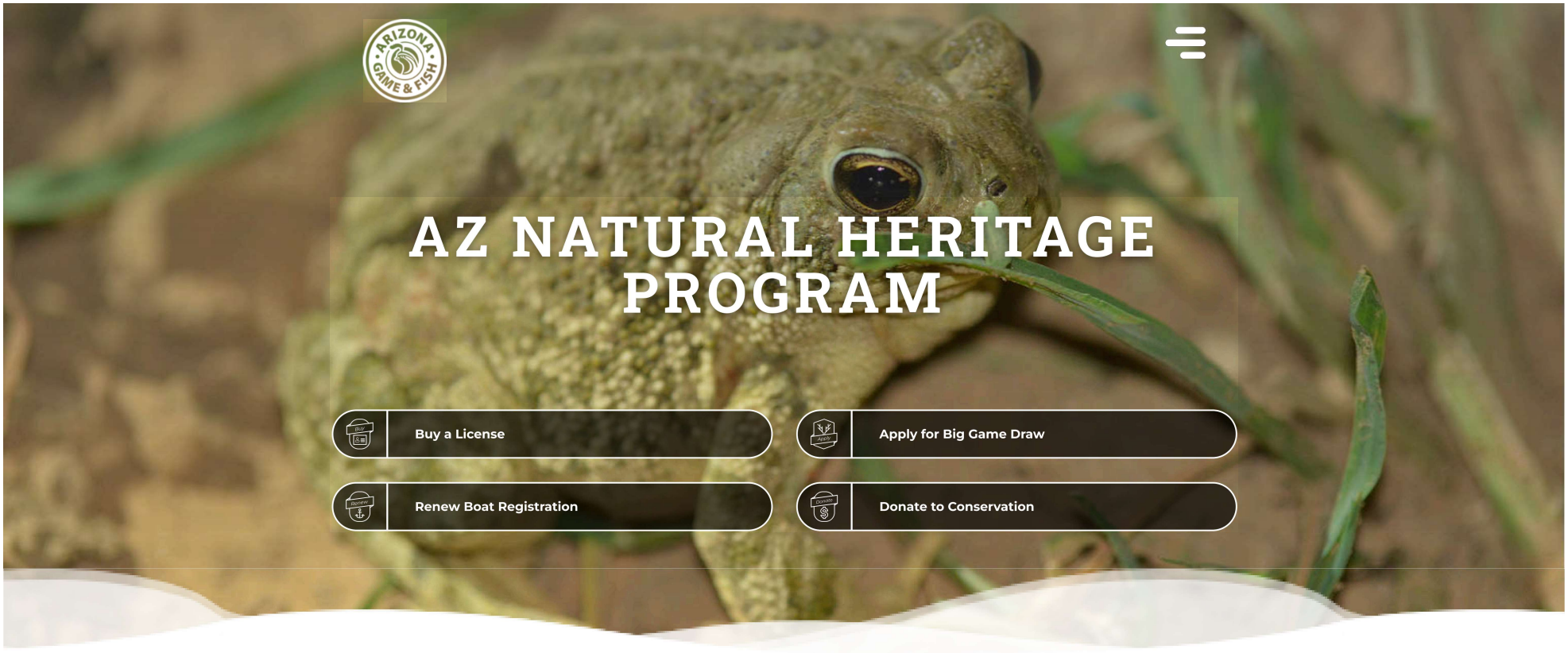

Data Systems within the Heritage Program

The Heritage Data Management System (HDMS) is part of a global network of more than 80 Natural Heritage Programs and Conservation Data Centers. HDMS information is available so Arizonans can make prudent decisions weighing future development, economic growth, and environmental integrity. Using published and unpublished reports, data collected by cooperating agencies, review of scientific collections, collaboration with professionals and many other sources of information, HDMS identifies wildlife, plants and geographic areas of special concern in Arizona, and consolidates information about their status and distribution within the State.

The Online Environmental Review Tool (ERT) provides a special status species list for Phase I Environmental Compliance and NEPA documents, and provides information and guideline links for incorporating wildlife conservation into project planning. This information can be used to guide preliminary decisions and assessments of proposed land and water development, management, and conservation projects.

HERITAGE DATA MANAGEMENT SYSTEM

Abstracts below provide information on taxonomy, identification and description, biology, distribution, population trends, management, photos and illustrations and references as available for each special status species.

Species lists, status definitions, ranking definitions

SPECIES ABSTRACTS

Distribution maps, photos and illustrations.

Amphibians
Invertebrates including mollusks
Birds
Mammals
Reptiles
Fish
Plants

HERITAGE FUND PROGRAM

For more than 20 years the Heritage Fund has made a difference not just to wildlife conservation efforts, but also to the state's economy, public access, environmental education and outdoor recreation.

PROGRAM DETAILS ›

ONLINE ENVIRONMENTAL REVIEW TOOL (ERT)

To obtain information on special status, environmental compliance and NEPA documents, submit your request through this tool, or contact the Project Evaluation Program.

GO TO ERT ›

PROJECT REVIEW REQUESTS

Contact Project Evaluation Program (PEP)

Data Submissions to HDMS

Submit data for inclusion to the HDMS, by filling out an Element Occurrence Card, and mailing to the address below, or submit your information through our iNaturalist application or website.

Online submission tool – contact hdms for log in credentials.
Data can be submitted for inclusion to HDMS by filling out an Element Occurrence Card and emailing HDMS@azgfd.gov or through our online application. Send requests for login credentials to HDMS@azgfd.gov.

Element Occurrence Card
Element Occurrence Card (Word format)

Data Requests from HDMS

HDMS Program Coordinator
623 236-7618
623 236-7366 Fax

Arizona Game & Fish Department
WMHB – HDMS Program
5000 W. Carefree Hwy
Phoenix, AZ 85086-5000

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Arizona Game and Fish Department Plant Species Abstracts and Maps

Common Name (*Scientific Name*)

Acuna cactus (*Echinomastus erectocentrus* var. *acunensis*)

Alamos deer vetch (Lotus alamosanus)

Alamos deer vetch (*Lotus alamosanus*) - map

Aravaipa sage, also known as Galiuro sage (*Salvia amissa*)

Aravaipa woodfern (*Thelypteris puberula* var. *sonorensis*)

Aravaipa woodfern (*Thelypteris puberula* var. *sonorensis*) - map

Arizona bugbane (*Actaea arizonica*)

Arizona bugbane (*Actaea arizonica*) - map

Arizona eryngo (*Eryngium sparganophyllum*)

Arizona hedgehog cactus (*Echinocereus arizonicus* ssp. *arizonicus*)

Arizona phlox (*Phlox amabilis*)

Arizona Sonoran rosewood (*Vauquelinia californica* ssp*. sonorensis*)

Arizona Sonoran rosewood (*Vauquelinia californica* ssp*. sonorensis*) - map

Bartram stonecrop (*Graptopetalum bartramii*)

Blumer's dock (*Rumex orthoneurus*)

Bristle-tipped aster (*Dieteria bigelovii* var. *mucronata*)

Bristle-tipped aster (*Dieteria bigelovii* var. *mucronata*) - map

Broadleaf lupine (*Lupinus latifolius* ssp. *leucanthus*)

Chihuahua breadroot, also known as scurfpea (*Pediomelum pentaphyllum*)

Chihuahuan sedge (*Carex chihuahuensis*)

Chiricahua Mountain alumroot, also known as Arizona alumroot (*Heuchera glomerulata*)

Cochise sedge, also known as Arizona giant sedge (*Carex ultra* ; also *Carex spissa* var. *ultra*)

Countess Dalhousie's spleenwort (*Asplenium dalhousiae*)

Davidson sage (*Salvia davidsonii*)

Eastwood alumroot (*Heuchera eastwoodiae*)

Fish Creek fleabane (*Erigeron piscaticus*)

Fish Creek fleabane (*Erigeron piscaticus*) - map

Fish Creek rockdaisy (*Perityle saxicola*)

Fish Creek rockdaisy (*Perityle saxicola*) - map

Flagstaff beardtongue (*Penstemon nudiflorus*)

Flagstaff beardtongue (Penstemon nudiflorus) - map

Flannel bush (*Fremontodendron californicum*)

Gentry's indigobush (*Dalea tentaculoides*)

Gentry's indigobush (*Dalea tentaculoides*) - map

Gila rockdaisy (*Perityle gilensis* var. *gilensis*)

Gila rockdaisy (*Perityle gilensis* var. *gilensis*) - map

Grand Canyon century plant (*Agave phillipsiana*)

Grand Canyon century plant (*Agave phillipsiana*) - map

Arizona Game and Fish Department Plant Species Abstracts and Maps

Hodgson's fleabane (*Erigeron hodgsoniae*)
Hohokam agave, also known as Murphey agave (*Agave murpheyi*)
Hohokam agave, also known as Murphey agave (*Agave murpheyi*) - map
Horseshoe deer vetch also known as Mearns' bird-foot trefoil (*Lotus mearnsii* var. *equisolensis*)
Huachuca golden aster (*Heterotheca rutteri*)
Huachuca golden aster (*Heterotheca rutteri*) - map
Huachuca Mountain milkvetch (*Astragalus hypoxylus*)
Huachuca Mountain milkvetch (*Astragalus hypoxylus*) - map
Huachuca water-umbel (*Lilaeopsis schaffneriana* var. *recurva*)
James' rubberweed (*Hymenoxys jamesii*)
Kearney's blue star (*Amsonia kearneyana*)
Kearney's blue star (*Amsonia kearneyana*) - map
Lace-leaf rockdaisy (*Perityle ambrosiifolia*)
Mapleleaf false snapdragon (*Mabrya acerifolia*)
Marsh rosemary also known as Trans-Pecos sea lavender (*Limonium limbatum*) - map
Metcalfe's tick-trefoil (*Desmodium metcalfei*)
Metcalfe's tick-trefoil (*Desmodium metcalfei*) - map
Mt. Dellenbaugh sandwort (*Eremogone aberrans*)
Nichol's Turk's head cactus (*Echinocactus horizonthalonius* var. *nicholii*)
Nichol's Turk's head cactus (*Echinocactus horizonthalonius* var. *nicholii*) - map
Parish's Indian mallow (*Abutilon parishii*)
Parish's Indian mallow (*Abutilon parishii*) - map
Peebles Navajo cactus (*Pediocactus peeblesianus* var. *peeblesianus*)
Peebles Navajo cactus (*Pediocactus peeblesianus* var. *peeblesianus*) - map
Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*)
Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*) - map
Pinaleno Mountain rubberweed (*Hymenoxys ambigens* var. *ambigens*)
Pinaleno Mountain rubberweed (*Hymenoxys ambigens* var. *ambigens*) - map
Pringle's fleabane (*Erigeron pringlei*)
Ripley wild buckwheat (*Eriogonum ripleyi*)
Ripley wild buckwheat (*Eriogonum ripleyi*) - map
Round dunebroom (*Errazurizia rotundata*)
Round dunebroom (*Errazurizia rotundata*) - map
Salt River rockdaisy (*Perityle gilensis* var. *salensis*)
Salt River rockdaisy (*Perityle gilensis* var. *salensis*) - map
San Pedro River wild buckwheat (*Eriogonum terrenatum*)
San Pedro River wild buckwheat (*Eriogonum terrenatum*) - map
Sierra Ancha fleabane, also known as Mogollon fleabane (*Erigeron anchana*)
Sierra Ancha fleabane, also known as Mogollon fleabane (*Erigeron anchana*) - map

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDCAC0J0E1
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Echinomastus erectocentrus* var. *acuñensis* (W.T. Marshall) Bravo
COMMON NAME: Acuña cactus, redspine fishhook cactus, red pineapple cactus
SYNONYMS: *Echinomastus acuñensis* W.T. Marshall, *Neolloydia erectocentra* var. *acuñensis* (W.T. Marshall) L. Benson, *Sclerocactus erectocentrus* var. *acuñensis* (Coulter) Taylor
FAMILY: Cactaceae

AUTHOR, PLACE OF PUBLICATION: *Echinomastus erectocentrus* var. *acuñensis* (W.T. Marshall) Bravo, Cactaceas y suculentas mexicanas 25(3): 65. 1980. *Echinomastus acunensis* W.T. Marshall, Saguaroland Bulletin. 7: 33. 1953.

TYPE LOCALITY: Organ Pipe Cactus National Monument, Pima County, Arizona.

TYPE SPECIMEN: Lectotype: DES. William Supernaugh, 02 Jan 1951.

TAXONOMIC UNIQUENESS: The HDMS follows USFWS publication use of the taxonomy *Echinomastus erectocentrus* var. *acunensis*. According to NatureServe (2004), "The USFWS uses the name *Echinomastus erectocentrus* var. *acunensis* in publications regarding this taxon's status under the U.S. Endangered Species Act. Kartesz (1999) does not recognize this variety, but it may be because the combination in *Sclerocactus erectocentrus* has not been made (it is not in the Gray Card Index, internet version, June 28, 2001).

Summary of bibliographic citation and taxon history: W.T. Marshall partially described the species in his first edition of Arizona's Cactuses (1950). Marshall validly published the species in 1953 as *Echinomastus acunensis*. Lyman Benson (1969) placed the species in the genus *Neolloydia*, making it a variety of *Neolloydia erectocentra*. Hubert Earle (1980) raised the variety to a specific level, incorrectly assigning L. Benson (1969) as the authority. H. Bravo (1980) transferred the taxon back to *Echinomastus* and left it as a variety *of E. erectocentrus*. The consensus of the International Organization of Succulents (1990) is to place all of Lyman Benson's (1982) *Neolloydia* taxa into the genus *Sclerocactus* except for *N. conoidea.*"

DESCRIPTION: Cactus with solitary stems, ovoid, gray-green in color, 4.0-16.5(-27.0) x 4.0-9.0 cm (1.6-6.5(-10.6) x 1.6-3.5 in); ribs 21; areoles 15-19mm apart along ribs. Spines are distinctive, obscuring the surface of the stem; 13-16 per areole, purplish pink or nearly white with brown tips. Radial spines (11-)12-15 per areole; abaxil (shortest) radial spine 11-20 x 0.42-0.59 mm; adaxial and lateral (longest) radial spines 22-37 mm. Central spines ascending, (1-)2-3(-4) per areole, 19-44 x 0.6-0.8 mm, longest adaxial central spine curved

toward apex of plat, or sometimes slightly so; the abaxial or only central spine 25-35 mm. (eFloras, 2011). "Upper central spines ascending and converging, giving the appearance of a "red-headed crew cut" (A. Phillips, B. Phillips and N. Brian 1982). Flowers 3.6-6.0 x 4.0-9.0 cm (1.4-2.4 x 1.6-3.5 in); inner tepals pale to bright rose-pink, proximally blotched orangish brown, chestnut, maroon, or greenish brown (petaloid perianth parts coral pink to mallow per Benson (1982), or pink to purple per Rutman (1994)). Stigma lobes red to brownish red, papillae red to green. Fruits are pale green, drying to tan with several membranous scales, 1.25 cm (0.5 in.) long; opening along a dorsal slit. Black seeds are rigose.

AIDS TO IDENTIFICATION: Single plump stem and straight central spines. *Mammillaria microcarpa* has more than one stem, and hooked central spines. *Echinocereus* spp. flowers are produced on old growth, below the apex, and usually have several stems and lighter colored spines. (A. Phillips, B. Phillips and N. Brian, 1982).

ILLUSTRATIONS:

B&W photo showing tubercles and spines (Benson 1982: 795)
Herbarium photo (*In* http://ridgwaydb.mobot.org/cpcweb/CPC_ViewProfile.asp?CPCNum=13150)
Color photo and line drawing (Falk, Jenkins et al. 2001)
Color photo (Felger 2000)

TOTAL RANGE: Historically found in southern Arizona, and northern Mexico (Sonora) on the Pinacate Biosphere Reserve. Currently found in Arizona in western Pima, Maricopa, and Pinal counties. (USFWS, 2011).

RANGE WITHIN ARIZONA: Western Pima, Maricopa, and Pinal counties. Includes Organ Pipe Cactus National Monument, Ajo, and Coffee Pot Mountain. Potential habitats exist in Sand Tank Mountains of the Barry M. Goldwater Air Force Range and the Tohono O'odham tribal lands.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Succulent perennial.

PHENOLOGY: Flowering occurs early March to mid-April; flowering correlated with plant size, and flower production is positively associated with winter rainfall. Fruiting April to May.

BIOLOGY: The taxon is self-incompatible, thus requiring insect vectors for pollination. The primary pollinators are polylectic bee species, especially *Megachile palmensis* and *Diadasia rinconis*, which are believed to have a maximum travel distance of 900m (2,950 feet). Like most cacti, the acuña cacti are susceptible to attacks from insects. Four native insects have been documented to impact the acuña, with the cactus longhorn beetle or the opuntia borer (*Moneilema gigas*) and the cactus weevil (*Gerstaeckeria spp*) being the most responsible for

the observed population decline. Seed predation by the pyralith moth larvae (*Yosemitia graciella*) and unknown ant species also occurs. While no specific diseases have been documented as detrimental to the cactus, the plants are exceptionally susceptible to bacterial rot after minor stem damage. A variety of small mammals can severely damage or kill both mature and young cacti during times of drought (USFWS 2012).

HABITAT: Patchy populations on open, rounded small hills, benches and flats (Holm 1997-2005). Low gravelly hills, bajadas and rocky hilltops (eFloras 2011). Restricted range occurring on well-drained knolls and gravel ridges between major washes (A. Phillips, B. Phillips and N. Brian 1982).

ELEVATION: 1,200 – 3,375 feet (365 – 1150 m), Phillips et al 1982.

EXPOSURE: Open, but up to 30% slope.

SUBSTRATE: The species is associated with various bedrock types including granite or granodiorate materials, with course to fine texture. Benson (1982) reported limestone hills and flats, and Rutman (1994) andesite (bright red to white).

PLANT COMMUNITY: Arizona Upland Subdivision of Sonoran desert scrub (Palo-Verde/ Sahuaro Association). Dominant associated species include: *Ambrosia deltoidea* (Triangleleaf bursage), *Cercidium microphyllum* (Foothill paloverde), *Encelia farinosa* (White brittlebush), *Ephedra* spp. (Mormon tea), *Fouquieria splendens* (Ocotillo), *Larrea tridentata* (Creosotebush), *Olneya tesota* (Ironwood), and *Opuntia acanthocarpa* (Buckhorn cholla). (A. Phillips, B. Phillips and N. Brian 1982). The acuña cactus is often found growing under the protective canopy of these and other species.

POPULATION TRENDS: The number of dead individuals documented within acuña cactus populations has increased greatly since monitoring began in the 1970s. Current population estimates are as follows:

- USNPS lands (Organ Pipe Cactus National Monument): 2000 plants, or 58.9% of known individuals. This population was estimated at 10,000 in 1981.
- Sonora, Mexico: 659 plants, or 19.4% of total known population. 942 dead plants were also noted during a 2009-2010 survey.
- Private lands: 48 plants, or 1.4% of total population (37 near Ajo, 11 near Florence).
- State Trust lands: 32 plants, or 0.9% of population.
- Military lands (BMGR): a single plant. (USFWS 2012).

Population numbers are down due to destruction of habitat through development which results in fragmentation and isolation of populations; past mining operations; illegal collection; and perhaps drought induced mortality. (USFWS 2011).

Kelvin Highway population was down, probably due to poaching. According to NatureServe (2004), Data collected through 1981 at Organ Pipe Cactus National Monument strongly

suggested a total population decrease since 1977 (Buskirk 1981). Since 1988, the Organ Pipe population has been declining and the number of juveniles reaching reproductive age is decreasing. In 1997, a large number of flowering individuals were uprooted by small mammals and the cactus skeletons remained (S. Rutman, pers. comm. 1998). Of all the populations, the Organ Pipe population appears the healthiest (Rutman 1988).

A 1987 trip report (Rutman 1988) from Coffee Pot Mountain indicated an unusually high mortality. This population was monitored for several years but the data has not been processed. The Sonoita (Mexico) population is reported as being extensive and healthy (Richard Felger, pers. comm.. 1998).

Johnson (1993) reported a pattern suggesting that small individuals are more susceptible to abiotic sources of mortality due to their limited water storage capacity, and because larger individuals are mostly affected by biotic factors like predation.

Past mining activities in the Ajo area have removed a significant portion of the population and the remaining plant populations have been fragmented (Falk 2002).

Mortality of more than 80% of individuals has been documented within populations that have been surveyed more than once. This loss has also occurred on protected lands with ongoing management efforts for acuña cactus (USFWS 2012).

SPECIES PROTECTION AND PRESERVATION

ENDANGERED SPECIES ACT STATUS: LE (USDI, FWS 2013)
[PE with CH, USDI, FWS 2012]
[C USDI, FWS 1996]
[C USDI, FWS 2002, 2004-2011]
[C USDI, FWS 1997, 1999]
[C1 USDI, FWS 1985, 1990, 1993]
[LT USDI, FWS 1975]

STATE LIST STATUS: Highly Safeguarded (ARS, ANPL 1999, 2008)

OTHER STATUS: Determined Endangered (Norma Oficial Mexicana PROY-NOM-059-ECOL-2000)

MANAGEMENT FACTORS: Threats include the destruction of habitat through development which results in fragmentation and isolation of populations; mining operations; illegal collection; border related impacts; and perhaps drought induced mortality. (USFWS 2011). NatureServe (2004) reported illegal collection and trampling as a primary threat to this cactus variety, with other threats include mining, land development, road maintenance and development, recreation, grazing, small mammal predation, and seed predation. USFWS 2012 notes that 78% of the known living acuña cacti occur within 16.5 km (10.25 mi) of the

border in either OPCNM or Sonoita, Mexico. This means that illegal activity (drug and human smuggling) as well as efforts to prevent this activity can have an impact on the species. It was also noted that non-native invasive species do not appear to pose a threat. Insects and various rodents have a negative impact, the latter especially during periods of drought. It appears that the combination of drought stress and insect attack have seriously reduced adult plant numbers, and that warmer winters may be increasing the insect attacks.

In 2012, the USFWS proposed the endangered status for the acuña cactus because they found the species to be in danger of extinction throughout its entire range due to current and ongoing modification and destruction of habitat and range from long term drought, effects of climate change, and ongoing and future border activities. Insect predation was also determined to be a serious impact, and all these threats are exacerbated at local scales by off-road excursions by cross-border violators and those charged with LE response. While there were some mechanisms in place that afford some protection, there are no regulations to address insect predation, drought and the effects of climate change. Mortality of more than 80% of individuals has been documented within populations that have been surveyed more than once. This loss has also occurred on protected lands with ongoing management efforts for acuña cactus.

CONSERVATION MEASURES TAKEN: The populations within Organ Pipe Cactus National Monument and the Sonoran Desert National Monument are protected. The taxon is also offered protection under the Arizona Native Plant Law and is listed as endangered in Mexico. As of October 2012 (USDI, USFWS) the *E. e. acunensis* was given proposed Endangered status with critical habitat, which includes a total of 21,740 ha (53,720 acres) divided into six separate units on federal (55%), State (26%), Tribal (10%) and private (8%) lands. As of October 31, 2013, the acuña cactus was listed as an endangered species.

SUGGESTED PROJECTS: All known populations should be monitored. Further research needed, focusing on reproduction, demography, and limitations on the geographic distribution of all known populations. Additional information on the effect of seed predation by the pyralid moth larvae and the opuntia borer (*Moneilema gigas*) should be gathered. More detailed soil analysis and geographical material preference should be examined. Genetic analysis of the known populations should be conducted to determine validity of variety. Efforts are needed to locate additional populations, especially on habitats existing in the Sand Tank Mountains and on the Tohono O'odham tribal lands.

Per Holm (1997-2005) for the OPCNM population: 1) Relate existing acuña data to climate data to determine relationships; analyze archived Buskirk data from 1982-1986; determine if the fluctuations in the acuña data are similar to the normal fluctuations one would see in other cacti populations. 2) Revise the acuña cactus monitoring protocol to better address factors relating to reproduction and mortality. 3) Systematically survey and map occupied habitat and compare with Buskirk and Ruffner associate maps to detect and significant expansion or contraction of distribution and range. 4) Conduct studies of predators such as cricetine rodents, *Moneilema gigas*, and *Yosemitia graciella* to better understand their relationships to acuña cactus. Determine if other species are impacting the cactus. 5) Experiment with methods to protect acuña cactus from predators such as exclosures around cacti. 6) Determine

genetic and environmental sources of variation in fruit set and low seed set. 7) Continue to discourage visitor access to population by maintaining the road as narrow and rough trail, without obvious pullouts. 8) Employ law enforcement strategies that discourage undocumented alien traffic and off-road vehicle activity in acuña cactus habitat.

LAND MANAGEMENT/OWNERSHIP BLM - Phoenix and Tucson Field Offices; NPS - Organ Pipe Cactus National Monument and Sonoran Desert National Monument; State Land Department; Private.

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Cactus) and Pediocactus peeblesianus var. fickeiseniae (Fickeisen Plains cactus) Throughout their Ranges; Final Rule. Federal Register 78(190): 60608-60652.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

Mima Falk – U.S. Fish and Wildlife Service, Tucson, Arizona.
Sue Rutman – Organ Pipe Cactus National Monument, Ajo, Arizona.
Peter Holm – Organ Pipe Cactus National Monument, Ajo, Arizona.

ADDITIONAL INFORMATION:

Peters: Population study since 1977 on two populations in Organ Pipe Cactus National Monument, a population on the top of Childs Mt., west northwest of Ajo. However, this habitat is wrong according to Sue Rutman. Frank Reichenbacher said it could be *E. johnsonii* which grows on black limestone.

Notes from Diversity Review, 1989, by SST. Decline of OPCNM population in past 10 years. Also, "Childs Mt. misleading (Black Mt.)" population now stable (BLM Safford District, Rare Plant Workshop 1994).

Phillips, 1982: Recommended for Federal Threatened listing

Frank Reichenbacher (Bureau of Land Management, Safford District, Rare Plant Workshop) stated that the spines get darker and longer as you go west. The Sonoran, Organ Pipe and Ajo populations are similar. The Florence population is intermediate between *E.e. erectocentrus* and *E.e. acuñensis*, having fewer central spines and occurring on granite soil.

Distribution and range on Safford District is not known. Information on poaching activity is needed.

Revised: 1989-12-27 (SST)
1994-11-28 (DBI)
1997-11-12 (SMS)
1999-12-20 (DJG)
2004-07-30 (AMS)
2004-08-19 (SMS)
2011-11-01 (SMS)
2013-10-17 (BDT)

abstract). X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code: PDFAB2A020**
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Lotus alamosanus* (Rose) Gentry
COMMON NAME: Alamos Deer Vetch, Sonoran Birdsfoot Trefoil
SYNONYMS: *Hosackia alamosana* Rose
FAMILY: Fabaceae (Leguminosae)

AUTHOR, PLACE OF PUBLICATION: Gentry, Howard Scott. 1942. Publ. Carnegie Inst. Wash. 527:135. (*Hosackia alamosana:* Rose. 1891. Contr. U.S. Natl. Herb. 1(4):96).

TYPE LOCALITY: Sierra de los Alamos, Mexico.

TYPE SPECIMEN: *Hosackia alamosana:* NYBG #15488. E. Palmer #400. 1890.

TAXONOMIC UNIQUENESS: The genus *Lotus* contains approximately 100 species (Barneby 1989), and is divided into five major groups. Thirteen species of *Lotus* were recognized by Lehr (1978) as occurring in Arizona. NatureServe (2019) lists 45 species in the U.S. and Canada, with an additional 39 varieties. Fourteen of these species occur in Arizona. *Lotus alamosanus* occurs in only in Arizona and Mexico, while *L. mearnsii* is endemic to the State.

DESCRIPTION: Perennial herb, procumbent, forming mats or clumps. Stems slender and numerous, somewhat sprawling, to a foot high. Leaves divided into 3-5 obovate (egg-shaped, widest at the tip) leaflets, these 6-8 mm long. The banner (upper petal) is white, fading to pink. Flowers yellow and red; corolla yellow and white. Pods small, 1-1.5 mm wide. Stems sometimes root at the nodes.

AIDS TO IDENTIFICATION: Similar to *Simpeteria,* except the stipules are reduced to glands in *Simpeteria,* whereas in *Lotus,* the stipules are membranous (Isely 1981). Differs from *Lotus oblingifolius,* in that *L. oblongifolius* has 7-11 leaflets, 1-3 cm long and pods about 2 mm wide (Kearney et al 1960). *Lotus alamosanus* differs from *Hosackia repens* and *Hosackia angustifolia* in that *H. repens* and *H. angustifolia* have fewer leaflets, the flowers and bracts are smaller in *H. angustifolia,* and the heads are fewer flowered and the calyx glabrous in *H. repens* (Rose 1891).

ILLUSTRATIONS:
Herbarium Mounts: http://swbiodiversity.org/seinet/taxa/index.php?tid=1653.

TOTAL RANGE: Southern Arizona, and Sonora, Chihuahua south to Durango and Sinaloa, Mexico. The southern extent is near Mazatlan. The Arizona occurrences are the northern-most extent of the range.

RANGE WITHIN ARIZONA: Extreme southern Santa Cruz County: Sycamore and Pena Blanca Canyons in the Pajarito Mountains, and one collection in the Patagonia Mountains.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Herbaceous perennial.

PHENOLOGY: April and May. In Sonora February to June.

BIOLOGY: Semi-aquatic, forming carpets along streams of canyons or meadows, oak woodlands; said to be locally abundant (Isley, 1981).

HABITAT: Restricted to stream banks in canyons. Wetland obligate.

ELEVATION: 3,500 - 5,580 feet (1068 - 1700 meters), based on Arizona occurrence records.

EXPOSURE: Open and in partial shade.

SUBSTRATE: Mud, damp to wet soil or sand; in springs, seeps, or streams.

PLANT COMMUNITY: Oak woodland in Sycamore Canyon; Pine-oak forest in Sierra Madre Occidental in eastern Sonora.

In Arizona, species associated with *Lotus alamosanus* include *Mimulus guttatus, Salix gooddingii, Salix bonplandiana, Populus fremontii, Juncus, Polypogon monspeliensis, Eleocharis, Vitis arizonica, Toxicodendron radicans, Scutellaria potosina, Amsonia grandiflora, Juglans major, Fraxinus velutina, Asclepias angustifolia, Aquilegia chrysantha, Baccharis salicifolia, Veronica anagallis-aquatica, Quercus emoryi, Quercus arizonicus,* and *Platanus wrightii* (NatureServe 2019, from SEINet records).

POPULATION TRENDS: Unknown. There are only three known occurrences in Arizona, defining the northern-most extent of the species' range. *L. almosanus* is much more widely distributed in Mexico. One of the sites in Arizona, Sycamore Canyon, has been collected multiple times between 1938 and 2015. Some of the collections note the plant as common or even abundant. Although actual population estimates are not available, the species has persisted in the canyon for over 75 years. The other two sites are known from single collections in 1935 and 2014. NatureServe (2019) notes that about 10% of the total

collections report the species to be common or abundant, but trends cannot be ascertained due to lack of monitoring data.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None.
STATE STATUS: None.
OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 2013)
[Forest Service Sensitive USDA, FS Region 3 1999]

MANAGEMENT FACTORS: Overgrazing can be a threat. Extreme weather events (resulting in either severe flooding or droughts) can also be a threat (NatureServe 2019).

PROTECTIVE MEASURES TAKEN: None, other than the listing as a Sensitive species by the Forest Service.

SUGGESTED PROJECTS: The two sites (Pena Blanca Canyon and the Patagonia Mountains) that have only been collected once should be re-visited to determine if the plant is still extant. If possible other riparian canyons and springs sites in the general locality should also be searched. Additional occurrences could improve the ranking status of *L. alamosanus* is the United States. It would also be beneficial to devise some type of monitoring program for the species in Sycamore Canyon (perhaps something as simple as matched photo plots taken every five years). This would help define the trend of *L. alamosanus* within Arizona.

LAND MANAGEMENT/OWNERSHIP: USDA Forest Service - Coronado National Forest.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

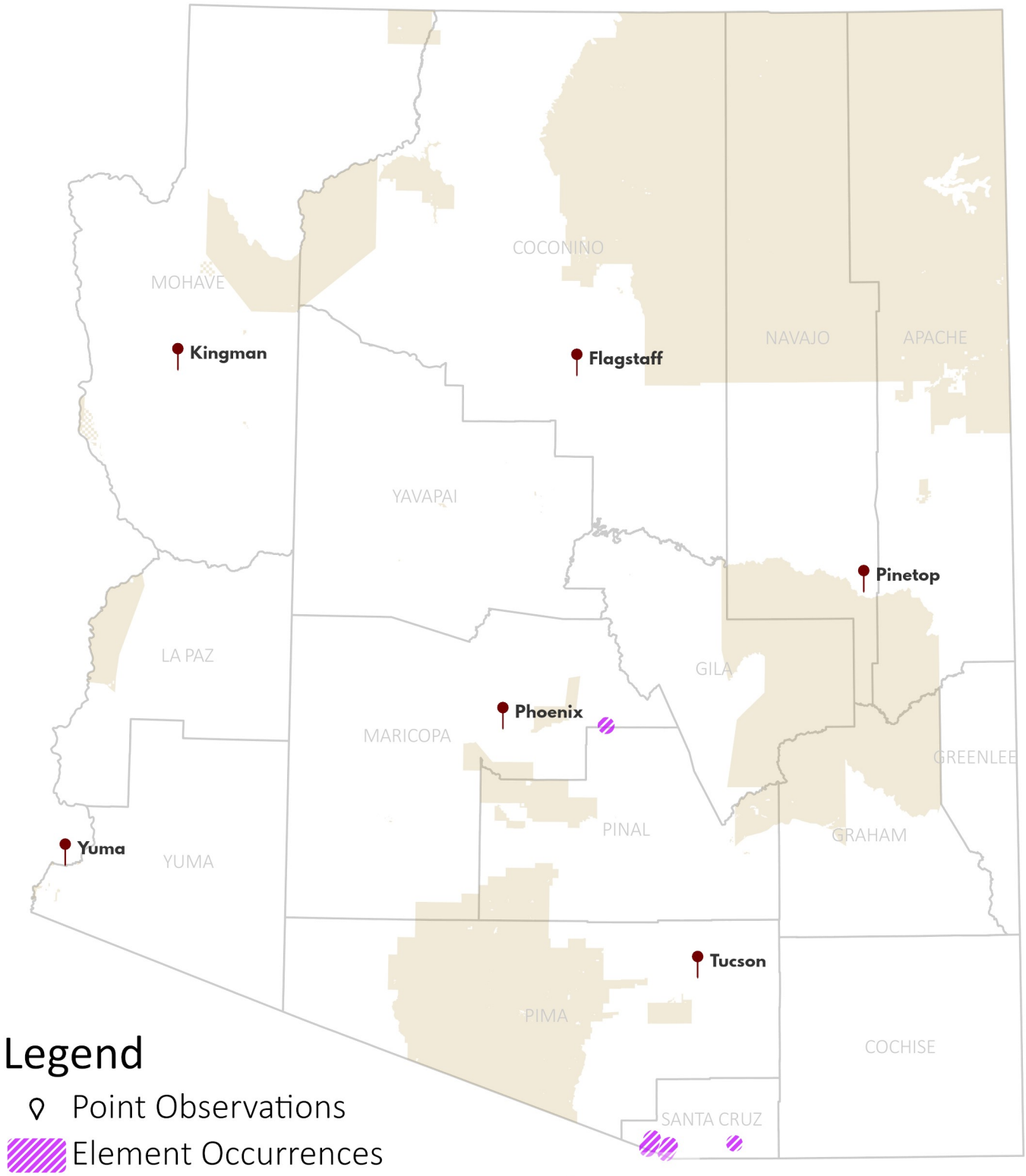
Isely (1981) presumes that "*Lotus alamosanus* is related to the Mexican *L. chihuahuanus* (Wats.) Greene".

If Lotus subgenus Hosackia is recognized as a separate genus, the name *Hosackia alamosana* Rose is applied to the plants here called *Lotus alamosanus* (Rose) Gentry (Brouillet 2008).

Revised: 1999-11-17 (JCP)
2019-10-11 (BDT)

Lotus alamosanus

Sonoran Bird's-foot Trefoil



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

Kilometers

0 50 100

ARIZONA GAME & FISH

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences.

Heritage Data Management System
2019-06-13

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDLAM1S020
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Salvia amissa* Epling.
COMMON NAME: Aravaipa Sage; Galiuro Sage
SYNONYMS: *Salvia albiflora* var. *pringlei*
FAMILY: Labiatae

AUTHOR, PLACE OF PUBLICATION: Epling. 1939. Rep. Spec. Nov. Beih. 110:187.

TYPE LOCALITY: Arizona: Santa Catalina Mountains.

TYPE SPECIMEN: Pringle. 1881.

TAXONOMIC UNIQUENESS: One of 15 members of the genus in Arizona (Kearney and Peebles 1960).

DESCRIPTION: A perennial herb to 1.0 m (3.3 ft) tall; leaves canescent (heavily haired on both sides of leaf) giving grayish appearance, simple, opposite, deltoid-ovate, with toothed margins; flowers 3 or more per verticel (whorl); pale lavender to purple, corolla tube 6.0-7.0 mm (0.24-0.28 in.) long, surpassing the calyx (Malusa et al. 1993). Square stem.

AIDS TO IDENTIFICATION: "Flowers have an unusual tooth on the stamen connective" (Malusa et al. 1993). To observe this, need dissecting microscope. Leaf shape, hairs, elevation, and pale flowers exerted beyond calyx, distinguishes Salvia amissa from other *Salvias* in the area. For example, *S. incisa* has oblong leaves, and *S. arizonica* which occurs at higher elevations has glabrous, not canescent leaves. *S. amissa* could be confused with *S. subincene* which has no hairs.

ILLUSTRATIONS:

TOTAL RANGE: South-central Arizona.

RANGE WITHIN ARIZONA: Galiuro Mountains: Aravaipa, Bass, Double R, Keilberg, Oak Grove, Rattlesnake, Redfield, Sycamore and Turkey Creek canyons; Superstition Mountains: Fish Creek. Historically in the Santa Catalina Mountains.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Herbaceous perennial.

PHENOLOGY: Flowering July to October (Malusa et al. 1993; D. Gori, pers obs); fruits August to November. Kearney and Peebles 1960, report it flowering as early as May, but apparently no evidence or observations exist to support this early date.

BIOLOGY: Unknown

HABITAT: Upper floodplain terraces in shady canyon bottoms near streams in understory of mature sycamore, ash, walnut and mesquite (Gori 1999). "Alluvial benches in understory of sycamore walnut and cottonwood, not far from permanent water" Malusa et al. 1993. Distribution puzzling according to Warren; habitat looks good but plant not found. "Intermittent stream with good overstory and steep canyon walls. Spread across flood plain mid-level and higher terraces and pediment of canyon walls" (Gori 1994).

ELEVATION: 1,500 - 5,000 ft. (458 - 1,525 m). Based on records in the Heritage Data Management System (HDMS), elevation ranges from 3,120-5,000 ft (952-1525 m) (AGFD, unpublished data accessed 2002).

EXPOSURE: Shady canyons.

SUBSTRATE: Alluvium; floodplain. Gravel, sand and silt substrates.

PLANT COMMUNITY: Oak woodland; deciduous riparian woodland. Found where sycamore, ashes and willows grow. Gori (1999) reports that it is found "in understory of mature sycamore, ash, walnut and mesquite."

POPULATION TRENDS: Unknown; locally abundant in Turkey Creek at east end of Aravaipa Creek. More abundant than thought. About 4,000 plants in Bass Canyon; 3,000 in Aravaipa.

Surveys in Santa Catalina Mountains in 1992 failed to locate plants although the historic (type) locality is recorded only as Santa Catalina Mountains; also unknown whether species still occurs in Superstition Mountains (Gori 1999).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None (USDI, FWS 1996)
[C2 USDI, FWS 1993]

STATE STATUS: None

OTHER STATUS:

Forest Service Sensitive (USDA, FS Region 3 2007)
[Forest Service Sensitive (USDA, FS Region 3 1999)]
Bureau of Land Management Sensitive (USDI, BLM AZ 2000, 2005, 2008, 2010)

MANAGEMENT FACTORS: Riparian canyon bottom habitat is potentially vulnerable to numerous impacts: grazing, camping, off-road vehicles, etc. Threats are: heavy cattle grazing (light grazing acceptable); possibly recreation/hiking; also poor watershed conditions. Accept intermediate amount of disturbance. Needs some light but also fair amount of shade.

PROTECTIVE MEASURES:

SUGGESTED PROJECTS: Survey for possible populations. Abundant where found but restricted to the Galiuros and Superstition mountains. Monitor known populations to determine trends and potential impacts.

LAND MANAGEMENT/OWNERSHIP: BLM - Safford Field Office; USFS - Coronado and Tonto National Forests; State Land Department; TNC - Aravaipa Canyon and Muleshoe Ranch Preserves.

SOURCES OF FURTHER INFORMATION

REFERENCES:

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Warren, P.L. 1994. Bureau of Land Management, Safford District, Rare Plant Workshop. November 14-16. Tucson, Arizona.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

Dave Gori - The Nature Conservancy, Tucson, Arizona.
Jim Malusa - The Nature Conservancy, Tucson, Arizona.

ADDITIONAL INFORMATION:

Type locality, Catalina Mountains, never relocated.

According to Malusa et al. (1993), "... the range of variation in *S. amissa* is greater than previously believed with corolla color ranging to include purple; plants often up to a meter in height; and the density of flowers (verticels) varying greatly from plant to plant within a single population."

"The Sycamore Canyon population is an anomaly, growing at 5000 feet on a slope well above the canyon bottom" Malusa et al. (1993).

Revised: 1991-11-06 (PLW)
1994-10-14 (PLW)
1994-12-19 (DBI)
1997-10-24 (SMS)
2002-01-07 (SMS)

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PPTHE05192
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Thelypteris puberula* (Baker) Morton var. *sonorensis* A. Reid Smith
COMMON NAME: Aravaipa wood fern, Sonoran maiden fern, Sonoran maidenfern
SYNONYMS: *Cyclosorus puberula*, *Dryopteris feei* C. Chr., *Lastrea augescens* (Link) J. Smith misapplied, *Thelypteris augescens* var. *puberula*
FAMILY: Thelypteridaceae

AUTHOR, PLACE OF PUBLICATION: A.R. Smith, University of California Publication in Botany. 59: 91-92. 1971.

TYPE LOCALITY: Aravaipa Canyon, Galiuro Mountains, Pinal County, Arizona.

TYPE SPECIMEN: HT: US-1915953. W.S. Phillips 2877 and H.G. Reynolds, 10 April 1946. IT: MO, NY, UC, and US.

TAXONOMIC UNIQUENESS: Formerly in the family Polypodiaceae. Variety *sonorensis* is 1 of 2 varieties in the species *puberula*, and the only one in North America; variety *puberula* is found from Mexico to Costa Rica. The species puberula is 1 of 62 in the genus *Thelypteris*.

DESCRIPTION: Large perennial rhizomatous fern, with leaves finely dissected, generally 50-130 cm (20-51 in) long and 15-30 (51) cm (6-12 (20) in.) wide, and regularly spaced. Rhizomes are thick (3-8 mm in diameter), long-creeping, scaly prostrate or underground roots, which produce shoots. Petiole scales are lanceolate, 2-4 mm long, mostly dark reddish-brown, not persistent, and sparsely pilosulous along the margin. Fronds are light green, papery to leathery. The pinnae are pinnatifid, ascending or sometimes largest ones spreading, straight, lobes ascending, sparsely and evenly pilosulous throughout, especially on abaxial side. Sori are circular, within conspicuous, small, pilose, kidney-shaped indusia; indusia are tan to brownish. Stipes 20-30 cm (8-12 in.) long, glabrous, straw colored above with pale brown base.

AIDS TO IDENTIFICATION: Variety *sonorensis* can usually be recognized by the presence of hairs on the lamina above.

ILLUSTRATIONS:
Line drawing (Mickel 1979: p. 205)
Line drawing of abaxial surface of pinna (Smith 1971: Fig. 125e)
Line drawing (Hickman 1993: p. 113)

Color photos of Isotype collections (Phillips 2877, *in* http://mobot.mobot.org/cgi-bin/search_vast)
Color photo of Isotype collection (Phillips 2877, *in* NYBG Virtual Herbaiurm)

TOTAL RANGE: Arizona, southwestern California to western Mexico.

RANGE WITHIN ARIZONA: Coconino, Maricopa, Pima, Pinal and Yavapai counties.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Pteridophyte. Perennial fern.

PHENOLOGY: Emergent after summer rains, growing into winter.

BIOLOGY:

HABITAT: In moist soil in the shade of boulders in mesic canyons. On riverbanks, seepage areas, and meadow habitats.

ELEVATION: 2,220 - 4,500 feet (677 - 1373 m); 164-1800 feet (50-550 m) in California.

EXPOSURE: Various, but always in shade of boulders.

SUBSTRATE: Granite.

PLANT COMMUNITY: Primarily riparian.

POPULATION TRENDS: Unknown. Known to cultivate in moist garden soil or potting mix in partial sun (Lellinger 1985).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: None
OTHER STATUS: Bureau of Land Management Sensitive (USDI, BLM AZ 2000, 2005, 2008, 2010)
Forest Service Sensitive (USDA, FS Region 3 2007)

MANAGEMENT FACTORS: Easily disturbed. May be affected by grazing animals and collection.

CONSERVATION MEASURES TAKEN: BLM proposed areas of critical environmental concern in 1982.

SUGGESTED PROJECTS: Surveys and research are needed on population range and habitat requirements.

LAND MANAGEMENT/OWNERSHIP: BLM - Safford Field Office; NPS - Grand Canyon National Park; USFS - Coronado and Tonto National Forests; Arizona State Land Department; Private.

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USDI, Bureau of Land Management Region 2. 2010. Arizona BLM Sensitive Species List.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

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Michael Windham - Northern Arizona University, Flagstaff, Arizona.
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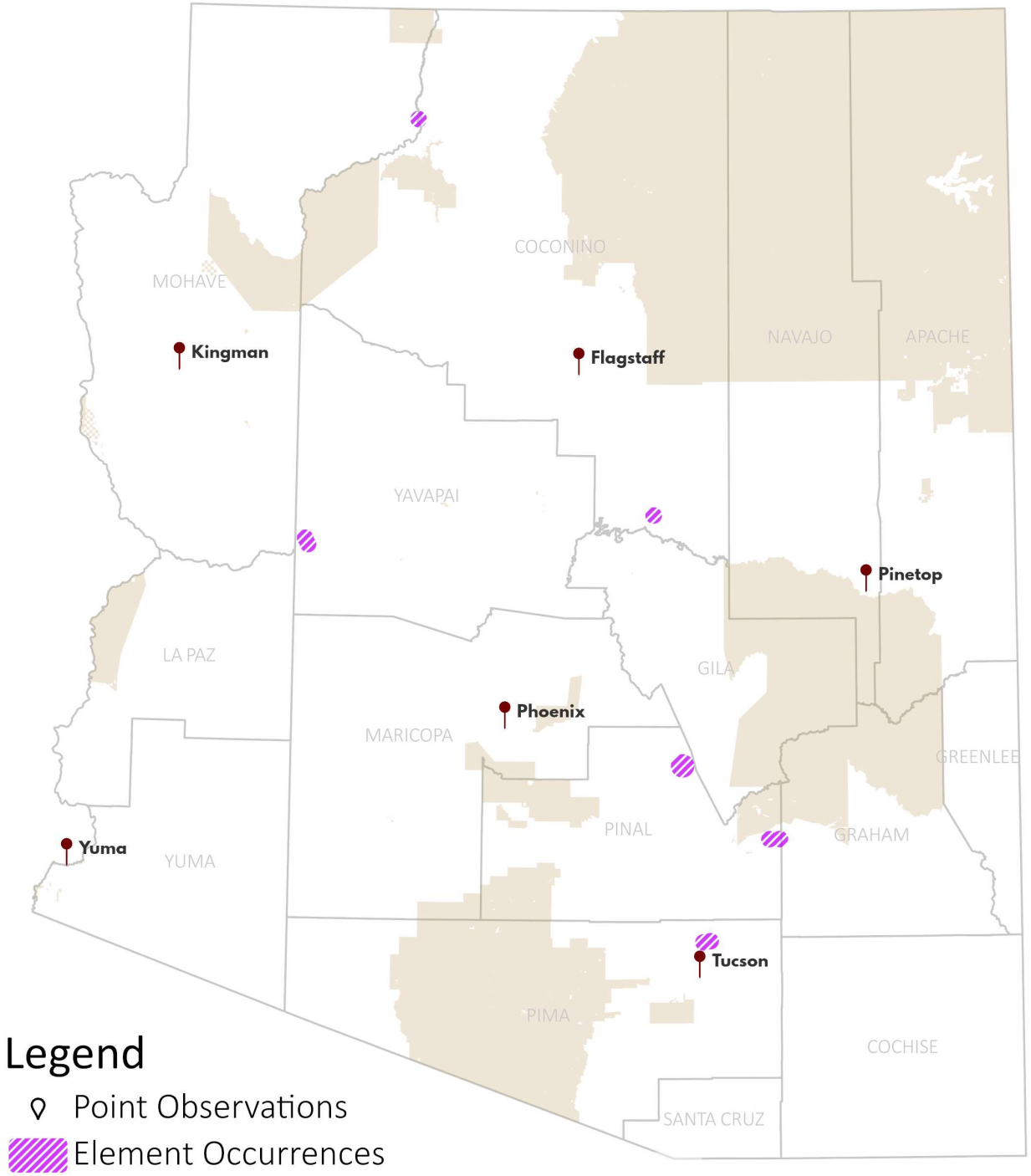
ADDITIONAL INFORMATION:

Thelypteris means female fern, from *thely* meaning female or maiden and *pteris* meaning fern, *puberula* means minutely pubescent with scarcely elongate hairs, and *sonorensis* means of or from Sonora (Brian, 2000).

Revised: 1992-12-09 (JSP)
1994-12-27 (DBI)
2004-03-04 (SMS)

Thelypteris puberula var. sonorensis

Aravaipa Woodfern



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

0 50 100 Kilometers

ARIZONA GAME & FISH

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences.

Heritage Data Management System
2019-06-13

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDRAN07020
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Actaea arizonica*
COMMON NAME: Arizona Bugbane
SYNONYMS: *Cimicifuga arizonica* S. Watson
FAMILY: Ranunculaceae

AUTHOR, PLACE OF PUBLICATION: Watson, S. 1885. Proceedings of the American Academy 20:352-353.

TYPE LOCALITY: Bill Williams Mountain, Coconino County, Arizona. Lemmon, J.G. 1884.

TYPE SPECIMEN: Isotype: ARIZ 11737. Lemmon, J.G. 1884.

TAXONOMIC UNIQUENESS: *Actaea arizonica* is closely related to *A. elata*, which grows in Oregon, Washington, and British Columbia (Compton 1994). In 1998, the genus *Actaea* was reclassified based on both morphology and genetic sequencing to include the 23 species of *Cimicifuga*, the 4 *Actaea*, and the single *Souliea* (Compton, Culham and Jury, 1998).

DESCRIPTION: A perennial herb that may grow up to 2.0 m (6.5 feet) tall with large palmately, compound leaves. Leaf blade divided by three with segments also divided, ultimate segment more or less 3-lobed and toothed. Small, white, petal-less flowers on long, slender raceme, borne on long stems above the leaves with 50 -70 stamens of long filaments and form most of the visual display. The number of carpals per flower varies from one to four. Sepals fall off one day after opening. Fruits are follicles that are erect (slanting upward) and close to the stalk and have a bottle-brush appearance. The follicle splits on one side as it dries. The leaf has a maple leaf-like appearance.

AIDS TO IDENTIFICATION: *Actaea arizonica* is easily confused with *Actaea rubra arguta*. The presence of a flowering stalk is required for positive identification. The flowering stalk of *A. arizonica* is a long, narrow spike; flowers lack petals and fruits, and are dehiscent (longitudinally opened). The flowering stalk of *Actaea* is short with an open panicle. Fruits are borne perpendicular to the stalk with red or white shiny berries. The texture of the leaves also differs. Leaf veins of *Actaea* are embedded in the leaf as if in grooves. *A. arizonica* is a larger plant, and will form large stands. *Actaea* may be shorter and is usually found in small groups. Young plants can look like young maples.

ILLUSTRATIONS: Line drawing of plant, leaves and flower (USFWS).

TOTAL RANGE: Central Arizona.

RANGE WITHIN ARIZONA: Bill Williams Mountain (Kaibab National Forest), tributaries to Oak Creek, and West Clear Creek (Coconino National Forest), Coconino County; Workman Creek and Cold Springs Canyon in the Sierra Ancha Mountains (Tonto National Forest), Gila County.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Herbaceous perennial

PHENOLOGY: Flowers July - August, after summer rains; fruits August - September.

BIOLOGY: Social bees and especially bumblebees (*Bombus occidentalis*, *Separatobombus morrisoni*, and *Probombus huntii*) are almost exclusively the pollinators. Flowers abort if adverse pollination conditions (rain, no pollinators) exist. Plants senesce in the late fall. Since above-ground parts die back each winter making it difficult to find, surveys for this plant should be conducted during the flowering/fruiting season.

HABITAT: Most of the known populations are located along moist, shady canyon bottoms and lower canyon slopes (at times under overhangs) in association with Douglas fir, white fir, bigtooth Rocky Mountain maple, and sometimes aspen with a diverse herbaceous understory and lots of duff. Some populations are found on mountains at seeps and springs, in drainages and on shaded north slopes. Grows in moist, loamy soil of ecotone between coniferous forest and riparian habitat; stays close to ecotone and appears to require deep shade from forest or riparian overstory. Barb Phillips (1993a) stated that the Bill Williams site is not typical habitat.

ELEVATION: 4,700 - 8,800 ft (1434 - 2684 m).

EXPOSURE: Heavily shaded areas, especially along canyon bottoms and lower canyon slopes.

SUBSTRATE: Rich humus

PLANT COMMUNITY: Rocky Mountain Riparian Deciduous Forest

POPULATION TRENDS: Gobar (1990) and Farmer (1994) stated that the population at Workman Creek Falls, Sierra Ancha Mountains, appears to be stable or increasing. This site attains little use by insects and wildlife, no damage from livestock no apparent collecting activities occur. Incidental trampling has taken place due to hikers accessing the falls. Monitoring of populations on Coconino and Kaibab National Forests show leaf numbers ranging from 1 -17. All plants sampled in 1990 (Warren 1991) were present in 1995, with five additional young plants found (Phillips et al 1995).

The James Canyon population (an isolated population in a rugged canyon) had the highest reproductive percentages for all sizes of plants (Phillips et al. 1996). Phillips (1993b) stated that two to three sites were completely eliminated in West Fork of Oak Creek Canyon due to scouring by heavy rains during the winter of 1993. One new population was found further up the canyon. Sycamore Canyon was searched and no populations were found. West Clear Creek population has a disease, cause unknown, which creates brittle stems that break off the plant when touched. Phillips (pers comm, 1990) states *A. arizonica* occurs along "miles" in West Fork of Oak Creek Canyon.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None (USDI, FWS 1999)
[C USDI, FWS 1996]
[C1 USDI, FWS 1980]
STATE STATUS: Highly Safeguarded (ARS 1993)
OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 1999)
[Forest Service Sensitive USDA, FS Region 3 1990]

MANAGEMENT FACTORS: Major threats include general disturbance to riparian areas, together with recreation, off-road vehicle use and grazing by livestock. Water transfers may also be a threat. A small number of populations and a small amount of area covered by each population render this species vulnerable. Some populations are not readily accessible.

Implementation of Management Plans; maintain sufficient shade; eliminate loss of plants due to trampling; do not construct new trails through or near populations; no populations should be traded away from federal ownership during land exchanges; secure water rights; water diversions (if any) should be done below populations.

CONSERVATION MEASURES TAKEN: Monitoring plots have been established for Bill Williams Mountain site by Kaibab National Forest in 1988, and Renee-Galeano-Popp. Workman Creek population is being monitored in addition to several Coconino National Forest populations. Ninety-five percent of known populations receive some protection by Wilderness Area designation. Conservation assessments and strategies have been completed on the Coconino, Kaibab and Tonto National Forests.

SUGGESTED PROJECTS: Conduct additional surveys; continue monitoring populations, assess impacts of recreation.

LAND MANAGEMENT/OWNERSHIP: All known populations are located within the Coconino, Kaibab and Tonto National Forests.

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Barbara Phillips - USDA Forest Service, Zone Botanist, Flagstaff, Arizona.
Carl Tomoff - Prescott Center College, Prescott, Arizona.
Peter Warren - Tucson, Arizona.

ADDITIONAL INFORMATION:

Revised: 1990-11-21 (SR)
1992-09-21 (BKP)
1993-04-20 (SSS)
1997-04-08 (BGP)
1997-04-22 (SMS)
1997-11-12 (SMS)
1999-12-20 (DJG)
2008-02-19 (CAS)
2008-02-28 (TFH)
2012-12-26 (BDT)

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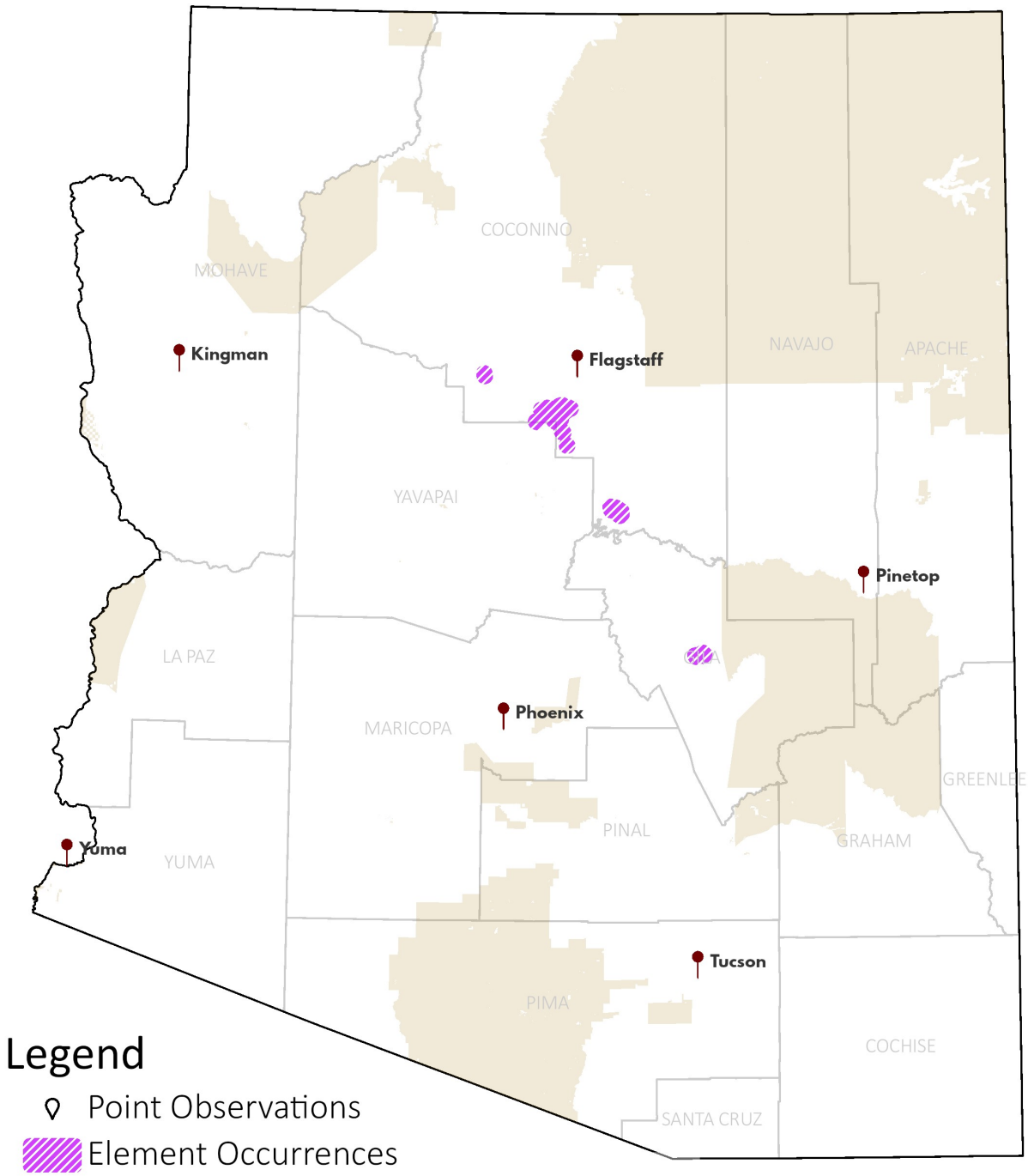
Arizona Game and Fish Department. 2012. *Actaea arizonica*. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

Actaea arizonica

Arizona Bugbane



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

0 50 100 Kilometers

Point Observations are not guaranteed to have been thoroughly quality controlled. Element Occurrence data represent areas where a population occurs.

Heritage Data Management System
2018-02-08

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDAPI0Z0T0
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Eryngium sparganophyllum* Hemsley
COMMON NAME: Arizona Eryngo
SYNONYMS: *Eryngium longifolium* Gray
FAMILY: Apiaceae

AUTHOR, PLACE OF PUBLICATION: *Eryngium sparganophyllum* W. B. Hemsley, Hooker's Icones, Plantarum 6: pl. 2508. 1897. MBG (accessed 2004) reports volume as 26. *Eryngium longifolium* Gray, Pl. Wright 2: 65. 1853, **not** Cav. Ann. 2: 133.

TYPE LOCALITY: Las Playas Springs, near Sierra de las Animos, New Mexico, United States.

TYPE SPECIMEN: HT: NY 405897. Charles Wright #1103, 1851. IT: GH, US.

TAXONOMIC UNIQUENESS: *Eryngium sparganophyllum* is 1 of 34 species in the genus. The common name Arizona eryngo has not only been applied to the correct species *E. sparganophyllum*, but has also be applied in past literature, to *Eryngium lemmonii*. However, the common name of this species is Chiricahua eryngo.

DESCRIPTION: Perennial scapose herb with tall stems, 4-12 dm (16-47 in) high, dichotomously branching. Linear leaves in a basal rosette, 1-9 dm (4-35 in) long, 5-15 mm wide, entire (rarely with 1 or 2 bristle teeth), tapering to a point; strongly involute when dry. Cauline leaves few and reduced. Inflorescence branching, flower heads ovoid or ovoid-oblong, 12-25 mm long, 10-15 mm broad, with 8-12 short ovate-lanceolate bracts and similar bractlets; bractlets 5 mm long, slightly exceeding the fruit. Fruit ovoid, 3-4 mm long, with large scales at the angles, and smaller ones between.

AIDS TO IDENTIFICATION: Species differs from other New Mexico congeners in having linear leaves and parallel venation.

ILLUSTRATIONS: Color photo of type specimen (NY 405897, *in* http://scisun.nybg.org:8890/searchdb/owa/wwwcatalog.detail_list?this_id=4386088)
Color photo of Isotype (US 48594, *in* http://ravenel.si.edu/botany/types//fullRecords.cfm?myFamily=)
Color photo (Restoration News *in* http://www.dot.co.pima.az.us/flood/AguaC/nletter/news2.pdf.

Color photo (Markings *in* http://seinet.asu.edu/collections/TaxaDetails.jsp?wbid=9792&sciName=Eryngium%20spar)

TOTAL RANGE: New Mexico to southern Arizona, and Sonora, Mexico.

RANGE WITHIN ARIZONA: North and east Tucson, Pima County, along the Agua Caliente and west of Tanque Verde Wash. Recently (Makings 2003, ARIZ 369487) collected in the San Pedro Riparian National Conservation Area on the Upper San Pedro River floodplain, in Cochise County.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Perennial forb/herb.

PHENOLOGY: Flowers from March to June.

BIOLOGY:

HABITAT: Occurs in riparian zones and marshes within Pinyon-Juniper Woodland and Madrean Evergreen Woodland (a mild winter-wet summer woodland of oaks and pines such as the Emory Oak and Chihuahua Pine). Recently collected (Makings 2003, ARIZ 369487) in a cienega amid desertscrub.

ELEVATION: 2,720 – 4,000 feet (830-1220 m) in Arizona, and 4,500-5,000 feet (1373-1525 m) in New Mexico. In Mexico, collected from 4,918-6,885 feet (1500-2100 m).

EXPOSURE:

SUBSTRATE: It has been located in organic muck and silty clay-loam, in marshy areas.

PLANT COMMUNITY: Pinyon-Juniper and Madrean Evergreen Woodlands, and Desertscrub. Associates include: *Anemopsis californica* (yerba mansa), *Arbutus* sp. (madrone), *Asclepias subverticillata* (horsetail milkweed), *Carex praegracilis* (clustered field sedge), *Eleocharis* sp. (spikerush), *Helianthus annuus* (annual sunflower), *Juncus balticus* var. *montanus* (mountain rush), *Juncus* sp. (rush), *Lobelia cardinalis* (Cardinal flower), *Lythrum californicum* (California loosestrife), *Schoenoplectus* (=*Scirpus*) *americanus* (American bulrush), and *Sisyrinchium* sp. (blue-eyed grass). (SEINet, accessed 2004).

POPULATION HISTORY AND TRENDS: According to NatureServe (2004), "the trend appears to be one of decline. The one documented location in Arizona has not been rediscovered since it was reported in 1908. There are no recent reports of this species in New Mexico. The potential habitat (wetlands, marshes, and riparian zones) of this plant has significantly declined

within the last few decades and therefore it is not surprising that the species has also suffered a decline. However, recent surveys have documented a large population of this species within habitats surrounding a spring that is located on private property just a few miles southeast of Agua Caliente Park, Tucson, Arizona."

Although known from the Agua Caliente Ranch area, this species was recently collected from Pima County Flood Control District property west of Tanque Verde Wash (Titus 2001, ARIZ 360955), and from the San Pedro National Conservation Area in Cochise County (Makings 2003, ARIZ 369487). More extensive surveys may help in understanding the population distribution and trend.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: None
OTHER STATUS:

MANAGEMENT FACTORS: Threats to this species are likely associated with its riparian and marsh habitat. Such habitats are frequently disturbed, suffer invasive weeds, and at least in the southwest U.S., are in serious decline from activities such as livestock grazing and agricultural, and urban development.

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: Since recent discovery of this species in two new areas in Arizona, extensive surveys are needed to determine full distribution, along with studies on their ecology and biology. Not only should surveys be conducted in the U.S., but should be conducted in Mexico to determine total distribution, which would help in adequately determining this species rarity.

LAND MANAGEMENT/OWNERSHIP: BLM – Tucson Field Office, San Pedro National Conservation Area; Pima County (Flood Control District); Private.

SOURCES OF FURTHER INFORMATION

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

Revised: 2004-08-20 (AMS)
2004-09-30 (SMS)

Game and Fish Department. Please use the following citation:

Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDCAC060K1
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Echinocereus triglochidiatus* var. *arizonicus*
COMMON NAME: Arizona hedgehog cactus
SYNONYMS: *Echinocereus arizonicus* Rose ex Orcutt 1926, *E. coccineus* var. *arizonicus* (Rose ex Orcutt) Ferguson, *E. triglochidiatus* var. *neomexicanus* auct. non (Standl.) W.T. Marsh, *E. polyacanthus* var. *neomexicanus* auct. non (Standl.) L. Benson
FAMILY: Cactaceae

AUTHOR, PLACE OF PUBLICATION: *Echinocereus triglochidiatus* var. *arizonicus* (Rose ex Orcutt) L.D. Benson, The cacti of Arizona (ed. 3) 21: 129. 1969. *Echinocereus arizonicus* Rose ext Orcutt, Cactography 3. 1926.

TYPE LOCALITY: Zion (boundary) monument between Pinal and Gila counties, Arizona, USA, at 4,700 feet.

TYPE SPECIMEN: HT: US. C.R. Orcutt s.n., July 1922. LT: NY.

TAXONOMIC UNIQUENESS: Lehr (1978) recognizes five varieties of *E. triglochidiatus* in Arizona. Parfitt and Zimmerman are working on the *Echinocereus* group for the Vascular Plants of Arizona, with clarification of the *E. triglochidiatus* varieties (Parfitt wants to raise it to full status). Difficulties in interpreting the taxon lie at the extremes of character variation where plants more closely resemble the other two varieties, primarily along the fringes of its distribution. Brack (1985) believes that this taxon is only one step along a cline of variation from southwestern New Mexico into central Arizona, and that it belongs with *Echinocereus coccinea* rather than *E. triglochidiatus*. Crosswhite (1985) believes the taxon may be a polyploid and that it is a good entity that should perhaps even be recognized at the specific level again. Plants resembling var. *E. t.* var. *arizonicus* were found near Tombstone, Arizona and Deming, New Mexico, and were determined by Parfitt not to be *E. t.* var. *arizonicus*.

DESCRIPTION: Large succulent perennial plant, with dark green cylindroid stems occurring singly or most often in clusters of 4-20 stems, occasionally exceeding 50. Large, robust stems are 23-41 cm (9-16 in.) tall, averaging 8 cm (3 in.) in diameter, but commonly 10 cm and over; stems are longer than similar varieties. Each stem has an average of 9 tuberculate ribs; ribbing strong. Spines are smooth, and consist of 1-3 gray or pinkish central spines, the **largest is deflexed** (points down), and 5-11radial spines that are slightly curved. Relative to other *Echinocereus*, spines are shorter but more robust. Flowers are red to crimson with yellow anthers and a green stigma, and are broad, about 5 cm (2 in) in diameter

and 7.4 cm (3 in) in length. Flowers burst through the stem sides, leaving a scar on the stem above the spine. Flowers occur on the upper third of stem ribs (Reichenbacher 1994). The fruit is red, 2.5 cm in diameter, globose, and spiny. Seeds are black, 2 mm in diameter.

AIDS TO IDENTIFICATION: **Hallmark of *Echinocereus*:** flowers burst through sides of stem, leaving scar on stem right above spine. Brilliant red flowers (no bluish or lavender hues), track it to section *triglochidiatus*. *E. t. arizonicus* is distinguished from other hedgehog cacti in Highland area below 6,000 ft (2000 m) by flowers on upper third of stem ribs.

The typical plant of var. *arizonicus* is visually very different from var. *melanacanthus*. In var. *melanacanthus*, stems are much smaller (in height and width) and each cluster has many (up to 500) stems. In contrast, var. *arizonicus* has just a few stems per cluster. The species *E. fasciculatus*, typically exhibits well in excess of 11 ribs, and the flowers are magenta in color.

Variety *arizonicus* also intergrades with var. *neomexicanus* (common in southeastern Arizona), which will form clusters of up to 45 stems. Ribbing of var. *neomexicanus* is weaker than var. *arizonicus*. Central spines on var. *neomexicanus* are thinner (0.5-1.0 mm) than central spines of var. *arizonicus* (1.5 mm) (Benson 1982). Largest central spine of var. *arizonicus* is deflexed with minute striations and is 2.5-4.0 cm (1.0-1.5 in.) long; central spines of var. *neomexicanus* are smooth, not deflexed, and are 4.5-7.0 cm (1.8-2.8 in.) long (Benson 1982).

ILLUSTRATIONS: B&W photo of plant in flower (Benson, 1982: Fig. 654, p. 617).
Line drawing (USFWS).
Color photo and line drawing (USFWS, *in* Kelly and McGinnis 1994)
Color photos of plant and habitat (Sue Rutman/FWS, *in* Falk & Jenkins et al. 2001)
Line drawing (Falk & Jenkins et al. 2001)
Color photos of plant and habitats (Steven R. Viert, 1996: pls. 1-8)
Color photo (Jane Villa-Lobos, *in* USDA NRCS PLANTS web site http://plants.usda.gov/cgi-bin/plant_search.cgi)
Color photo (Andrew Cooper, Accessed 9/12/2003 from http://www.whitethornhouse.com/cacti/cacti04-20.htm)
Color photo (*in* http://www.lisowski58.freeserve.co.uk/1184.jpg Accessed 9/12/2003)
Color photo (Accessed 9/12/2003 from http://arizonaes.fws.gov/images/AZ_Hedgehog_Cactus.jpg)

TOTAL RANGE: Central Arizona, from Pinal and Gila counties. This includes the Pinal, Dripping Springs, Superstition and Mescal mountains. It also can be found in the highlands between Globe and Superior. Falk & Jenkins et al. (2001), reports range as "Superstition Mountains, Top of the World, Tonto NF."

RANGE WITHIN ARIZONA: See "**Total Range**."

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Succulent perennial.

PHENOLOGY: Budding occurs from April to May, anthesis from late-April to mid-May, and fruiting from May to June; germination occurs in mid-summer. Weather can hasten, prolong, or inhibit flowering by a couple of weeks. According to Parfitt (1992), flowering occurred in April and early May. By June, fruits were nearly ripe with mature seeds. Normal sexual reproduction by seeds is the means of reproduction.

BIOLOGY: Pollen dissemination agents are bees and hummingbirds. Seed dissemination agents are unknown. Variations in annual seed production, viability and longevity are also unknown. Approximately 100 seeds are produced per fruit (Phillips 1985). There does not appear to be any special germination or cultivation requirements. Germination of seeds in cultivation observed at 17% (Boyce-Thompson Arboretum) and 90% (S. Brack).

Limiting factors include specialized soil type, Mediterranean-type climate, frost and perhaps fire. Predators include borers and leaf-foot bugs (Coreidae), which attack the stems, and rodents which eat the fruits (Crosswhite 1976; Phillips et al. 1979).

HABITAT: Rugged steep-walled canyons, boulder-pile ridges and slopes. Cactus scattered on open slopes, in narrow cracks between boulders and in understory of shrubs. This plant does well within extensive rock cover. It is commonly found among shrubby vegetation within the Arizona desert grassland.

ELEVATION: Commonly found from 3,300 – 5,700 ft. (1007-1740 m), but ranges up to 6,360 ft. (1940 m).

EXPOSURE: On slopes from almost vertical to nearly level.

SUBSTRATE: Normally found on Orthoclase-rich granite of late Cretaceous age; other parent materials in the area include volcanic tuft, mid-Tertiary age dacite and perhaps rhyolite. Schultze granite, light in color. Devils Chasm has dacite substrate, Gila/Pinal County line (Queen Creek) has much lighter granite. S. Bingham's locations on limestone would be separate species (Rutman 1994). Ph ranges from 5 to 6, or slightly acidic.

PLANT COMMUNITY: Found in the ecotone between Interior Chaparral and Madrean Evergreen Woodland; also into desert grassland. Often with the following associated species: *Agave chrysantha* (century plant), *Arctostaphylos pungens* (point-leaf manzanita), *Berberis haematocarpa* (red holly grape), *Ceanothus greggii* (desert ceanothus), *Cercocarpus montanus* (mountain mahogany), *Dasylirion wheeleri* (desertspoon), *Garrya wrightii* (silktassel), *Juniperus deppeana* (alligator-bark juniper), *J. erythrocarpa* (=*J. coahuilensis*,

redberry juniper), *Mimosa biuncifera* (catclaw mimosa), *Muhlenbergia emersleyi* (bullgrass), *Nolina microcarpa* (beargrass), *Opuntia spinosior* (cane cholla), *Pinus edulis* (pinyon pine), *P. monophylla* (singleleaf pinyon), *Quercus turbinella* (desert scrub oak), *Quercus emoryi* (Emory oak), *Rhus trilobata* (squawbush), *R. ovata* (sumac), *Rhamnus crocea* (hollyleaf buckthorn), and *Yucca baccata* (banana yucca).

POPULATION TRENDS: Unknown. Major threat would be habitat loss due to mining. Devil's Chasm special collection plant.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: LE (USDI, FWS 1985)
[LE USDI, FWS 1980]
[LE USDI, FWS 1979 (without Critical Habitat)]
[PE USDI, FWS 1976]
[PT-E USDI, FWS 1975]

STATE STATUS: Highly Safeguarded (ARS, ANPL 1999)
[Highly Safeguarded (ARS, ANPL 1993)]

OTHER STATUS: Forest Service Sensitive (USDA, Apache-Sitgreaves NF 2000)
[Forest Service Sensitive USDA, FS Region 3 1990]
CITES Appendix 1

MANAGEMENT FACTORS: The limited geographic distribution of this plant increases its vulnerability to threats from mining, off-road vehicle use, illegal collecting, and road and utility construction. Other threats include potential land exchanges at the "Top of the World" vicinity, along with recreational activity, especially in the Oak Flat campground vicinity, which receives seasonally heavy recreation use, including camping, hiking, hunting, and off-road vehicle use (trail bikes). This area has been identified for increased recreational development.

CONSERVATION MEASURES TAKEN: Seeds have been collected for propagation by the Forest Service. These are held, and have been grown, at the Boyce Thompson Arboretum. Question remains about the source of these seeds and what should be done with the plants grown at the arboretum? The Globe Ranger District, Tonto National Forest, conducted surveys for this species in 1989 and 1990. It is unclear at this time, if these surveys provided the seeds for propagation.

SUGGESTED PROJECTS: Strong need to complete chromosomal studies. Zimmerman (1989) recommended a morphological study of *Echinocereus* populations on a

transect from the type locality up into the Pinal Mountains to determine if var. *arizonicus* is conspecific with the ordinary *E. coccineus* that grow on Pinal Peak.

Research needed to determine susceptibility of this cactus to fire. Has fire suppression and livestock grazing contributed to a conversion from a grassland habitat to a shrubbier habitat?

Additional survey needed, especially in eastern Superstition Mountains. If identification is questionable, take photograph and notes on habitat. Bring in for examination (S. Rutman 1994).

Research (genetic) is needed to determine if the cactus populations in the Cochise County mountain ranges, are the same as variety *arizonicus*.

LAND MANAGEMENT/OWNERSHIP: USFS - Tonto National Forest (most plants, including plants within the Superstition Wildness Area); Private. Possibly State Land Department.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Frank Crosswhite - Boyce Thompson Arboretum, Superior, Arizona.
Bill Feldman - Boyce Thompson Arboretum, Superior, Arizona.
David Ferguson - Albuquerque, New Mexico.
Reggie Fletcher - USFS Regional Ecologist, Albuquerque, New Mexico.
Bruce Parfitt - Missouri Botanical Garden, St. Louis, Missouri.
Allan Zimmerman - Phoenix, Arizona.

ADDITIONAL INFORMATION:

Reichenbacher emphasizes that new Arizona Flora is not based on in-depth surveys. New version will not be ideal but will help.

Ferguson (Cactus and Succulent Journal) gave name *arizonicus* to all red flowered hedgehogs in southeastern Arizona but Parfitt believes new species exists in Globe-Superior area, and another closely related, in southeastern Arizona. Heavily collected at Top of the World sites.

Revised: 1990-11-21 (SR)
1992-09-15 (BKP)
1994-08-18 (DBI)
1994-12-08 (DBI)
1997-11-05 (SMS)
2003-10-02 (SMS)

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDPLM0D050
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Phlox amabilis* Brand
COMMON NAME: Arizona Phlox
SYNONYMS:
FAMILY: Polemoniaceae

AUTHOR, PLACE OF PUBLICATION: Brand, Das Pflanzenreich IV. 250: 74.1907.

TYPE LOCALITY: Prescott Mountain District, Arizona, United States of America.

TYPE SPECIMEN: HT:? E. Palmer 391, 1876. IT: NY-336972.

TAXONOMIC UNIQUENESS: The species *amabilis* is 1 of 70 species in the genus *Phlox*.

DESCRIPTION: A low perennial herb usually about 10cm (4 in) tall that produces pink, tubular flowers with deeply notched petals. This plant has a taproot, the herbage glandular-pubescent throughout; stems mostly 5 to 15 cm (2-38 in) tall. One or few from the base usually simple except in the branched inflorescence. The leaves are linear to narrowly oblong, 10 to 30 mm (0.4-1in) long. The flowers are in a loose compound cyme; calyx 8-10 mm long intercostally flat or only slightly carinate; corolla tube 12-18 mm long the lobes 6-9 mm long, pink sometimes notched at the end. Stamens and style nearly as long as the corolla tube.

AIDS TO IDENTIFICATION: *Phlox amabilis* is a low plant with thick oblong leaves and when as is often the case its corolla lobes are deeply notched, it bears a striking resemblance to *P. woodhousei*. In the former however, the stamens and styles are nearly as long as the corolla tube, whereas in the latter they are much shorter than the tube. Both *P. amabilis* and *P. longifolia* have taproots and usually deciduous leaves, whereas *P. cluteana* (Navajo Mountain phlox) has a slender rhizomatous rootstock and evergreen leaves (Roth 1999).

ILLUSTRATIONS: Color photo of Isotype specimen (NY-336972, NYBG *in* http://207.156.243.8/emu/vh/specimen.php?irn=216667)

TOTAL RANGE: Arizona endemic.

RANGE WITHIN ARIZONA: Mainly in southern Coconino, Mohave, Navajo and Yavapai counties, but also found in Gila and Graham counties.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Herbaceous perennial subshrub, shrub or forb/herb.

PHENOLOGY: March to May.

BIOLOGY:

HABITAT: Open exposed limestone-rocky slopes within pinyon-juniper woodlands and ponderosa pine-gambel oak communities.

ELEVATION: 3,500 – 7,800 ft (1068-2379 m). (AGFD, HDMS unpublished database records accessed 2003; SEINet accessed 2005).

EXPOSURE: collected on 3-8% south-facing slope; E, SE to W-facing slopes.

SUBSTRATE: Limestone-rocky slopes; clay soil, volcanic silt.

PLANT COMMUNITY: Pinyon-juniper woodlands and ponderosa pine-gambel oak communities; grama grassland. Associated species include: *Artemisia tridentata* (Big sagebrush), *Bouteloua gracilis* (Blue Gramma), Bouteloua sp., *Cercocarpus montanus* (Colorado Birch-leaved Mountain-mahogany), *Echinocereus coccineus* (Hedgehog cactus), *Eriogonum racemosum* (Red-root Wild Buckwheat), *Gutierrezia sarothrae* (Broom Snakeweed), *Juniperus deppeana* (Alligator Juniper), *Nolina microcarpa* (Sacahuista Bear-grass), *Opuntia* sp., *Opuntia engelmannii* (Prickly-pear), *Pinus ponderosa* (Ponderosa pine), *Poa fendleriana* (Muttongrass), *Purshia stansburiana* (Stansbury Cliffrose), *Quercus* (oak), *Spharalcea* (Globemallow), and *Yucca baccata* (Fleshy-fruit Yucca). (Collections in SEINet, accessed 2005).

POPULATION HISTORY AND TRENDS: Unknown.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: None
OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 1999)

MANAGEMENT FACTORS:

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS:

LAND MANAGEMENT/OWNERSHIP: BIA – Yavapai-Prescott Reservation; DOD – Military Reservation; USFS - Prescott and Tonto National Forests; State Land Department; Private. Possibly on the Grand Canyon National Park and Navajo Nation.

SOURCES OF FURTHER INFORMATION

REFERENCES:

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Daniela Roth – Navajo Natural Heritage Program, Flagstaff or Window Rock, Arizona.

ADDITIONAL INFORMATION:

Revised: 2002-12-27 (AMS)
2005-08-04 (SMS)

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDROS1R024
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Vauquelinia californica* ssp. *sonorensis* Hess & Henrickson
COMMON NAME: Sonoran Mountain rosewood, Arizona Sonoran rosewood, Arizona rosewood, Sonora rosewood
SYNONYMS: *Vauquelinia californica* (Torr.) Sarg.
FAMILY: Rosaceae

AUTHOR, PLACE OF PUBLICATION: W.J. Hess and Henrickson, Sida 12(1): 130-132, f. 9, 11a-c. 1987.

TYPE LOCALITY: Arizona, U.S.A.

TYPE SPECIMEN: Type protologue - HT: MOR. W.J. Hess and G. Wilhelm, 4258. IT: MO-3383000. Hess & Wilhelm 4259, 2 Jun 1978. Additional Isotypes include GH and NY.

TAXONOMIC UNIQUENESS: *Vauquelinia* is a small genus of 3 to 4 species native to Arizona and Mexico. Hess and Henderson (1987) split the species *californica* into four subspecies, based primarily on leaf characters (Falk et al., 2001). Three of the subspecies occur in Arizona, and not only include ssp. sonorensis, but include *V.c.* ssp. *californica* (Torrey's Vauquelinia), and *V.c.* and *pauciflora* (Arizona Limestone Rosewood).

DESCRIPTION: Medium-sized tree up to 5 m tall (Turner et al. (1995) reports as large shrub or small tree 3-8 m high with a dense, dark green canopy). Leathery leaves are green above, white-hairy below. Leaves are alternate, narrow (7-10 mm) and long (up to 10 cm), and leathery. Leaf margins are serrate with pronounced marginal spines. Flowers are white and small, 8-9 mm in diameter, and are clustered in flat-topped corymbs 5-8 cm broad. The woody, 5-parted capsules are 6 mm long, and the bark is reddish brown and scaly. (Falk and Jenkins et al. 2001; Turner et al. 1995).

AIDS TO IDENTIFICATION: No other tree in the Ajo Mountains has long, narrow leaves with white undersides. The ssp. *californica* has broader leaves and less pronounced marginal teeth than ssp. *sonorensis* and the ranges of the two subspecies do not overlap. (Falk and Jenkins et al. 2001, and Turner et al. 1995).

ILLUSTRATIONS:
Line drawing (in Falk and Jenkins et al., 2001).

Color photo (in Falk and Jenkins et al., 2001).
Line drawing and Color photo of species (Lamb 1975: 134).
Line drawing of species (Elias 1980: 556).
Color photo of Isotype (MO-3383000, *in* http://mobot.mobot.org/cgi-bin/search_vast)
Color photo of Isotype (NY-429894, *in* NYBG Virtual Herbarium)

TOTAL RANGE: Known from the Ajo and Sand Tank mountains of southwestern Arizona. Also found in Sierra Cobabi, northern Sonora, Mexico.

RANGE WITHIN ARIZONA: Southwestern Arizona in the Ajo, Diablo, Mesquite, and Santa Rosa mountains of Pima County, and Sand Tank Mountains of Maricopa County.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Perennial medium-sized tree.

PHENOLOGY: Leaves evergreen; flowers May to July; fruit ripens in the fall.

BIOLOGY: This plant is occasionally cultivated as an ornamental. Young plants require moderate irrigation until established and need little care thereafter (Turner et al. 1995). The species is unimportant to wildlife.

HABITAT: Desertscrub and desert grassland, in woodland or forest at base of cliffs, along canyon bottoms and on moderate to steep slopes. "*Vauquelinia californica* grows on rocky slopes of hillsides and canyons on a variety of substrates…. (Williams and Bonham 1972)" (Turner et al. 1995).

ELEVATION: 2,328 – 3,720 ft. (710–1135 m).

EXPOSURE: Collected on northeast- to northwest-facing slopes.

SUBSTRATE: According to Williams and Bonham (1972 in Turner et al. 1995), "*Vauquelinia californica* grows.… on a variety of substrates including rhyolite, andesite, granite, granitic gneiss, limestone, dolomite, sandstone, and tuff."

PLANT COMMUNITY: Sonoran Desert with interior chaparral species at higher elevations. Often found with *Juniperus coahuilensis* and *Quercus ajoensis*. Associated species include: *Acacia greggii* (cat-claw acacia), *Ambrosia ambrosioides* (Ambrosia-leaf bursage), *Anisacanthus thurberi* (Thurber's Anisacanthus), *Artemisia* (sagebrush), *Baccharis* (false-willow), *Calliandra eriophylla* (fairy duster), *Carnegiea gigantea* (Saguaro cactus), *Condalia globosa* (bitter snakewood), *Dodonaea viscosa* (varnish-leaf), *Ephedra trifurca* (long-leaf Mormon-tea), *Gymnosperma glutinosum* (Tatalencho), *Juniperus coahuilensis* (red-berry juniper), *Opuntia*

acanthocarpa (stag-horn cholla), *Parkinsonia microphylla* (little-leaf paloverde), *Prosopis* (mesquite), *Quercus ajoensis* (Ajo Mountain scrub oak), *Q. turbinella* (shrub live oak), *Rhamnus* (buckthorn), *Sacrostemma* (=*Funastrum*) *cynanchoides* (southern twinevine), *Sapindus saponaria* (wing-leaved soapberry), and *Solanum douglasii* (Douglas horse-nettle). (SEINet accessed 2005). According to NYBG Isotype, found with *Condalia*, *Dodonaea*, *Encelia* (brittlebush), *Fouquieria splendens* (Ocotillo), and *Simmondsia chinensis* (Jojoba).

In the Sonoran Mountaintop Woodland of the Sand Tank Mountains, "unusual species include redberry juniper (*J. coahuilensis*), Arizona Sonoran rosewood (*V.c. sonorensis*), Spanish dagger yucca (*Yucca arizonica*) and Kofa barberry (*Berberis harrisoniana*)." (Laurenzi and Marshall, 2000). "The only other similar combination of plants occurs at the upper elevations of the Ajo Mountains to the south." (Laurenzi and Marshall, 2000).

POPULATION HISTORY AND TRENDS: Unknown. Based on 1990 collection from the Organ Pipe Cactus National Monument, it was observed to be "locally common on upper canyon slopes and in canyon bottom."

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: None
OTHER STATUS: Bureau of Land Management Sensitive (USDI, BLM AZ 2000, 2005, 2008, 2010)

MANAGEMENT FACTORS:

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS:

LAND MANAGEMENT/OWNERSHIP: BIA – Tohono O'Odham Nation; BLM – Tucson Field Office; DOD – Barry M. Goldwater Air Force Range; NPS – Organ Pipe Cactus National Monument.

SOURCES OF FURTHER INFORMATION

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

The wood of *V. californica* "… is cross-grained, very hard, heavy, and difficult to carve but worth the effort for making small articles" (Lamb 1975).

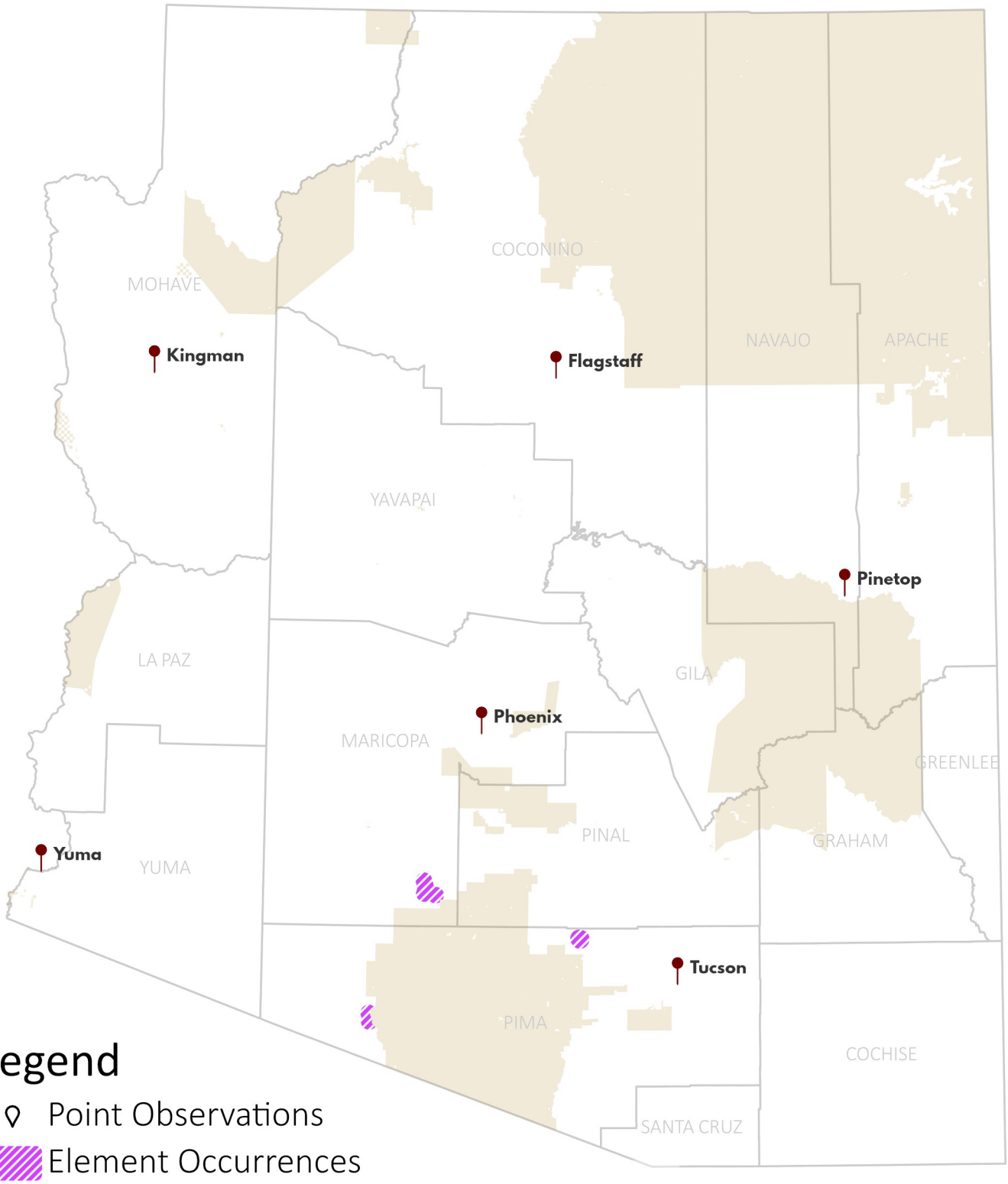
Revised: 2002-03-21 (SMS)
2005-09-01 (SMS)

To the user of this abstract: you may use the entire abstract or any part of it. We do request, however, that if you make use of this abstract in plans, reports, publications, etc. that you credit the Arizona Game and Fish Department. Please use the following citation:

Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

Vauquelinia californica ssp. sonorensis

Arizona Sonoran Rosewood



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

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Kilometers

0 50 100

ARIZONA GAME & FISH

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences.

Heritage Data Management System
2019-06-13

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDCRA06010
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Graptopetalum bartramii* Rose
COMMON NAME: Bartram Stonecrop
SYNONYMS: *Echeveria bartramii*
FAMILY: Crassulaceae

AUTHOR, PLACE OF PUBLICATION: Rose. 1926. Addisonia 11:1-2, pl. 253.

TYPE LOCALITY: Arizona: Santa Cruz County: Patagonia Mountains: Flux Canyon.

TYPE SPECIMEN: E. Bartram. 1920.

TAXONOMIC UNIQUENESS: One of nine species in the genus *Graptopetalum*, one of two in Arizona, which also includes *G. rusbyi*.

DESCRIPTION: Small succulent perennial with a **rosette of basal leaves**. These leaves, numbering 20 or more, are flat or somewhat concave, bluish-green with a reddish margin and tip, up to 6.5 cm (2.6 in.) long, and ovate to broadly spatulate with a pointed tip. Flower stalk up to 0.3 m (1.0 ft.) high with alternate bractlike leaves. Five-parted flowers arranged along multi-branched stalk are 19.0-32.0 mm (0.76-1.28 in) wide. Five petals joined at bottom are broadly campanulate when blooming. Colored pale- or greenish-yellow, 13.0 mm (0.52 in.) petals are transversely banded or blotched with red. Ten red stamens often recurve outside of petals. Valves of 5 carpels abruptly tipped with styles.

AIDS TO IDENTIFICATION: Grows as solitary rosettes or in clumps on ledges or slopes of steep walled canyons. Thick succulent leaves glaucous and gray-green in color. Old flowering stalks give population reddish-brown appearance from a distance. Flowers reported to have strong disagreeable odor resembling odor of stinkhorn fungus (Phillips 1982). Leaves of distinctive shape.

In its longer, apiculate leaves, acute sepals, paniculate inflorescence, and fall phenology *G. bartramii* differs from *G. rusbyi* (Anderson 1999).

ILLUSTRATIONS:
Line drawings of flowers (Moran 1949 Fig.1:4).
Line drawings of flowers (Moran 1949 Figs.2 and 3:55).
B&W photo of rosette (Moran 1974 Fig.1:94).

TOTAL RANGE: Southern Arizona and Chihuahua, Mexico (one record).

RANGE WITHIN ARIZONA: Santa Cruz County: Patagonia, Santa Rita and Tumacacori Mountains; Pima County: Baboquivari, Dragoon, Mule and Rincon Mountains; Cochise County: Chiricahua Mountains.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Perennial succulent.

PHENOLOGY: Flowering and fruiting in October. Anderson (1999) reports a flowering/fruiting period from September to February.

BIOLOGY: Both sexual and vegetative reproduction.

HABITAT: Cracks in rocky outcrops in shrub live oak-grassland communities along meandering arroyos on sides of rugged canyons. Usually heavy litter cover and shade where moisture drips from rocks, often with Madrean evergreen woodland.

ELEVATION: 3,650 - 6,700 ft (1113-2044 m). Based on records in the Heritage Data Management System (HDMS), elevation ranges up to 6,300 ft (1922 m).

EXPOSURE: North.

SUBSTRATE:

PLANT COMMUNITY: Madrean evergreen woodland. Dominant associated species include: *Agave schottii, Bouteloua curtipendula, Cercocarpus montanus, Choisya mollis, Dasylirion wheeleri, Fouquieria splendens, Juniperus deppeana, Muhlenbergia* spp., *Rhus trilobata,* and *Yucca baccata*. Also in rocky outcrops in shrub live oak-grassland communities.

POPULATION TRENDS: Unknown

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None (USDI, FWS 1996)
[C2 USDI, FWS 1983]
[C1 USDI, FWS 1980]

STATE STATUS: Salvage Restricted (ARS, ANPL accessed 2011)
[Salvage Restricted (ARS, ANPL 1993)]

OTHER STATUS:
Forest Service Sensitive (USDA, FS Region 3, 2007)
[Forest Service Sensitive (USDA, FS Region 3 1990, 1999)]
Bureau of Land Management Sensitive (USDI, BLM AZ 2000, 2005, 2008, 2010)

MANAGEMENT FACTORS: Small, isolated populations. Illegal collection main management issue. Mining and mineral exploration; habitat alteration due to livestock grazing; trampling by cattle and recreationists; road construction and maintenance. Protect population(s) from expansion of Ruby Road.

PROTECTIVE MEASURES:

SUGGESTED PROJECTS: Surveys needed to delimit range.

LAND MANAGEMENT/OWNERSHIP: BLM - Tucson Field Office; NPS - Saguaro National Park; USFS - Coronado National Forest; TNC - Thomas Canyon Preserve. Possibly on BIA - Tohono O'odham Nation.

SOURCES OF FURTHER INFORMATION

REFERENCES:

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Tom Deecken - Coronado National Forest, Sierra Vista, Arizona.
Art Phillips - Private Consultant (Botanist), Colorado.
Barb Phillips - USFS Zone Botanist, Coconino, Kaibab and Prescott National Forests, Flagstaff, Arizona.

ADDITIONAL INFORMATION:

Species name *Graptopetalum* from Greek "petals marked with writing."
New treatment of *Graptopetalum*: Moran, Reed. 1993. Journal of Arizona-Nevada Academy of Science. Vol. 27:190-193. Newest and best key for Crassidaceae.

Isotypes include: NY 387949, E.B. Bartram, 21 Nov 1924; NY 387950, E.B. Bartram 54708, Sep-Oct 1925.

Revised: 1990-12-20 (SR)
1991-10-20 (BKP)
1997-07-22 (SMS)
2001-12-20 (SMS)

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDPGN0P0Z0
Data Sensitivity: YES

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Rumex orthoneurus*
COMMON NAME: Blumer's Dock, Chiricahua Dock
SYNONYMS:
FAMILY: Polygonaceae

AUTHOR, PLACE OF PUBLICATION: Rechinger, K.H. 1936. Repert. Spec. Nov. Regni Veg. 40:294.

TYPE LOCALITY: Barfoot Park, Chiricahua Mountains, Cochise County, Arizona. Blumer.

TYPE SPECIMEN: NY, Z, UT, MW. Blumer 1949.

TAXONOMIC UNIQUENESS: Lehr (1978) recognizes 15 species of *Rumex* occurring in Arizona.

Relationship to *Rumex occidentalis*: Fletcher suggested that *R. orthoneurus* is very closely related to *R. occidentalis*, a species distributed throughout North America. He believes the two taxa are commonly confused and that many specimens assigned to *R. occidentalis* are actually *R. orthoneurus*. See Fletcher (1982) for discussion.

Relationship to other *Rumex* species: In 1979, Dawson reviewed a total of 15 specimens of *R. orthoneurus* from seven locations. Because he based his description on only one specimen, he believed that his treatment should be accepted with the reservation that additional material is needed to be certain of the delimitation of the species from R. densiflorus, R. pycnanthus, and *R. praecox* and its relationships to them. For a description of the differences between *R. orthoneurus* and *R. densiflorus*, see Rechinger and Dahlgren (1937).

DESCRIPTION: A large, long-lived herbaceous perennial plant that can reach a height of 1.2 to 2 m (3.9 to 6.6 ft). The basal leaves are oblong, large (as much as 45 cm (18 in.) long and 18 cm (7.1 in.) wide) and clustered, are semi-succulent and bright green (with a tinge of yellow) with conspicuous secondary veins that leave the midvein at a right angle. The cauline (stem) leaves are alternate and become progressively thinner, shorter and acuminate (more sharply pointed) up the stem. A membranous stipular sheath wraps around the stem at the base of the leaf. Flowers lack petals (typical of the buckwheat family) and have a cup-like involucre; the inflorescence is a large, narrow panicle occupying the upper half of a tall stalk. The seeds (achenes) are ovate, brown, and 2.6-4.0 mm (0.1-0.16 in.) long. Capsule valves are grainless. Plants have a creeping rootstock (rhizomes).

AIDS TO IDENTIFICATION: Secondary leaf veins perpendicular (or nearly so) to the midvein; secondary veins nearly parallel. Leaves somewhat more succulent than other *Rumex*. For a discussion of the study of leaf venation in *Rumex* to determine the variation in leaf veins as pertaining to species distinction, see Malusa et al. 1992. *R. occidentalis* looks very similar to *orthoneurus* but *occidentalis* has a tap root compared to the rhizome creeping-like roots of *orthoneurus*.

ILLUSTRATIONS: Line drawing (Rechinger and Dahlgren 1937:97).

TOTAL RANGE: East-central to southeastern Arizona (depending on taxonomic interpretation). Huachuca Mountains in Santa Cruz County (historic); Chiricahua Mountains in Cochise County; Sierra Ancha Mountains in Gila County. Also reported from the Gila, Baldy and Pecos Wilderness Areas in New Mexico.

Populations "**in dispute**" include those in the White Mountains (Apache County) and Pinaleno Mountains (Graham County) in Arizona, and the Mogollon, Black and Gila Mountains in New Mexico.

Introduced populations occur on the Tonto National Forest in drainages below the Mogollon Rim and on the Coronado National Forest in several spring sites along the crest of the Chiricahua Mountains.

RANGE WITHIN ARIZONA: See "**Total Range**."

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Herbaceous Perennial

PHENOLOGY: Flowers late July to mid-August; sets seed late August. May flower when 30-60 cm (12-24 in.) tall.

BIOLOGY:

HABITAT: Mid- to high-elevation wetlands with moist, organic soil adjacent to perennial springs or streams in canyons or meadow situations.

R. Fletcher has suggested that *R. orthoneurus* is intolerant of shading and is a poor competitor with other species in its habitat. However, at some sites, such as in the lower Rustler Park drainage and at Workman Creek, the plant seems to grow in deep, shaded canyons.

ELEVATION: 4,480 - 9,660 ft. (1,366 - 2,946 m).

EXPOSURE: Various.

SUBSTRATE: Moist, organic, loamy soil (parent material not important).

PLANT COMMUNITY: Madrean Subalpine Grassland meadows (within the Madrean Montane Conifer or Mixed Conifer forests) or Interior Southwestern Riparian Deciduous Forest. Associated species include *Helenium hoopesii*, sedges and rushes (*Carex* and *Juncus* species). Often sympatric with *R. occidentalis*.

POPULATION TRENDS: Species is declining. Extirpated from Rose Canyon in the Sierra Ancha Mountains by road construction. Extirpated from Barfoot Park (re-established from plants from Rustler Park) probably due to livestock grazing.

Workman Creek population has declined due to road maintenance activities, livestock grazing, and recreation. However, Gobar (1990) reports the population in Workman Creek is "doing very well" and is scattered throughout below the falls. Both large and small plants were observed, including seed stalks on most of the larger plants. The natural population in Reynolds Creek and the introduced populations in Canyon Creek Spring, and Pine Creek are "doing well." Introduced populations at Bray Creek, Ellison Creek, Dude Creek, Tonto Creek, Tonto Spring, and Weber Creek were damaged (eliminated?) by the flooding, erosion and mud slides that occurred after the Dude and Bray fires in 1990. Insects heavily impacted the introduced plants in See Canyon and Christopher Creek. Cattle grazing impacted the introduction sites in Chase Creek, Christopher Creek, Horton Spring, and Cold Springs Canyon.

Populations on the Coronado and Tonto National Forests in AZ are being monitored under a conservation strategy. Population trends in general are unknown due to lack of monitoring and threat assessment at other sites. (Brooks 1999).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None (USDI, FWS 1999)
[PT USDI, FWS 1998]
[C USDI, FWS 1996]
[C1 USDI, FWS 1980]
[PE USDI, FWS 1976]
[PTN-E USDI, FWS 1975]

STATE STATUS: Highly Safeguarded (ARS, ANPL 1993)

OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 1990, 1999)

MANAGEMENT FACTORS: Species occurs in mid- to high-altitude wetlands known to be declining in the southwest. Habitat area is small. Degradation of habitat due to trampling and grazing by livestock; recreation (trails, campsites); spring developments; road

construction and maintenance; de-watering of habitat; mining; direct and indirect affects of fire (particularly flooding, erosion and mud slides).

Livestock grazing is the most common management conflict (Brooks 1999). This is a very palatable species to livestock and wildlife.

CONSERVATION MEASURES TAKEN: A wood pole fence was built around Barfoot Spring in 1983(?) after plants were re-established from plants from Rustler Park. During 1991, all of Barfoot Park was fenced excluding campers and livestock to enhance meadow habitats. Lower Rustler Spring site was fenced in the 1960s; and later, a barbed wire fence was built around Rustler Park campground area to exclude cattle. Erosion control structures were built at Rustler Park in 1991 to prevent down-cutting of the stream channel.

Transplant/introduction program begun by the Tonto and Coronado National Forests. All plants used in the introductions along the Mogollon Rim were grown at Desert Botanical Gardens (Phoenix) from seed obtained from Workman and Reynolds creeks, Sierra Ancha Mountains.

SUGGESTED PROJECTS: Taxonomic issues need to be resolved. Secure water rights. Re-survey historic drainages and associated springs; accurately map distribution and record negative searches. Set clear goals for transplanting. Summarize the site characteristics and site ecological setting of introduced populations and correlate with success.

Increase awareness of highway/road maintenance crews; develop livestock management plans and *Rumex* management plan for Tonto National Forest; monitor natural and introduced populations (See Coronado National Forest Recovery Plan).

LAND MANAGEMENT/OWNERSHIP: BLM - Tucson Field Office; USFS - Apache-Sitgreaves, Coconino, Coronado and Tonto National Forests; Private.

SOURCES OF FURTHER INFORMATION

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USDI, Fish and Wildlife Service. 1998. Endangered and Threatened Wildlife and Plants; Proposed Threatened Status for the Plant *Rumex orthoneurus* (Chiricahua Dock); Notice of Review; Proposed Rule. Federal Register 63(62):15813-15820.

USDI, Fish and Wildlife Service. 1999. Endangered and Threatened Wildlife and Plants; Review of Plant and Animal Taxa that are Candidates or Proposed for Listing as Endangered or Threatened; Annual Notice of Findings on Recycled Petitions; Annual Description of Progress on Listing Actions; Proposed Rule. Federal Register 64(205):57546.

Van Devender, T.R. 1980. Status report for *Rumex orthoneurus*. Prepared for Arizona Natural Heritage Program. Arizona Game and Fish Department files. Phoenix, Arizona.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

Tom Deecken - US Forest Service, Coronado National Forest, Sierra Vista, Arizona.

Reggie Fletcher - US Forest Service, Region 3, Albuquerque, New Mexico.
Renee Galeano-Popp - US Forest Service, Lincoln National Forest, New Mexico.
Keith Menasco - US Forest Service, Kaibab National Forest, Williams, Arizona.
David Mount - University of Arizona, Tucson.
Sue Rutman - National Parks Service, Organ Pipe Cactus National Monument, Arizona.

ADDITIONAL INFORMATION:

The taxonomic identity of the collections from the White Mountains (Phelps Cabin Research Natural Area, Sheeps Crossing and upper Little Colorado River), Pinaleno Mountains (Hospital Flat) and the Pat Scott area of the Huachuca Mountains remains unresolved. However, David Mount (University of Arizona) has conducted taxonomic studies of *Rumex* through molecular genetics (1991). He has found that all individuals within a mountain range are very similar genetically. However, differences among mountain ranges are readily discernible genetically; each having a unique DNA fingerprint. Though his conclusions are not finalized, his work suggests that the Chiricahua and Sierra Ancha mountain populations are certainly *orthoneurus*, the Pinaleno Mountain population is possibly *orthoneurus*, and the White Mountains populations is most likely *occidentalis*.

Revised: 1990-10-17 (SR)
1992-09-21 (BKP)
1992-10-19 (PLW)
1993-06-22 (SSS)
1997-11-12 (SMS)
1998-04-03 (SMS)
1999-12-20(DJG)
2002-01-04 (SMS)

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDAST64073
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Dieteria bigelovii* var. *mucronata*
COMMON NAME: Bristle-tipped Aster
SYNONYMS: *Machaeranthera mucronata*, *Machaeranthera bigelovii* var. *mucronata*, *Aster adenolepis*
FAMILY: Asteraceae

AUTHOR, PLACE OF PUBLICATION: Morgan, David Randal and Ronald Lee Hartman. Sida 20(4): 1394. 2003.

TYPE LOCALITY: Arizona. Thompson Canyon [in the Grand Canyon NP].

TYPE SPECIMEN: US 128853 (syntype of *Machaeranthera mucronata*). M.E. Jones, #6056 bl. Sept. 19, 1894.

TAXONOMIC UNIQUENESS: The family Asteraceae is the largest plant family in the world by most accounts. The genus *Dieteria* has five species in North America, and the species *bigelovii* has three recognized varieties, two of which occur within Arizona.

DESCRIPTION: **Leaf blades** linear to linear-oblanceolate, mid 20–80 × 2–6 mm, margins entire, faces glabrate, puberulent, or canescent. **Involucres** hemispheric, 8–12 mm, widths 2–3 times heights. **Phyllaries** 90–100, 0.5–1 mm wide (at midpoint), apices long-acuminate, 2–5 mm. **Ray florets** 20–60. **2*n*** = 8. Flora of North America 2016.

AIDS TO IDENTIFICATION: The following key from Flora of North America can be used to separate the three varieties:

1 Involucres hemispheric, widths 2–3 times heights; phyllaries 90–100, 0.5–1 mm wide (at midpoint), apices long-acuminate, 2–5 mm……. *Dieteria bigelovii* var. *mucronata*
1a Involucres broadly turbinate to hemispheric, 1–2(–3) times heights; phyllaries 25–100, 1–2 mm wide (at midpoint), apices acute to long-acuminate (2)

2 Phyllaries 50–100, apices long-acuminate, 3–6 mm, ray florets 30–60……..... *D. bigelovii* var. *bigelovii*
2a Phyllaries 25–50, apices acute to acuminate, 2–4 mm; ray florets 12–30…… D. bigelovii var. commixta

ILLUSTRATIONS:
Herbarium Mounts:
http://swbiodiversity.org/seinet/taxa/index.php?taxon=Dieteria%20bigelovii%20var.%20mucronata.

TOTAL RANGE: According to the Flora of North America (2016) the plant is endemic to the Kaibab Plateau, Coconino County, Arizona. A review of current records in SEINet, however, indicates that the variety also extends to the vicinity of Flagstaff and south to Mormon Lake. There are two other records, even further south, from the Mogollon Rim near Strawberry and the Houston Mesa, in Gila County. There is also a single record from Kane County, Utah.

RANGE WITHIN ARIZONA: See Total Range.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Biennial or short-lived perennial herbaceous plant.

PHENOLOGY: Flowering Aug – Sept.

BIOLOGY:

HABITAT: Meadows and open areas in coniferous forests. High open meadows between Jacob Lake and the North Rim (Fletcher 1978).

ELEVATION: 7870 – 9840 feet (2400 – 3000m) from Flora of North America 2016. Noted only in higher meadows or disturbed areas about 8500 feet (Fletcher 1978). The two collections along the Mogollon Rim are from 4930 and 5800 feet (1500-1770m).

EXPOSURE: Grows in full sunshine, slope 0-20% (Phillips et al 1982).

SUBSTRATE: Loam, pH 5.0, SCS Soil Association is Soldier-Hogg. Litter 0-2 cm. Bedrock is limestone, so habitat usually has fair drainage (Phillips et al 1982).

PLANT COMMUNITY: Open meadows in Spruce-Fir-Douglas Fir Forest (*Picea, Abies, Pseudotsuga*). Along the Mogollon Rim found with *Pinus ponderosa, Juniperus deppeana, Arctostaphylos,* and *Quercus*.

POPULATION HISTORY AND TRENDS: In 1981, the population was numerous and extended over an airline distance of 41.6 km from East Lake to Thompson Canyon. The species was common along roadways and abundant in open meadows and forest openings. Plants were healthy and reproducing successfully. Five populations were censused. Densities

ranged from 1.2 – 9 plants/100m^2, with an average of about 4 plants/100m^2. The area of potential habitat was estimated to be 500 km^2, Phillips et al 1982.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None.
STATE STATUS: None.
OTHER STATUS: None.

MANAGEMENT FACTORS: Extensive grazing in the meadows between 8090 and 9000 feet have benefited this plant. The high mountain meadow area of the North Kaibab (De Motte Park) is unique and should be managed accordingly (Fletcher 1978). The species is not grazed by wildlife or livestock. The species seems to be tolerant of disturbance in the form of fire, logging, road building, grazing and land use by humans (Phillips et al 1982). There are no known threats.

PROTECTIVE MEASURES TAKEN: Was proposed as a Category Two Candidate species in 1980 (Fed Reg. 45 (242). The Status Report prepared by Phillips et al in 1982 recommended that this plant be removed from consideration. Not listed as Forest Service Sensitive.

SUGGESTED PROJECTS:
Ralph Gierisch recommended continued studies to determine distribution, habitat and ecological factors affecting this species (Fletcher 1978).

LAND MANAGEMENT/OWNERSHIP: USDA Forest Service (Kaibab, Coconino and Tonto NF), USDI National Park Service (Grand Canyon NP).

SOURCES OF FURTHER INFORMATION

REFERENCES:

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Endangered Species, USFWS, USDI, Albuquerque, NM. Museum of Northern Arizona, Flagstaff.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

Revised: 2016-11-22 (BDT)

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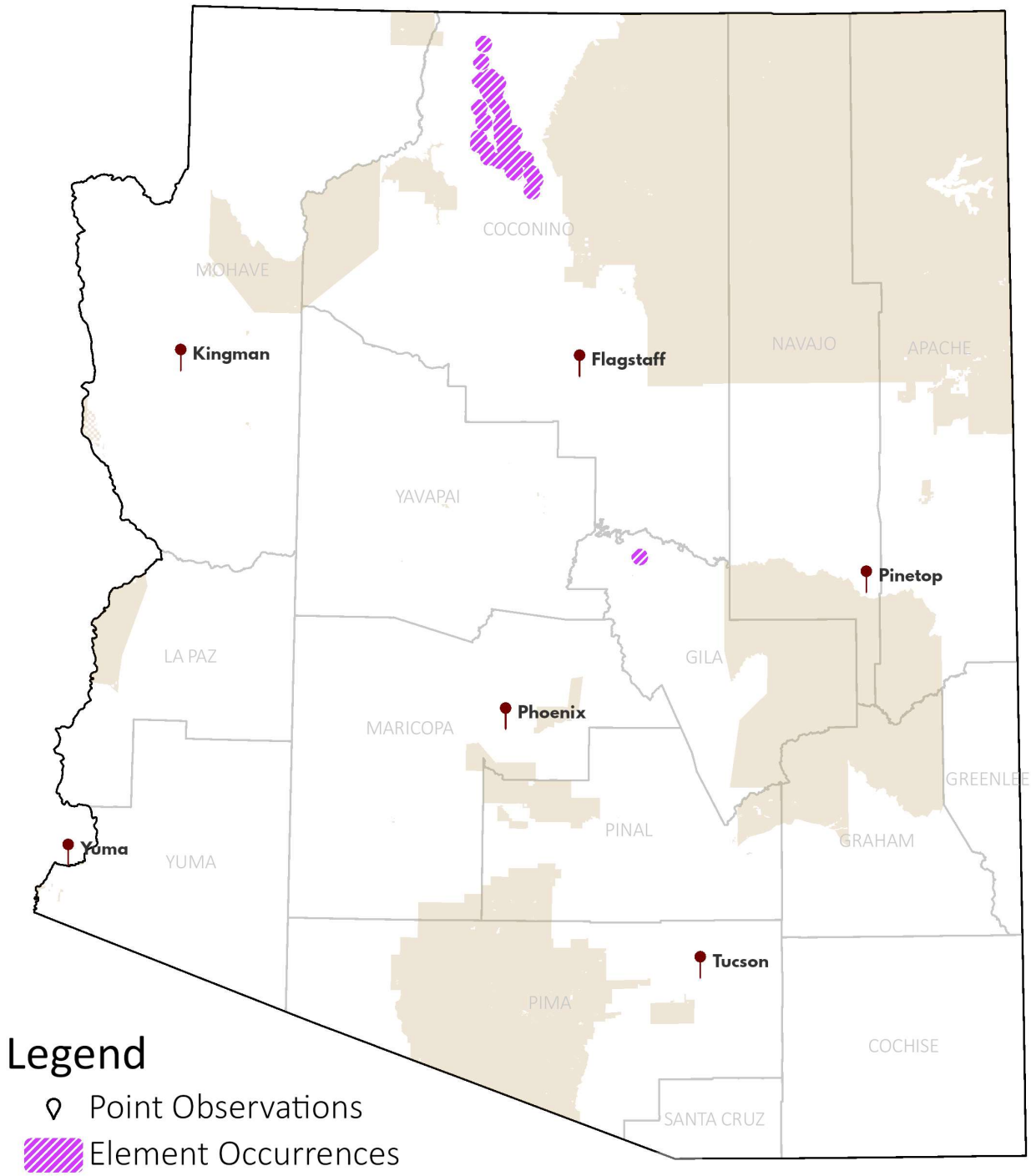
Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

Dieteria bigelovii var. mucronata

Bigelow's Tansy-aster



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

Kilometers

0 50 100

Point Observations are not guaranteed to have been thoroughly quality controlled. Element Occurrence data represent areas where a population occurs.

Heritage Data Management System
2018-02-09

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDFAB2B29D
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Lupinus latifolius* ssp. *leucanthus* (Rydb.) Kenney & D. Dunn
COMMON NAME: Broadleaf lupine, Springdale lupine
SYNONYMS: *Lupinus leucanthus* Rydb., *Lupinus latifolius* var. *parishii* auct. Non C.P. Sm., *L. l.* var. *columbianus*
FAMILY: Fabaceae

AUTHOR, PLACE OF PUBLICATION: *Lupinus latifolius* ssp. *leucanthus* (Rydb.) Kenney & D. Dunn, Trans. Missouri Acad. Sci. 10-11: 100. 1977. *Lupinus leucanthus* Rydberg, Bull. Torrey Bot. Club 30(4): 259. 1903.

TYPE LOCALITY: United States of America: Utah: Springdale, alt. 4000 ft.

TYPE SPECIMEN: HT: US-326569. M.E. Jones 5249e, 16 May 1894. IT: MO, NY.

TAXONOMIC UNIQUENESS: Species *latifolius* is 1 of 156 in the genus *Lupinus*, while subspecies *leucanthus* is 1 of 6 in the species *L. latifolius*. According to Isely (1998) and Kartesz (1999), the ssp. *leucanthus* includes plants called "*L. parishii*" in Kearney and Peebles (1951), and "*L. latifolius* var. *columbianus*" in Welsh et al. (1993). (NatureServe 2001, 2005).

DESCRIPTION: Herbaceous perennial from a branch caudex, with stout stems that are glabrous or nearly so, up to 2 m (6.6 ft) tall (3-12 dm (1-4 ft) tall in Welsh et al., 1993). Pubescence appressed strigose or almost lacking. Leaves mainly cauline; petioles 5 - 20 cm (2-8 in) long. Leaflets 5-11 (usually 7-9), and are 3 - 8 cm (1.2-3 in) long, 5 - 20 mm wide, and are oblong to elliptic or oblanceolate, flat, glabrous above, thinly appressed-strigose beneath. Ten to 35 loosely flowered racemes are 8-25 cm (3-10 in) long at anthesis, and 10 - 45 cm (4-18 in) long in fruit. Flowers are 10 - 14 mm long, with the upper lip of the calyx notched, and the lower lip entire. The keel of the whitish to ochroleucous corolla is ciliate on the upper margins from the middle downward; banner with a central yellowish spot. Ovules are 7-10. The pods are about 3 cm (1.2 in) long, hairy with brown hairs.

Kenney and Dunn (1977), indicated that most of the Arizona specimens have a whitish or ochroleucous corolla, whereas those described as *L. parishii* (now included under ssp. *leucanthus* per Kartesz 1999) from the California specimens, have violet corollas. (NatureServe, 2001).

AIDS TO IDENTIFICATION:

ILLUSTRATIONS: Color photos of species (Lee Dittmann 1997, *in* http://www.mindbird.com/lupinus_latifolius_coe.htm).
Color photos of species (Lee Dittmann 1978 and 1979, *in* http://www.mindbird.com/lupinus_latifolius.htm)
Color photo of species (Flora Skelly 2000, *in* Washington Native Plant Society 2002, http://www.wnps.org/plants/lupinus_latiofolius.html).
Color photo of species (http://www.calflora.net/)
B&W line drawing of species (Cronquist et al., 1989: p. 245)
Color photos of Isotypes (Jones 1894, *in* MBG at http://mobot.mobot.org/cgi-bin/search_vast)
Color photo of type fragment (NY-15933, *in* http://207.156.243.8/emu/vh/specimen.php?irn=452287)
Color photo of Isotype (NY-15932, *in* http://207.156.243.8/emu/vh/specimen.php?irn=452286)
Color photo of Holotype (US-326569, *in* http://ravenel.si.edu/botany/types//fullRecords.cfm?myFamily=)
Color photo of species (Delphino Cornali, in http://www.hiddenvilla.org/Assets/Gallery/Wildflowers/Lupin.htm)
Color photos of species (*in* CalPhotos at http://dlp.cs.berkeley.edu/cgi/img_query/)

TOTAL RANGE: From southwestern Utah (Zion National Park) and central to northwestern Arizona, and perhaps disjunctly in New Mexico. Possibly in Nevada and California. If *L. parishii* and *L.l.* var. *columbianus* are included in *L.l.* ssp. *leucanthus*, as Kartesz (1999) and Isely (1998) state, than the distribution would extend to the Pacific states down to northern Baja California.

RANGE WITHIN ARIZONA: Mohave County: Hualapai Mountains. Yavapai County: Bradshaw, Santa Maria, and southern Weaver Mountains; Cottonwood Creek. McDougall (1973) reported near Williams in Coconino County, and near Prescott and Crown King in Yavapai County.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Perennial forb/herb.

PHENOLOGY: May to July.

BIOLOGY: *Lupinus latifolius* and several other species of lupine contain the alkaloid anagyrine. If these lupines are consumed by a pregnant cow between 40 and 70 days gestation, "Crooked calf disease" can occur.

HABITAT: Occurs along streams and moist soil of dry stream beds, in oak-cottonwood, mixed shrub, and ponderosa pine forest communities. In Yavapai County (NW of Prescott), Arizona, collected among rocks and boulders of canyon bottom (SEINet accessed 2005).

ELEVATION: 4,800 – 7,000 ft (1464-2135 m) in Arizona; 4,000-4,508 ft (1220-1375 m) in Utah.

EXPOSURE:

SUBSTRATE: Red Sand. Granitic hills in Mohave County, and among rocks and boulders in Yavapai County, Arizona.

PLANT COMMUNITY: Oak-cottonwood, mixed shrub, and ponderosa pine forest and chaparral-ponderosa pine forest communities. Associated species include: *Acer negundo* (box-elder), *Amelanchier utahensis* (Utah serviceberry), *Amorpha californica* (California indigo-bush), *Apocynum* (dogbane), *Aquilegia chrysantha* (golden columbine), *Arctostaphylos pungens* (Mexican manzanita), *Asclepias asperula* (spider milkweed), *Baccharis salicifolia* (willow-leaf false-willow), *B. sergiloides* (squaw false-willow), *Celtis reticulata* (=*C. laevigata* var. *reticulata*, netleaf hackberry), *Cercocarpus montanus* (Colorado birch-leaved mountain-mahogany), *Erigeron macranthus* (=*E. speciosus* var. *macranthus*, aspen fleabane), *Forestiera pubescens* (dwarf swamppivet), *Fraxinus velutina* (velvet ash), *Juglans major* (Arizona black walnut), *Juniperus* (juniper), *Lotus utahensis* (Utah bird's-foot-trefoil), *Pinus ponderosa* (ponderosa pine), *Populus* (cottonwood), *Quercus emoryi* (Emory's oak), *Q. gambelii* (Gambel oak), and *Salix* (willow). (SEINet, accessed 2005).

POPULATION HISTORY AND TRENDS: Unknown. Locally common.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: None
OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 1999)

MANAGEMENT FACTORS: This species may have horticultural potential due to their splendid display of long racemes of large flowers.

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: Additional data is needed on the distribution and status in Arizona, along with taxonomy and relationships of ssp. *leucanthus*.

LAND MANAGEMENT/OWNERSHIP: BLM – Kingman Field Office; USFS – Prescott National Forest.

SOURCES OF FURTHER INFORMATION

REFERENCES:

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

Revised: 2002-11-07 (SMS)
2005-05-26 (SMS)

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Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDFAB5L070
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Pediomelum pentaphyllum* Rydberg
COMMON NAME: Chihuahua scurf pea; Three-nerved Scurf-pea
SYNONYMS: *Psoralea pentaphyllum*; *Psoralea pentaphylla* L.; *Psoralea trinervata* (Rydberg) Standley; *Pediomelum trinervatum* Rydberg
FAMILY: Fabaceae

AUTHOR, PLACE OF PUBLICATION: Rydberg. 1919. N. Amer. Fl. 24:23.

TYPE LOCALITY: Mexico: Vicinity of Chihuahua City.

TYPE SPECIMEN: E. Palmer. 5-10 June 1908.

TAXONOMIC UNIQUENESS: From NatureServe (2001), "A member of a group of legumes sometimes placed in the genus *Psoralea* and sometimes placed in the genus *Pediomelum*; in his 1994 checklist, Kartesz places this species (and other similar species) in *Pediomelum* rather than *Psoralea*. This plant was formerly called *Pediomelum trinervatum* (or *Psoralea trinervata*); the name *P. pentaphyllum* was formerly incorrectly applied to the common Mexican plant now called *P. palmeri* (information from Peter Warren, Arizona Field Office, TNC, letter 28Nov94, based on revision by Grimes, Mem. N.Y. Bot. Gard. 61:82-84, 1990). John Kartesz agreed (phone discussion with Larry Morse, 31Aug95) that *Pediomelum pentaphyllum*, as treated in his 1994 checklist, is known in the United States only from Arizona and New Mexico, and (1/98) Texas, with no current records. A different use of the name *Pediomelum pentaphyllum*, with authorship of "(B. Juss. ex L.) J. Grimes" instead of "(L.) Rydb." is given as the species-level name for the var. *scaposum*, considered by Kartesz to be a synonym of *Pediomelum hypogaeum* var. *scaposum* of Texas. *P. palmeri* has recently been renamed *P. ockendonii*."

There are a total of ten *Pediomelum* species that occur in Arizona (Welsh and Licher 2010).

DESCRIPTION: Glandular, strigose, subacaulescent perennial herbs to 30.0 cm (12.0 in.) tall from thick, deep taproots. Usually has one pseudoscape, to 4.0 cm (1.6 in.), sometimes branched. Main stems to 4.0 cm (1.6 in.), densely tomentose, often branched at base. Leaves palmately or pseudopalmately 5-6 foliolate. Petioles 8.5-15.0 cm (3.4-6.0 in.) long with hairs (tomentose) about 3.0 mm (0.12 in.) long (stems appear furry). Leaves lanceolate, rhombic or slightly oblanceolate, upper surface brown- to black-glandular and uniformly strigose to pubescent only on veins and margins, lower surface strigose and with glands usually of lighter color. Inflorescence short- to long-ovoid, with 6-9 nodes and 3 flowers per node. Flowers 14.0-18.0 mm (0.56-0.72 in.), petals purple; calyx tube 4-5 mm long, the upper 4 lobes 10-12 mm

long; fruits enclosed in the calyx, the beak broad, 10-15 mm long, projecting beyond the calyx lobes; seeds large, reticulate.

AIDS TO IDENTIFICATION: The plants are short stemmed, nearly acaulescent, with grayish to whitish pubescent herbage, tuberous roots, and very unequal calyx lobes (NatureServe 2001). In Arizona, *P. megalanthum* is similar, but has more perfectly palmately compound (rather than shortly pinnately compound) leaves with 5-8 leaflets that are often broadly rounded at the tip (Spellenberg 1999).

ILLUSTRATIONS:
Color photo (Spellenberg 1999)
Color photos (SEINet)

TOTAL RANGE: Southeastern Arizona; Hidalgo County, New Mexico; possibly western Texas; and Chihuahua, Mexico (although the contemporary presence of this plant in Mexico is dubious) (USFWS 2018). Recent collections have expanded the known range within Arizona (SEINet 2020).

RANGE WITHIN ARIZONA: Cochise County: Multiple locations in Sulphur Springs Valley, and just west of Chiricahua National Monument. Graham County: San Simon Valley.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Herbaceous perennial.

PHENOLOGY: Spellenberg (1999), reports that it "Flowers in April and May, and again in July and August, depending on rainfall."

BIOLOGY: Dies back to tuberous roots every year.

HABITAT: Desert grasslands and shrublands with mesquite, mesa dropseed (*Sporobolus flexuosus*), soaptree yucca, and creosote. Alexander (in USFWS 2018) writes that deep sandy soils is the "fundamental niche" for this species. Generally found in bare areas between shrubs.

In New Mexico, *P. pentaphyllum* tended to be associated with mesquite. This observation and the fact that there was evidence of recent, shallow, water channels around plants leads to speculation that the areas where the plants were growing may be more subject to flooding during rain and/or may have slightly more favorable ground water availability. At the present time this suggestion is very speculative but should be considered in future surveys (NatureServe 2001).

The habitat requirements of this species are better understood now that it has been documented and surveyed for in both Arizona and New Mexico. Generally , the substrates are sandy to

sandy-loamy soils; these sandy soils are often associated with aeolian-deposited sand dunes, as well as alluvial deposits from ephemeral drainages (USFWS 2018). Within these areas, *P. pentaphyllum* occupies the bare areas between shrubs.

ELEVATION: 3,600 - 4,500 feet (1098-1373 m) in Arizona. Elsewhere, 4,400 - 6,600 ft (1342-2013 m).

EXPOSURE: Generally found on flat to 5% slopes. Our current knowledge does not suggest it prefers one aspect to another, although in modeling habitat USFWS omitted north and south aspects, presumably because it has never been documented from these aspects (USFWS 2018).

SUBSTRATE: In New Mexico, they are generally found on sandy, loamy soils, but the proportion of small sized (0.5-1.0 cm diameter) gravel ranges from sparse to moderate. (NatureServe 2001).

PLANT COMMUNITY: Per NatureServe (2001), Chihuahuan scurfpea plants are found in at least three different community types:

1. A honey mesquite (*Prosopsis glandulosa*)/littleleaf sumac (*Rhus microphylla*) community. Other shrubs that can be in equal or lower abundance are creosote bush (*Larrea tridentata*), mariola (*Parthenium incana*), Torrey yucca (*Yucca torreyi*) and soaptree yucca (*Yucca elata*).
2. A sparsely distributed, but dominant, creosote bush (*Larrea tridentata*) community with mesquite, longleaf jointfir (*Ephedra trifurca*), snakeweed (*Gutierrezia micrantha*), and desert zinnia (*Zinnia acerosa*) in lower abundance.
3. An open grassland habitat with burrograss (*Scleropogon brevifolius*) and scattered mesquite.

Additionally, soaptree yucca (*Yucca elata*) has been found to be "unambiguously associated" with *P. pentaphyllum* (USFWS 2018).

POPULATION TRENDS: Unknown. Baker's 2011 status report indicated ca. 700 plants in Arizona. In 1998, 3-5 extant occurrences were found in New Mexico. It was first collected around 1740 in Mexico, and has only been collected 5 times in the last 250 years. The collections were widely separated localities: 1 from northern Mexico, 1 from southwestern New Mexico, 1 from western Texas, and 2 (including what was the most recent collection before 1998) made in 1963 from southeastern Arizona. Many botanists had looked for it since 1963, but the known specimen labels lacked precise locality and habitat information and so provided few clues that would aid in the search. Given its fairly broad geographic range, it seemed likely that the species did survive somewhere. It was described as being common, at least locally, on a 1936 specimen label from Arizona (NatureServe 2001).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None (USDI, FWS 2019)
None (USDI, FWS 1996)

[Category 2 under *Pediomelum pentaphyllum*, USDI FWS 1993]
[Category 2 under *Pediomelum trinervatum*, USDI, FWS 1990]
[Category 2 under *Psoralea trinervata*, USDI FWS 1985]

STATE STATUS: None

OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 2013)
[Forest Service Sensitive (USDA, FS Region 3 1990, 1999, 2007)]
Bureau of Land Management Sensitive (USDI, BLM AZ 2010)
[Not BLM Sensitive (USDI, BLM AZ 2005)]
[Bureau of Land Management Sensitive under *P. trinervatum* (USDI, BLM 2000)]

MANAGEMENT FACTORS: The impact of common management practices such as grazing, burning, mowing, herbicide use, and mechanical soil disturbance on this species is unknown (NatureServe 2001). However, it appears that this plant is tolerant to slight disturbance, given that it grows in areas of alluvial runoff and shifting sand, and thus subject to erosion and deposition. Additionally, its presence in shrubland that was once historically grassland may suggest a further tolerance for disturbance, although this is speculative (USFWS 2018). Present knowledge of the ecology of this plant suggests populations may be able to be augmented or introduced at occupied or potential habitats (NatureServe 2020).

PROTECTIVE MEASURES: By virtue of nearly 80% of all known plants occurring on federal lands, there are safeguards already in place for this plant, including survey and avoidance procedures for projects that may take place in *P. pentaphyllum* habitat.

SUGGESTED PROJECTS: USFWS has recommended that more frequent monitoring is needed in the four known analysis (population) units to determine population trends (USFWS 2018). Additionally, they recommend studies to define "pollinators and seed dispersal mechanisms and distances", which will aid in conservation measures. Another need is for further surveys; Alexander estimates that only one-third to one-half of the Lordsburg Mesa area in New Mexico has been surveyed (USFWS 2018).

LAND MANAGEMENT/OWNERSHIP: NPS - Chiricahua National Monument, BLM - Safford Field Office, private - Sulfur Springs Valley.

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REFERENCES:

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Peter Warren - Tucson, Arizona.

ADDITIONAL INFORMATION:

Revised: 1990-12-14 (SR)
1991-10-19 (BKP)
1994-12-19 (DBI)
2001-12-27 (SMS)
2020-08-31 (TME)

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PMCYP032T0
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Carex chihuahuensis* Mack.
COMMON NAME: Chihuahuan sedge
SYNONYMS:
FAMILY: Cyperaceae

AUTHOR, PLACE OF PUBLICATION: K.K. Mackenzie, Bull. Torrey Bot. Club. 35(5): 265-266. 1908.

TYPE LOCALITY: Moist places, Puerta de St. Diego [Puerta de Santiago], Chihuahua, Mexico. 1981 m.

TYPE SPECIMEN: HT: NY-7075. C.V. Hartman 620, 12 April 1891. IT: US.

TAXONOMIC UNIQUENESS: The genus *Carex* contains approximately 1,100 species worldwide (Smith 1977), and 490 species in North America (USDA, NRCS 2002). Fifty-eight species of *Carex* are recognized by Lehr (1978 and Lehr et al 1980) as occurring in Arizona.

DESCRIPTION: A grass-like perennial plant. Loosely cespitose with long rhizomes, often forming large tussocks. Stems 2-4 dm high, slender, exceeding the leaves, aphyllopodic. Leaves 2-3 mm wide. Inflorescence 2-7 cm long, 7-15 mm wide, ovoid or oblong with many, densely aggregated (or the lower separate), sessile, androgynous spikes, 6-15 mm long, 3-6 mm wide, the spikes simple or somewhat compound. Bracts scale-like, the lower somewhat prolonged. Pistillate scales oblong-ovate, obtuse, brown or light brownish with paler center and white-hyaline margins, as wide as, but somewhat shorter than the perigynia. Perigynia plano-convex, narrowly ovate, deltoid, widest near the bottom, 3-3.5 mm long, 1-1.5 mm wide, straw-colored or yellowish-brown-tinged, sharp margined, conspicuously several-veined dorsally, less so ventrally, short-stipitate, serrulate above the middle, tapering into a serrulate, deeply bidentate beak 1/4 to 1/3 the length of the body. Stigmas 2 (Fritts 1998).

AIDS TO IDENTIFICATION: *Carex chihuahuensis* can be most easily distinguished from *C. occidentalis,* by its perigynia. It's larger (3.5 mm vs. 2.5-3.5 mm), broadest at the base (vs. broad well above the base), tapering into the beak (vs. abruptly contracted into the beak), and sharp-edged without raised margins (vs. raised margins) (Kearney et al 1960).

ILLUSTRATIONS: Line draw of plant and parts (H.C. Creutzburg, *in* TAMU image page at

http://www.csdl.tamu.edu/FLORA/carex/k2325200.htm)

TOTAL RANGE: From southeastern Arizona, Hidalgo County, New Mexico, and Sonora, and Chihuahua, Mexico.

RANGE WITHIN ARIZONA: Cochise County: Chiricahua and Huachuca Mountains, and San Bernardino Valley; Graham County: Pinaleno Mountains; Gila County: Sierra Anchas; Pima County: Santa Catalina, San Luis and Rincon Mountains; Santa Cruz County: Atascosa and Santa Rita Mountains, and Santa Cruz River.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Herbaceous graminoid perennial.

PHENOLOGY: April to August.

BIOLOGY:

HABITAT: Wet soil in streambeds, shallower draws in pine-oak forest and riparian woodland (Bowers and McLaughlin 1985). Wet meadows, cienegas, marshy areas, canyon bottoms.

ELEVATION: In Arizona, the elevation ranges from 3,600 - 7,200 feet (1098-2196 m). For the range, the elevation is about 1,109 - 8,000 feet (338-2400 m).

EXPOSURE: North and northwest facing slopes.

SUBSTRATE: Damp sand, mud, among rocks, streambeds; colluvial slope overlain by boulders, sediment, or granite bedrock, and underlain by alluvium. Granite-gneiss.

PLANT COMMUNITY: Found in pine oak forests and riparian woodlands. Associated species may include: *Acer grandidentatum* (big-toothed maple), *Alnus oblongifolia* (Arizona alder), *Amsonia grandiflora* (Arizona slimpod), *Aquilegia chrysantha* (golden columbine), *Asclepias angustifolia* (Arizona milkweed), *Ambrosia* sp. (bursage), *Baccharis salicifolia* (willow-leaf false-willow), *Celtis reticulata* (netleaf hackberry), *Cupressus arizonica* (Arizona cypress), *Eleocharis* sp. (spikerush), *Equisetum arvense* (field horsetail), *E. hiemale* (scouring rush), *Fraxinus velutina* (velvet ash), *Juglans* sp. (walnut), *Juncus* sp. (rush), *Mimulus guttatus* (common large monkey-flower), *Pinus cembroides* (Mexican pinyon), *P. ponderosa* (ponderosa pine), *Platanus wrightii* (Wright sycamore), *Populus fremontii* (Fremont cottonwood), *Polypogon monspeliensis* (annual rabbit-foot grass), *Quercus arizonica* (Arizona oak), *Q. emoryi* (Emory's oak), *Q. hypoleucoides* (silver-leaf oak), *Ranunculus macranthus* (large butter-cup), *Salix bonplandiana* (a willow), *S. gooddingii* (Goodding willow), *Scutellaria potosina* (Mexican scullcup), *Toxicodendron radicans* (eastern poison ivy), *Veronica anagalis-aquatica* (brook-pimpernell), and *Vitis arizonica* (Arizona grape).

POPULATION TRENDS: Unknown

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: None
OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 1999)

MANAGEMENT FACTORS:

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS:

LAND MANAGEMENT/OWNERSHIP: DOD-Fort Huachuca Military Reservation; NPS - Saguaro National Park and Chiricahua National Monument; USFS - Coronado and Tonto National Forests; AMNH Southwestern Research Station; Johnson Historical Museum (San Bernardino Ranch); Private.

SOURCES OF FURTHER INFORMATION

REFERENCES:

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

"Many species, especially those with rhizomes, are invasive. This is one of the most effective genera for knitting moist or wet soil" (Hickman 1993).

Revised: 1999-11-03 (LBK)
2000-02-07 (JCP)
2004-03-05 (SMS)

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDSAX0E0F0
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Heuchera glomerulata* Rosend., Butters & Lakela
COMMON NAME: Arizona alum root, Chiricahua Mountain alumroot, Chiricahua alum-root
SYNONYMS:
FAMILY: Saxifragaceae

AUTHOR, PLACE OF PUBLICATION: C.O. Rosendahl, F.K. Butters, & O.K. Lakela, Minnesota Stud. Pl. Sci. 2: 155. 1936.

TYPE LOCALITY: Arizona: Cochise County: Chiricahua Mountains, Rustler's Park.

TYPE SPECIMEN: HT: MO. G.J. Goodman and C.L. Hitchcock 1184.

TAXONOMIC UNIQUENESS: The genus *Heuchera* contains approximately 50 species in North America (Hickman 1993); 36 species reported in PLANTS Database (USDA, NRCS 2002). Six species of *Heuchera* are recognized by Elvander (1992) as occurring in Arizona.

DESCRIPTION: Herbaceous perennial with a stout woody crown and root. Leaves all basal, downy rather than hairy, blades 1.5-5 cm (0.6-2 in) long and 3.5-5.5 cm (1.4-2.2 in) wide, broadly ovate-cordate, shallowly 7-10 lobed, the lobes crenate. Petioles are glabrous or with some small hairs, 2-15 cm (0.8-6 in) long. Flowering stems are 25-40 cm (10-16 in) tall, the inflorescence consisting of condensed racemes (3-10), slightly paniculate below, 30-60 cm (12-24 in) tall. The flowers are 3-5 mm long, mostly pale yellow-cream, and densely hirsute to pilose; portion of hypanthium fused to ovary 1-1.5 mm long, ovoid, about equal to free part. Sepals are equal, oblong, and occasionally pink tinged; petals 1-2 mm long, shorter than sepals, obovate to oblanceolate, occasionally pink tinged. The stamens are shorter than the sepals; the anthers are usually purple, sometimes yellow; mature styles are shorter than the sepals. The fruit is short-ovoid with rather obtuse valves.

AIDS TO IDENTIFICATION: *Heuchera glomerulata* is most similar to *H. novomexicana*, in that the leaves are all basal and long-stalked and the petals are shorter than the sepals (Rickett 1970). However, *H. glomerulata* has leaves that are downy rather than hairy, the blades are variegated, thicker, and purple beneath, the flowers are larger (up to 1/6 inch long) and bristly (bristly-hirsute), and are aggregated into dense glomerulate cymules. *H. glomerulata* also has more strongly incurved stamens with larger anthers, much larger petals, and shorter beaks to the carpels. The fruit is short-ovoid with rather obtuse valves, abruptly

tipped with very short true styles and barely exserted; *H. novomexicana*, has valves that taper gradually into narrow points, which are considerably exserted (Rosendahl et al 1936).

ILLUSTRATIONS: Color photo of Holotype collection (G.J. Goodman & C.L. Hitchcock *in* MGB at http://mobot.mobot.org/cgi-bin/search_vast)

TOTAL RANGE: The mountains of southeastern Arizona, and from Animas Peak in New Mexico.

RANGE WITHIN ARIZONA: From Pinaleno, Santa Theresa and Galiuro mountains in Graham County; the Santa Catalina and Chiricahua mountains in Cochise County; and the Pinal Mountains in Gila County. Also present in Greenlee, and southern Apache and Navajo counties.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Herbaceous/deciduous perennial.

PHENOLOGY: Flowers from May to August.

BIOLOGY: *Heuchera glomerulata* may hybridize with *H. novomexicana*, with intermediate forms between the two occasionally occurring in Greenlee, southern Apache and Navajo counties, in Arizona.

HABITAT: Found on shaded rocky slopes, in humus soil, near seeps, streams and riparian areas.

ELEVATION: 4,000 to 9,000 feet (1220-2750 m).

EXPOSURE: North facing slope.

SUBSTRATE: Sandstone; Humus soil among rocks.

PLANT COMMUNITY: Oak, pine-oak, and pinyon-juniper woodlands, and ponderosa pine and mixed conifer forests. In Frank W. Reichenbacher's 1983 collection (ARIZ 1446), *H. glomerulata* was located in a Madrean evergreen woodland, associated with *Quercus emoryi* (Emory's oak) and *Q. arizonica* (Arizona oak). Also reported to be associated with *Arctostaphylos* sp. (Manzanita), *Ceanothus* sp., *Cupressus arizonica* (Arizona Cypress), *Juniperus deppeana* (Alligator juniper), *Penstemon piaifolius*, *Pinus cembroides* (Mexican pinyon), *P. edulis* (Two-needle pinyon pine), and *Quercus reticulata* (*rugosa*) (Net-leaf oak).

POPULATION TRENDS: Unknown.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: None
OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 1999)
[Forest Service Sensitive USDA, FS Region 3 1990]

MANAGEMENT FACTORS:

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS:

LAND MANAGEMENT/OWNERSHIP: USFS - Coronado and Apache-Sitgreaves National Forests; AGFD – Cluff Ranch Wildlife Area.

SOURCES OF FURTHER INFORMATION

REFERENCES:

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Patrick Elvander - University of California.

ADDITIONAL INFORMATION:

"A very difficult genus, highly variable at many levels and needing much additional research" (Hickman 1993).

Forms intermediate with *H. novomexicana* occasionally in Greenlee, southern Apache, and southern Navajo counties and may be of hybrid origin (Elvander 1992).

Revised: 1999-11-08 (LBK)
2000-02-03 (JCP)
2004-04-01 (SMS)

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PMCYP03E50
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Carex ultra* L. H. Bailey
COMMON NAME: Arizona Giant Sedge, Cochise Sedge
SYNONYMS: *Carex spissa* var. *ultra* (L. H. Bailey) Kuk.
FAMILY: Cyperaceae

AUTHOR, PLACE OF PUBLICATION: Bailey, L. H. 1886. Proc. Amer. Acad. Arts 22(1): 83.

TYPE LOCALITY: Arizona: Huachuca Mountains.

TYPE SPECIMEN: Lemmon 2901, 2902. 1882.

TAXONOMIC UNIQUENESS: Approximately 50 species of *Carex* known from Arizona.

DESCRIPTION: Has appearance of bulrush but is actually a large sedge with round, stout, erect, culms 1.0-2.0 m (3.3-6.6 ft.) tall, 1.5 cm thick at the base, smooth on the obtuse angles below, densely caespitose from stout rootstocks. Leaves 6-15 to a culm, not septate-nodulose, thick, glaucous, 6-12 conspicuously striate-nerved, strongly rough-serrulate on the margins; lower sheaths rough, scabrous and filamentose ventrally, concave at the mouth, the ligule longer than wide. Staminate spikes 2 to 4, 3.0-12.0 cm (1.2-4.8 in.) long, 4-6 mm wide, the lateral sessile or short-peduncled; pistillate spikes 3 to 6 and 2.5 to 15.0 cm (1.0-5.9 in.) long and 0.6 to 1.2 cm (0.24-0.47 in.) wide, sometimes staminate at the apex; upper spikes sessile and overlapping, lower spikes more or less strongly peduncled and separate, erect, elongate, linear-cylindric, 2.5-15 cm long, 6-12 mm wide, containing very numerous appressed-ascending perigynia. Perigynia (bract enclosing the achene) broadly ovoid, compressed-trigonous, leaf-like, 3.5- 4.5 mm (0.24-0.47 in.) long by 2.0 mm (0.08 in.) wide, little inflated, glabrous, light-brown and red-striolate at maturity, obscurely several-nerved on both surfaces, rounded at the base and apex, abruptly short-beaked with beak 0.3 mm (0.12 in.) long; scales lanceolate, acute to acuminate or tapering into a short rough awn, reddish-brown, the center several-nerved and green or staw-colored, half as wide as the perigynia. Achenes trigonous with blunt angles, elliptica-obovoid, about 2.5 mm long and 1.25 mm wide, silvery-black, minutely pitted, substipilate, abruptly contracted into the slender, straight style.

AIDS TO IDENTIFICATION: Largest sedge in southern Arizona, growing up to 2.0 m (6.6 ft.) tall. Spikelets very long for sedge, approximately 5.0-10.2 cm (2.0-4.0 in.) long.

ILLUSTRATIONS: USFWS Line Drawings.

TOTAL RANGE: Southeast Arizona, extreme southwest New Mexico (Hidalgo County: Indian Springs in Peloncillos) and Mexico (Sonora, Coahila).

RANGE WITHIN ARIZONA: Cochise County: Huachuca, Chiricahua, Dragoon and Galiuro Mountains; Graham County: Galiuro Mountains; Pinal County: Aravaipa Canyon; Pima County: Santa Rita Mountains, Rincon Valley; Santa Cruz County: Santa Rita and Atascosa Mountains; Yavapai County: Hieroglyphic and Mazatzal Mountains. Only one patch per mountain range except for the Huachucas which have several patches (Warren 1994).

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Herbaceous perennial.

PHENOLOGY: Flowering late March through September.

BIOLOGY: Populations often small and widely separated. *Carex spissa* has unusual geographical range similar to that of *Lilium parryi* with disjunct populations; *C.s.* var. *ultra* in the mountains of southeast Arizona and *C.s.* var. *spissa* found in coastal southern California and northern Baja California, Mexico.

HABITAT: Moist soil near perennially wet springs and streams; undulating rocky-gravelly terrain.

ELEVATION: 2,040 - 6,000 feet (610-1800 m).

EXPOSURE: Southeast-facing, often shaded.

SUBSTRATE: Wet alluvial soil, sand and gravel.

PLANT COMMUNITY: Aquatic/riparian woodland; oak-pinyon woodland. Associated species may include: *Juniperus deppeana, Platanus wrightii, Cupressus, Fraxinus, Mimulus guttatus, M. cardinalis, Salix goodingii, S. bonplandiana, Populus fremonti, Juncus, Polypogon monspeliensis, Eleocharis montevidensis, Vitis arizonica, Toxicodendron radicans, Scutellaria potosina, Amsonia grandiflora, Fraxinus velutina, Asclepias angustifolio, Aquilegia chrysantha, Baccharis salifolia, B. rubens, B. marginatus,Veronica anagallis-aquatica, Quercus emoryi, Q. arizonica, Q. hypoleucoides, Rhamnus californicus, Bouvardia glaberrima, Lobelia laxiflora, Yucca arizonica, Cammandra pallida, Astragalus arizonicus, Cammisonia chamaenerioides, Chaenactis carphoclinia, Cryptantha angustifolia, C. muricata, Cynodon dactylon, Eriogonum deflexum, Erodium cicutarium, Galium aparine, Juncus balticus, Mentzelia multiflora, Phalaris minor, Prenanthella exigua, Prosopsis velutina, Rorippa nasturtium-aquaticum, Spenopholis obtusata, Tamarix chinensis, Trisetum interruptum, Avena fatua, Bothriochloa, Castilleja linariifolia.*

POPULATION TRENDS: Unknown

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: None
OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 2007)
[Forest Service Sensitive (USDA, FS Region 3 1999)]
Bureau of Land Management Sensitive (USDI, BLM AZ 2005, 2008, 2010)

MANAGEMENT FACTORS: Small populations in isolated wetlands vulnerable to local disturbance of aquatic habitat, therefore, protection of springs required.

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: Revisit known sites to determine population and habitat, then track population condition. Survey potential Bureau of Land Management sites in Galiuro Mountains.

LAND MANAGEMENT/OWNERSHIP: DOD - Fort Huachuca Military Reservation; NPS - Chiricahua National Monument; USFS - Coronado and Tonto National Forests; Pima County - Cienega Creek Natural Preserve; TNC - Aravaipa Canyon and Muleshoe Ranch Preserves; Private.

SOURCES OF FURTHER INFORMATION

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USDI, Bureau of Land management Region 2. 2008. Arizona BLM Sensitive Species List.
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Warren, P.L. 1994. Bureau of Land Management, Safford District, Rare Plant Workshop. November 14-16. Tucson, Arizona.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

Gary Helbing - US Forest Service, Douglas, Arizona.
Steve McLaughlin - University of Arizona, Tucson, Arizona.
Peter Warren - Tucson, Arizona.
Miriam C. Fritts

ADDITIONAL INFORMATION:

Revised: 1994-08-31 (PLW)
1994-12-15 (PLW)
2000-02-18 (JCP)

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Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PPASP020A0
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Asplenium dalhousiae* Hook.
COMMON NAME: Dalhousie spleenwort, Countess Dalhousie's spleenwort
SYNONYMS: *Ceterach dalhousiae* (Hook.) C. Christens., *Ceterachopsis dalhousiae* (Hook.) Ching
FAMILY: Aspleniaceae

AUTHOR, PLACE OF PUBLICATION: Hooker, Icones Plantarum, pl. 105. 1837.

TYPE LOCALITY:

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: A distinct species in a genus of about 650 species distributed worldwide, mostly in tropical and subtropical regions. One of 84 species in North America (USDA, NRCS 2004). The pattern of disjunction in the worldwide range of this species is highly unusual (FNA Editorial Committee, 1993+).

DESCRIPTION: A perennial fern with a rosette of fronds from a rhizome; roots are not proliferous. The stems are erect, unbranched; scales are black with brown margins, lanceolate, 2-5 x 0.6-1 mm, sparsely denticulate. The leaves are monomorphic. Petiole is dark to light brown throughout, dull, to 1 cm, 1/10 - 1/15 length of the blade, indument of scales throughout. The narrowly elliptic to narrowly lanceolate blade is pinnatifid, 4 - 15 x 1.5 - 6 cm, thick, and sparsely puberulent to glabrescent, with 6-13 pairs of lobes, the lobes 5-12 mm wide. The base is gradually tapered, and the apex is obtuse, not rooting; stipes shorter than the blade. Rachis green in color, scaly beneath, however, FNA Editorial Committee (1993+) reports the rachis as light brown to tan, dull-scaly; the scales brown and lanceolate. The veins are free and obscure. The sori are 3-7 pairs per pinna, on both basiscopic and acroscopic sides of the lobes. There are 64 spores per sporangium. (Falk, Jenkins et al. 2001; FNA Editorial Committee, 1993+). Martin et al. (1998) reports the petioles absent or very short; sori long and narrow along the veins.

AIDS TO IDENTIFICATION: *Asplenium dalhousiae* is distinguished by its once pinnatifid leaves from *A. exiguum* which has bipinnatifid leaves. It is sometimes placed in the genus *Ceterach* on the basis of its thick, pinnatifid leaves. However, most pteridologists restrict *Ceterach* to species with densely scaly, pinnatifid leaves. *A. dalhousiae* is placed in

Ceterachopsis by pteridologists who believe it merits its own genus. (FNA Editorial Committee, 1993+).

ILLUSTRATIONS:
B&W line drawing (*In* Falk, Jenkins et al. 2001)
Color photo (Yatskievych, *in* Falk, Jenkins et al. 2001)
Color photo of plant in habitat (Falk, *in* Falk, Jenkins et al. 2001)
Color photo (George Yatskievych, 2003, from http://pick4.pick.uga.edu/)

TOTAL RANGE: Southern Arizona and northern Mexico in the New World, and is disjunct to the Himalaya Mountains in Asia.

RANGE WITHIN ARIZONA: Scattered localities in the Mule and Huachuca mountains of Cochise County, and the Baboquivari Mountains of Pima County.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Perennial fern with a robust growth form.

PHENOLOGY:

BIOLOGY:

HABITAT: A sky island species that grows in shady, rocky ravines in moist soil among and at the bases of rocks, in Madrean oak woodland.

ELEVATION: 4,000 – 6,000 ft (1220-1830 m). According to FNA Editorial Committee (1993+), the elevation ranges from 4,262 – 6,557 ft (1300-2000 m).

EXPOSURE: A locality found in the Mule Mountains of Arizona, was growing on a northwest facing slope (Windham #0238D, ASC 37015). Collected on a northwest-facing slope of about 40 degrees.

SUBSTRATE: Appears to be restricted to granitic substrates in southern Arizona. Shallow soil derived by in situ and alluvial processes from Juniper Flat Granite and organic detritus (Wingham 238-C, ASU 115791).

PLANT COMMUNITY: Madrean oak woodland. Evergreen woodland, associated with *Dasylirion* (sotol), *Garrya* (silktassel), *Heuchera* (alumroot), *Pinus* (pine), *Quercus* (oak), and *Rubus* (blackberry), (Windham #0238D, ASC 37015).

POPULATION HISTORY AND TRENDS: Not well known. In 1985, considered "rare" in Arizona; status today unknown. Status in Mexico and Asia is unknown. Where found, locally common in seepy shaded granitic crevices and overhangs.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: None
OTHER STATUS: Bureau of Land Management Sensitive (USDI, BLM 2000, 2005, 2008, 2010).

MANAGEMENT FACTORS: Cultivated in terraria, thus possible threat from collecting in the wild.

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS:

LAND MANAGEMENT/OWNERSHIP: BIA – Tohono O'Odham Nation; BLM – Tucson Field Office. Possibly USFS – Coronado National Forest.

SOURCES OF FURTHER INFORMATION

REFERENCES:

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USDI, Bureau of Land management Region 2. 2008. BLM Arizona Sensitive Species List.
USDI, Bureau of Land management Region 2. 2010. BLM Arizona Sensitive Species List.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

Revised: 2002-04-04 (SMS)
2004-07-29 (SMS)

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Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDLAM1S0E0
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Salvia davidsonii*
COMMON NAME: Davidson sage, Davidson's sage
SYNONYMS:
FAMILY: Lamiaceae

AUTHOR, PLACE OF PUBLICATION: Greenman, Proceedings of the Academy of Arts and Sciences 41: 246, 1905.

TYPE LOCALITY: Chiricahua Mountains, Cochise County, Arizona, USA.

TYPE SPECIMEN: Syntype: GH 1541. Lemmon #3077, Sep 1881.

TAXONOMIC UNIQUENESS: Species *davidsonii* is 1 of 76 in the genus *Salvia*.

DESCRIPTION: Herbaceous perennial with 1 to several stems up to 70 cm (28 in) tall, puberulent and often villous with slender, white hairs. Leaves exceedingly variable, those near the base may be 12 cm (4.7 in) long and pinnate with 3 to 7 leaflets, the terminal leaflet large and coarsely crenate-serrate or shallowly lobed, the lateral ones much smaller and entire. The upper leaf blades are often simple and entire, from 3-30 mm long and from 1-15 mm wide. Flowers 1 or more in the upper leaf axils; calyx about 1 mm long, cleft to near the middle. The corolla is pinkish to red, perhaps with a blue tinge, and is tubular, about 2.5 cm long, the lips less than 5 mm long; connectives of the stamens with anther cells at both ends.

AIDS TO IDENTIFICATION: The pubescence of this species, like some other Labiatae, is highly variable in the presence and abundance of elongate slender hairs on stems and leaves. So far as available material indicates, these hairs are infrequent in *S. davidsonii* and generally represented in *S. henryi*.

ILLUSTRATIONS:

TOTAL RANGE: North-central to southeastern Arizona, and from Hidalgo County, New Mexico.

RANGE WITHIN ARIZONA: North-central to southeastern Arizona. Collections include Coconino, Greenlee, and Mohave counties (SEINet, accessed 2004), although most collections are from the Grand Canyon National Park. Per Kearney and Peebles (1951), it can be found in western Coconino, Greenlee, and eastern Maricopa and Cochise counties.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Perennial forb/herb.

PHENOLOGY: Flowers April to July (May to August).

BIOLOGY:

HABITAT: Rocky soils in canyons, and in rich, moist soils on wooded slopes. The species has been collected on seepy detritus slope, and ledge, and on terrace above stream bed.

ELEVATION: 1,600 - 9,514 ft (488 - 2900 m).

EXPOSURE:

SUBSTRATE: Rocky soils in canyons and in rich, moist soils on wooded slopes. In the Grand Canyon, it can be found on seepy detritus slopes and ledges, and sandy soils on terraces. In Greenlee County, it has been found on Gila conglomerate soil; bedrock. (SEINet, accessed 2004).

PLANT COMMUNITY: Associated species in the Grand Canyon may include Acacia, and Berberis. In Greenlee County, the species has been observed in the Chihuahuan Desert habitat.

POPULATION HISTORY AND TRENDS: Unknown

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: None
OTHER STATUS: None

MANAGEMENT FACTORS:

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: Surveys to determine current population status and distribution range need to be performed.

LAND MANAGEMENT/OWNERSHIP: BIA - Havasupai and Hualapai Reservations; BLM - Kingman Field Office; NPS - Grand Canyon National Park; USFS - Tonto National Forest; Private.

SOURCES OF FURTHER INFORMATION

REFERENCES:

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

Revised: 2004-09-02 (AMS)

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDSAX0E0B0
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Heuchera eastwoodiae*
COMMON NAME: Eastwood alum root, Senator Mine alumroot, Senator Mine Alum-root
SYNONYMS:
FAMILY: Saxifragaceae

AUTHOR, PLACE OF PUBLICATION: Rosendahl, Butters & Lakela, Minnesota Studies in Plant Science 2: 152. 1936.

TYPE LOCALITY: "Senator Mine, Prescott Region", Bradshaw Mountains, Yavapai County, Arizona.

TYPE SPECIMEN: Eastwood 17659, Minn. s.n.

TAXONOMIC UNIQUENESS: The species *eastwoodiae* is 1 of 36 in the genus *Heuchera*, and 1 of 7 in Arizona.

DESCRIPTION: Perennial herb with a flower stalk up to 20 inches (51 cm) tall. Leaves, which are basal on long leaf stalks, are dark green, roundish, and scalloped, with fine hair; to 3.5 in (9 cm) wide. Yellowish green flowers are in loose, terminal racemes on weak, leafless stalks. The flowers do not have petals, and the 6 sepals are short and pointed, with yellow stamens.

AIDS TO IDENTIFICATION:

ILLUSTRATIONS: Color photos (L.E. Epple *in* A.O. Epple, 1995: plates 492A and B).
Color photo (ASU-84960, http://seinet.asu.edu/collections/TaxaDetails.jsp?)

TOTAL RANGE: Endemic to central Arizona. Coconino County: Mogollon Rim near Telephone Ride, Oak Creek Canyon, and West Fork of Oak Creek Canyon. Gila County: Christopher Creek, Mogollon Rim south of Woods Canyon Lake, and Sierra Ancha. Maricopa County: New River Mountains. Yavapai County: Bradshaw and Mazatzal Mountains, Mingus Mountain, and Lime Creek.

RANGE WITHIN ARIZONA: See "**Total Range**."

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Perennial forb/herb.

PHENOLOGY: Flowers May – August.

BIOLOGY:

HABITAT: Found on moist shaded slopes in ponderosa pine forests and canyons.

ELEVATION: 3,480 – 7,874 feet (1061-2400 meters).

EXPOSURE: In New River Mountains, found on north-facing rocky slopes.

SUBSTRATE: Rocky clay. Collected from crevices of basalt boulders, and deep basaltic soils.

PLANT COMMUNITY: Ponderosa pine forests. Associated species include *Abies concolor* (white fir), *Acer grandidentatum* (big-toothed maple), *Achillea millefolium* (common yarrow), *Agave toumeyana* var. *bella*, *Berberis* (*=Mahonia*) *repens* (creeping Oregon-grape), *Cercocarpus* (mountain-mahogany), *Echinocereus triglochidiatus* (mound hedgehog-cactus), *Erigeron oreophilus* (Chaparral fleabane), *Fendlera rupicola* (cliff Fendler-bush), *Goodyera oblongifolia* (giant rattlesnake-plantain), *Juniperus deppeana* (Alligator juniper), *Nolina microcarpa* (Sacahuist bear-grass), *Pinus ponderosa* (Ponderosa pine), *Ptelea trifoliata* (western hoptree), *Quercus gambellii* (Gambel oak), *Q. turbinella* (shrub live oak), *Robinia neomexicana* (New Mexico locust),and *Valeriana* (valerian).

POPULATION HISTORY AND TRENDS: Locally common.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: None
OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3, 1999)

MANAGEMENT FACTORS:

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS:

LAND MANAGEMENT/OWNERSHIP: USFS - Apache-Sitgreaves, Coconino, Prescott and Tonto National Forests; Private.

SOURCES OF FURTHER INFORMATION

REFERENCES:

Epple, A.O. and L.E. Epple. 1995. A field guide to the plants of Arizona. Falcon. Helena, Montana. P. 86.

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USDA, NRCS. 2004. The PLANTS Database, Version 3.5 (http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

Revised: 2002-10-17 (SMS)
2005-05-17 (SMS)

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDAST3M4X0
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Erigeron piscaticus*
COMMON NAME: Fish Creek Fleabane
SYNONYMS: *Erigeron lemmoni* Gray (in part)
FAMILY: Asteraceae

AUTHOR, PLACE OF PUBLICATION: Nesom, G.L. 1989. Phytologia 67(4):304-306.

TYPE LOCALITY: Fish Creek Canyon, Maricopa County, Arizona.

TYPE SPECIMEN: US. Peebles, R.H. and E.D. Eaton (7953). 16 July 1931.

TAXONOMIC UNIQUENESS: One of at least 29 species of *Erigeron* occurring in Arizona. *E. piscaticus* was originally considered as part of *E. lemmoni* Gray.

DESCRIPTION: **Annual**, up to 40 cm (16 in.) tall from slender tap root with numerous branches. Entire plant minutely but densely stipitate-glandular. **Sparsely but evenly pilose (soft hairs) with stiffly spreading trichomes**. Leaves obovate, sessile or with a short petiolar region, not clasping; mostly 10.0-22.0 mm (0.4-0.88 in.) long, 2.0-7.0 mm (0.08-0.28 in.) wide; **leaves entire or rarely with single tooth**; apex apiculate (small, broad point). Ray flowers 4-58 in 1-2 series (layers), corollas white. Disc corollas 1.5-1.8 mm (0.06-0.07 in.) long, inflated and white-indurated just above the tube. Achenes 0.8-1.0 mm (0.03-0.04 in.) long, tan, sparsely strigose to glabrate; pappus of 8-11 bristles about two-thirds as long as disc corollas, with a few but prominent outer setae, 0.1-0.2 mm (0.004-0.008 in.) long. **Rays typically blue when dried**. **Phyllaries (toothed bracts surrounding heads) in 2-3 series of nearly equal length**, other species unequal.

AIDS TO IDENTIFICATION: *E. piscaticus* lacks lobed leaves, has only sparse hairs on the upper stem. Heads (disc area) 4.0-5.0 mm (0.16-0.20 in.) wide. All of co-occurring species (*E. divergens, E. lobatus, E. lemmonii* and *E. piscaticus*) have much larger heads. For comparison of these species, see chart, page 3 of abstract (Gori 1994).

ILLUSTRATIONS: Line drawing (USFWS)

TOTAL RANGE: Central Arizona, Graham County, Galiuro Mountains, Oak Grove Canyon, Aravaipa Canyon Preserve. Historically from Fish Creek Canyon, Superstition Mountains, Maricopa County; Turkey Creek, also in the Aravaipa Canyon Preserve, Graham County; and Box Canyon, Santa Catalina Mountains, Pima County.

According to Dave Gori (1999), surveys have been conducted since 1989, including a 1998 survey of Aravaipa Creek, and to his knowledge there are no other extant locations for this plant except Oak Grove Canyon.

RANGE WITHIN ARIZONA: See "**Total Range**."

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Annual

PHENOLOGY: Flowers and fruits May - August, probably continuing until October.

BIOLOGY: Environmental cues to initiate germination are unknown. As an annual, this species may not emerge in some years.

HABITAT: Moist, sandy canyon bottoms associated with perennial streams.

ELEVATION: 2,250 to 3,500 feet (686-1068 m).

EXPOSURE: Level

SUBSTRATE: Sandy alluvium

PLANT COMMUNITY: Southwest riparian plant community

POPULATION TRENDS: 1993 and 1994 surveys showed 79 plants both years. Population stable. In July, 1994, 30 plants with an increase in September to 79 plants. Greater germination after summer rains is evidence that plant can germinate and flower later in season (previously believed to be only after winter rains).

Five collections known: two from Fish Creek in 1929 and 1931, two from Turkey Creek and vicinity in 1976 and 1979, and one from Box Canyon Santa Catalina Mts in 1962 (originally collected under *E. lemmonii*). A survey on July 15-16 and August 11-14, 1990, from the historic Turkey Creek location, and the Oak Grove Canyon location (a tributary of Turkey Creek), failed to relocate any plants, and no new collections were made in nearby areas (Gori and Malusa, 1991). A similar survey of the Galiuro Mountains located 87 plants in Oak Grove Canyon in 1992, part of the TNC (The Nature Conservancy) Aravaipa Canyon Preserve.

Per Gori (1999), plants have been found and annually monitored in Oak Grove Canyon since 1992, with no other extant locations found for this plant, except in Oak Grove Canyon.

Unknown if Box Canyon population is still extant in the Santa Catalina Mountains.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None (USDI, FWS 1996)
[Category 2 USDI, FWS 1993]

STATE STATUS: Salvage Restricted (ARS, ANPL 1993, 2010, accessed 2011)

OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 1990, 1999, 2007)
Bureau of Land Management Sensitive (USDI, BLM AZ 2000, 2005, 2008, 2010)

MANAGEMENT FACTORS: Small range and population size of this species make it susceptible to natural and man-caused disturbances. Other factors that could affect the species include poor watershed conditions; Oak Grove Canyon hiking traffic; flooding; and recreation (casual camp sites). Greatest problem: only one population known with 80+ plants. Light grazing does **not** seem to affect plant.

CONSERVATION MEASURES TAKEN: The possible historical Fish Creek site is located in the Superstition Mountains within Superstition Wilderness Area. The possible historic Turkey Creek, and extant Oak Grove Canyon sites are located within the Aravaipa Canyon Preserve.

SUGGESTED PROJECTS: Regularly survey Fish Creek over the course of many years and changing environmental conditions; timing of plant observance and flowering possibly tied to moisture. When plants are present at Fish Creek, expand survey into other potential streams in the Superstition Mountains, and possibly Aravaipa Canyon in the Galiuro Mountains, and Box Canyon in the Santa Catalina Mountains. Survey is greatest management need throughout Aravaipa Canyon watershed as well as the Superstition Mountains. July or August good time for survey.

LAND MANAGEMENT/OWNERSHIP: USFS - Tonto National Forest; TNC - Aravaipa Canyon Preserve; Possibly BLM - Safford District.

SOURCES OF FURTHER INFORMATION

REFERENCES:

Arizona Revised Statutes, Chapter 7. 1993. Arizona Native Plant Law. Appendix A:3.
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Gori, D.F., P.L. Warren, and L.S. Anderson (TNC). 1990. Population studies of sensitive plants of the Huachuca, Patagonia, and Atascosa mountains, Arizona. Prepared for the Coronado National Forest, Tucson, Arizona.

Gori, D. and J. Malusa (TNC). 1991. A survey of *Erigeron piscaticus* in the regions of Aravaipa Canyon, Galiuro Mountains and Fish Creek Canyon, Superstition Mountains, Arizona. Prepared for U.S. Fish and Wildlife Service, Phoenix, Arizona.

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USDI, Bureau of Land Management Region 2. 2010. Arizona BLM Sensitive Species List.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Dave Gori - The Nature Conservancy, Tucson, Arizona.
Jim Malusa - The Nature Conservancy, Tucson, Arizona.
Guy L. Nesom - University of Texas, Austin.

ADDITIONAL INFORMATION:

Erigeron piscaticus incorrectly included in the flora of the Pinaleño Mountains (W.T. Johnson, M.S. thesis, Arizona State University, 1986?), but this misidentification was corrected in Johnson, 1988. Flora of the Pinaleno Mountains. Desert Plants 8:147-191.

Revised: 1990-01-23 (SST)
1990-12-04 (SR)
1992-09-16 (BKP)
1994-09-08 (PLW)
1994-03-28 (DBI)
2001-12-18 (SMS)

E. divergens	*E. lobatus*	*E. lemmoni*	*E. piscaticus*
Canyon bottoms (can be wider)	Canyon bottoms (can be wider)	Next to cliffs, (only 1 population)	Shady canyon bottoms.

Leaves mostly entire (base of plant may be lobed)	All lobed	Lobed and entire	All entire
Heads: 8.0-10.0 mm. (0.32-0.4 in.) Erect, taller plant	Heads: 8.0-10.0 mm (0.32-0.4 in.)	Heads: 6.0-10.0 mm (0.24-0.40 in.)	Heads: 4.0-5.0 mm (0.16-0.20 in.) Low growing with very small flowers

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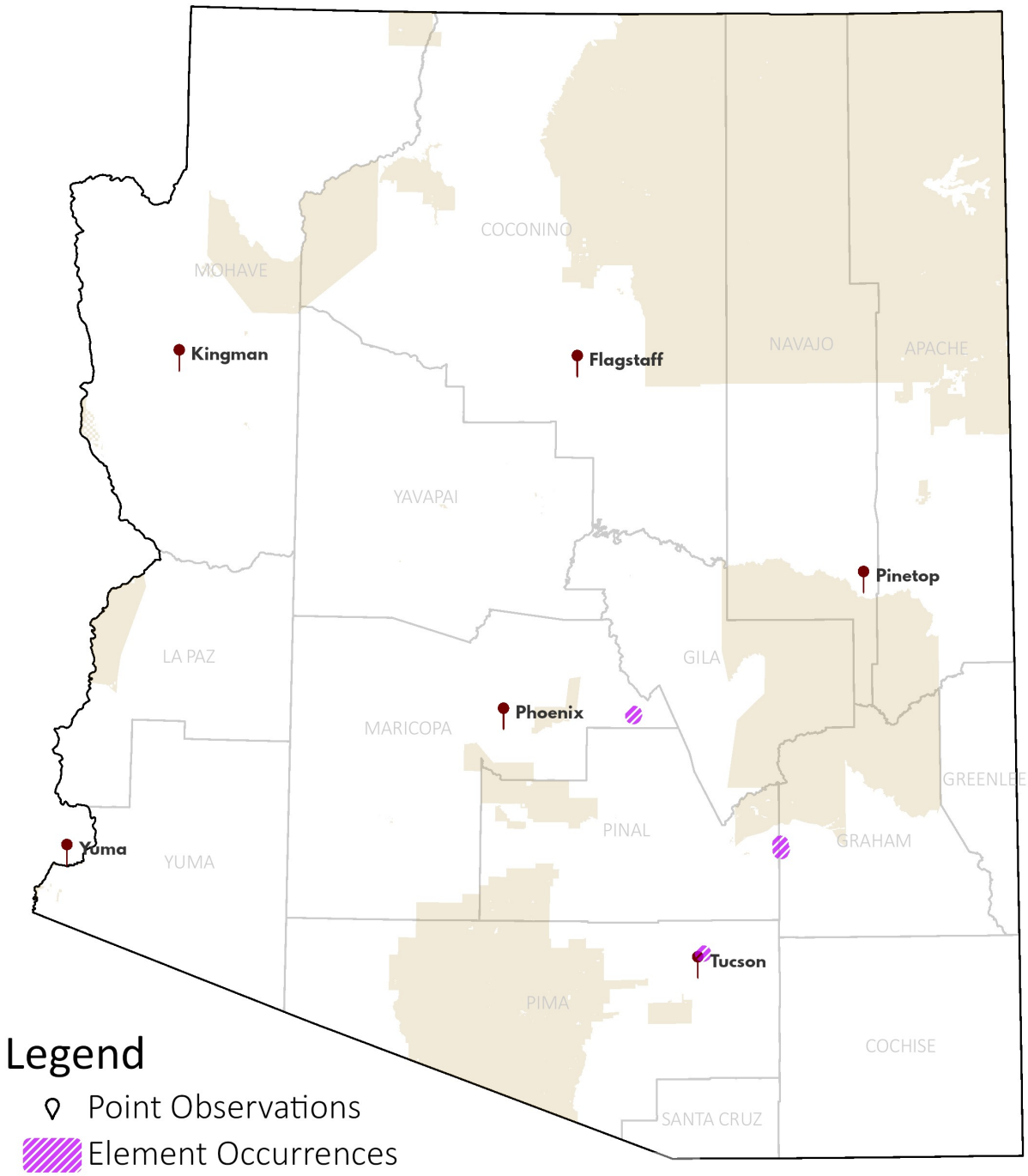
Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

Erigeron piscaticus

Fish Creek Fleabane



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

0 50 100 Kilometers

ARIZONA GAME & FISH

Point Observations are not guaranteed to have been thoroughly quality controlled. Element Occurrence data represent areas where a population occurs.

Heritage Data Management System
2018-02-08

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDAST700P0
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Perityle saxicola* (Eastw.) Shinners
COMMON NAME: Fish Creek rock daisy, Roosevelt Dam rockdaisy
SYNONYMS: *Laphamia saxicola* Eastwood
FAMILY: Compositae

AUTHOR, PLACE OF PUBLICATION: *Perityle saxicola* (Eastwood) L.H. Shinners, Southwestern Naturalist 4(4): 204-206. 1959. *Laphamia saxicola* Eastwood, Proc. Calif. Acad. Sci. IV, 20(5): 159-160. 1931.

TYPE LOCALITY: United States of America. Arizona. Maricopa County near Roosevelt Dam on the road to Fish Creek, Apache Trail, 22 May 1929.

TYPE SPECIMEN: HT: CAS-167470. A. Eastwood 17401, 22 May 1929. IT: CAS, DS, GH, NY, POM, UC, US.

TAXONOMIC UNIQUENESS: A distinct species in a genus of about 25 species native to southwestern U.S. and Mexico. USDA, PLANTS Database (2002), reports 35 species in the genus *Perityle*. Lehr (1978) recognized 12 species of *Perityle* as occurring in Arizona. Genus is "characterized by a high degree of endemism accentuated by a rapid rate of evolution in part allowed (or promoted by) polyploid tendencies" (Fletcher 1978). *Perityle* and *Laphamia* have had taxa transferred from one to the other for over 100 years.

DESCRIPTION: Slender, suffruticose (woody base, herbaceous branches) perennial herb, 20-40 cm (8-16 in.) tall spreading to clumps about 30 cm (12 in) wide. Stems are finely striate, brittle, branching near the cuadex and in the upper portions. Leaves are mostly opposite, 3.0-6.0 cm (1.4-2.4 in.) long, **highly dissected** into filiform lobes, sometimes glandular, each segment 5-15 mm long. Petioles usually shorter than blades, narrowly winged, minutely glandular. The inflorescence is densely glandular. The ray and disk flowers are yellow; disks about 10 mm in diameter. Achenes are 2.8-3.2 mm long, oblong-obconical to narrowly obconical, with conspicuous callous margins. The usually present pappus has 1, sometimes 2 awns (Falk, Jenkins et al. 2001). **See** "Aids To Identification" for discussion on pappus.

AIDS TO IDENTIFICATION: *P. saxicola* differs from other species in genus by its highly dissected leaves and location. It may be sympatric with *Perityle gilensis* in part of its suspected range. *P. gilensis* ssp. *gilensis* occurs downstream on the Salt River approximately

10 miles from the nearest *P. saxicola* population. *P. gilensis* ssp. *salensis* occurs along the Salt River approximately 35 air miles upstream of *P. saxicola*.

According to Mazzoni et al. (1982), "Eastwood placed this plant in the genus *Laphamia* because it lacks a pappus. Shinners (1959) transferred the species to *Perityle* because he believed the differences between the two genera were arbitrary. The two genera are distinguished by the presence or absence of small pappus scales with or without awns."

ILLUSTRATIONS: Line drawing (Niles 1970:55).
Line drawing (USFWS).
Color photo of Isotype collection (*in* US Nat. Herb, accessed 12/12/2003, http://rathbun.si.edu/botany/types/printImage.cfm?mupic=00124652.jpg)
Color photo of Isotype collection (*in* NYBG, accessed 12/12/2003, http://scicun.nybg.org:8890/searchdb/owa/wwwcatalogrenz.detail_list)
Color photos of plant and habitat (USFS, *in* Falk, Jenkins et al. 2001)

TOTAL RANGE: Gila and Maricopa counties, Arizona. Near Tonto National Monument, Roosevelt Lake, and above Horse Camp Creek in the Sierra Ancha Mts. Not found at Fish Creek. Suspected throughout Superstition Mountains (Reichenbacher 1989) and at Tonto National Monument (several hundred plants) (Palmer 1994). Kearney and Peebles location is doubtful, and needs to be resurveyed and verified (Palmer 1994). Few known sites, all of which are within 5 miles of each other.

RANGE WITHIN ARIZONA: See "**Total Range**."

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Herbaceous perennial with a woody base stock.

PHENOLOGY: Flowers and sets seed from May to June.

BIOLOGY: Local conditions of drought/shade may affect morphology of individual plant, especially leaf size and degree of dissection. Substrate driven. Many species of *Perityle* are edaphically restricted and are local endemics (Palmer 1994). This species has very specific habitat requirements. Aphids are a common predator.

HABITAT: A narrow endemic with specific habitat requirements. It grows in very xeric habitat on very steep slopes, from cracks and crevices on cliff faces, large boulders and rocky outcrops in canyons and on buttes composed of Barnes conglomerate and Mescal limestone. Dripping Springs location is on quartzite.

ELEVATION: 2,025 - 3,800 ft. (618 - 1159 m). Falk, Jenkins et al. (2001), reports elevation range of 2,500 – 3,400 ft. (760 - 1035 m).

EXPOSURE: Very steep cliffs with generally east and northeast exposure. Slopes range from 50-100%.

SUBSTRATE: Complex geology of rock, consisting of Barnes conglomerate, Mescal limestone, and igneous material (quartzite).

PLANT COMMUNITY: Arizona Upland Subdivision of Sonoran Desertscrub. Dominant associated species include: *Bromus rubens* (red brome), *Cereus giganteus* (saguaro), *Dasylirion wheeleri* (sotol), *Dudleya saxosa* ssp. *collomae* (stonecrop), *Encelia* sp. (brittle bush), *Fouquieria splendens* (ocotillo), *Heuchera* sp. (alumroot), *Mirabilis bigelovii* (four-o'clock), *Penstemon eatoni* (beard tongue), and *Simmondsia chinensis* (jojoba). (Mazzoni et al. 1982). Other plant species observed with taxon include: *Aloysia* sp., *Brickellia* sp., *Echeveria* sp., *Galium* sp., *Selaginella* sp., and *Stipa* sp.

POPULATION TRENDS: A narrow endemic, with few known localities. It is sporadic to common in Tonto National Monument, and sporadic near Roosevelt Dam. It occurs in the Sierra Ancha Mountains, and may occur throughout the Superstition Mountains. The type locality population just below Roosevelt Dam, consists of about 60 plants, while the plants at Tonto National Monument are "locally common." Reproductive success in 1982 appeared to be good.

SPECIES PROTECTION AND PRESERVATION

ENDANGERED SPECIES ACT STATUS: None (USDI, FWS 1996)
[C2 USDI, FWS 1985]
[3C USDI, FWS 1983]
[C1 USDI, FWS 1980]
[PTN-T USDI, FWS 1975]

STATE STATUS: None

OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 1999)
[Forest Service Sensitive (USDA, FS Region 3 1990)]

MANAGEMENT ISSUES: A narrow endemic with very specific habitat requirements. Threats are limited to major activities requiring blasting (i.e. dam, road and trail construction). Roosevelt Dam re-construction in the 1990s, may have impacted some plants, however, most plants occur higher up-slope, above construction activities.

CONSERVATION MEASURES TAKEN:

SUGGESTED PROJECTS: Distribution expected to extend throughout the Superstition Mountains, especially in southeast portion of range, south of Tonto National Monument. Additional surveys need to be conducted on distribution and possible range extension. Analysis of soil survey maps may aid in identification of potential habitat.

LAND MANAGEMENT/OWNERSHIP: NPS - Tonto National Monument; USFS - Tonto National Forest.

SOURCES OF FURTHER INFORMATION

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Reggie Fletcher - USFS Regional Ecologist, Albuquerque, New Mexico.
Wesley Niles - University of Nevada, Las Vegas, Nevada.
Barb Phillips - USFS Zone Botanist, Coconino, Kaibab and Prescott National Forests, Flagstaff, Arizona
Frank Reichenbacher - Southwest Field Biologists, Tucson, Arizona.
Lloyd Shinners - Southern Methodist University, Dallas, Texas.

ADDITIONAL INFORMATION:

Chromosome number: N=17.

Revised: 1990-12-06 (SR)
1992-02-16 (BKP)
1994-10-19 (PLW)
2004-01-27 (SMS)

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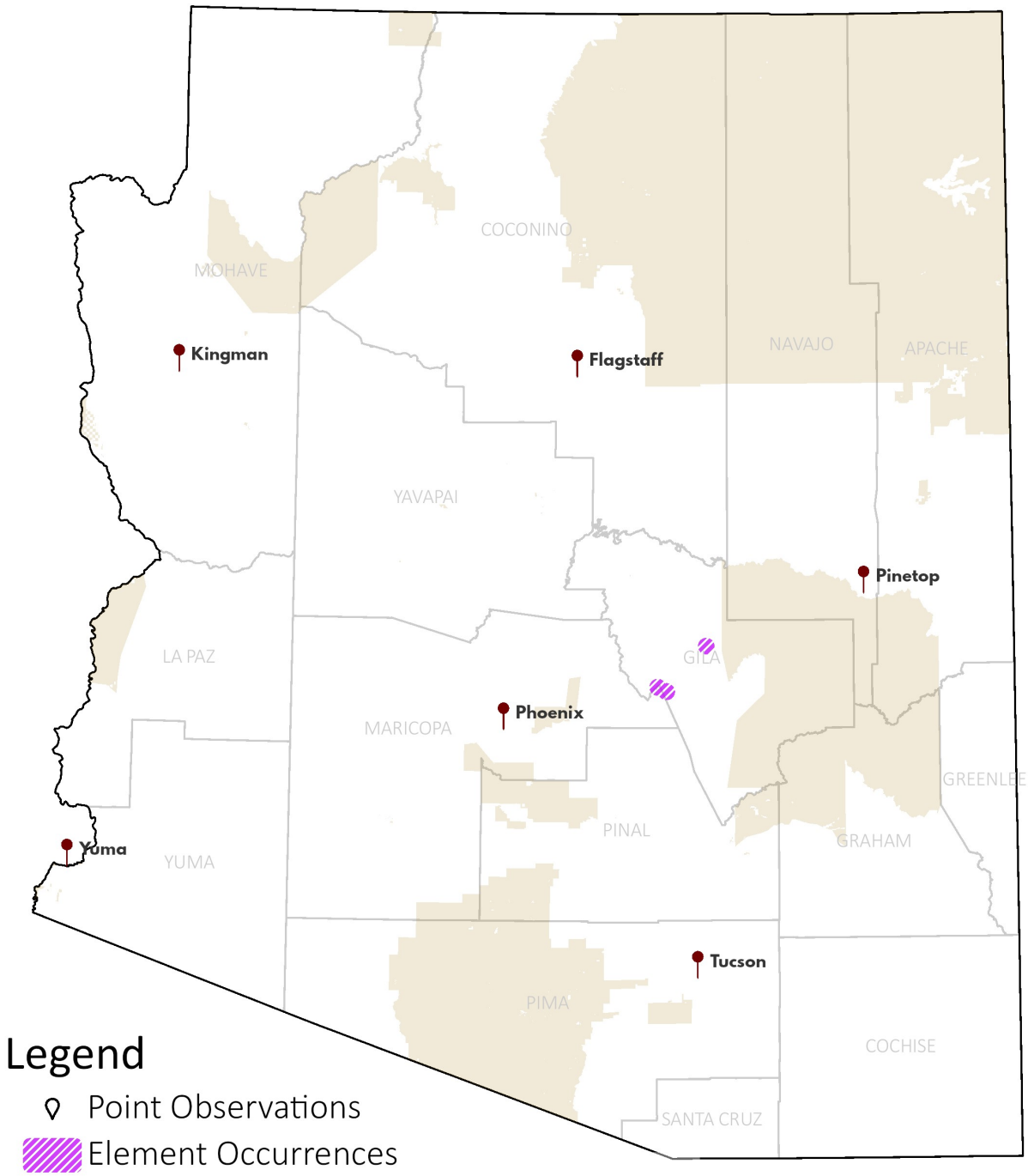
Perityle saxicola

Roosevelt Dam Rockdaisy



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

0 50 100 Kilometers

ARIZONA GAME & FISH

Point Observations are not guaranteed to have been thoroughly quality controlled. Element Occurrence data represent areas where a population occurs.

Heritage Data Management System
2018-02-08

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDSCR1L4A0
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Penstemon nudiflorus*
COMMON NAME: Flagstaff beardtongue
SYNONYMS:
FAMILY: Scrophulariaceae

AUTHOR, PLACE OF PUBLICATION: A. Gray, Proc. Amer. Acad. Arts 20: 206. 1885.

TYPE LOCALITY: United States of America. Arizona. Coconino County. Flagstaff.

TYPE SPECIMEN: HT: GH, J.G. Lemmon 3227, 1884, flower and fruit.

TAXONOMIC UNIQUENESS: The species *nudiflorus* is 1 of 246 in the genus *Penstemon*.

DESCRIPTION: Herbaceous perennial with blue-whitish leaves and stems. Stems are solitary or few, 50-100 cm (20-39 in) tall, often puberulent toward the base, glabrous above. The leaf blades are mostly lanceolate, entire, 3-7 cm (1.18-2.8 in) long, the basal blades narrowed to a petiole, the cauline ones sessile and somewhat clasping. Lavender flowers in an open panicle, the divergent peduncles 1-3 cm long, the pedicels 5-20 mm long. The calyx is about 3 mm long, the lobes are oblong to nearly orbicular. The lavender corolla is 20-30 mm long and about 10 mm wide at the throat, pilose at the orifice, otherwise glabrous or nearly so; staminode bearded. (McDougall 1973).

AIDS TO IDENTIFICATION:

ILLUSTRATIONS:

TOTAL RANGE: Endemic to Arizona. Found in Apache, Coconino, Gila, Navajo, and Yavapai counties.

RANGE WITHIN ARIZONA: See "**Total Range**."

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Perennial forb/herb.

PHENOLOGY: Flowers in summer from June to August.

BIOLOGY:

HABITAT: Dry ponderosa pine (*Pinus ponderosa*) forests in mountainous regions south of the Grand Canyon, Arizona. 1370-2130 m elevation. (NatureServe 2002).

ELEVATION: 5,035 – 7,375 ft (1536-2250 m), based on record in the Heritage Data Management System (AGFD, unpublished data accessed 2003). NatureServe (2002) reports elevation range of 1370 – 2130 m (4,492-6,984 ft).

EXPOSURE:

SUBSTRATE:

PLANT COMMUNITY: In Arizona (select survey areas in the Prescott National Forest), associated plants SW of Pinetop Mountain includes: *Bouteloua gracilis*, *Cercocarpus montanus*, *Coryphantha vivipara*, *Hymenopappus filifolius*, *Juniperus deppeana*, *Penstemon linarioides*, *Pinus ponderosa*, *Psoralidium tenuiflora*, and *Quercus emoryi*. Associated plants on a hillside of basalt rocks on the north side of Horse Wash includes: *Arctostaphylos pungens*, *B. curtipendula*, *Eriogonum umbellatum*, *Forestiera pubescens*, *J. osteosperma*, *Lotus utahensis*, *Opuntia engelmannii*, *P. linarioides*, *Q. turbinella*, *Rhamnus crocea*, *Rhus trilobata*, *Senecio*, and *Yucca baccata*. (Baker and Wright 1994).

POPULATION HISTORY AND TRENDS: Not abundant in any known occurrences.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS:
STATE STATUS:
OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 1999)

MANAGEMENT FACTORS:

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS:

LAND MANAGEMENT/OWNERSHIP: BIA – Fort Apache Reservation; USFS – Coconino, Kaibab, Prescott, and Tonto National Forests; Private.

SOURCES OF FURTHER INFORMATION

REFERENCES:

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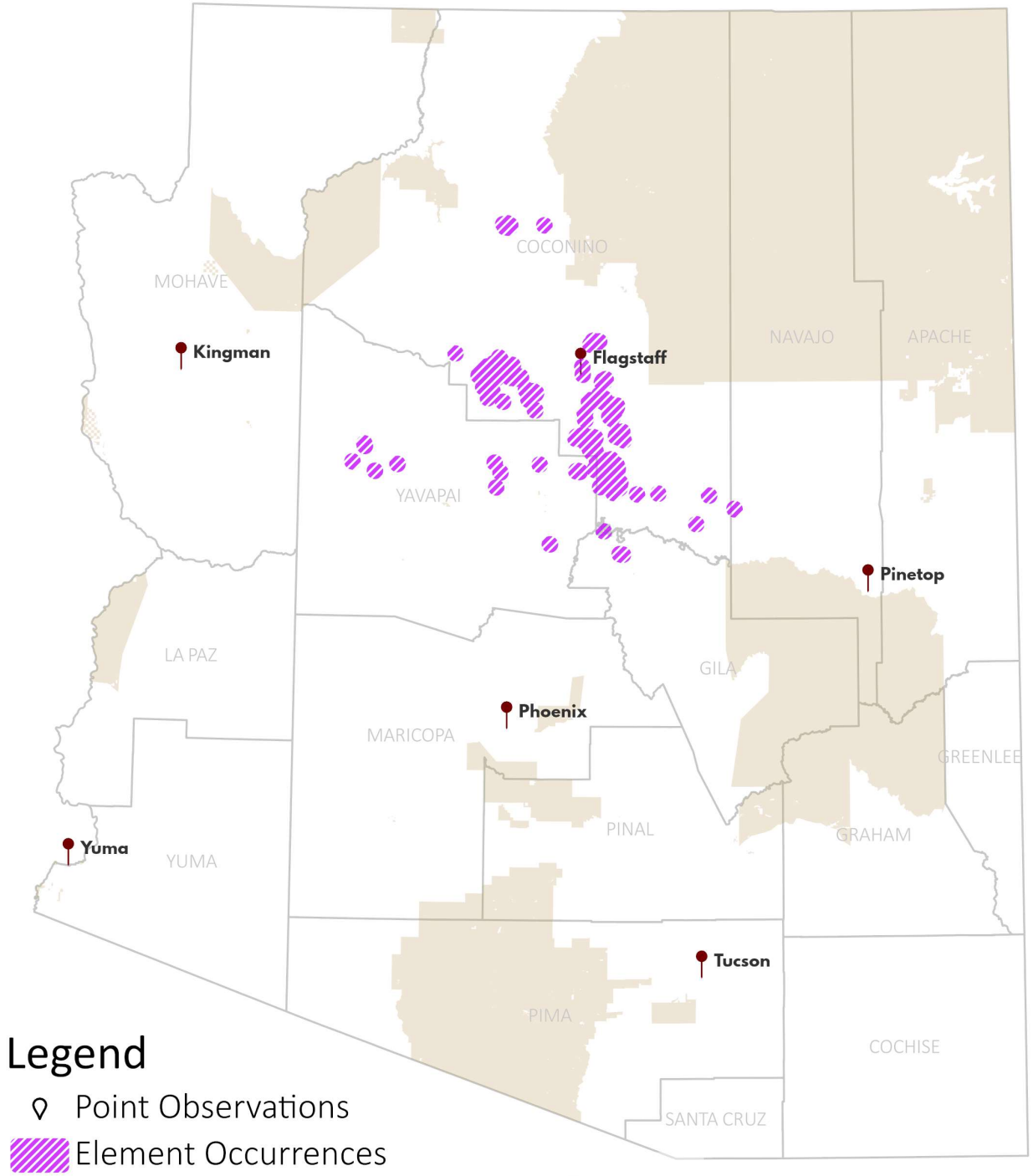
MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

Revised: 2003-03-13 (SMS)

Penstemon nudiflorus

Flagstaff Beardtongue



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

0 50 100 Kilometers

ARIZONA GAME & FISH

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences.

Heritage Data Management System
2019-06-13

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDSTE03010
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Fremontodendron californicum* (Torr.) Coville
COMMON NAME: Flannel bush, California flannelbush, California slippery elm, California fremontia
SYNONYMS: *Fremontia californica* Torr., *F. crassifolia* Eastw., *F. napensis* Eastw., *F. obispoensis* Eastw., and many others
FAMILY: Sterculiaceae

AUTHOR, PLACE OF PUBLICATION: *Fremontodendron californicum* (Torr.) Coville, Contributions from the United States National Herbarium 4: 74. 1893. *Fremontia californica* Torr., Smithsonian Contributions to Knowledge 6(2): 5, t. 2. 1853.

TYPE LOCALITY: California: Mariposa City: Source of Sacramento River.

TYPE SPECIMEN: HT: MO. John C. Fremont 470-1846, May 1846.

TAXONOMIC UNIQUENESS: A distinct species in a genus of 3 species, with at least 2 that are native to southwestern North America; only species in Arizona.

DESCRIPTION: Large spreading shrub or small tree up to 8 m (26.25 ft) tall, but more often 1-4 m (3.28-13.12 ft) tall, with roughish, dark gray bark and densely stellate-pubescent twigs. Young twigs are yellowish brown and densely covered in wooly hairs, while older twigs become smooth and gray brown. Leaves and flowers mostly on short, spurless branches. Leaves evergreen, alternate and simple. The leaf blades are ovate or broadly so, shallowly lobed or less commonly subentire, subcordate at base, usually acute but sometimes rounded at apex, margins often slightly undulate-crisped, larger ones 1-3 cm (0.39-1.18 in) long, green, with scattered stellate hairs above, densely stellate-pubescent and canescent beneath. Petioles usually one-half to as long as leaf blades (1-4 mm long); bractlets lance-subulate, 4-7 mm long. Flowers with 5 yellow petal-like sepals, 3-5 cm (1.18-1.97 in); sepals broadly ovate, mucronate, densely stellate-pubescent without, glabrous except for bristly or densely pubescent basal area around gland within. Capsule ovoid but pointed, 2-2.5 cm (0.8-1.0 in) long, densely hispid-bristly, golden brown, splitting into 4 or 5 sections when ripe. Seeds short-pubescent, dark, ovoid, 3-4 mm long. (Shreve and Wiggins, 1964; McDougall, 1973).

AIDS TO IDENTIFICATION: *Fremontodendron californicum* is most closely related to *F. mexicanum* which is known from Baja California and southern California. The later species is

distinguished by its black, glabrous seeds, yellow flowers with reddish bases, and glabrous basal glands. (Stallings, 1980).

ILLUSTRATIONS:

B&W line drawing (Jaeger, 1941: pl. 315).
B&W line drawing (Munz, 1974: pl. 87, fig. B).
B&W line drawing (Hickman, 1993: p. 1079).
Color photos of shrub, flowers (Saint Mary's College, 1995: http//elib.cs.Berkeley.edu/cgi/img_query)
Color photo of flower (Carr, *in* http://www.botany.hawaii.edu/faculty/carr/images/fre_cal.jpg)
Color photo of Holotype (*in* MBG, http://mobot.mobot.org/cgi-bin/search_vast)
Color photos of Iso- Lecto- and Isolectotype (*in* NYBG, http://207.156.243.8/emu/vh/specimen.php?irn=707971 & 482051 & 408052)
Color photos of plant and flowers (*in* USDA, NRCS at http://plants.usda.gov/cgi_bin/plant_profile.cgi?symbol=FRCA6)
Line drawing of seed (*in* USDA, NRCS at http://plants.usda.gov/cgi_bin/plant_profile.cgi?symbol=FRCA6)
Color photos (Virginia Tech Forestry Department 2005-2006, *in* http://www.cnr.vt.edu/dendro/dendrology/Syllabus2/factsheet.cfm?ID=512)
Color photo (http://www.calflora.net/bloomingplants/flannelbush.html)
Color photo (*in* SEINet at http://seinet.asu.edu/collections)

TOTAL RANGE: Central Arizona, California (western base of Sierra Nevadas from Shasta to Kern counties through the mountains to San Diego County), and Baja California, Mexico.

RANGE WITHIN ARIZONA: Gila County (Mazatzal Mountains); Maricopa Co. (Four Peaks – Mazatzal Mts. and Superstition Mts.), Mohave Co. (between Big Sandy and Burro Creek), Pinal Co. (Superstition Mountains), and Yavapai Co. (Black Hills, Peeples Valley, and Bradshaw, New River, and Weaver Mountains).

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Large spreading perennial shrub or small tree.

PHENOLOGY: Average month of flowering is May, but throughout its range, may flower from April to June. Fruit matures August – September.

BIOLOGY: The flowers are hermaphrodite (have both male and female organs). "Flannelbush is well adapted to recurring fires with its abundant seed production, prolific sprouting, and rapid growth. It reaches maturity relatively quickly; seeds can spread via animal or wind into fire-opened areas." (Pavek, 1993).

HABITAT: Mainly well-drained rocky hillsides and ridges, in chaparral and oak/pine woodland. In Arizona, usually on dry, north slopes in canyons (McDougall, 1973). In California, on slopes in chaparral, yellow pine forest, and pinyon-juniper woodland.

ELEVATION: In Arizona, ranges from 3,500 to 6,500 feet (1068-1983 m). For the range, reported from around 1,312 - 6,562 ft (400–2000 m) (Hickman, 1993).

EXPOSURE: North slopes in Arizona.

SUBSTRATE: Poor, dry, rocky soils, and granite boulders.

PLANT COMMUNITY: Upper Sonoran Zone to Transition Zone, but entering edge of the Sonoran Desert in various localities in Arizona and along the western margin of the Colorado Desert in Imperial County, California, and northern Baja California (Shreve and Wiggins, 1964).

Associated species include: *Acacia greggii* (catclaw acacia), *Agave parryi* var. *couesii* (Coues agave), *Amelanchier utahensis* (Utah service berry), *Arctostaphylos pringlei* (pink-bracted manzanita), *A. pungens* (Mexican manzanita), *Arenaria* (sandwort), *Ceanothus greggii* (Mohave Desert whitethorn), *C. integerrimus* (deerbrush), *Cercocarpus montanus* (Colorado birch-leaved mountain-mahogany), *Cupressus arizonica* (Arizona cypress), *Dudleya* (live-forever), *Eriodictyon angustifolium* (narrowleaf Yerba Santa), *Fendlera rupicola* (cliff fendlerbush), *Fraxinus anomala* (single-leaf ash), *Garrya flavescens* (ashy silktassel), *G. wrightii* (Wright's silktassel), *Juniperus deppeana* (Alligator juniper), *Nolina microcarpa* (Sahauista bear-grass), *Pinus edulis* (two-needle pinyon pine), *Platanus wrightii* (Wright sycamore), *Prunus*, *Quercus dunnii* (Dunn's Oak), *Q. emoryi* (Emory Oak), *Q. gambellii* (Gambel Oak), *Q. turbinella* (shrub live oak), *Rhus ovata* (sugar sumac), *R. trilobata* (sumac), *Robinia neomexicana* (New Mexican locust), and *Yucca baccata* (Banana Yucca). (Stallings 1980, SEINet accessed 2005).

POPULATION HISTORY AND TRENDS: Widespread and common in California though "rare and local" in Arizona (Kearney & Peebles, 1960). (NatureServe 2005).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None

STATE STATUS: Salvage Restricted (ARS, ANPL accessed 2011)

[Salvage Restricted (ARS, ANPL 1993, 1999).]

OTHER STATUS: Bureau of Land Management Sensitive (USDI, BLM AZ 2000, 2005, 2008, 2010).

MANAGEMENT FACTORS: Subject to browsing by livestock, and large game animals. The stem is clothed with brown hairs, which rub off easily and can be a severe irritant. In California, it has been used for erosion control, by planting it on banks and levees of flood control channels (Pavek, 1993).

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS:

LAND MANAGEMENT/OWNERSHIP: BIA – Tonto Apache Reservation; BLM – Kingman and Phoenix Field Offices; NPS – Tonto National Monument; USFS – Tonto National Forest; State Land Department; Private.

SOURCES OF FURTHER INFORMATION

REFERENCES:

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

From the outer bark, rope was sometimes made by the Indians (Jaeger, 1941). It has also been used as a poultices for wounds, and as a tea (from the bark) to relieve throat irritations (Pavek, 1993).

"Frequently planted in California as an ornamental…. The bark is said to have the same properties as that of the true slippery elm (*Ulmus fulva*) and to be used for the same purpose, that is, to relieve irritation of the throat. Cattle browse this plant." (Kearney and Peebles, 1959).

Revised: 2002-04-04 (SMS)
2005-05-13 (SMS)

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Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDFAB1A1K0
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Dalea tentaculoides* Gentry
COMMON NAME: Gentry Indigo Bush
SYNONYMS:
FAMILY: Fabaceae

AUTHOR, PLACE OF PUBLICATION: Gentry, H. S. 1950. Madroño 10:238.

TYPE LOCALITY: Arizona: Santa Cruz County: Pajarito Mountains: Sycamore Canyon.

TYPE SPECIMEN: ARIZ 30239. R.A. Darrow. 09 May 1941.

TAXONOMIC UNIQUENESS: Kearney et al. (1960) list 36 species of *Dalea* in Arizona. However, the taxonomy is unclear. "*Dalea tentaculoides* is a distinctive member of the genus, with no closely related species" (Toolin, 1982).

A distinct, recently described species in a genus of 250-300 species in the warmer parts of the Americas (NatureServe 2001).

DESCRIPTION: Shrubby, erect, perennial shrub (has been referred to as perennial herb), growing from woody root crown, up to 2.0 m (6.6 ft.) high but usually less; up to 1 m (3.28 ft) tall. Numerous hairless stems in older plants, 30.0-50.0 cm (12.0-20.0 in.) tall. Stems branch from near base, covered with pustulate tubercles. Young branches are green, turn brown with age. **Compound leaves 3.0-6.0 cm (1.2-2.4 in.) long with 9-17 pairs of leaflets**, upper leaves smaller with 3-8 pairs of leaflets; **Hairless leaflets, midribs not obvious, notched at tips**, dotted with small punctate glands below (Gori). Flowers sessile 6.0 mm (0.24 in.) long, bracts persistent, 3.0-5.0 mm wide. Inflorescences spiked, **flowers sessile (6 mm), borne in oblong clusters**, petals rose-purple, borne above middle of stamen tube. **Sepals, floral bracts, and branches bear elongate, tentacle-like glands**. Seeds 1.5 mm long.

AIDS TO IDENTIFICATION: Only *Dalea* with elongate, tentacle-like glands on calyx and floral bract. Easily confused with, and misidentified as, *D. versicolor* and *D. greggii*. *D. pulchra* has grey-green hair covered leaflets. Each leaf has 2-4 pairs of leaflets, and inflorescence is sphere. *D. sessilis* and *D. versicolor* (Now [1994] *D. versicolor sessilis*) are spring blooming, 4-9 pairs of curved (smaller than *D. tentaculoides*)), leaflets per leaf. *D. versicolor* has blister glands on calyx.

ILLUSTRATIONS:
Line drawing (Barneby 1977:835)
Line drawing (USDI, FWS)
Color drawing (http://www.pima.gov/cmo/sdcp/)

TOTAL RANGE: Southern Arizona, and one site in Mexico.

RANGE WITHIN ARIZONA: Santa Cruz County: Sycamore Canyon drainage in Atascosa and Pajarito Mountains; Pima County: Baboquivari Mountains (in the 1930s), 1965 location in Mendoza Canyon.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Herbaceous perennial shrub.

PHENOLOGY: May be bifloral, flowering April-June, and possibly again in September-October, following winter and summer rains. Flowers smaller at second flowering, looking more like globe.

BIOLOGY: Plants grow back vigorously (resprout) when buried by flooding; multiple stems arising from under ground make it difficult to determine number of individuals. Largest plants in 1991 were found in the lee of obstructions (boulders, trees), protecting plants from severe flooding effects. Largest clumps in Sycamore Canyon on lee side of trees and boulders. Plants survived severe flooding in 1990.

HABITAT: Found along canyon bottom on cobble terraces subject to occasional flooding. Historic collection records indicate possible growth on rocky hillsides. Occurs in disturbance prone environments.

ELEVATION: 3,600 - 4,580 ft. (1,098 - 1,397 m).

EXPOSURE: Full sun to partial shade.

SUBSTRATE: Sandy, gravelly loam of rhyolite parent material.

PLANT COMMUNITY: Oak-juniper woodland and Madrean Evergreen Woodland. Associated species include: *Platanus wrightii, Fraxinus velutina, Juglans major* and *Quercus* spp.

POPULATION TRENDS: In Sycamore Canyon (1981), only one population of over 100 plants found. In 1989, problems with fence maintenance of Goodding Research Natural Area allowed extensive livestock utilization of Sycamore Canyon population (1990). Fence was repaired and the population improved; between 1990 and 1991, population increased from

1291 to 1389 individuals. Study plot, however, showed higher mortality than recruitment, with population dropping from 148 to 118. Despite drop, mortality very low for larger size classes; significant growth of last year's individuals. Hence, number of large individuals nearly quadrupled. Number of inflorescences produced increased greatly (Malusa et al. 1992). In early 1993, severe flooding occurred. When plot was surveyed in June, 1993, 20-30 individuals observed although many were completely covered by sand (Falk and Warren 1994).

Species not found in Mendoza Canyon (Gori 1994), although 1965 specimen from that location has detailed locality information.

Specimen of *Dalea* from Kitt Peak, Quinlan Mountains (see Toolin 1986) determined **NOT** to be *Dalea tentaculoides* by The Nature Conservancy in 1990.

Population size varies year to year (impacts from trespassing cattle and flooding, 1990). Can rebound rapidly by root sprouting. Plants grows along flood plains along streams, and thus are subject to being "scoured out" by seasonal flooding (DBG 1999).

Current status and trend of population is unknown.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS:
None (USDI, FWS 1998)
[C USDI, FWS 1996, 1997]
[C1 USDI, FWS 1990, 1993]
[C1 USDI, FWS 1980, 1985]

STATE STATUS:
Highly Safeguarded (ARS, ANPL accessed 2011)
[Highly Safeguarded (ARS, ANPL 1993, 1999)]

OTHER STATUS:
Forest Service Sensitive (USDA, FS Region 3, 2007)
[Forest Service Sensitive (USDA, FS Region 3 1990, 1999)]
Bureau of Land Management Sensitive (USDI, BLM AZ 2000, 2005, 2008, 2010)

MANAGEMENT FACTORS: Major threats include seasonal flooding, limited range, habitat degradation due to grazing by livestock, consumption by livestock, and trampling by people and livestock. Fence maintenance needs to be maintained to protect populations.

CONSERVATION MEASURES TAKEN: Goodding Research Natural Area extended to include more of population.

SUGGESTED PROJECTS: Seed collection needed for future propagation and reintroduction, along with additional surveys (particularly east side of Baboquivaris) to determine potential habitat. Monitoring of whole drainage (Sycamore Canyon population) needed to better understand plant's adaptation to disturbance.

LAND MANAGEMENT/OWNERSHIP: USFS - Coronado National Forest; BIA - Tohono O'odham Nation.

SOURCES OF FURTHER INFORMATION

REFERENCES:

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Mima Falk - Botanist, U.S. Fish and Wildlife Service, Tucson, Arizona

Dave Gori - The Nature Conservancy, Tucson, Arizona

Jack Kaiser - Retired (USDA), Nogales, Arizona

Jim Malusa – The Nature Conservancy, Tucson, Arizona

Peter Warren - Tucson, Arizona

ADDITIONAL INFORMATION:

Revised: 1992-11-23 (JSP)
1993-11-09 (DBI)
1994-10-19 (PLW)
1997-11-12 (SMS)
1998-04-22 (SMS)
2001-12-12 (SMS

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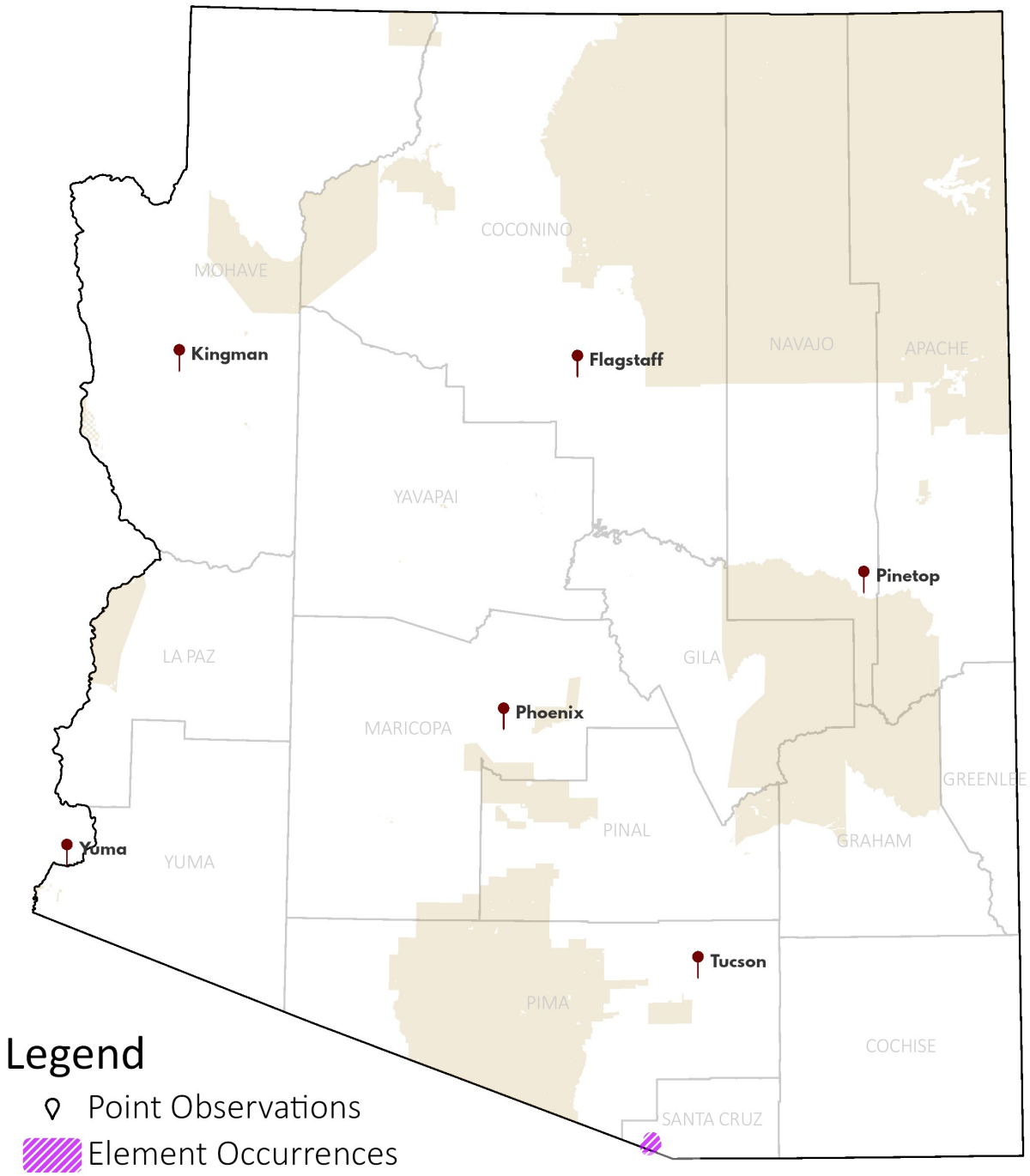
Comparison of *D. tentaculoides, D. pulchra* and *D. versicolor* ssp. *sessilis* (All have same growth form)

D. tentaculoides	*D. pulchra*	*D. versicolor* ssp. *sessilis*
Leaves dense up and down stem	Sparse	Sparse
Leaflet number: 9-17	2-4	6-9
Midrib: No	Yes	Slight
Hairs on leaves: None	Yes (dense silver)	Dense but fine
Inflorescence: Long stem	Intermediate	Very short
Calyx: Tentacle glands	None	Blister glands

Dalea tentaculoides

Gentry's Indigo Bush



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

0 50 100 Kilometers

ARIZONA GAME & FISH

Point Observations are not guaranteed to have been thoroughly quality controlled. Element Occurrence data represent areas where a population occurs.

Heritage Data Management System
2018-02-08

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDAST700D1
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Perityle gilensis* var. *gilensis*
COMMON NAME: Gila rock daisy, Fish Creek rock daisy
SYNONYMS: *Lamphamia gilensis*
FAMILY: Asteraceae

AUTHOR, PLACE OF PUBLICATION: *Perityle gilensis* (M.E. Jones) J.F. Macbride, Contributions from the Gray Herbarium of Harvard University 56: 39. 1918. *Lamphamia gilensis* M.E. Jones, Zoë 2: 15. 1891.

TYPE LOCALITY: Putnam's Ranch, near Gila River, Arizona, USA.

TYPE SPECIMEN: IT: US, M.E. Jones s.n., 23 May 1890.

TAXONOMIC UNIQUENESS: NatureServe (2019) list 35 species of *Perityle*, and another 14 varieties. Eighteen of these species occur in Arizona, with nine being found only within the state. Genus is "characterized by a high degree of endemism accentuated by a rapid rate of evolution in part allowed (or promoted) by polyploid tendencies" (Fletcher 1978). Perityle and Laphamia have had taxa transferred from one to the other for over 100 years. Perityle gilensis has two varieities: *gilensis* and variety *salensis*. It is an Arizona endemic.

DESCRIPTION: For the species, Perityle gilensis: Perennials or subshrubs, 22–70 cm (often in dense clumps, stems upright to pendent or spreading); glabrous or puberulent, often glandular. Leaves: petioles 9–45(–80) mm; blades usually pinnately 3-foliolate (proximal) or 3-lobed, 14–30 × 4–20 mm, lobes much broadened distally, often cruciform, sometimes 3-lobed to divided, ultimate margins entire or lobed. Heads borne singly or (2–4) in corymbiform arrays, 8–11 × 9–12 mm. Peduncles 1–4 mm. Involucres broadly campanulate to hemispheric. Phyllaries 20–30, linear-lanceolate to oblanceolate, 4–7 × 0.8–1.5 mm. Ray florets 8–18; corollas yellow, laminae oblong to subovate, 4–10 × 2–4 mm. Disc florets 70–200; corollas yellow, tubes 1.5–2 mm, throats subtubular to narrowly funnelform, 2.5–3.5 mm, lobes 0.7–0.8 mm. Cypselae narrowly oblanceolate to narrow oblong-elliptic, 2.6–4 mm, margins notably calloused, sparsely short-hairy, sometimes glandular; pappi of 1(–3) bristles 3–4.6 mm, sometimes plus hyaline scales (Flora of North America). *P. g.* var. *gilensis* upright to spreading, as opposed to trailing.

AIDS TO IDENTIFICATION: Proximal leaves of vars. *gilensis* and *salensis* may appear similar; lobes of the mid and distal leaves are elliptic to ovate in var. *gilensis* and linear to long-spatulate in var. *salensis.* Also, petioles 9-25 mm in *gilensis*; 25-45 mm in *salensis*.

ILLUSTRATIONS:
Herbarium mounts: http://swbiodiversity.org/seinet/taxa/index.php?tid=13677.
Color photos: http://www.arizonensis.org/sonoran/fieldguide/plantae/perityle_gilensis.html.
Color photos: https://calphotos.berkeley.edu/cgi/img_query?enlarge=0000+0000+0516+0646.

TOTAL RANGE: South-central Arizona

RANGE WITHIN ARIZONA: Maricopa, Pinal and Gila counties. From Apache Lake and the Superstition Mountains southeast to the Pinal and Dripping Springs Mountains; north of the Gila River.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Perennials or subshrubs.

PHENOLOGY: Arizona collections have noted flowers present from January through May, and again in September, October and November

BIOLOGY:

HABITAT: The species may be found in crevices in rocks and small pockets of soil in vertical and near vertical cliffs and canyons; also desert slopes and rocky hillsides.

ELEVATION: 1,529 – 4,170 feet (466 – 1,271 m) based on HDMS collection records.

EXPOSURE: Based on collection record notes, the plant can be found on all exposures.

SUBSTRATE: Rhyolite and other porous igneous rocks; one collection mentioned conglomerate rock and another limestone

PLANT COMMUNITY: Arizona Upland Sonoran Desert and Chaparral zone just below Pinyon pine. Associated species from collection notes include: *Encelia farinosa, Viguiera deltoidea, Descurainia, Ericamerica laricifolia, Carnegia gigantea, Opuntia acanthocarpa, O. engelmannii, Agave chrysantha, Hymenothrix wrightii, Eriogonum fasciculatum, E. wrightii, E. abertianum, Mirabilis bigelovii, Echinocereus engelmannii, Bernardia incana, Crossosoma bigelovii, Cercocarpus montanus, Heterotheca villosa, Ceanothus greggii, Gutierrezia sarothrae,Populus fremontii, Platanus wrightii, Cephalanthus occidentalis, Morus microphylla, Frangula californica, Platanus wrightii, Fraxinus, Ziziphus obtusifolia, Celtis pallida, Juglans major, Colubrina californica, Oenothera, Sapindus saponaria, Ambrosia ambrosioides, Anisacanthus thurberi, Arabis peramoena, Bowlesia incana, Brickellia baccharidea, Bromus rigidus, Camissonia californica, Crossosoma bigelovii, Cryptantha muricata, Eragrostis lehmanniana, Eriogonum fasciculatum, Euphorbia eriantha, Galium*

aparine, Gilia sinuata, Hyptis emoryi, Lesquerella purpurea, Marina parryi, Mimulus guttatus, Nicotiana glauca, Parietaria pensylvanica, Pennisetum ciliare, Penstemon eatonii, Phacelia distans, Phlox tenuifolia, Salix gooddingii, Simmondsia chinensis, Thysanocarpus curvipes, Vauquelinia californica, Vulpia octoflora, Pinus monophylla, Quercus turbinella, Baccharis sarothroides, and *Artemisia ludoviciana*

POPULATION HISTORY AND TRENDS: Unknown. There are 19 documented occurrences of this Arizona endemic subspecies. Collection record notes indicate that the plant ranges from rare to common, and sometimes very common. NatureServe ranks the plant as imperiled.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None.
STATE STATUS: None.
OTHER STATUS: Not Forest Service Sensitive (USDA, FS Region 3 2007)
[Forest Service Sensitive, USDA, FS Region 3 1999]

MANAGEMENT FACTORS: None specified.

PROTECTIVE MEASURES TAKEN: None. The subspecies was listed as a Forest Service Sensitive plant in 1999, but removed in the 2007 update. There is no Federal or State status.

SUGGESTED PROJECTS: None specified.

LAND MANAGEMENT/OWNERSHIP: USDI Bureau of Land Management (Tucson Field Office); USDA Forest Service (Tonto National Forest); Arizona State Trust lands and Arizona State Parks, and private land holdings.

SOURCES OF FURTHER INFORMATION

REFERENCES:

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Dr. Michael Powell, Professor Emeritus and Director of the Sul Ross Herbarium, Alpine, TX

ADDITIONAL INFORMATION:

Revised: 2002-12-20 (AMS)
2003-02-12 (SMS)
2019-11-12 (BDT)

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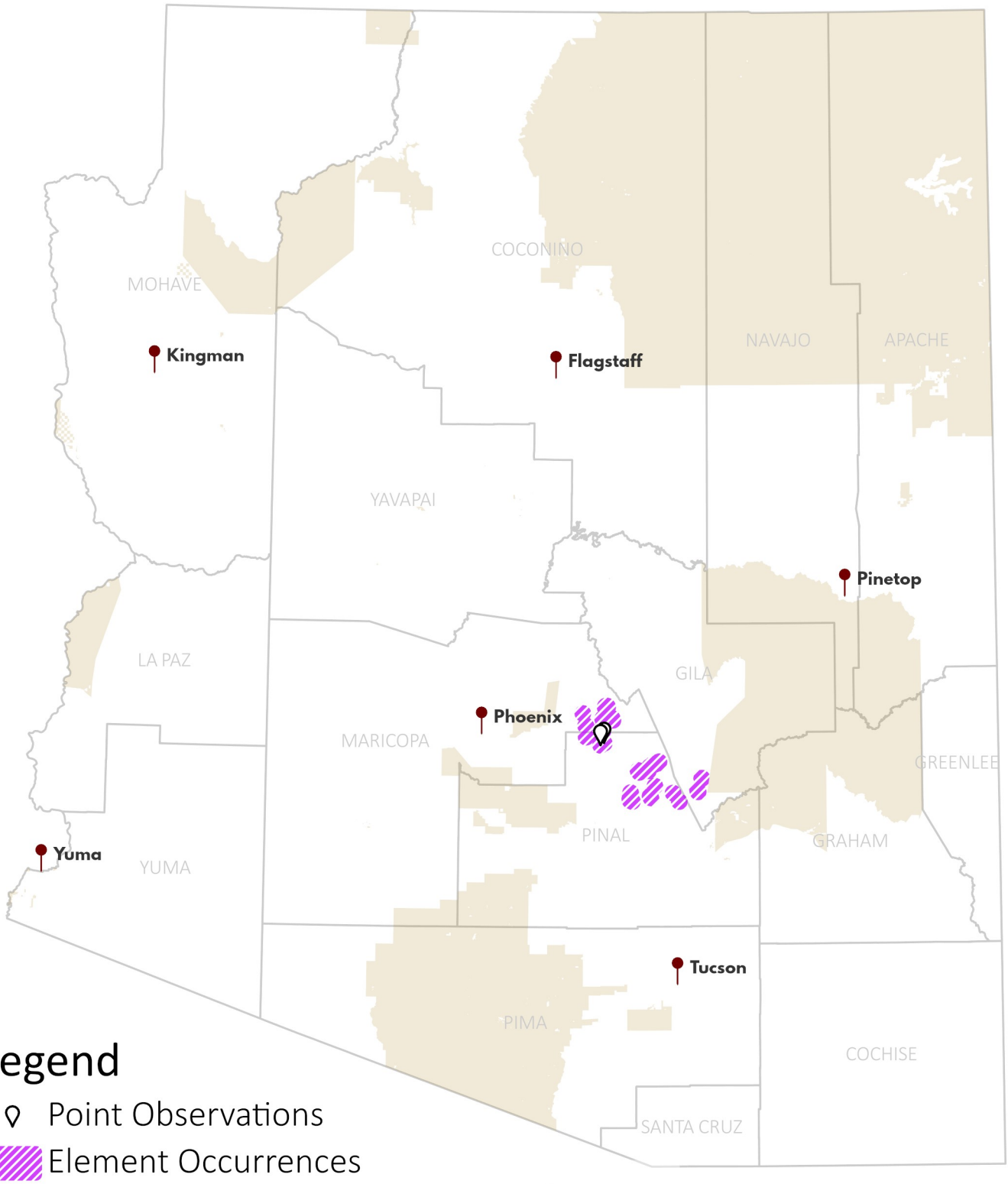
Perityle gilensis var. gilensis

Gila Rock Daisy



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

0 50 100 Kilometers

ARIZONA GAME & FISH

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences.

Heritage Data Management System
2019-06-13

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PMAGA01100
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Agave phillipsiana*
COMMON NAME: Grand Canyon Century Plant, Phillips Agave
SYNONYMS:
FAMILY: Asparagaceae

AUTHOR, PLACE OF PUBLICATION: Hodgson, Wendy C. 2001. Novon 11(4): 410-413.

TYPE LOCALITY: Arizona: Coconino County, Grand Canyon National Park, Clear Creek Canyon, ca. 7 miles upstream from camping area, 1140 meters, 36°07.381'N, 12°00.568'W.

TYPE SPECIMEN: Desert Botanical Garden: DES 44332 (holotype). Wendy C. Hodgson, 11861. September 13, 1999.

TAXONOMIC UNIQUENESS: NatureServe Explorer reports there are 30 species of Agave in the United States; 10 of these are found only in Arizona. There are another 14 subspecies or varieties; 4 of these are restricted to the Arizona as well. There is also one hybrid Agave which is only found in the State. *A. phillipsiana* is one of the 10 species found only in Arizona.

DESCRIPTION: Plants acaulescent, freely suckering; rosettes solitary to cespitose, 7.5–10 × 7.5–10 dm, open. Leaves erect, 76–78 × 10–11 cm; blade glaucous-green to dark green, lightly cross-zoned, lanceolate, rigid, adaxially concave toward apex, abaxially convex at base; margins straight or undulate, armed, teeth single, well defined, brittle, 4–7 mm, 1–2.5 cm apart, interstitial teeth (2–)3–7, mostly along distal 2/3 of margins; apex not conspicuously incurved, spine brownish gray, slender, 2.5–4 cm. Scape 2.7–5.5 m. Inflorescences narrowly paniculate, not bulbiferous, open; bracts persistent, triangular, 1–2+ cm; lateral branches 9–16, ascending to nearly perpendicular, comprising distal 1/3–1/2 of inflorescence, longer than 10 cm. Flowers 32–45 per cluster, erect, 7.4–8.6 cm; perianth greenish cream, tube campanulate, 15.5–20 × 15–23 mm, limb lobes persistent and often leathery during and after anthesis, spreading, unequal, 15–22 mm, apex often flushed with maroon; stamens long-exserted; filaments inserted subequally below rim of perianth tube, erect, yellow, 4.8–6.4 cm, apex flushed with maroon; anthers yellow, 17–25 mm; ovary 3.3–4.6 cm, neck slightly constricted, 4–8 mm. Capsules not seen. Seeds unknown. (Flora of North America.)

AIDS TO IDENTIFICATION: According to the author (Hodgson 2001), *Agave phillipsiana* is distinguished by its open rosette, large glaucous leaves, narrowed paniculate inflorescence, and large flowers. The following key to identify *A. phillipsiana* is taken from Flora of North America, volume 26:

- Inflorescences paniculate; flowers in clusters, borne on peduncles terminating in lateral branches longer than 10 cm (subg. Agave).
- Leaf blade linear-lanceolate, oblanceolate, lanceolate to ovate, or spatulate, less than 10 times longer than wide; limb lobes not drying reflexed on perianth tubes; capsules variable; Florida, Texas, sw United States.
- Rosettes usually shorter than 16 dm (up to 20 dm in *A. sisalana* and *A. shawii*); leaves typically shorter than 160 cm.
- Leaf margins armed with well-defined teeth longer than 2 mm.
- Limb lobes (6–)9–27 mm; plants forming single rosettes, or new plants budding from rhizomes and forming clones; mature rosettes up to 15 dm; scape (1.7–)2–7(–7.2) m; sw United States.
- Leaf blade linear-lanceolate, lanceolate, oblanceolate, or obovate, variously colored, apical spine usually longer than 2 cm; inflorescences not bulbiferous, or producing bulbils only when damaged; Arizona, California, New Mexico, Texas.
- Leaves of rosettes usually open; leaf blade linear-lanceolate to lanceolate or oblanceolate; inflorescences open, usually with 6–26 (–32) lateral branches.
- Perianth tube not shallow, 6–20 mm, frequently equaling or exceeding limb lobes (6–22 mm); filaments inserted near perianth tube base to ca. mid tube (inserted at 2 levels in A. palmeri, mid-tube and near rim, inserted near rim in *A. phillipsiana*); limb lobes erect to erect-ascending, unequal, persistent and often leathery during and after anthesis; flowers 3.5–8.6 cm.
- Perianth greenish cream to cream to pale yellow or light green, apex of limb lobes and filaments flushed with maroon; leaf margins armed with teeth 3–7 mm, 0.2–2.5 cm apart, interstitial teeth (2–)3–12 on distal 2/3 of margins; Arizona, sw New Mexico.
- Leaves ascending to spreading, blade variously colored, margins armed, interstitial teeth (2–)3–7 on distal 2/3 of margins, apex not conspicuously incurved; filaments inserted at 2 levels or subequally on perianth tube; Arizona, New Mexico.
- Flowers 7.4–8.6 cm; limb lobes 15–22 mm; filaments inserted subequally below rim of tube; scape 2.7–5.5 m; leaf margins armed with brittle teeth, 1–2.5 cm apart; rosettes solitary or cespitose; plants freely suckering; north-central Arizona….***Agave phillipsiana***

The following comparison of three Agave species is extracted from Hodgson (2001):

Characteristic	*A palmeri*	*A. delamateri*	*A. phillipsiana*
habit	usually solitary	strongly cloning	strongly cloning
leaf length (cm)	35-95	50-74	76-78
leaf orientation	spreading, flaring at tip	erect, ascending, incurved at tip	ascending to spreading, flaring at tip
leaf color	light glaucous green to dark green with purplish tinge	bluish gray glaucous with purplish tinge	glaucous green to dark green
interstitial teeth	4-6 on upper 2/3 of leaf	6-12 on upper 2/3 of leaf	3-7 on upper 2/3 of leaf
flower stalk height (m)	(1.75)4-7	4.5-6	2.7-5.5
inflorescence shape	open, broadly paniculate	open, broadly paniculate	open, narrowly paniculate
flower length (mm)	46-64	47-70	68-86
ovary length (mm)	18-36	21-29	29-46
floral tube lngth, wdth	10-18 x 10-16	11-19 x 11-16	15.5-20 x 15-23
outer/inner terpal length	12-18, 6.5-14	14-18, 9-15	20-21.5, 15-19
filament insertion	at 2 levels	equally	subequally
distribution	SE AZ, NM, Sonora	central AZ	N-central AZ

ILLUSTRATIONS:

Photos: http://swbiodiversity.org/seinet/taxa/index.php?taxon=18905.
Line drawing: Phillips (2001), p. 411.

TOTAL RANGE: A rare species endemic to Arizona; originally known from only four sites within the Grand Canyon NP, Coconino County. In the past almost two decades, however, additional collections have expanded its known range.

Arizona Heritage Data Management System records show there are five occurrences now from the Grand Canyon. One is along Clear Creek north of the 83rd Mile Rapids and another is about six miles to the west. The other three are about 25 miles to the northwest in the vicinity of 135 Mile Rapids near Tapeats Creek and Deer Creek.

In Yavapai County, there are 19 occurrences. All but two of these are situated in the extreme northeast corner of the county, northwest of Sedona and generally along the Verde River and its tributaries. The other two are some 40 miles to the southwest, west of the Bradshaw Mountains along, the Hassayampa River. There is a single occurrence in Gila County between Walnut and Oak Creeks, west of the Sierra Ancha Mountains. The southern-most recorded occurrence is from Graham County between the Santa Teresa and Pinaleno Mountains.

RANGE WITHIN ARIZONA: See **"Total Range."**

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Succulent perennial.

PHENOLOGY: Flowers in September.

BIOLOGY: No fruits have ever been found on old inflorescences. Reproduction may be only by vegetative means.

HABITAT: Terraces along permanent waterways between the elevations indicated. Three of four original sites are near pre-Columbian agricultural features or habitation sites (Hodgson 2001). Sandy, gravelly, rocky soils (granitic grus, limestone, or basalt) in desert scrub and grasslands on slopes, hillsides, and ridgelines (Baker 2014).

ELEVATION: 2300 – 3740 feet (700 – 1140 m) according to Hodgson (2001). Baker's surveys (2014) extend the upper range to 4920 feet (1500 m).

EXPOSURE: Not specified.

SUBSTRATE: Sandy, gravelly, rocky soils (granitic grus, limestone, or basalt), was reported by Baker 2014.

PLANT COMMUNITY: Desert, Grassland/herbaceous, Shrubland/chaparral (NatureServe 2019). Baker (2014) also includes open pinon pine grassland and juniper grassland.

POPULATION HISTORY AND TRENDS: Unknown. In the nearly twenty years since the species was first described, its known distribution has been expanded quite significantly as botanists have discovered the plant in many new areas. Given that *A. phillipsiana* seems to be an agricultural cultivar introduced by prehistoric people, this is not too surprising. But although there are about 25 occurrences scattered down nearly three-quarters of the state, the number of individuals is quite low. Baker (2014) reports that individuals per site number from one to a few, and there may be fewer than 100 total individuals known for the species. *A. phillipsiana* is a long lived perennial that produces clonal offshoots so that the plant itself can live indefinitely until it is killed from disease, or some natural (predation, wildfire) or human-caused action. The plant does not seem to produce seeds. The species is currently ranked as imperiled by NatureServe (2019), but Baker (2014), writing about the populations in the Prescott National Forest in Yavapai County, states that plants are subject to herbivory by javelina, probably fire damage in any area where the vegetation is relatively dense, and because it does not propagate by seeds, he predicts that the few plants with the Forest will eventually be extirpated by herbivory or attrition. In the 2014 Sensitive Plant List compiled by the Arizona Rare Plant Advisory Group, *Agave phillipsiana* was one of only eleven plants included in the "Very High Concern" category.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None.
STATE STATUS: Highly Safeguarded (ARS ANPL, 2016)
OTHER STATUS: Sensitive (US Forest Service, R3, 2013)

MANAGEMENT FACTORS: According to Baker (2014), agaves, in general, are a favorite food for javelina. He also suggests that fire might be another threat in areas where vegetation is relatively dense. He again calls attention to the fact that this species of agave appears to reproduce solely by clonal offshoots, and not through seed production, so that once a clonal plant is destroyed by herbivory, or wildfire, or any other cause, there is no seedbank from which the species can regenerate. Hodgson (2001) notes that the very low population numbers are a threat, and also identified the possibility of rodent predation and flash floods.

PROTECTIVE MEASURES TAKEN: *Agave phillipsiana* is listed as Highly Safeguarded under Arizona State statutes and Sensitive by the USDA Forest Service. As a sensitive species, it will receive some consideration in Forest Service management plans. Those specimens living within the USNPS Grand Canyon National Park will receive some additional protection from that location.

SUGGESTED PROJECTS: In Baker's 2014 report on viability of plant species for the USDA Prescott National Forest, he included several recommended conservation strategies for *Agave phillipsiana*. These recommendations can be extended range-wide for the species:

1. Survey for new individuals. Since the low population number has been indicated as an overall threat, the addition of new populations and/or individual plants would be a positive development. Note that this species has been associated with ancient cultural features.
2. Propagation from offshoots. Propagation from offshoots would be simple and ramets could be planted at various easily monitored sites. Since individuals often produce a large number of offshoots, there would probably be little damage to the longevity of the plant if a limited number of offshoots were taken for purposes of propagation. Clones could be established in test plots and public gardens in order to insure the genetic survival of the species. Although transplanting rare species is not generally recommended, this species may be an exception owing to its suspected history as a cultivated plant.
3. Javelina deterrents. Monitoring known populations/plants can indicate whether there is indeed a problem and its level of severity. Fencing to preclude javelina access is one potential solution since there are very limited number of plants. However the style of fence would have to be determined. The Arizona Game and Fish Department recommended fence is electric so this may not be a practical solution on forest lands. Anti-javelina pellets are also available and could be tried for effect (https://www.shake-away.com/Javelinas.php?page=Javelinas).
4. Fire Management. In the unlikely event that monitoring indicates that fire causes damage, it may be useful to remove some of the vegetation in the vicinity of the individual plants.

Since these agaves generally occur in areas of sparse vegetation, efforts should be minimal.

5. Monitoring should be scheduled every 5-10 years. Initial baseline data should include locations and number of individuals and offshoots; stage of maturation (presence or absence of flowering stalks); presence or absence of seeds (presently unknown); evidence of herbivory, disease, die-off caused by drought or fire; evidence of off-road vehicle travel or other human disturbances.

Between October 2-8, 2018, Lisa Kearsley and Wendy Hodgson conducted an agave survey of Clear Creek. This work was sponsored by the Grand Canyon Association Field Institute.

LAND MANAGEMENT/OWNERSHIP: USDI National Park Service (Grand Canyon National Park); USDA Forest Service (Prescott, Coconino and Tonto National Forests); Arizona State Land Department (State Trust Land); and possibly some USDI Bureau of Land Management and private land holdings.

SOURCES OF FURTHER INFORMATION

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Wendy C. Hodgson, Desert Botanical Garden, Phoenix, AZ

Andrew Salywon, Desert Botanical Garden, Phoenix, AZ

ADDITIONAL INFORMATION: The plant was first discovered by Stewart Aitchison in 1976. At the time of publication, it was known from only four sites within Grand Canyon National Park (Hodgson 2001). It is named in honor of the botanist Arthur Phillips III.

Agave phillipsiana is an ancient, relict cultivar that was intentionally introduced north of the Mexican border and farmed by pre-Columbian people for food and/or fiber. Other agaves occurring in isolated populations probably resulting from similar human intervention are *A. murpheyi, A. delamateri* (central Arizona) and *A. decipiens* (Florida).

There is no evidence that *A. phillipsiana* evolved from a hydridization event involving other extant members of Gentry's (1982) informal group Ditepalae (Hodgson 2001).

Revised: 2019-07-15 (BDT)

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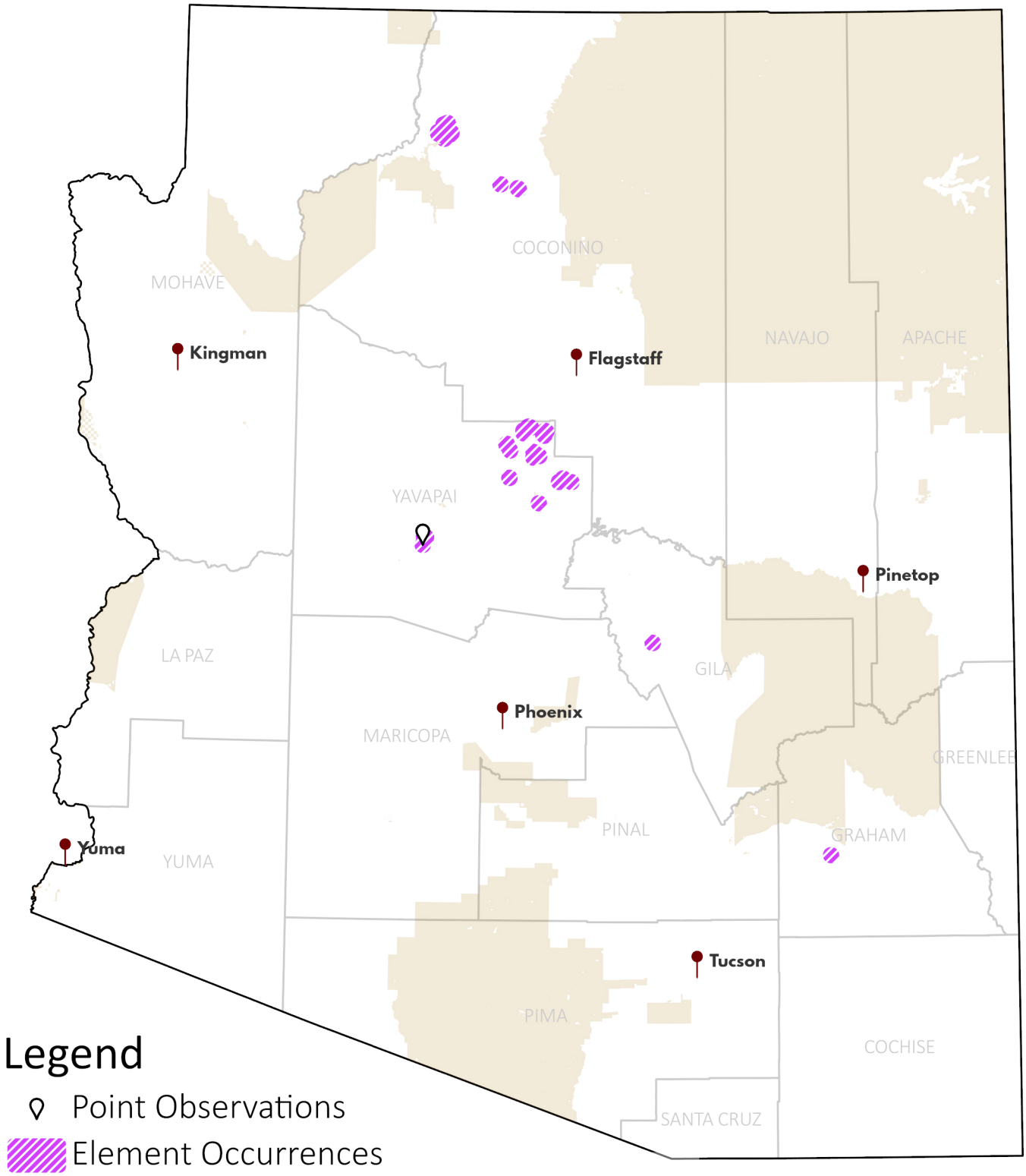
Agave phillipsiana

Phillips Agave



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

Kilometers

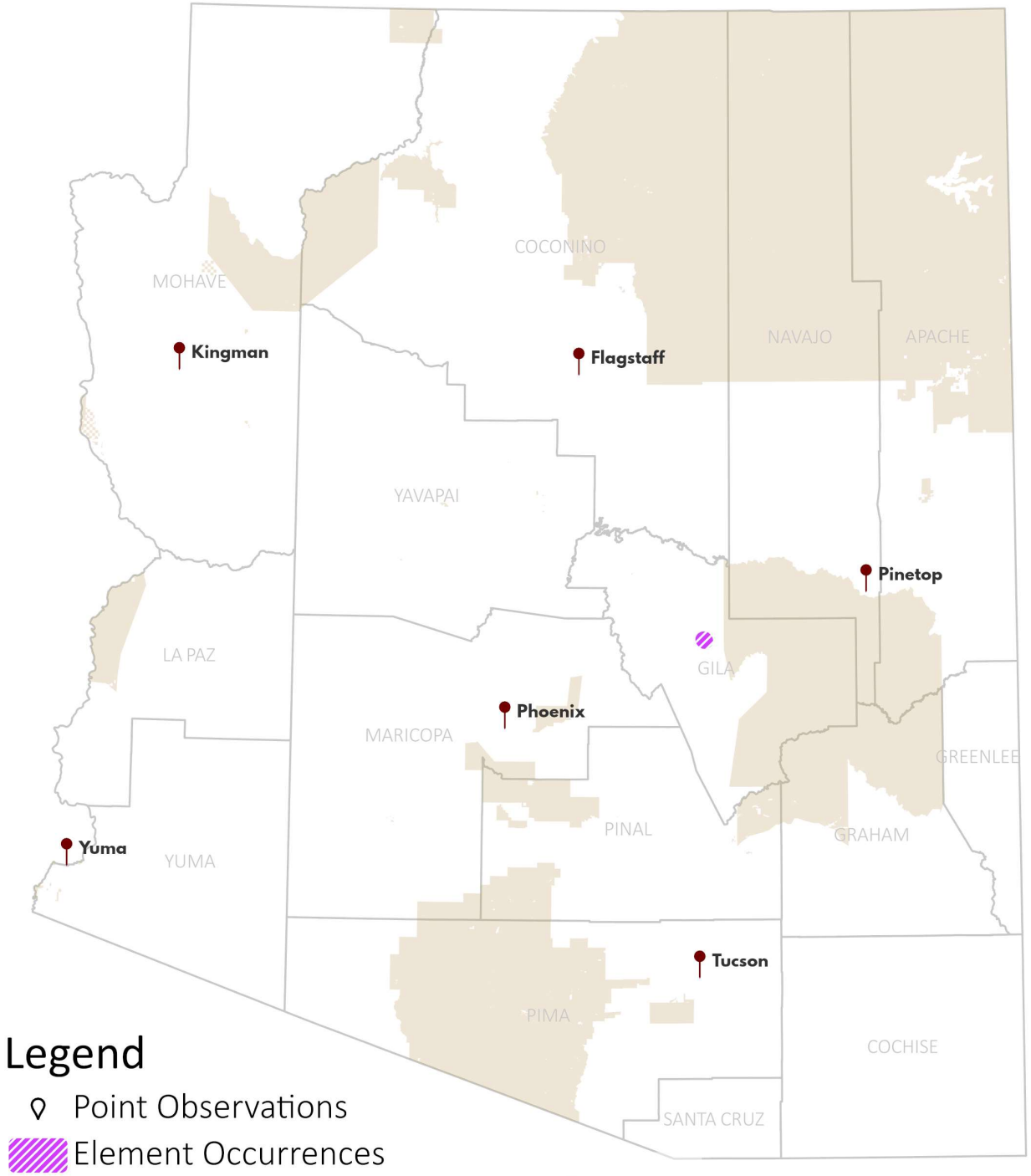
0 50 100

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences.

Heritage Data Management System
2019-06-12

Erigeron hodgsoniae

Hodgson's Fleabane



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

0 50 100 Kilometers

ARIZONA GAME & FISH

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences.

Heritage Data Management System
2019-06-13

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PMAGA010F0
Data Sensitivity: YES

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Agave murpheyi*
COMMON NAME: Hohokam Agave, Murphey Agave, Murphey's Century Plant, Maguey Bandeado
SYNONYMS:
FAMILY: Agavaceae

AUTHOR, PLACE OF PUBLICATION: F. Gibson, Contributions from Boyce Thompson Institute 7(1): 83-85, f. 1. 1935.

TYPE LOCALITY: USA: Arizona: Superior: from along Queen Creek near Boyce-Thompson Southwestern Arboretum.

TYPE SPECIMEN: HT: Gibson s.n., Deposited and cotypes cultivated at The Boyce Thompson Southwestern Arboretum (Missouri Botanical Garden, accessed 4/30/2003). "Type specimen unknown, uncertain whether living plants at Boyce-Thompson Southwestern Arboretum are of type clone" (Hodgson 1995).

TAXONOMIC UNIQUENESS: Species *murpheyi* is 1 of 34 in genus *Agave*. Perhaps of hybrid origin, but parent species unknown (Hodgson 1995). Hybridizes with *A. chrysantha* in Gila County (DBG 1999, 2001; ARPC 2001).

DESCRIPTION: Perennial succulent that grows in separated clumps. Dense rosette of light-green to dark green or blue-green leaves, 50-80 cm (20-31.5 in) long and 6-20 cm (2.4-8 in.) wide, usually with pale cross-bands. Rosette has a "closed" appearance (leaves curl inward slightly). Leaves narrowly spatulate, widest above the middle. Leaf margins are undulate with small teeth that are close set, and stick straight out from the leaf blade. Terminal spine very short and conical, 2.0 cm (0.8 in.) long. At time of flowering, leaves become yellowish-red (Hodgson et al. 1988). Flowers waxy cream-green with purplish or brownish tips, 5.1-7.5 cm (2-3 in) long. Inflorescence with stalk 3-4 m (9.8-13 ft) tall, narrowly paniculate, lateral branches ascending, always producing bulbils after flowering; bulbils develop at the nodes. Panicle can bear as many as a few hundred bulbils. Plants sucker readily, forming large stands. Inflorescence rarely seeds, however, if present, woody seed capsules are 5-7 cm (2-2.8 in) long, with thin seeds 9-21 mm long and 6-7 mm broad.

AIDS TO IDENTIFICATION: Although sympatric with *Agave chrysantha* and *A. delamateri*, *A. murpheyi* differs by its spoon-shaped, deep green leaves, short conical spine, and production of bulbils in undamaged inflorescences. *Agave murpheyi* leaves are somewhat similar to *A. angustifolia* and *A. rhodoacantha* which occurs only in Mexico. *Agave murpheyi* does not resemble any agaves in area (Hodgson 1994).

ILLUSTRATIONS:

B&W photo of entire plant (Gentry 1972:100).
Color photo, (http://www.fbmg.com/visitgarden/desertgotgaardens/Agave_Murpheyi.JPG).
Black and White drawing (M. Chamberland, *in* Kelly and McGinnis 1994 and ARPC 2001)
Color photo of plant (DBG *in* ARPC 2001)
Color photo of plant in habitat (J. Anderson *in* ARPC 2001)
Color photos of plant and bulbils (DBG, http://www.dbg.org/Collections/agave_murpheyi.html)
Color photo of plant in habitat (DBG, http://www.dbg.org/Involved/agave_murpheyi.html)
Color photo (Kelly and McGinnis 1994)
Color photos of plant and stalk (P. Faucon, 1998-2003: http://www.desert-tropicals.com/Plants/Agavaceae/Agave_murpheyi.html).

TOTAL RANGE: Found in wild from central Arizona to Sonora, Mexico. The Tohono O'odham and ranchers of Sonora, Mexico continue to cultivate the plant. Found in gardens of southern Arizona. "All of the populations from Caborca, Sonora, to New River, Arizona, are so similar that they may be one genetic clone. Proof of this would further substantiate the plant's cultural dispersal as one of the few domesticated north of Mesoamerica." (ASDM 2000).

RANGE WITHIN ARIZONA: Verde River Drainage, and Bradshaw, Paradise Valley (Phoenix Basin), McDowell, New River, and Wickenburg Mountains, Maricopa County; South Bradshaw and Hieroglyphic Mountains, Castle Creek and Agua Fria rivers, Yavapai County; Roosevelt Lake, Mazatzal and Sierra Ancha Mountains, and Tonto Basin, Gila County; Queen Creek near Superior, Pinal County.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Succulent perennial shrub/subshrub.

PHENOLOGY: March to July.

BIOLOGY: Stalk elongation initiated in winter. Plants flower but soon abort, thus few seeds are ever produced. As with most *Agaves*, *A. murpheyi* is probably self-incompatible requiring outcrossing. Bulbils are produced on the flower stalk. After the stalk falls to ground, bulbils may take root if ground disturbance has occurred; few bulbils root successfully if not aided. The primary mode of reproduction is vegetative by rhizomatous off-sets called "pups." Flower growth is delayed or stopped in freezing weather; plant may be killed by freezing temperatures. *Agave murpheyi* grows in full sun, requires infrequent water, has excellent heat tolerance, and is hardy to 10º F (-12º C). It also tolerates poor soil and drought, but requires good drainage. The plant is a diploid, based on one count (Pinkava and Baker 1985).

As with other Agaves, roots are shallow and spreading to derive maximum benefit from light rains and other habitat conditions that limit moisture to upper soil layers. The outwardly radial arrangement of leaves intercepts rainfall and conducts it toward the base and roots of the plant center. A thick waxy cuticle covering the leaves conserves moisture. Nighttime opening of leaf stomates also prevents water loss through transpiration during the hotter daylight hours.

HABITAT: In central Arizona, usually found on benches or alluvial terraces on gentle bajada slopes (not steep slopes or drainage bottoms) above major drainages in desert scrub, with pre-Columbian agricultural and settlement features, having been cultivated by the Hohokam. Also found near rock piles, which discourage rodents and help accumulate nutrients and water (Hodgson 1994). As do most *Agaves*, *A. murpheyi* requires a well-drained soil, being susceptible to root-rot.

In northern Sonora, Mexico, and southern Arizona (Tohono O'odham Reservation), associated with historic or present-day human habitation (gardens, yards, etc.); no "natural" or "wild" occurrences known south of Lake Pleasant. In Sonora, it is often said that the plants grown in yards came from "nearby hills."

ELEVATION: 1,300 - 3,200 feet (397 - 976 m).

EXPOSURE: Various.

SUBSTRATE: Various.

PLANT COMMUNITY: Lower Colorado Desert and Arizona Upland subdivision of the Sonoran Desert. Associated plants may include: *Acacia greggii*, *Aristida parishii*, *Calliandra eriophylla*, *Carnegia gigantea*, *Cercidium floridum*, *C. microphyllus*, *Encelia farinose*, *Eriogonum fasciculatum*, *Ferocactus acanthodes*, *Fouquieria splendens*, *Gutierrezia sarothrae*, *Krameria parviflora*, *Larrea divaricata*, *Lycium* spp., *Opuntia acanthocarpa*, *O. bigelovii*, *O. engelmannii*, *Prosopis velutina*, *Stipa speciosa*, *Simmondsia chinensis*, and *Viguiera deltoids*.

POPULATION TRENDS: About 35 - 40 known sites of *A. murpheyi* as of November, 1991 (Hodgson 1993). One clone lost due to re-construction of Roosevelt Dam and expansion of Roosevelt Lake. As of February 1995, 60 known sites from “wild” (Hodgson 1995). Each distinct population may consist of fewer than 50 genetic individuals (NatureServe 2002).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None (USDI, FWS 1996)
[C2 USDI, FWS 1990, 1993]

STATE STATUS: Highly Safeguarded (ARS, ANPL accessed 2011)

[Highly Safeguarded (ARS, ANPL 1993, 1999)]

OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 1990, 1999, 2007)
Bureau of Land Management Sensitive (USDI, BLM AZ 2000, 2005, 2008, 2010)

MANAGEMENT FACTORS: Isolated nature and small number of individuals make this species vulnerable to extinction. Threats include clearing of land for agricultural and urban development; illegal collection for cultivation and products; expansion of reservoirs and associated activities; recreation activities; grazing by livestock; and predation by rodents. Direct impacts should be avoided but little management required. Greatest threat is habitat loss due to urban sprawl and development.

CONSERVATION MEASURES TAKEN: Attempted to list as Threatened but attempt denied. Surveys conducted in Mexico by Centro Ecologico de Sonora, 1991 and 1992. One Mexican site (1991 survey) showed impact by livestock. Protected as an antiquity under the State Antiquities Act, but only when associated with rock alignments and artifacts with prehistoric ruins. Agaves found with Hohokam sites indicating use and probable cultivation (Hodgson 1994).

SUGGESTED PROJECTS: Determination of affinities of other agaves; evolutionary origin; further survey for plants, especially in the Salt River Canyon in the vicinity of Cibecue Creek and upper Verde towards Childs from Horseshoe Reservoir and Dam; also along Gila River east of Florence; and a systematic account of its possible association with archaeological features. Studies of the plant within an archaeological context. Determine status in Mexico. Train archaeologists on the Coronado National Forest with surveys near archaeological sites.

LAND MANAGEMENT/OWNERSHIP: BLM - Phoenix Field Office (and possibly Safford FO); BOR - Phoenix Area; USFS - Tonto National Forest; State Land Department; Lake Pleasant County Park; Boyce Thompson Southwestern Arboretum; TNC Hassayampa River Preserve; Private.

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USDI, Fish and Wildlife Service. 1996. Endangered and Threatened Wildlife and Plants: Review of Plant and Animal Taxa that are Candidates for Listing as Endangered or Threatened Species; Notice of Review; Proposed Rule. Federal Register 61(40):7596-7613.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

Karen Adams - Tucson, Arizona.
Vorsila Bohrer - Portales, New Mexico.
Wendy Hodgson - Desert Botanical Garden, Phoenix, Arizona.
Gary Nabhan - Native Seeds Search, Tucson, Arizona.
Liz Slauson - Desert Botanical Garden, Phoenix, Arizona.

ADDITIONAL INFORMATION:

Gentry (1982) and Hodgson et al. (1988) recommended for listing. Desert Botanical Garden has records and seed collected by Rodney Engard from a plant collected by Bartlett Lake. One plant flowered, records state it was from seed collected by Engard more than 20 years earlier. May be sterile clone of hybrid origin; original colonies may have been set out by Indians. Typically found in association with prehistoric habitation or agricultural sites in central Arizona. Native populations may occur in Mexico.

Prehistoric peoples (primarily Hohokam, 1100-1400 AD) used *A. murpheyi* for food just prior to stalk elongation. Cultivated for use in making mescal more than 40 years ago.

Hodgson (1991 Coronado National Forest Plant Workshop) postulated why this species is no longer found in Phoenix and Tucson basins: after fragmentation of tribes and their subsequent absence, plants used by other tribes but not tended. Plants exploited and habitat lost due to changes in last 75-100 years, so numbers reduced.

Revised: 1990-04-05 (SST)
1990-12-05 (WCH)

1991-10-18 (BKP)
1991-11-10 (PLW)
1991-12-04 (SR)
1992-09-15 (BKP)
1995-02-28 (WCH)
1997-04-24 (SMS)
2003-05-08 (SMS)

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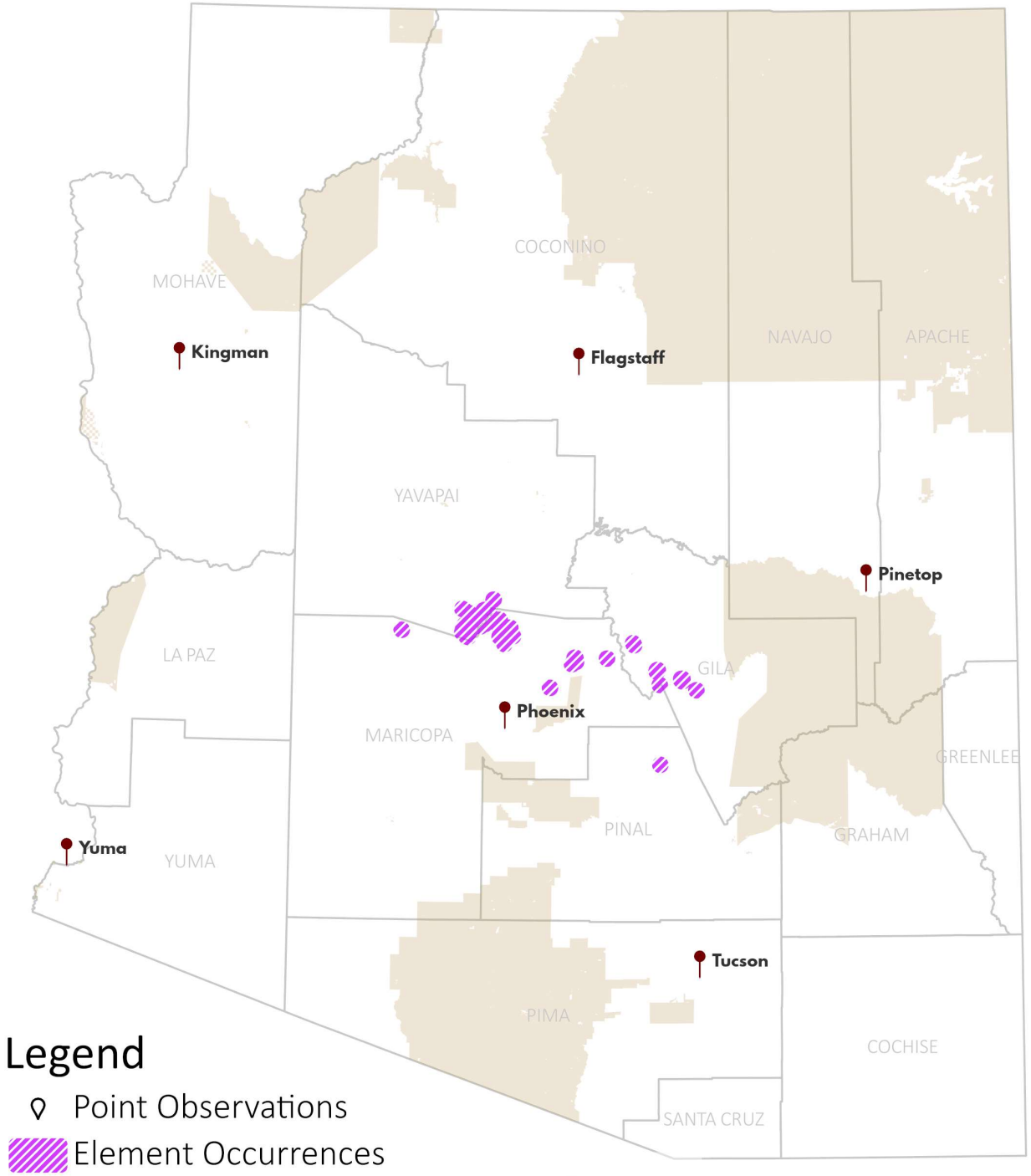
Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

Agave murpheyi

Hohokam Agave



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

0 50 100 Kilometers

ARIZONA GAME & FISH

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences.

Heritage Data Management System
2019-06-13

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDFAB2A0Q1
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Lotus mearnsii* var. *equisolensis*
COMMON NAME: Horseshoe Deer Vetch
SYNONYMS: *Acmispon mearnsii* var. *equisolensis*
FAMILY: Fabaceae

AUTHOR, PLACE OF PUBLICATION: Anderson, John L. Madrono 43(2) 261-263. 1996.

TYPE LOCALITY: Arizona: Maricopa County, Lower Verde River S of Horseshoe Reservoir, 0.3 mi W of road to Reservoir on FS 205. 2100 feet.

TYPE SPECIMEN: ASU 19168 (holotype). J.L. Anderson, #87-21. April 4, 1987.

TAXONOMIC UNIQUENESS: NatureServe (2015) list 43 species of *Lotus* in the United States and Canada. There are an additional 39 varieties. Fourteen of the species are found in Arizona. *L. mearnsii* and *L. alamosanus* are two species only found in the State. *L. mearnsii* has two varieties: *L.m. equisolensis* and *L.m. mearnsii*.

DESCRIPTION: Spreading to prostrate perennial herb arising from subterranean caudex; stems clustered, procumbent, 1-3 dm long; pubescence silvery to less dense at distal end of stems, sericeous; leaves shorter than to as long as internodes, subpinnate to palmate, sericeous on both surfaces, petiole 2-5 mm, leaflets 3-5, broadly obovate or obcordate, 6-16 mm long, 4-12 mm wide, length to width ratio less than 2; peduncles prolonged beyond the leaves, 25-75(95) mm long; umbels with 2-7 flowers, 14-20 mm long; calyx tube narrowly campanulate, 4-7 mm long, teeth 2-4 mm long; corolla bright yellow, petals subequal; ovary pubescent, ovules 16-20; pod erect to ascending, oblong, 25-35(40) mm long, 4-6 mm wide, subpersistent, dehiscent, valves strigulose, coriaceous; seeds few (Anderson 1996).

AIDS TO IDENTIFICATION: It differs from the typical variety, *L. mearnsii* var. *mearnsii*, found near Prescott and Ashfork, by the larger size of the elongated peduncle, larger corolla, fruits, and leaflet and the more compact growth habit with shorter internodes, its endemism to lacustrine deposits, and its 50 mile (80 km) separation from the nearest populations (Anderson 1996).

ILLUSTRATIONS:
Herbarium Mounts:
http://swbiodiversity.org/seinet/taxa/index.php?taxon=Lotus%20mearnsii%20var.%20equisolensis.
Line Drawing and Photos:
http://www.aznativeplantsociety.org/rareplants/Lotus_mearnsii_var_equisolensis.pdf.

TOTAL RANGE: See Range within Arizona

RANGE WITHIN ARIZONA: Endemic to Arizona. Known from only a single locality SW of Horseshoe Reservoir, Maricopa County.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Spreading to prostrate perennial herb.

PHENOLOGY: Flowering/fruiting period, mid-March to mid-May.

BIOLOGY: The edaphic island (late tertiary lacustrine deposits of interbedded white limestone and ash) on which the rare Horseshoe lotus grows does not support Sonoran Desert dominants such as creosote bush and foothill paloverde which allows it an ecological opening; occurs with other rare plants such as *Purshia subintegra* and *Eriogonum ripleyi* (Anderson 1996).

HABITAT: Desert scrub growing on late tertiary lacustrine deposits.

ELEVATION: 2100 feet (640m).

EXPOSURE: Not specified.

SUBSTRATE: Uniquely associated with late tertiary lacustrine deposits (interbedded white limestone and ash).

PLANT COMMUNITY: Desert scrub defined by *Purshia, Canotia, Dodonea, Eriogonum, Nolina* and *Encelia.* Other species associated with the collections include: *Cowania, Canotia holacantha, Dodonea viscosa, Purshia subintegra, Chamaesyce chaetocalyx, Eriogonum wrightii pringlei, Opuntia engelmannii, Simmondsia chinensis, Echinocereus engelmannii, Parkinsonia microphylla, Anemone tuberosa, Melampodium leucanthum, Opuntia phaeacantha, Lesquerella cinerea, Baileya multiradiata, Calliandra eriophylla, Erodium texanum, Lotus rigidus, Polygala macradenia, Eriogonum fasciculatum, Thamnosma texana, Cuscuta indecora, Salvia columbariae, Parietria pensylvanica, Linum lewisii, Calandrinia ciliata, Emmenanthe penduliflora, Mentzelia multicaulis, Mentzelia multiflora, Juniperus sp., Hedeoma nanum, Yucca elata, Fouquieria splendens, Eriogonum ripleyi, Packera*

neomexicana, Sphaeralcea ambigua, Bromus rubens, Prosopis velutina, Ambrosia deltoidea, Bouteloua trifida, Centaurea melitensis, Astragalus tephrodes var chloridae.

POPULATION HISTORY AND TRENDS: Unknown. *L.m.* var. *equisolensis* was first collected in 1986, and has been re-collected several times, the latest in 2005. It is known only from its type locality and is an endemic. It does seem uniquely adapted to its lacustrine deposit soils. No data for population abundance or trends is available.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None.
STATE STATUS: None.
OTHER STATUS: Forest Service Sensitive (USDA FS Region 3 2013)
[Forest Service Sensitive (USDA FS Region 3 2007)]

MANAGEMENT FACTORS: None specified.

PROTECTIVE MEASURES TAKEN: Listed as Forest Service Sensitive.

SUGGESTED PROJECTS: Monitor periodically and collect data on population density and trend.

LAND MANAGEMENT/OWNERSHIP: USDA Forest Service, Tonto National Forest.

SOURCES OF FURTHER INFORMATION

REFERENCES:

Anderson, John L. 1996. Floristic patterns on late tertiary lacustrine deposits in the Arizona Sonoran Desert. Madrono 43(2): 255-272.
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MAJOR KNOWLEDGEABLE INDIVIDUALS:

John L. Anderson, USDI Bureau of Land Management, Phoenix AZ (retired).

ADDITIONAL INFORMATION:

Revised: 2015-09-24 (BDT)

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Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDAST4V0J0
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Heterotheca rutteri* (Rothr.) Shinners
COMMON NAME: Huachuca Golden Aster, Rutter's Golden-aster, Rutter's False Goldenaster
SYNONYMS: *Chrysopsis rutterii*; *Chrysopsis villosa* var. *rutteri*
FAMILY: Asteraceae

AUTHOR, PLACE OF PUBLICATION: Shinners, Lloyd H. 1951. Field & Lab. 19(2): 71.

TYPE LOCALITY: Arizona: Sonoita Valley.

TYPE SPECIMEN: Rothrock 662.

TAXONOMIC UNIQUENESS: Seven species in the genus are known from Arizona. A recent revision of the genus did not consider this species, leaving its generic identity in question.

DESCRIPTION: Large (up to 1.0 m, 3.3 ft.) robust perennial (no woodiness) herb with alternate leaves (Warren (1999) reports up to 35 cm in height); herbage silvery-silky throughout; heads relatively few, large and leafy-bracted with disk 1.0-1.5 cm (0.4-0.6 in.) tall; ray flowers yellow, often surpassed by leafy bracts; pappus double in rays and disks with outer series of short squamellae and inner series of longer capillary bristles.

AIDS TO IDENTIFICATION: Erect growth form with few stems approximately 30.0 cm (1.0 ft.) tall; silky canescent hairs throughout (if these not present, not *H. rutteri*); yellow flower heads 2.0 cm (0.8 in.) in diameter. Bracts longer in *H. rutteri*, extend above top of head; very distinct, separates it from other *Heterothecas*. *H. rutteri* can be distinguished from *Senecio* by size and leaf shape, *Senecio* is much taller with linear leaves.

ILLUSTRATIONS:
Line drawing (USFWS, Phoenix).
Color photo (http://www.science.uwaterloo.ca/biology/jcsemple/het_rutt.jpg).

TOTAL RANGE: Known only from eleven locations in the United States (Reichenbacher 1994), including Cochise, Pima and Santa Cruz counties, Arizona; one record from Santa Barbara, southern Sonora, Mexico.

RANGE WITHIN ARIZONA: The Altar Valley, Sonoita, San Rafael Valley, Kino Springs, Canelo Hills, Garden Canyon, Huachuca and Patagonia mountains, and the Buenos Aires National Wildlife Refuge.

Warren (1999) reports range as "San Rafael, Empire, San Pedro and Altar valleys."

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Herbaceous perennial.

PHENOLOGY: Flowers summer from July - October after summer rains; fruits in August to November.

BIOLOGY: Unknown. Rarity of this plant puzzling because it has many close relatives that are very weedy. Very robust with enough rain, much smaller with less rain. Robustness could also depend on soil conditions. Fuzzy, dirty white when it goes to seed. Before this time, appears as other daisies do.

HABITAT: Level, open grassland. Grows on roadcuts, and disturbed sites. May be mistaken for "yellow daisy."

ELEVATION: 4,500 - 6,500 feet (1373 - 1983 m). Based on records in the Heritage Data Management System (AGFD), elevation ranges from 3,560 - 5,275 ft (1086 - 1609 m) (AGFD, unpublished data accessed 2001).

EXPOSURE: Various

SUBSTRATE: Various

PLANT COMMUNITY: Grassland and oak savanna.

POPULATION TRENDS: Populations are small and patchy within what appears to be relatively extensive, uniform heads (Warren 1999).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None (USDI, FWS 1996)
[Category 2 USDI, FWS 1993]

STATE STATUS: None

OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 1999, 2007)
Bureau of Land Management Sensitive (USDI, BLM AZ 2000, 2005, 2008, 2010)

MANAGEMENT FACTORS: If this species is dependent upon healthy grassland habitat, it may be vulnerable to loss of grassland, and may have experienced historic declines for that reason.

Fire may be an important management factor for this species because it is found in habitats that historically burned with high frequency.

PROTECTIVE MEASURES:

SUGGESTED PROJECTS: Population monitoring is needed to determine status and trends. Relationship to habitat conditions should be studied to determine need for grassland habitat.

The fire ecology of this species should be studied to determine dependency on fire. Most forbs tend to benefit from cooler fires. As *H. rutteri* is a stout forb, it should survive (Reichenbacher 1994).

LAND MANAGEMENT/OWNERSHIP: BLM - Tucson Field Office; DOD - Fort Huachuca Military Reservation; FWS - Buenos Aires National Wildlife Refuge; USFS - Coronado National Forest; TNC - Cottonwood Spring Preserve; Private.

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Threatened Species; Notice of Review. Proposed Rule. Federal Register 61(40):7595-7613.

Warren, P. 1999. *Heterotheca rutteri* (Rothr.) Shinners (Rutter's Golden Aster), Asteraceae. Draft abstract from Arizona Rare Plant Book, in prep.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

Mark Fishbein - Department of Ecology, University of Arizona, Tucson, Arizona.
Steve McLaughlin - University of Arizona, Office of Arid Lands Studies, Tucson.
Peter Warren - Tucson, Arizona.

ADDITIONAL INFORMATION:

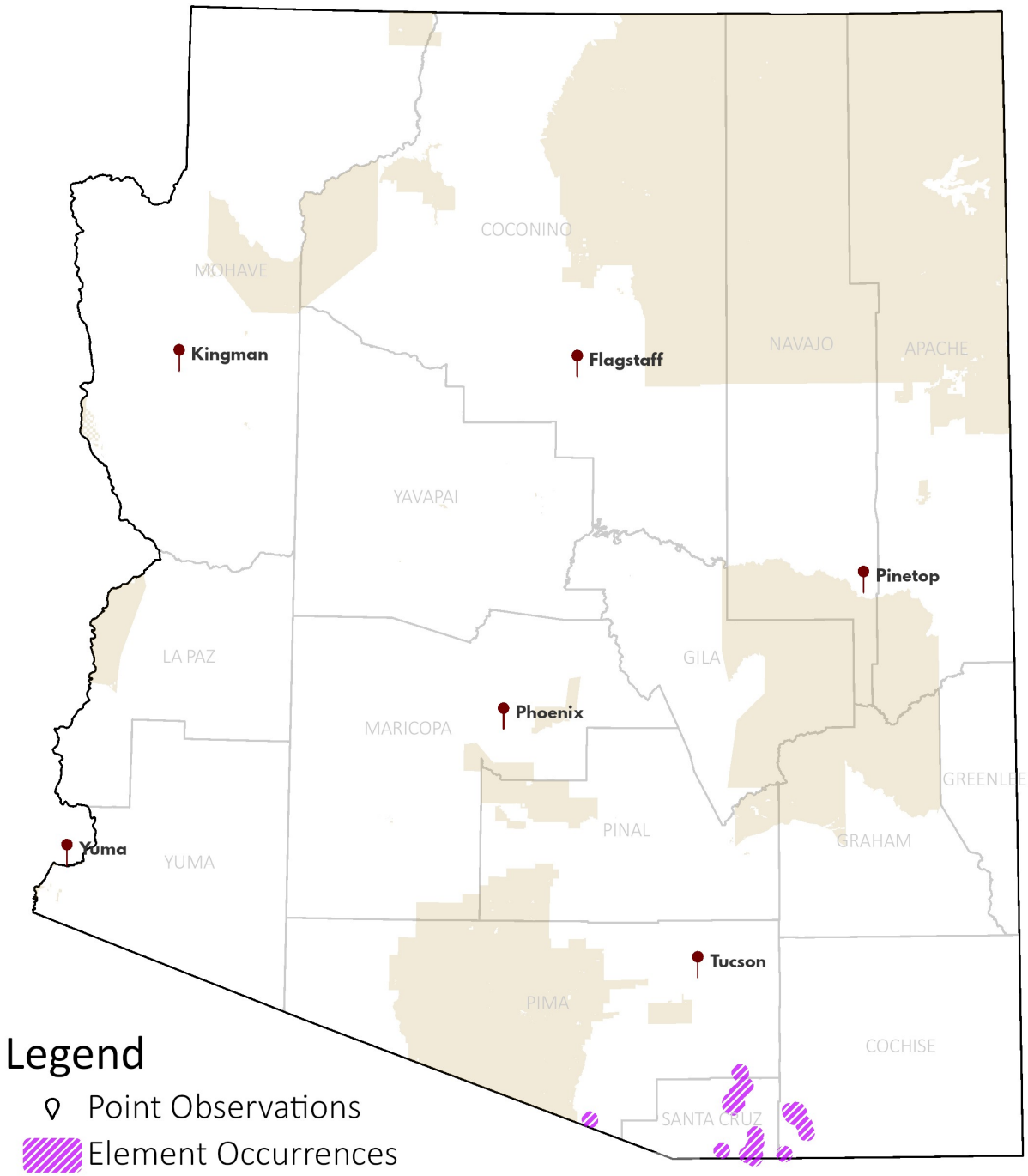
F. Reichenbacher currently preparing status report (which will be completed by end of December, 1994) for USFWS. He is contracted to survey throughout state and determine federal listing.

Dr. Semple: University of Maryland expert who has looked at all collected specimens. Stated that none occur in the Santa Ritas, specimen actually *H. fulcrata* which is greener. *H. rutteri* tends to be silvery white all over plant. Semple's report in press (University of Waterloo, Ontario, (#37).

Revised: 1991-10-30 (PLW)
1991-11-13 (SR)
1994-10-17 (PLW)
1994-12-07 (DBI)
1998-01-08 (SSS)
2001-12-21 (SMS)

Heterotheca rutteri

Huachuca Golden Aster



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

0 50 100 Kilometers

ARIZONA GAME & FISH

Point Observations are not guaranteed to have been thoroughly quality controlled. Element Occurrence data represent areas where a population occurs.

Heritage Data Management System
2018-02-08

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDFAB0F470
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Astragalus hypoxylus* Wats.
COMMON NAME: Huachuca Milk-vetch
SYNONYMS: *Hamosa hypoxylus; H. hypoxyla; Tragacantha hypoleuca*
FAMILY: Leguminosae

AUTHOR, PLACE OF PUBLICATION: Watson, S. 1883. Proceedings of the American Academy of Arts and Sciences 18: 192.

TYPE LOCALITY: Arizona: Cochise County: Mahoney's Ranch, near Ft. Huachuca.

TYPE SPECIMEN: J.G. Lemmon. July 1882.

TAXONOMIC UNIQUENESS:

DESCRIPTION: **Compact rosette of branches**, generally less than 10.0 cm (4.0 in.) in diameter, **typically flat against ground**, although the outer ends of branches may turn upward somewhat. Alternate leaves are compound with 9-13 ovate leaflets of 3.0-5.0 mm long, gray-green in color and glabrous above and sparsely pubescent underneath. **Leaflets appear folded along midrib**. **Inflorescence very compact and globose**, ca. 1.0 cm (0.4 in.) in diameter, somewhat resembling clover inflorescence. Flowers about 6.0 mm long with petals whitish with pale purple tips. Fruits are small oval pods 8.0-10.0 mm long and 3.0-4.0 mm in diameter. Pods indehiscent. Mature fruits typically pale yellowish toward base and are purplish toward tip.

AIDS TO IDENTIFICATION: The dense, subcapitate inflorescence with mat-forming growth, distinguish this milk-vetch from others in the area.

ILLUSTRATIONS:
USFWS Line Drawing.

TOTAL RANGE: Southern Arizona.

RANGE WITHIN ARIZONA: Cochise County: Huachuca Mountains; Santa Cruz County: Patagonia mountains.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Herbaceous perennial.

PHENOLOGY: March - April with fruit into May; Plants have dried up by June.

BIOLOGY: Seeds may be heavily parasitized by chalcid wasps.

HABITAT: Open, limestone rocky clearings in oak-juniper-pinyon woodland. Found on hillsides with slopes of 25 to 30 percent, generally unshaded. Distinctive during the summer when other *Astragalus* have died back. May be dependent on some mild disturbance regime. Bear Creek population occurson Lone Mountain Allotment.

ELEVATION: 5,300 - 6,100 feet (1590-1861 m).

EXPOSURE: Southerly to southwesterly.

SUBSTRATE: Loosely consolidated, very gravelly or cobbly soil of limestone/metamorphic mix (association with limestone uncertain).

PLANT COMMUNITY: Openings in woodland of Emory oak, Mexican blue oak, alligator juniper and Mexican pinyon.

POPULATION TRENDS: High mortality due to drought in 1989-1990. See Gori et al. (1990) for demographic information. The populations show huge fluctuations in relation to the amount of rainfall. Current population status is not well known.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None (USDI, FWS 1996)
Category 2 USDI, FWS 1993]

STATE STATUS: Salvage Restricted (ARS, ANPL accessed 2011)
[Salvage Restricted (ARS, ANPL 1993)]

OTHER STATUS: Bureau of Land Management Sensitive (USDI, BLM AZ 2000, 2005, 2008, 2010)
Forest Service Sensitive (USDA, FS Region 3 1990, 1999, 2007)

MANAGEMENT FACTORS: Threats: Trampling by recreationists and livestock; degradation of habitat due to livestock grazing. Evidence that the population in Bear Canyon was extirpated due to excessive livestock trampling. Additionally, their limited range and small numbers, make this species susceptible to human disturbance. Management objectives include improvement of livestock management, and improved trail and off-road vehicle management.

CONSERVATION MEASURES TAKEN: Monitoring plots established in 1988 at the Patagonia Mountains (Harshaw Road) population. Additional monitoring plot at a Huachuca Mountains population (Bear Canyon) established in 1989.

SUGGESTED PROJECTS: Continue monitoring/surveying. Consider plant when developing the Lone Mountain AMP.

LAND MANAGEMENT/OWNERSHIP: USFS - Coronado National Forest, and private (Scotia Canyon).

SOURCES OF FURTHER INFORMATION

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Warren, P.L., L.S. Anderson, and P.B. Shafroth (The Nature Conservancy). 1989. Population studies of sensitive plants of the Huachuca and Patagonia mountains, Arizona. For USFS Coronado National Forest. 99 pages.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

Mima Falk - U.S. Fish and Wildlife Service, Tucson, Arizona.

Dave Gori - The Nature Conservancy, Tucson, Arizona.

G.A. Levin - San Diego Natural History Museum, San Diego, California.

Jim Malusa - The Nature Conservancy, Tucson, Arizona.
Peter Warren - Tucson, Arizona.
T.R. Van Devender - Arizona-Sonora Desert Museum, Tucson, Arizona.

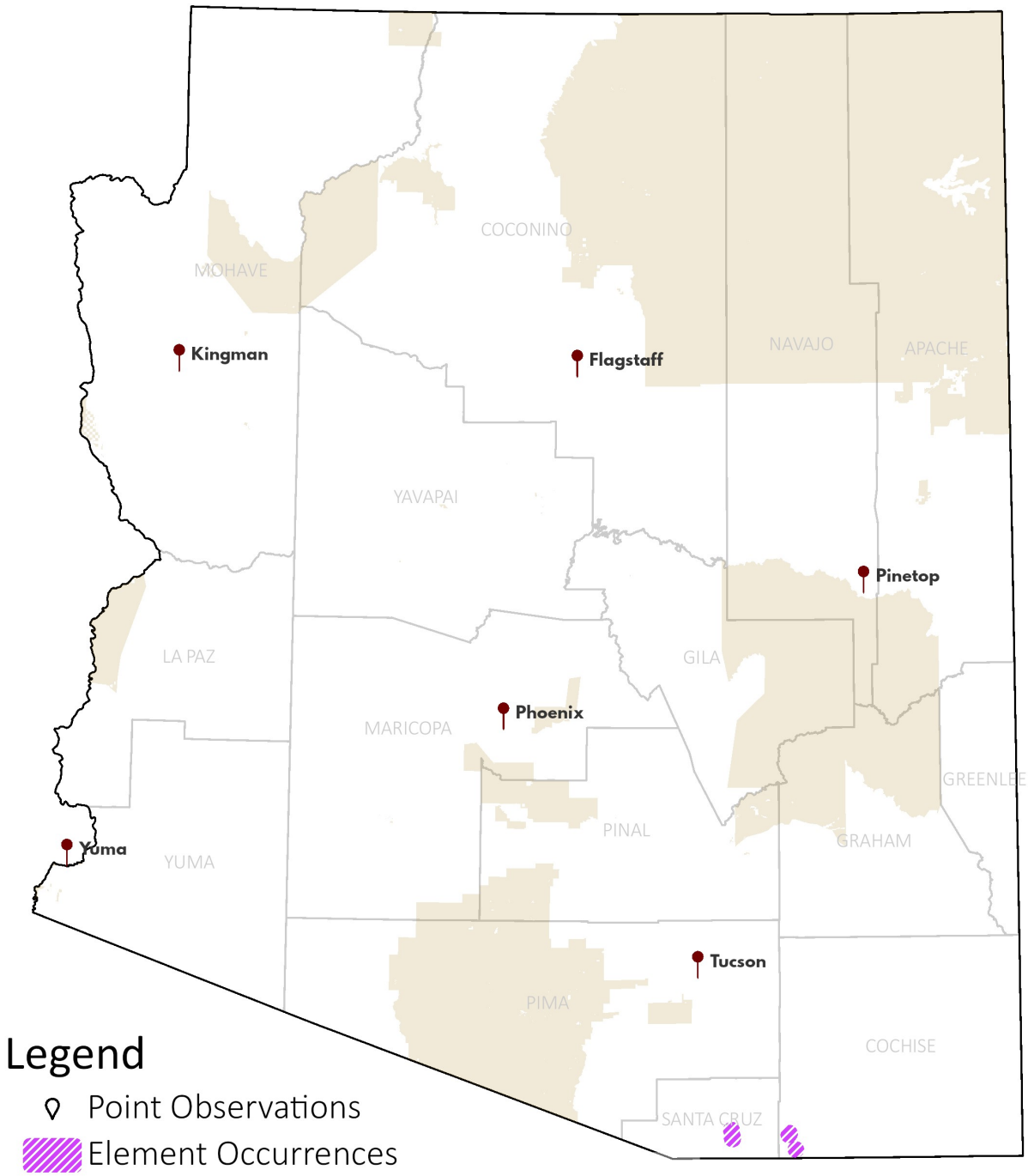
ADDITIONAL INFORMATION:

This species is sometimes found in ditches along roadsides. It appears to respond favorably to some disturbance.

Revised: 1989-10-25 (SST)
1991-10-18 (BKP)
1991-12-04 (SR)
1998-01-06 (SSS)
1999-08-13(DJG)

Astragalus hypoxylus

Huachuca Milkvetch



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

0 50 100 Kilometers

ARIZONA GAME & FISH

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Heritage Data Management System
2018-02-08

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDAPI19051
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Lilaeopsis schaffneriana* (Schlecht) ssp. *recurva* (A.W. Hill) Affolter
COMMON NAME: Huachuca water umbel, Huachuca water-umbel, Huachuca waterumbel, Schaffner's grasswort, Cienega False-rush
SYNONYMS: *Lilaeopsis recurva* A.W. Hill, *L. schaffneriana* var. *recurva*
FAMILY: Apiaceae

AUTHOR, PLACE OF PUBLICATION: A.W. Hill, J. Linn. Soc. Bot. 47: 525-551. 1927.

TYPE LOCALITY: Santa Cruz Valley near Tucson, Pima County, Arizona, U.S.A.

TYPE SPECIMEN: LT: GH. C.G. Pringle s.n. 19 May 1881. LT: US. ST: NY, GH.

TAXONOMIC UNIQUENESS: In the genus *Lilaeopsis*, the species *schaffneriana* is 1 of 5 species in North America, and contains only 1 variety *recurva*. According to Affolter (1985), "The genus *Lilaeopsis* Greene contains approximately 20 species. It is well developed in the temperate zones of North America, South America, Australia and New Zealand. 6 or 7 species recognized in North America."

According to NatureServe (2003), "The USFWS listed this taxon as *Lilaeopsis schaffneriana* ssp. *recurva* (Federal Register, Jan. 6, 1997). As of 11/31/99, *L. schaffneriana* var. *recurva* is used in its List of Endangered and Threatened Plants. The latter rank, is also used by Kartesz (1999). However, subspecies seems to be the rank used by Affolter (1985, p. 61), and is accepted in the Gray Index (online, 8/2000)." It is also used by the Missouri Botanical Garden (2003).

DESCRIPTION: Herbaceous, semi-aquatic to aquatic perennial with cylindrical, wavy, yellowish green, slender hollow leaves borne individually or in clusters, that grow from the nodes of creeping rhizomes; inconspicuous septa at irregular intervals. Leaves terete in cross section, generally 1.0-3.0 mm in diameter, however, length varies depending on micro-habitat. When growing out of water in wet soil near a stream, leaves usually only 4-8 cm (1.6-3.2 in) tall; growing in water that supports their weight, leaves can grow up to 22.5 cm (9 in) long. Umbels of 3-10 very small, white flowers (commonly with maroon-tinted petals) of less than 1 mm, borne at the base of the leaves. Inflorescence peduncles typically 1.0-7.0 cm (0.4-2.8 in.) long, always shorter than leaves. Fruits are globose, 1.5-2.0 mm in diameter, slightly longer than wide, and red colored in late fall.

AIDS TO IDENTIFICATION: Wavy, yellowish-green leaves best field characteristic (Warren 1994). Leaves curve slightly above the water surface. This characteristic distinguishes it from young or small *Eleocharis*. *Lilaeopsis* has semi-succulent leaves that are somewhat flexuous, while *Eleocharis* leaves are pithy, strictly straight and not at all succulent. Leaf color of *L. s.* var. *recurva* is pale yellow-green compared to the darker green of most co-occurring herbaceous species.

ILLUSTRATIONS: Line drawing of habit, flower and fruit (Affolter, 1982: Fig.9, p.52).
Color photo (Lynda Pritchett-Kozak, *in* CPC 2003: CPC #9357, http://ridgwaydb.mobot.org/cpcweb/CPC_ProfileImage.asp?FN=9357a)
Color photos (Peter L. Warren, *in* http://www.co.pima.az.us/cmo/sdcp2/species/umbel.html)
Line drawing (*in* Falk, Jenkins et al., 2001)
Color photo of plant (FWS, *in* Falk, Jenkins et al., 2001)
Color photo of habitat (Peter Warren/TNC, *in* Falk, Jenkins et al., 2001)
Color photo (DBG, *in* Kelly and McGinnis 1994)
Line drawing (Michael Chamberland, *in* Kelly and McGinnis 1994).

TOTAL RANGE: Southwestern New Mexico, southeastern Arizona and adjacent Sonora, Mexico.

RANGE WITHIN ARIZONA: Disjunct locations in Cochise and Santa Cruz counties. Cochise County: Huachuca Mountains, San Pedro area, Saint David (extirpated), and San Bernardino Valley/Black Draw. Santa Cruz County: Canelo Hills/Turkey Creek, Sonoita Creek and San Rafael Valley. Historically in Pima County, Tucson. **See Population Trends**.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Herbaceous, semi-aquatic to aquatic perennial.

PHENOLOGY: Flowering observed March through October (DBG, accessed 2001), giving way to red fruits in late fall. According to Brooks (1999 draft), "primarily reproducing vegetatively through rhizomes; flowering in June through August; ellipsoid fruits July through September."

BIOLOGY: Rhizomes branch freely, may form dense mats (carpet) in sand or mud streambed, making it impossible to identify individual plants. Flowers may be self-fertile. Rapid colonization of newly constructed pond at San Bernardino National Wildlife Refuge suggests that species may have extended seed dormancy (K. Cobble, pers comm.). Reproduces vegetatively via rhizomatous spreading, dispersing if clumps dislodged. *Lilaeopsis* seems to require an intermediate level of flooding frequency to keep competition manageable. Plant does not compete well with larger, semi-aquatic species (sedges, bulrushes) but populations can be destroyed when floods are too frequent and intense. They

are vegetatively reduced during cooler months, resuming active growth in the spring. After spring floods scour out a riparian system, *Lilaeopsis* is one of the first plants to establish itself.

HABITAT: Cienegas or marshy wetlands at 2,000 to 6,000 feet elevation, within Sonoran desertscrub, grassland or oak woodland, and conifer forest. Plants found in unshaded or shaded sites in shallow water, saturated soil near seeps, springs and streams. *Lilaeopsis* requires perennial water, gentle stream gradients, small- to medium-sized drainage areas, and (apparently) mild winters. Usually found in water depths from 5.0-15.0 cm (2.0-16.0 in.), but occasionally to 25.0 cm (10.0 in.) deep.

ELEVATION: 2,000 - 7,100 ft. (610 - 2166 m).

EXPOSURE:

SUBSTRATE: Submerged sand, mud and/or silt.

PLANT COMMUNITY: Within Sonoran desertscrub, grassland or oak woodland, and conifer forest. Associated vegetation includes: *Alnus* sp. (alder), *Baccharis* sp. (willow) and *Populus* sp. (cottonwood), along with *Aster* (*Almutaster*) *pauciflorus*, *Berula erecta* (water (or wild) parsnip), *Carex* sp. (sedge), *Eleocharis acicularis* (needle or least) spikerush), *E. parishii* (Parish's spikerush), *Ludwigia palustris* (Marsh seedbox), *Rorippa* sp. (watercress), *Scirpus americanus* (three-square bulrush), *Typha domingensis* (southern cattail), *Veronica americana* (American speedwell), and algal mats, grasses and rushes.

POPULATION TRENDS: There are 8 known populations in the U.S. and 4 documented sites in Mexico (CPC 2003). San Pedro River Conservation Area is the chief location for this plant on BLM land, where it is recolonizing fairly rapidly. Most plants are found on the San Pedro River. Scotia and Bear canyons on the Coronado National Forest, was monitored during 1993 showing population increase. Sierra Vista's watershed condition is very important to this plant, particularly groundwater pumping.

Populations found in Mexico along Black Draw, a few miles south of San Bernardino NWR boundary and at Los Fresnos (approximately 2 miles south of the International Boundary southwest of the Huachuca Mountains).

Species has apparently been lost from at least four historic sites in Arizona (Saint David, 2 sites; Tucson; Monkey Springs), probably representative of the general loss and decline of cienega and stream habitats throughout Arizona. Twenty locations historically in Tucson. The House Pond population on the San Bernardino National Wildlife Refuge was extirpated during pond re-construction in the 1970s. Saint David area population presumed extirpated due to channel erosion.

Species appears to be naturally recolonizing the San Pedro River at several locations, including the Highway 90 crossing and Boquillas Ranch (D. Gori and P. Warren, pers. obs. 1993-1994), apparently as a result of improved aquatic habitat stability following improvement in management of the BLM San Pedro Riparian National Conservation Area. This population was believed to be lost due to destabilization of habitat and loss of water. Present in the 1930s but not present in the 1987-88 survey.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: LE (USDI, FWS 1997) with Critical Habitat
[PE USDI, FWS 1995]
[C1 USDI, FWS 1994]
[PE USDI, FWS 1993]
[C1 USDI, FWS 1993]
[C2 USDI, FWS 1983]

STATE STATUS: Highly Safeguarded (ARS, ANPL 1999)
[Highly Safeguarded (ARS, ANPL 1993)]

OTHER STATUS: No FS Status (USDA FS Region 3 1999)
[Forest Service Sensitive, USDA FS Region 3, 1990]

MANAGEMENT FACTORS: Perennial water flow and excessive erosion are key issues of management. A small number of *Lilaeopsis* populations are restricted to wetland habitats that are rare in the southwest United States and adjacent Mexico. Habitats are threatened by growing water demands and associated diversions and impoundments, uncontrolled livestock grazing (which contributes to the degradation of watersheds resulting in destructive flooding), introductions of invasive non-native plant species, sand and gravel mining, and flash flooding.

The primary management need of this species is to protect the cienega habitat that supports known populations. Management procedures include protecting water supplies by acquiring instream flow water rights and managing watersheds to reduce flood frequency and intensity. Recreation management may be needed at some local populations. (NatureServe 2003).

PROTECTIVE MEASURES: Friends of the San Pedro River docents given training to identify and monitor species on the San Pedro River (Sept. 1994).

SUGGESTED PROJECTS: Examination of possible seed dispersal mechanisms. Molecular work would reveal the degree of genetic diversity of this species along the respective drainages. Additional information as to the reproductivity in habitat would be useful.

LAND MANAGEMENT/OWNERSHIP: BLM - Tucson Field Office; DOD - Fort Huachuca Military Reservation; USFS - Coronado National Forest; USFWS - San Bernardino National

Wildlife Refuge; Cienega Creek Natural Preserve; TNC - Bingham Cienega and Cottonwood Spring Preserves; Private.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Kevin Cobble - USFWS
Dave Gori - The Nature Conservancy, Tucson, Arizona
Peter Warren - Tucson, Arizona

ADDITIONAL INFORMATION:

Specimens from three populations have been sent to Dr. Peggy Fiedler, California State University at San Francisco for DNA analysis to compare genetic relatedness to two California species of *Lilaeopsis*.

"Currently, *Lilaeopsis* is held at the Desert Botanical Garden in the form of live plants. Although the plants are easily grown and propagated vegetatively, they seldom flower in conventional cultivation. There is a crucial need to establish a genetically representative seed bank of this plant, and to investigate seed storage and germination requirements." (CPC 2003).

Experimental transplant study, was conducted by The Nature Conservancy back in 1990-1991 on the San Bernardino NWR. The first site failed, the second site did not grow beyond its original 5 inch diameter, but the third site grew from 5 inch to approximately 2 feet in diameter. The major conclusion is that *Lilaeopsis* can not survive where there is heavy competition from other herbaceous aquatic plants. (NatureServe 2003).

Revised: 1990-12-26 (SR)
1991-10-18 (BKP)
1994-10-17 (PLW)
1995-05-15 (DBI)
1997-01-07(SMS)
1997-10-23 (SMS)
2003-11-13 (SMS)

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDAST530R0
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Hymenoxys jamesii*
COMMON NAME: Jame's Rubberweed
SYNONYMS:
FAMILY: Asteraceae

AUTHOR, PLACE OF PUBLICATION: M.W. Bierner, Madroño 40(1): 38-46, f. 1. 1993.

TYPE LOCALITY: U.S.A. Arizona, Navajo County, Forest Road 504, road to Winslow from Heber, 5.9 miles northwest of highway 260, junction west of Heber.

TYPE SPECIMEN: HT: TEX. Bierner 91-87, 12 Aug 1991. IT: NY-180205, US-03241718.

TAXONOMIC UNIQUENESS: Species *jamesii* is 1 of 18 in the genus *Hymenoxys*.

DESCRIPTION: Herbaceous biennial are 3.5-11.4 dm (14-45 in) tall, excluding the root. NatureServe (2004) reports heights of mostly 4.3-7.7 dm (17-30 in). Stems usually 1, but sometimes 2-4. They are paniculately to corymbosely branched above, sulcate below becoming striate above, usually distinctly purple-red below becoming green above. Moderately to densely below, becoming sparsely to moderately pubescent above. Leaves are dotted with impressed glands, entire, and simple to pinnately or bipinnately divided into 3-9 linear segments. Basal leaves in a dense rosette, usually devided into 5-7 segments. Peduncles range 1.3-5.0 cm, straite, expanded apically. Numerous flower heads (usually 50-180) are subhemispheric to campanulate, excluding the rays. Involucral bracts in two morphologically distinct series; outer bracts usually 8 or 9 per head; inner bracts usually 10 =/- 2 per head. Ray florets carpellate, fertile, usually 8 per head; ligules yellow, 3-lobed, tube glabrous to sparsely pubescent. Disc florets hermaphroditic, fertile; corallas yellow with yellow lobes, 5-lobed, the lower one-fourth to one-third usually constricted into a narrower yellow-brown tube. Achenes narrowly obconic, densely pubescent with straight, forked, antrose hairs, 1.6-2.1 x 0.4-0.7 mm. Pappus scales usually 5, obovate, apex acuminate into an acute point or short awn. (Bierner, 1993).

AIDS TO IDENTIFICATION:

ILLUSTRATIONS: Color photo of specimen (NYBG *in* http://scisun.nybg.org:8890/searchdb/owa/wwwcatalog.detail_list?this_id=4389390)
Color photo of specimen (USNM *in* http://ravenel.si.edu/botany/types//fullRecords.cfm?myFamily=)

TOTAL RANGE: Mogollon Plateau of eastern central Arizona.

RANGE WITHIN ARIZONA: Collected in Coconino, Gila, and Navajo counties.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Herbaceous biennial.

PHENOLOGY: Flowers July and August.

BIOLOGY:

HABITAT: General area is evergreen forest dominated by pines, especially Ponderosa pine (*Pinus ponderosa*).

ELEVATION: 5,370 - 7,500 ft (1638 - 2288 m).

EXPOSURE:

SUBSTRATE:

PLANT COMMUNITY: Pine dominated evergreen forest.

POPULATION HISTORY AND TRENDS: Unknown

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: None
OTHER STATUS: None

MANAGEMENT FACTORS:

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: Studies to determine life history factors, population status, and distribution range need to be performed.

LAND MANAGEMENT/OWNERSHIP: USFS - Apache-Sitgreaves, Coconino, and Tonto National Forests; Private.

SOURCES OF FURTHER INFORMATION

REFERENCES:

Bierner, M.W. 1993. *Hymenoxys jamesii* (Asteraceae: Heliantheae): A New Species from Arizona. Madroño 40(1): 38-46.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

Revised: 2004-09-02 (AMS)
2004-12-10 (SMS)

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDAPO030M0
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Amsonia kearneyana*
COMMON NAME: Kearney's Blue Star, Kearney's blue-star, Kearney's bluestar, Kearney's Amsonia
SYNONYMS:
FAMILY: Apocynaceae

AUTHOR, PLACE OF PUBLICATION: R.E. Woodson, Ann. Missouri Bot. Gard. 15(4): 415. 1928.

TYPE LOCALITY: USA, Arizona, Pima County, south canyon (Baboquivari Mts.), 9 April 1928, F. Thackery #55, MBG.

TYPE SPECIMEN: Type: MO, F.A. Thackery, 9 April 1928, Arizona. Paratype: US 01367358, F.A. Thackery 2018, 24 Mar 1926, USA. Arizona. Baboquivari Mts., south canyon.

TAXONOMIC UNIQUENESS: The species *kearneyana* is 1 of 16 in the genus *Amsonia*, and 1 of 5 in the subgenus *Sphinctosiphon*, which also includes: *A. tharpii, A. jonesii, A. palmeri*, and *A. peeblesii. A. kearneyana* was considered as synonymous with *A. palmeri* (North American Flora 29:129), but Kearney et al. (1951) maintains *A. kearneyana* based on distinct characteristics of mature follicles. McLaughlin (1982) retains species based on geographic separation between species, larger corolla lobes, and stem pubescence. Not a synonym of *A. palmeri* as suggested by Woodson (1928). Should be retained as distinct species. McLaughlin (1982): A specimen of *A. palmeri* from the Rio Bavispe, northeastern Sonora, has some characteristics of *A. kearneyana*.

DESCRIPTION: Perennial, milky sap multi-stemmed herb up to 90 cm (35.4 in) tall, with a thickened woody root. Up to 50 pilose stems are usually clustered from the base, giving plant hemispherical shape; sparingly branched and densely pubescent. Alternate to subverticillate, oblong-lanceolate to lanceolate leaves (lower: 6-10 cm [2.4-4.0 in.] long and 11-17 mm broad, upper: 4-6 cm [1.6-2.4 in] long and 3-8 mm broad), with soft spreading hairs along the margins. The inflorescence is not too conspicuous. White flowers (with pale pinkish/bluish bottom) are borne in clusters at the ends of the inflorescence. The pubescent calyx is 3.0-5.0 mm long, while the salverform **corolla** (long tube **with short lobes** [2-4 mm long] on the end) is 12-15 mm (range 10-22 mm) long, broadest below the apex and constricted at the orifice. The fruit is a pair of follicles, 3.0-10.0 cm (1.2-4.0 in.) long, slightly constricted between seeds. Seeds are cylindrical, corky, 8-11 mm long and 3-4 mm broad. *A. kearneyana* has largest seed size for its sub-group within *Amsonia*.

AIDS TO IDENTIFICATION: *A. kearneyana* has pubescent foliage and calyx; large seed 3-4 mm wide and 8-11 mm long; short corolla lobes, 2-4 mm long. Not sympatric with any other *Amsonias*. Closest *Amsonia* is *A. palmeri* with very showy flowers, narrower leaves, and different pubescence. *A. grandiflora* typically occurs at slightly higher elevations in oak woodlands and is glabrous, its leaves are longer and narrower, its corolla is longer, and its fruits are terete and not constricted between seeds (Falk, Jenkins et al. 2001).

ILLUSTRATIONS: Line drawing. USFWS.
Color photo (Accessed 6/18/2003 from http://arizonaes.fws.gov/images/Jrorabaugh/05-30-2000/PlantsB/Kearneys%20bluestar.jpg)
Line drawing (*In* Falk, Jenkins et al. 2001)
Color photo of plant (F. Reichenbacher, *in* Falk, Jenkins et al. 2001).
Color photo of plant in habitat (J. Rorabaugh, *in* Falk, Jenkins et al. 2001).
Color photo (Kathy Rice CPC #119, Accessed 6/18/2003 from http://ridgwaydb.mobot.org/cpcweb/CPC_ProfileImage.asp?NF=119a)
Color photos of plant and habitat (Accessed 6/18/2003 from http://genome-lab.ucdavis.edu/People/RickTopinka/kearneyana.htm)
Color drawing (Accessed 6/18/2003 from http://www.co.pima.az.us/cmo/sdcp/sdcp2/fsheets/kbs,html)

TOTAL RANGE: Western slopes of the Baboquivari Mountains, Pima County, Arizona.

RANGE WITHIN ARIZONA: South and Sycamore canyons, Baboquivari Mountains, Pima County. Introduced into Brown Canyon, east side of the Baboquivari Mountains.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Herbaceous perennial.

PHENOLOGY: Flowers late April and May, fruiting June through August. Seeds sterile (Woodson 1928). However, McLaughlin (1982) states that sterility due to insect predation on embryo.

BIOLOGY: Insect predators attack embryo giving sterile appearing seeds. Responds to winter precipitation. Reichenbacher has found variability in flower shapes and sizes in plants from the introduction site, implying that the population has some genetic variability. Hawk moths may pollinate at night. As plants mature, become five to six feet across.

HABITAT: Dry, open, slopes (20-30 degrees) at 4,000-6,000 ft (1220-1830 m) elevation in Madrean evergreen woodlands/interior chaparral transition zone and on stable, partially-shaded, coarse alluvium along dry washes at 3,600-3,800 ft (1095-1160 m) elevation under deciduous riparian trees and shrubs in Sonoran desertscrub or desertscrub-grassland ecotone (Falk, Jenkins et al. 2001).

ELEVATION: 3,600 - 6,400 ft. (1097 - 1950 m).

EXPOSURE:

SUBSTRATE: Granitic alluvium.

PLANT COMMUNITY: "Mexican Blue Oak association, Sonoran Desertscrub, Semidesert Grassland plant communities, or a transition zone between the two" (Reichenbacher, 1993). Madrean evergreen woodland/interior chaparral transition zone to Sonoran desertscrub or desertscrub-grassland ecotone (Falk, Jenkins et al. 2001). Associated plants (Van Devender 1981b) include: *Prosopis velutina*, *Brumelia lanuginosa*, *Coursetia glandulosa*, *Baccharis sarothroides*, *Quercus oblongifolia*, *Dasylirion wheeleri*, *Celtis reticulata*, *Juglans major*, *Forestiera*, *Cocculus diversifolius*, *Acacia greggii*, *Anisacanthus thurberi*, *Phacelia*, *Cryptantha*, *Crossosoma biglovii*, *Gossypium thurberi*, *Dodonaea viscosa*, *Vauquelinia pauciflora*, *Ptelea trifoliolata*, *Vitis arizonica*, and *Nicotiana trigonophylla*.

POPULATION TRENDS: Location of this plant forgotten between 1928 and mid-1970's. McLaughlin found plant in South Canyon (8 individuals in entire population). In 1987, Howell surveyed for additional locations but none were found. From 1987 to 1989, U.S. Fish and Wildlife Service contracted with Southwestern Field Biologists to transplant Arizona Sonoran Desert Museum seeds from South Canyon to establish a new population. In spring of 1988, about 90 plants were planted in Brown Canyon, which is now part of the Buenos Aires National Wildlife Refuge. In 1989, 110 plants were also planted in Brown Canyon. The introduced population in Brown Canyon (east side of Baboquivari Mountains) declined from approximately 130 to 35 plants (2/3 of the population) following a flood in 1990. (At the Bureau of Land Management, Safford District, Rare Plants Workshop, Frank Reichenbacher stated that the flood occurred in July, 1991. However, his report of 1991 gives the year as 1990).

The one native population consists of approximately 10-15 individuals (late 1980's). Native population in 1986 and 1987 was 8-12 individuals in field. Flooding occurred in 1988, 1989 and 1992. By November 1993, had 65 plants surviving. Low recruitment due partially to seed pods being collected for two years because insects were boring into pods and eating seeds. No young in South Canyon at all. The status of the Sycamore Canyon population is unknown.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: LE (USDI, FWS 1989)
[C1 USDI, FWS 1985]
[C1 USDI, FWS 1980]

STATE STATUS: Highly Safeguarded (ARS, ANPL 1999)
[Highly Safeguarded (ARS, ANPL 1993)]

OTHER STATUS: Not Forest Service Sensitive (USDA, FS Region 3 1999)

[Forest Service Sensitive (USDA, FS Region 3 1990)]

MANAGEMENT FACTORS: Extreme rarity, vulnerable canyon bottom habitat. Protection of populations from disturbance. Physical damage from livestock.

CONSERVATION MEASURES TAKEN: Artificial population established by transplants in Brown Canyon; Baboquivari protected area on Tohono O'odham Reservation.

SUGGESTED PROJECTS: Surveys should be done in the Coyote Mountains (S. Rutman 1994).

LAND MANAGEMENT/OWNERSHIP: BIA - Tohono O'odham Nation; BLM - Phoenix and Tucson Field Offices; Private. Introduction site on FWS - Buenos Aires National Wildlife Refuge.

SOURCES OF FURTHER INFORMATION

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Jefford Francisco - Tucson, Arizona.

Steve McLaughlin - University of Arizona, Office of Arid Lands Studies, Tucson, Arizona.

Barb Phillips - USFS Zone Botanist, Coconino, Kaibab and Prescott National Forests, Flagstaff, Arizona.

Frank Reichenbacher - Southwestern Field Biologists, Tucson, Arizona.

ADDITIONAL INFORMATION:

Revised: 1991-11-10 (PLW)
1991-12-04 (SR)
1994-12-07 (DBI)
1997-11-05 (SMS)
2003-06-27 (SMS)

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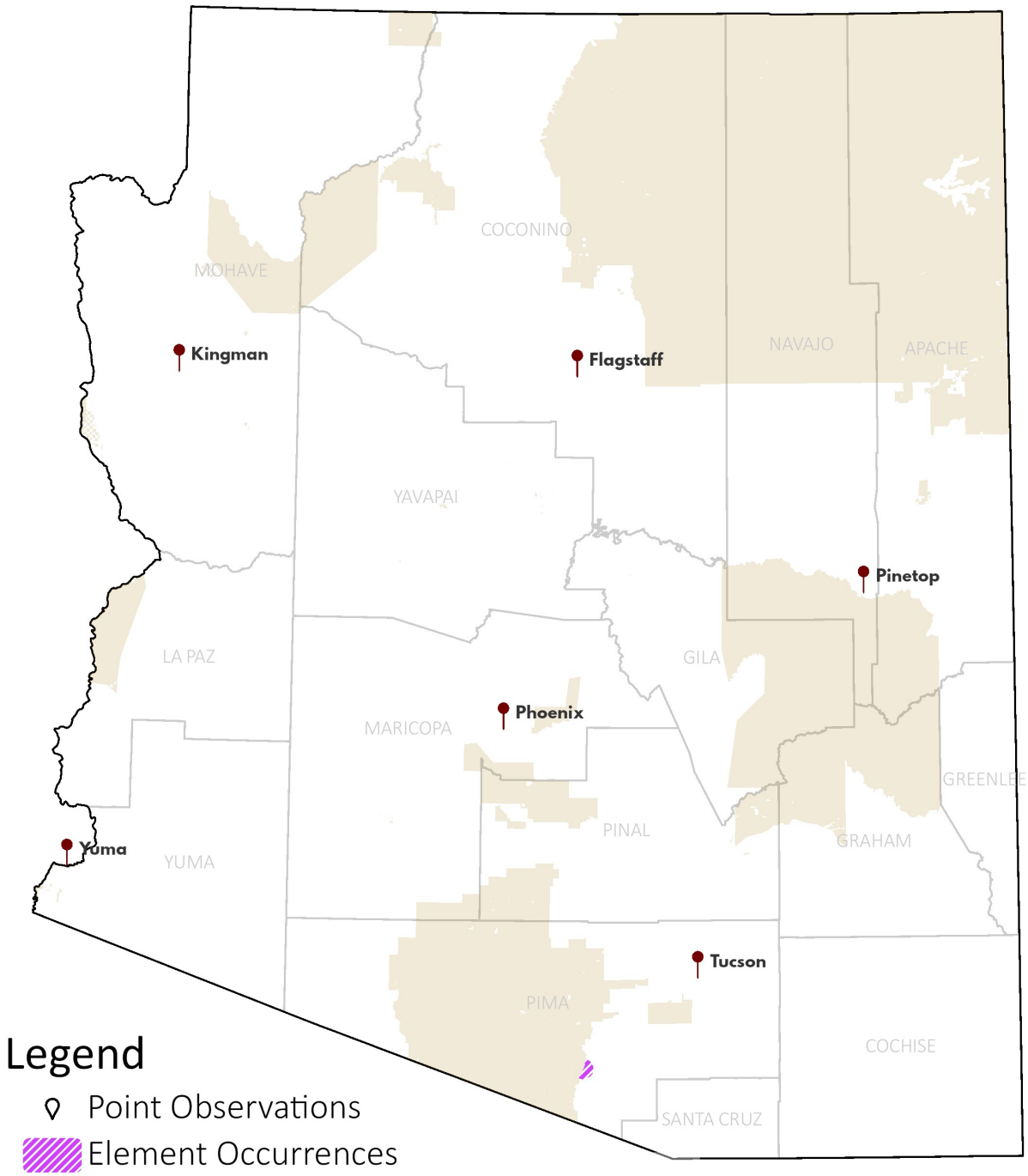
Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

Amsonia kearneyana

Kearney Blue-star



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

0 50 100 Kilometers

ARIZONA GAME & FISH

Point Observations are not guaranteed to have been thoroughly quality controlled. Element Occurrence data represent areas where a population occurs.

Heritage Data Management System
2018-02-08

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDAST70120
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Perityle ambrosiifolia*
COMMON NAME: Lace-leaf Rockdaisy, Lace-leaved Rockdaisy
SYNONYMS: *Laphamia ambrosifolia* Greene
FAMILY: Asteraceae

AUTHOR, PLACE OF PUBLICATION: Greene ex A.M. Powell & S.C. Yarborough, in Phytologia, 76(4): 325-327 (1994). 1994.

TYPE LOCALITY: United States of America, Arizona, Greenlee Co., above San Francisco River bank, S. Clifton.

TYPE SPECIMEN: HT: NY-39620. B. Maguire, B.L. Richards, Jr. & T. Moeller 11787, 05 Jun 1935, in flower. IT: GH, UC, US, UTC.

TAXONOMIC UNIQUENESS: Species *ambrosiifolia* is 1 of 35 in the genus Perityle, and was first described as a new species in 1994. "It is possible that *P. ambrosiifolia* could have resulted from intrasectional hybridization (Niles 1970; Powell 1972) between *P. lemmonii* and *P. gilensis* or *P. saxicola*, or intersectional hybridization (Niles 1970; Powell 1970, 1972, 1974) between *P. lemmonii*, *P. gilensis*, or *P. saxicola* and *P. coronopifolia* A. Gray (with white rays). All of these taxa are geographically proximal and their hybrids would be expected to exhibit at least some characters of *P. ambrosiifolia* (Niles 1970)." (Powell and Yarborough 1994).

DESCRIPTION: "Suffructicose perennial, 10-30 cm (3.93-11.81 in) high, usually villous, occasionally pilose, often with glandular hairs. Stems brittle, densely leafy. Leaves opposite or alternate; petioles 5-10 mm long; lower leaf blades usually 1.7-3.5 cm long, 1.7-3.0 cm wide, tripartitely parted or appearing compound pinnatifid with the segments lobed, cleft, parted, or divided, upper leaves often smaller and less divided, the margins crenate. Heads discoid, or with a few ray flowers; peduncles 3-10 mm long; head 7-10 mm high, 6-11 mm wide; involucres campanulate; phyllaries 14-20, linear to linear-lanceolate, 6-9 mm long, 0.5-1.2 (-2) mm wide, villous. Ray flowers (the few observed) pistillate and fertile; ligules (color unknown) 3-5 mm long, 1.5-2.0 mm wide. Disk flowers 25-45; corollas yellow, 4.0-5.5 mm long, throat glandular, tubular to narrowly funnelform…. Achenes narrowly oblanceolate, with one or both surfaces rounded or angled; 3-4 mm long; margins thin-calloused, short ciliate; surfaces more or less dense with short, appressed hairs." (Powell and Yarborough 1994).

AIDS TO IDENTIFICATION:

ILLUSTRATIONS:
Line drawing (Powell and Yarborough, 1994: fig. 1).
Color photo of Holotype specimen (NY-39620, *in* http://207.156.243.8/emu/vh/specimen.php?irn=325724)
Color photo of Isotype specimen (US-1921411, *in* http://ravenel.si.edu/botany/types/fullRecords.cfm?myFamily=)

TOTAL RANGE: On cliffs above Eagle Creek and San Francisco River, Greenlee County, Arizona.

RANGE WITHIN ARIZONA: See "**Total Range**."

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Perennial subshrub forb/herb.

PHENOLOGY:

BIOLOGY:

HABITAT: Holotype collected on face of conglomerate cliff with *Prosopis* and *Euphorbia*. In fissures and crevices in conglomerate rock, near seeps and water falls; high desert above and riparian below.

ELEVATION: 1,800 – 4,900 ft (549-1494 m).

EXPOSURE: A specimen collected in 1994 was on north and east facing walls.

SUBSTRATE: Sandstone rock and rock crevices.

PLANT COMMUNITY: Pinyon-juniper grassland. Associated species include: *Acacia*, *Baccharis* (false-willow), *Dasylirion wheeleri* (spoonflower), *Echinocereus triglochidiatus* (mound hedgehog-cactus), *Fraxinus* (ash), *Nicotiana* (tobacco), *Opuntia phaeacantha* (New Mexican Prickly-pear), *Platanus wrightii* (Wright Sycamore), *Populus* (cottonwood), *Prosopis* (mesquite), and *Simmondsia chinensis* (Jojoba).

POPULATION HISTORY AND TRENDS: Unknown.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: None
OTHER STATUS: Bureau of Land Management Sensitive (USDI, BLM AZ 2000, 2005, 2008, 2010)

MANAGEMENT FACTORS:

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS:

LAND MANAGEMENT/OWNERSHIP: Private.

SOURCES OF FURTHER INFORMATION

REFERENCES:

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

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ADDITIONAL INFORMATION:

Revised: 2002-04-19 (SMS)
2005-07-28 (SMS)

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDSCR2L010
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Mabrya acerifolia* (Pennell) Elisens
COMMON NAME: Mapleleaf false snapdragon, Maple-leaf snapdragon, brittlestem
SYNONYMS: *Maurandya acerifolia* Pennell, *Asarina acerifolia* (Pennell) Pennell
FAMILY: Scrophulariaceae

AUTHOR, PLACE OF PUBLICATION: *Mabrya acerifolia* (Pennell) Elisens, Systematic Botany Monographs 5: 58. 1985. *Maurandya acerifolia* Pennell, J. Wash. Acad. Sci. 19: 69. 1929.

TYPE LOCALITY: USA, Arizona, Maricopa County, Fish Creek Canyon.

TYPE SPECIMEN: HT: US-1368262. R.H. Peebles 5246, G.J. Harrison, and T.H. Kearney, 1 Apr 1928. IT: ARIZ, PH.

TAXONOMIC UNIQUENESS: Only species in the genus *Mabrya*.

DESCRIPTION: Prostrate, mat-forming plant, to 10 inches (25.4 cm) long, with brittle stems. Stems often hang down from moist, rock ledges. Leaves are up to 1 inch wide, wider than long, dark green, downy and sticky. They are heart-shaped to kidney-shaped, and coarsely toothed. Flowers are white to greenish white, up to 1 inch long, 5-lobed and tubular. Seeds 1-1.5 mm long, gray too blackish, with low corky longitudinal ridges.

AIDS TO IDENTIFICATION:

ILLUSTRATIONS: Color photo (Lewis Epple, in A.O. Epple, 1995: plate 315)
Color photo (ASU 185277, in http://seinet.asu.edu/collections/)

TOTAL RANGE: Endemic to Maricopa and Pinal counties, in south-central Arizona, including Superstition Mts. (Pinal County), Pinal Mts. (Maricopa Co.), above Canyon Lake (Maricopa Co.), near Horse Mesa Dam (Maricopa Co.).

RANGE WITHIN ARIZONA: See "**Total Range**."

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Perennial vine.

PHENOLOGY: Flowers March – May.

BIOLOGY:

HABITAT: Occurs on rock overhangs, on shaded cliffs and rock ledges.

ELEVATION: 1,800 – 3,350 ft (549-1022 m).

EXPOSURE: North to east facing canyon walls.

SUBSTRATE: Rhyolite rock crevices.

PLANT COMMUNITY: Lower Sonoran Desert Zone. Associated species include: *Acacia greggii* (catclaw acacia), *Agave chrysantha* (golden flower agave), *Ambrosia ambrosioides* (Ambrosia-leaf bursage), *A. confertiflora* (weak-leaf bursage), *Baccharis* (false-willow), *Berberis* (=*Mahonia*) *haematocarpa* (Colorado mahonia), *Calliandra eriophylla* (fairy duster), *Carnegiea gigantea* (Saguaro cactus), *Celtis pallida* (spiny hackberry), *Eriogonum fasciculatum* (California wild buckwheat), *Eriogonum* ssp. (buckwheat), *Ferocactus eastwoodiae* (Eastwood's barrel-cactus), *Fouquieria splendens* (Ocotillo), *Gutierrezia sarothrae* (broom snakeweed), *Justica*, *Larrea tridentata* (Creosotebush), *Opuntia*, *Parkinsonia* (paloverde), *Psilostrophe cooperi* (white-stem paper-flower), *Quercus* (oak), *Rhus ovata* (sugar sumac), *Simmondsia chinensis* (Jojoba), *Sphaeralcea* (globemallow), and Cholla. (SEINet, accessed 2005).

POPULATION HISTORY AND TRENDS: Unknown.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: None
OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 1999)

MANAGEMENT FACTORS:

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS:

LAND MANAGEMENT/OWNERSHIP: USFS – Tonto National Forest; Usery Regional Park.

SOURCES OF FURTHER INFORMATION

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U.S. National Herbarium Type Specimen Register (US). http://ravenel.si.edu/botany/types/. Accessed: 7/6/2005.

USDA, Forest Service Region 3. 1999. Regional Forester's Sensitive Species List.

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USDA, NRCS. 2004. The PLANTS Database, Version 3.5 (http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

Revised: 2002-11-14 (SMS)
2005-07-07 (SMS)

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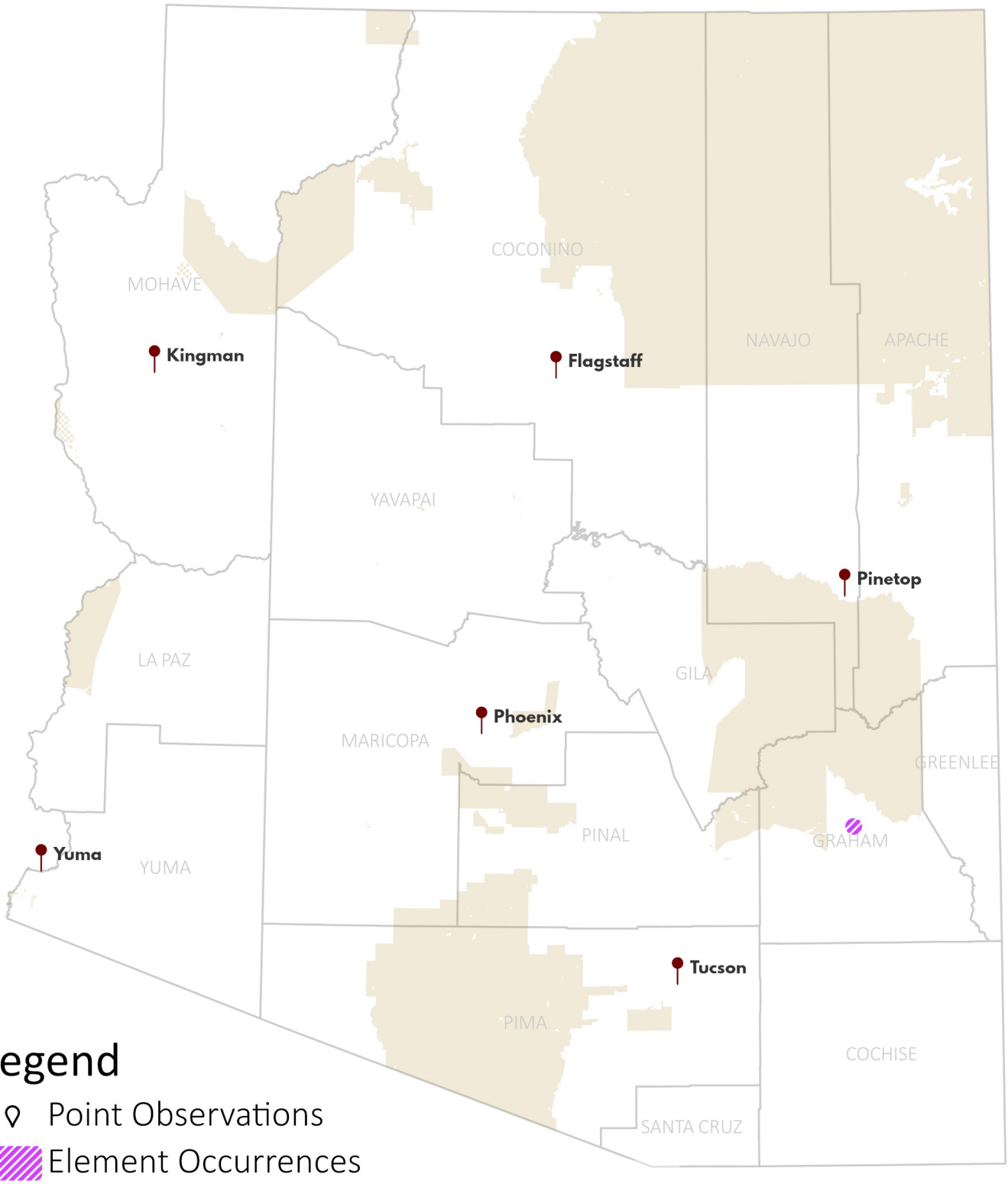
Limonium limbatum

Trans-Pecos Sea Lavender



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

Kilometers

0 50 100

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences.

Heritage Data Management System
2019-06-13

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDFAB1D0V0
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Desmodium metcalfei*
COMMON NAME: Metcalf's Tick-trefoil
SYNONYMS: *Meibomia metcalfei*
FAMILY: Fabaceae

AUTHOR, PLACE OF PUBLICATION: Kearney, Thomas Henry, Jr. and Robert Hibbs Peebles. Jour. Wash. Acad. Sci. 29(11): 485. 1939.

TYPE LOCALITY: New Mexico: Sierra County: Animas Creek, in and around the south end of the Black Range.

TYPE SPECIMEN: Amherst College, AC 319913 (isotype for *Meibomia metcalfei*). O.B. Metcalf, #1137. July 13, 1904.

TAXONOMIC UNIQUENESS: NatureServe (2015) lists 49 species of *Desmodium* in the U.S. and Canada, with another eight varieties. Fourteen of these species are found in Arizona, and four of these found *only* in Arizona.

DESCRIPTION: Perennial, Herbs, Stems woody below, or from woody crown or caudex, Taproot present, Nodules present, Stems erect or ascending, Stems less than 1 m tall, Stems solid, Stems or young twigs glabrous or sparsely glabrate, Leaves alternate, Leaves petiolate, Stipules free, Leaves compound, Leaves pinnately 3-foliolate, Leaves odd pinnate, Leaf or leaflet margins entire, Leaflets opposite, Stipels present at base of leaflets, Leaflets 3, Leaves hairy on one or both surfaces, Inflorescences racemes, Inflorescence axillary, Inflorescence terminal, Bracts conspicuously present, Bracteoles present, Flowers zygomorphic, Calyx 2-lipped or 2-lobed, Calyx hairy, Petals separate, Corolla papilionaceous, Petals clawed, Petals blue, lavander to purple, or violet, Banner petal ovoid or obovate, Wing petals narrow, oblanceolate to oblong, Wing tips obtuse or rounded, Keel tips obtuse or rounded, not beaked, Stamens 9-10, Stamens diadelphous, 9 united, 1 free, Filaments glabrous, Style terete, Fruit a loment, jointed, separating into articles, Fruit stipitate, Fruit unilocular, Fruit indehiscent, Fruit elongate, straight, Fruit spirally coiled or contorted, Fruit exserted from calyx, Fruit compressed between seeds, Fruit hairy, Fruit 3-10 seeded, Seeds ovoid to rounded in outline, Seeds reniform, Seed surface smooth, Seeds olive, brown, or black (Bogler 2015).

AIDS TO IDENTIFICATION: *Desmodium metcalfei* is similar to *D. cinerascens*, which occurs in southeastern Arizona, but whose leaflets are villous below. The trifoliolate-leaves of *Desmodium* are similar to those in *Phaseolus*, whose stems are twining. Other trifoliolate sympatric genera, *Cologania* and *Galactia*, as well as *Phaseolus*, all have diadelphous stamens (united by their filaments into two unequal sets), whereas D. *metcalfei* has monadelphous stamens (Bleakly 2009).

A taxonomic key to all the species of *Desmodium* in Arizona can be found in Kearney and Peebles 1960.

ILLUSTRATIONS:
Photos and Herbarium Mount:
http://swbiodiversity.org/seinet/taxa/index.php?taxon=Desmodium%20metcalfei.
Photos and Line Drawing:
http://nmrareplants.unm.edu/rarelist_single_photo.php?SpeciesID=67&FileName=desmet_h2.jpg&Phototype=N&Photographer=Max+Licher+at+swbiodiversity.org%2Fseinet%2Findex.php.

TOTAL RANGE: Arizona, New Mexico, and Sinaloa, Mexico.

RANGE WITHIN ARIZONA: Although somewhat widely distributed across the State, there are only 11 collections. The species occurs in Coconino, Yavapai, Gila, Greenlee, Santa Cruz and Cochise Counties.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Perennial forb.

PHENOLOGY: Flowers: August to October. Arizona collections reported fruits in September and October.

BIOLOGY:

HABITAT: Rocky slopes and canyons in grasslands, oak/pinyon-juniper woodlands, and riparian settings

ELEVATION: Per Bleakly (2009) in New Mexico: 4000-6500 feet (1310-2000m). Collections in Arizona range from 2760 – 8200 feet (840-2500m).

EXPOSURE: Not specified.

SUBSTRATE: Not specified.

PLANT COMMUNITY: Ponderosa Pine/Gambel Oak, mesquite wash, grassland and riparian or cienega were noted from Arizona collections. Other associated species included: *Pinus cembroides, Juniperus deppeana, Nolina microcarpa, Dasylirion wheeleri, Agave parryi ssp. huachucensis, Quercus gambelii, Quercus hypoleucoides, Quercus grisea, Quercus rugosa, Yucca schottii, Cercocarpus montanus, Ceanothus fendleri, Ipomoea thurberi, Vitis arizonica, Penstemon barbatus, Sanguisorba minor, Salix gooddingii, Baccharis salicifolia, Cynodon dactylon, Schoenoplectus americana, Agrostis stononifera, Helianthus annuus, Lythrum californicaum, Polygonum lapathifolium, Leersia oryzoides, Echinochloa crusgali, Paspalum dilatatum, Epilobium ciliatum, Hymenoclea monogyra, Xanthium strumarium, Polypogon monspeliensis, Plantago wrightiana, Juglans major, Fraxinus velutina, Celtis reticulata, Brickellia californica, Achillea millefolium, Arctostaphylos pringlei, Aristida orcuttiana, Asclepias tuberosa, Bouteloua gracilis, Carex occidentalis, Dalea leporina, Dichanthelium oligosanthes, Eragrostis curvula, Geranium caespitosum, Muhlenbergia rigens, Panicum bulbosum, Piptochaetium pringlei, Pseudocymopterus montanus, Quercus emoryi, Rhamnus californica, Schizachyrium sanguineum, Tragia nepetifolia, Heterotheca villosa, Solidago wrightii, Quercus turbinella, Platanus wrightii, Pinus ponderosa.*

POPULATION HISTORY AND TRENDS: Unknown. There are only eleven known occurrences of *D. metcalfei* in Arizona. Two of these are historical (1968 and 1970); all others have been collected since 2000. Notes from collection records have both indicated the species was infrequent, or common, at some sites. There are no multi-date collections from the same site, or other data that can be used to infer population abundance or trend. NatureServe considers this species to be vulnerable in Arizona, based on the limited number of collections.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None.

STATE STATUS: None.

OTHER STATUS: Forest Service Sensitive (USDA FS Region 3 2013)
[Forest Service Sensitive (USDA FS Region 3 2007)]
New Mexico Rare Plant List (NMRPTC 1999)

MANAGEMENT FACTORS: According to Bleakly (2009), current land use practices in New Mexico apparently pose no threat to this species.

PROTECTIVE MEASURES TAKEN: Listed as Forest Service Sensitive and considered Rare in New Mexico. About one-fourth of the known collections were found within wilderness or primitive areas.

SUGGESTED PROJECTS: Bleakly (2009) recommends additional field searches to determine the rarity of this plant.

LAND MANAGEMENT/OWNERSHIP: USDA Forest Service (Coconino, Apache Sitgreaves, Coronado, Prescott, and Tonto National Forests and Fossil Creek and Miller Peak Wilderness Areas and Blue Range Primitive Area); Arizona State Trust Land; USDI Bureau of Land Management; USDI Bureau of Indian Affairs Fort Apache Indian Reservation; and private land holdings.

SOURCES OF FURTHER INFORMATION

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

David Bleakly, Bleakly Botanical & Biological, Albuquerque, NM

ADDITIONAL INFORMATION: This plant is broadly distributed in Arizona, but there are relatively few collections in the database of the Southwest Environmental Information Network (SEINet). The specimen from Sinaloa, Mexico, is about 1,000 km (625 mi) disjunct from the nearest collections in southeastern Arizona. This genus is often considered to be difficult because collected specimens often lack fruit, and intermediate leaf shapes and sizes are common (Bleakly 2009).

Revised: 2015-09-25 (BDT)
2016-11-21 (BDT)

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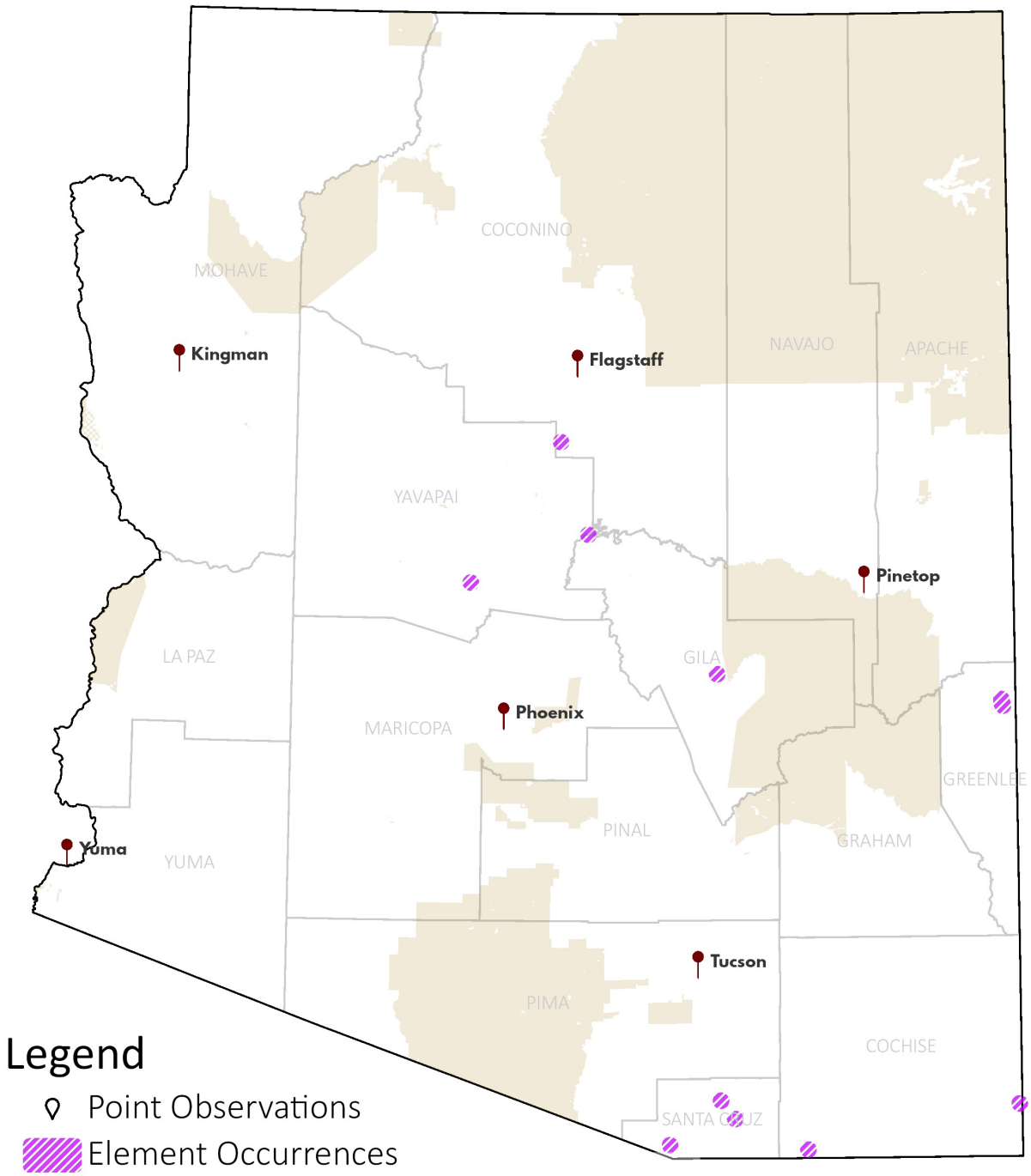
Desmodium metcalfei

Metcalfe's Tick-trefoil



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

0 50 100 Kilometers

ARIZONA GAME & FISH

Point Observations are not guaranteed to have been thoroughly quality controlled. Element Occurrence data represent areas where a population occurs.

Heritage Data Management System
2018-02-08

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDCAR04010
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Arenaria aberrans*
COMMON NAME: Mt. Dellenbaugh sandwort
SYNONYMS: *Eremogone aberrans* (M.E. Jones) Ikonnikov
FAMILY: Caryophyllaceae

AUTHOR, PLACE OF PUBLICATION: M.E. Jones, Contr. W. Bot. 16: 37. 1930.

TYPE LOCALITY: Mount Dellenbaugh, Arizona.

TYPE SPECIMEN: Cottam 4159.

TAXONOMIC UNIQUENESS: One of 20 species in the genus *Arenaria* that occurs throughout most of the US. However, the species *aberrans* only occurs in Arizona. Arizona specimens were previously referred to *A. capillaries* Poir., a closely related species, and to *A. aculeate* Wats. (Kearney and Peebles, 1951).

DESCRIPTION: Glandular-pubescent plant, 3-15 cm (1.2-6.0 in) tall, with several branched stems from a somewhat woody caudex. Leaves are mostly basal with 1 or more pairs on the stem, linear-subulate, rigid and pungent, 5-20 mm long. Plants have few- to several-flowered open cymes, with slender pedicels, mostly 10-15 mm long, glandular-pubescent. Sepals are ovate, obtuse, scarious-margined, about 3 mm long. White petals are narrowly oblong, and longer than the sepals. Capsules are usually 7-9 mm long. (McDougall, 1973).

AIDS TO IDENTIFICATION:

ILLUSTRATIONS: Color photo (Stockert *in* Rickett, 1970: plate 83).

TOTAL RANGE: North and north-central Arizona in Coconino, Mohave, and Yavapai counties, and possibly Gila County.

RANGE WITHIN ARIZONA: See "**Total Range**."

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Perennial forb/herb, shrub, or subshrub.

PHENOLOGY: Flowers May to July.

BIOLOGY:

HABITAT: Occurs mainly in oak and pine forests. Also found in open pine and pine-pinyon woodlands, and among junipers.

ELEVATION: 5,500 to 9,000 ft (1678-2745 m).

EXPOSURE: South, north and northeast facing aspects.

SUBSTRATE: Basaltic soil in Yavapai County, and sandy soil in north Coconino County.

PLANT COMMUNITY: Unknown

POPULATION HISTORY AND TRENDS: Unknown

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: None
OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 1999)

MANAGEMENT FACTORS:

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS:

LAND MANAGEMENT/OWNERSHIP: Most likely BLM and USFS.

SOURCES OF FURTHER INFORMATION

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

Revised: 2002-08-01 (SMS)
2004-07-29 (SMS)

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDCAC05022
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Echinocactus horizonthalonius* var. *nicholii*
COMMON NAME: Nichol Turk's Head Cactus, Nichol's Turk's-head cactus, Nichol's Turk's head cactus, Nichol turkshead, Nichol's echinocactus, Blue Barrel, Devil's Head, Horse Crippler
SYNONYMS:
FAMILY: Cactaceae

AUTHOR, PLACE OF PUBLICATION: L. Benson, The cacti of Arizona, 23, 175, f. 6.2-6.3 3rd edition. 1969.

TYPE LOCALITY: Southwest of Silver Bell, Silver Bell Mts., Arizona.

TYPE SPECIMEN: HT: POM-311314. L. Benson 16663, 3 July 1966.

TAXONOMIC UNIQUENESS: Variety *nicholii* is 1 of 2 varieties of the widespread Chihuahuan *Echinocactus horizonthalonius* Lemaire, and is an isolated variety in Arizona and Sonora. *Echinocactus horizonthalonius* var. *moelleri* Haage Jr., cited by Weniger, is probably a nomen nudum according to Benson (Pinkava). At some time, *E. h. nicholii* split from *E. h. horizonthalonius*.

DESCRIPTION: Small, single stem, blue-green to gray-green succulent barrel cactus, up to 45 cm (18 in) in height and 20 cm (8 in) in diameter. Often, several seedlings around the base gives appearance of small clumps. Juvenile stem grows primarily with an increase in diameter; adult stem grows primarily vertically. Eight ribs on plant; ribs spiral on some older plants. Each areole consists of three robust central spines (one curving downward, two upward) about 2.5 cm (1.0 in) long; five radial spines 1.9 cm (0.76 in.) long. Flower pink (magenta) to bright purple, 5-7 cm (2-3 in.) long, developing bud and immature fruit white wooly. Mature fruit briefly fleshy pink, soon drying brown. Seed longer than broad, 3.3-4.3 x 1.25 mm.

AIDS TO IDENTIFICATION: The only small, blue-green, eight-ribbed barrel cactus in Arizona; 8 spines per areole. In all Arizona populations, variation is found among adult plants in rib number, spine length, width, and shape (recurved, straight, or twisted), and flower color.

ILLUSTRATIONS:
Line drawings (Lucretia B. Hamilton, *in* Benson 1982: fig. 758 and USFWS). Color photos (*In* http://www.mineralarts.com/cactus/turksheadcactus.html)

Color photo of plant and habitat (Lynda Pritchett-Kozak, *In* http://ridgwaydb.mobot.org/cpcweb/CPC_ProfileImage.asp?FN=1545b)
Color photo (Cooper *in* http://www.whitethornhouse.com/cacti/cacti05-01.htm)
Line Drawing (M.S., *in* Falk et al. 2001)
Color photos of plant and habitat (R. Bellsey, *in* Falk et al. 2001)
Color photo of flowering plant (Brooks/TNC, *in* Falk et al. 2001)
Line drawing (*In* http://www.co.pima.az.us/cmo/sdcp/kids/color/Turk.jpg)

TOTAL RANGE: In the U.S. this cactus is consists of three populations in Arizona, and one Sierra del Viejo, Sonora, Mexico (Falk, Jenkins, et al 2001).

RANGE WITHIN ARIZONA: Found on Koht Kohl Hill and the Waterman Mountains in Pima County, and in the Vekol Mountains in southwestern Pinal County.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Succulent perennial.

PHENOLOGY: Germination occurs in mid-summer. Vegetative growth is primarily from March through May. Flowering usually occurs in late-April to mid-July but can flower as late as November. Mass flowering of a population occurs 2 to 3 days after the first warm-weather rain. Flowers open 10 am to 5 pm for one day; two days, if cool and overcast. Flower number coupled to number of areoles produced and dependent on a combination of summer and rain distribution.

BIOLOGY: Very slow growing plants; requires ten to thirty-two years to reach two-inch height (Element Global Ranking Form 1991; Schmalzel and Francisco, in prep.). Pollinated by many species of bees and butterflies. Seeds dispersed by birds, mammals, and rainwater. Average of 200 seeds produced per plant per year. Mean age 25, 25, 25, 28, 30, 40, 45, 45, and 50 years for nine studied populations: age estimated using BLM permanent plot growth rates (Schmalzel and Francisco, in prep.). Maximum age estimated to be 85 to 95 years (Schmalzel and Francisco, in prep.). Populations on parent rock differ demographically from bajada populations in density, fecundity, survivorship and probably recruitment. Shaded plants grow, flower, and survive at lower rates than plants in open. Erosion along bajadas appears to increase both seedling survival and adult mortality.

HABITAT: Habitat is characterized by open vegetation, few trees and scattered low shrubs (Phillips et al. 1979). Found in bedrock habitat at higher elevations; gravelly bajadas with limestone clasts at lower elevations (Van Devender 1994).

ELEVATION: 2,000 - 3,600 ft. (610 - 1,098 m).

EXPOSURE: On all exposures (N, S, E, W); substrate a more critical requirement.

SUBSTRATE: Pennsylvanian and Permian lime siltstones (Schmalzel and Francisco, in prep). Soil texture talus chips (Phillips et al. 1979). At higher elevations, inhabits bedrock habitat, and gravelly bajadas with limestone clasts at lower elevations (Van Devender 1994).

PLANT COMMUNITY: Paloverde-Cactus (*Cercidium-Opuntia*) Shrub community. Dominant associated species include: *Ambrosia deltoidea* (triangle bursage), *Carnegiea gigantean* (saguaro cactus), *Encelia farinosa* (white brittlebush), *Fouquieria splendens* (Ocotillo), *Krameria grayi* (white ratany), *Opuntia acanthocarpa* (stag-horn cholla), *Opuntia phaeacantha* (New Mexican prickly-pear), *Parkinsonia microphylla* (Little-leaf paloverde), and *Tiquilia canescens* (woody tiquilia). Associated species include: *Dasylirion* sp., *Fouquieria* sp., *Jatropha* sp., *Mammillaria lasiacantha* (lace-spine nipple-cactus), and *Parkinsonia* sp. (paloverde).

POPULATION TRENDS: T. Peebles (unpubl. Notes, and Kearney and Peebles. 1951 p. 573) thought *E. horizonthalonius* was introduced around mines by Mexican-American miners. Van Devender (1990), and Anderson and Van Devender (1991) identified one *E. horizonthalonius* seed from a packrat midden dated at 22,400 years B. P. in the Waterman Mountains. This demonstrates long-persistence of *E. horizonthalonius* for the Waterman Mountains. Benson's first edition of The Cacti of Arizona designated the Slate, Silver Bell, and Sawtooth Mountains as localities for *E. horizonthalonius* and C.H. Lowe (pers. comm. to B. Martin, 1997) remembers the plant from Twin Peaks (north end of Tucson Mountains). These localities were unvouchered and are either in error or represent interesting extirpations within the last 100 years.

Silver Hill Mine on Waterman Peak has good-sized population. "C. Button carried on M. Butterwick's monitoring plots and set up others" (Warren 1994). 1500-1600 plants tagged and plotted as part of Section 7 consultation. The population in the Waterman Mountains is estimated at 10,000.

Direct human interference is the most significant ongoing threat to the populations. Blading a landing strip removed an estimated 350 plants in the early 1980s. Mining and road construction on private patented land has killed a sizeable but unknown number. Persistent illegal collecting of small numbers of plants is well documented for the Waterman Mountains. One institution removed about 200 plants in the early 1990s; one individual removed about 100 plants for a private collection.

According to the Desert Botanical Garden it is estimated that over 10,000 individuals comprise both populations. There is a misconception that threats can be buffered by the number of individual plants. However, considering the advanced ages of sizeable plants, and the rapid decrease in available growing sites, these plants are in imminent danger of being extirpated.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: LE (USDI, FWS 1985)
[PE USDI, FWS 1980]
[PE USDI, FWS 1976]
[PTN-E USDI, FWS 1975]

STATE STATUS: Highly Safeguarded (ARS, ANPL 1999)
[Highly Safeguarded (ARS, ANPL 1993)]

OTHER STATUS: None

MANAGEMENT FACTORS: Direct human interference is the most significant ongoing threat to the populations. This includes collecting, off road vehicles, copper mining and urbanization. Subsequent erosion after disturbances is highly damaging to these cacti.

PROTECTIVE MEASURES TAKEN: A recovery plan was written in 1986 by the USFWS, however, no formal management plan has been implemented.

SUGGESTED PROJECTS: Detailed genetic studies are needed to determine if variety *nicholii* is a valid variety of *E. horizonthalonius*, and still affords the protection under the Endangered Species Act. In the meantime, detailed germination studies are needed, along with research on reproductive biology and ecology, demographic patterns and habitat requirements to aid in conservation efforts.

LAND MANAGEMENT/OWNERSHIP: BIA - Tohono O'odham Nation; BLM - Tucson Field Office; State Land Department; Private.

SOURCES OF FURTHER INFORMATION

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Warren, P.L. 1994. Bureau of Land Management, Safford District, Rare Plant Workshop. November 14-16. Tucson, Arizona.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

Regis Andrews- Gu Komelik, Sif Oidak District, Tohono O'odham Nation, Arizona.
Tony Burgess - University of Arizona, Tucson.
Jose Enriquez - Queen's Well, Schuk Toak District, Tohono O'odham Nation, Arizona.
Jefford Francisco - Tohono O'odham Nation, Arizona.
Clay May - Pima Community College, Tucson, Arizona.
Lucinda McDade - University of Arizona, Tucson.
Don Pinkava - (Retired) Arizona State University, Tempe.
Robert Schmalzel – Oracle, Arizona.
Tom Van Devender - Arizona-Sonora Desert Museum, Tucson.

ADDITIONAL INFORMATION:

Clay May (Pima Community College, Tucson) has collected data for many years from *E. horizonthalonius* plants growing on the Schuk Toak District, Tohono O'odham Nation and on private patented land in the Waterman Mountains. Researchers should not cite these data without explicit permission from the Tohono O'odham Nation and private landowners.

Van Devender has seeds 22,000 years old (at that time, Arizona Desert Scrub) from rat middens (Van Devender and Bertelsen 1994).

Revised: (AZNHP)
1994-12-20 (DBI)
1999-05-20 (RJS)
2004-07-30 (AMS)
2004-08-20 (SMS)
2008-10-07 (SMS)

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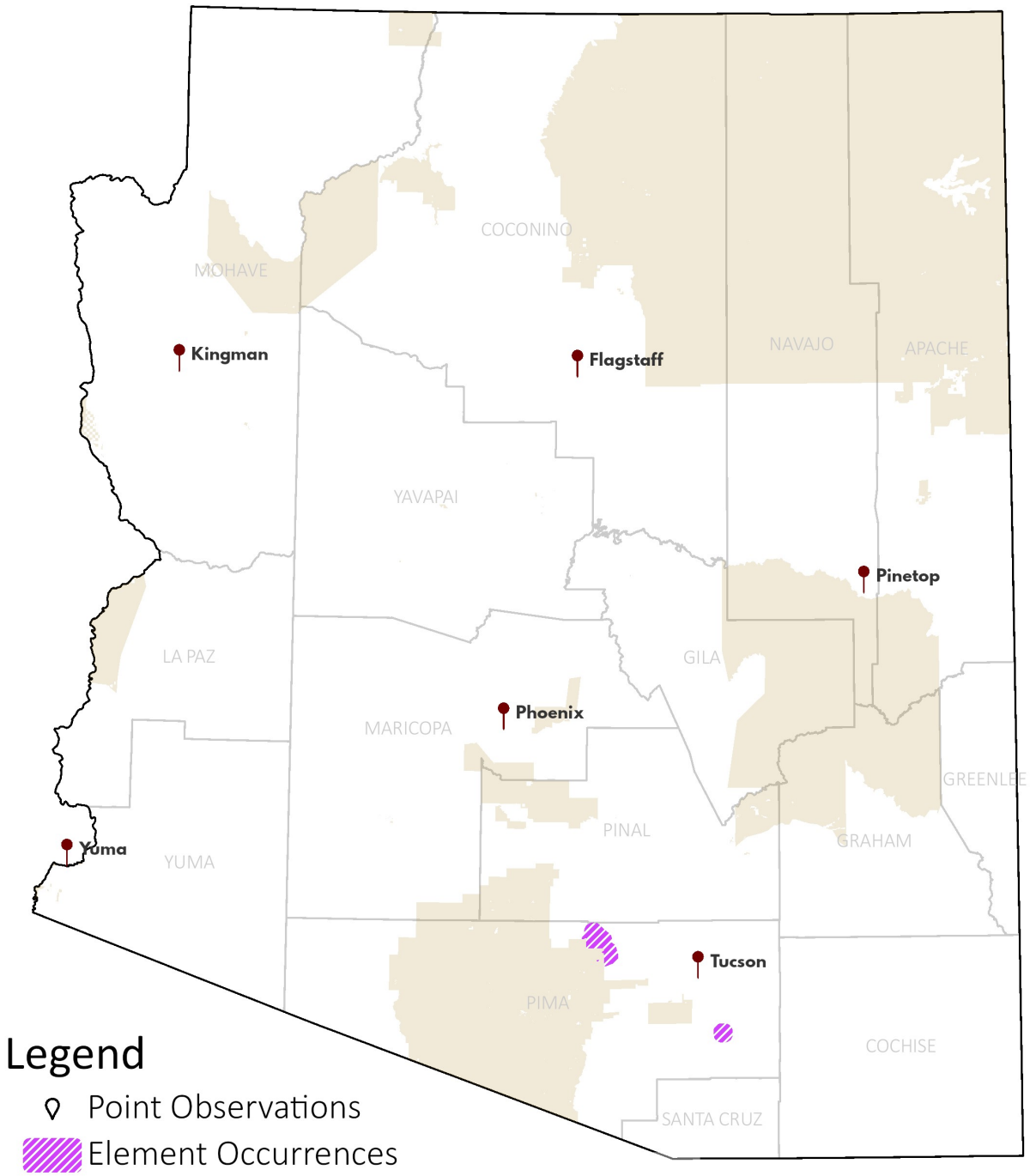
Echinocactus horizonthalonius var. nicholii

Nichol Turk's Head Cactus



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

0 50 100 Kilometers

ARIZONA GAME & FISH

Point Observations are not guaranteed to have been thoroughly quality controlled. Element Occurrence data represent areas where a population occurs.

Heritage Data Management System
2018-02-08

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDMAL020E0
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Abutilon parishii* Wats.
COMMON NAME: Pima Indian Mallow, Parish Indian Mallow
SYNONYMS:
FAMILY: Malvaceae

AUTHOR, PLACE OF PUBLICATION: Watson, S. 1885. Proc. Amer. Acad. 20:357.

TYPE LOCALITY: Arizona: Santa Catalina Mountains.

TYPE SPECIMEN: ARIZ, no number. C.G. Pringle. April 1884.

TAXONOMIC UNIQUENESS: The genus *Abutilon* contains approximately 150 species. Ten species of *Abutilon* are recognized by Lehr (1978) as occurring in Arizona. Kearney et al. (1960:539) relegated *A. parishii* to synonymy with *A. palmeri*, but in the supplement to Kearney et al. Peebles (1960:1060) separated the two species. Lehr (1978) recognizes both species. Shreve and Wiggins (1964) consider *A. parishii* more closely related to *A. wrightii* than *A. palmeri*. P. Fryxell retains this species in the revision of the Malvaceae completed in 1991 for the Vascular Plants of Arizona project.

DESCRIPTION: A suffrutescent plant (woody base, herbaceous branches) up to 190 cm (75 in.) tall from a woody rootstock; **1-11 stems per plant (average 2.5)**; branches and petioles densely stellate-tomentose (star-shaped hairs) and somewhat hirsute (coarse hairs), with slightly reflexed, simple hairs; petioles slender to 7.0 cm (2.8 in.) long; **leaf blades heart-shaped, usually with a long "drip tip"**, densely velvety on both surfaces, **dark green above, nearly white beneath**, 2.0-5.0 cm (0.8-2.0 in.) wide, 3.0-7.0 cm (1.2-2.8 in.) (up to 10.0 cm (4.0 in.)) cm long, corrugated appearance and indented veins, teeth irregular in size; average length:width ratio of leaf = 3:2; fruit 7.0-8.0 mm (0.28-0.32 in.) high, 8.0-10.0 mm (0.3-0.4 in.) wide, with aristate tip on carpel, thinly pubescent with simple spreading hairs along dorsal sutures of oblong carpels; **5-10 carpels with fine tips about 2.0 mm (0.08 in.) long**; three seeds in each carpel, brown, irregularly puberulent (minute pubescence). Petals light orange to orange-yellow, extend beyond the sepals.

AIDS TO IDENTIFICATION: Tall stem mostly naked. Larger leaves rarely over 10.0 cm (4.0 in.) long. Dead stems are up to 1.0 m (3.3 ft.) high, with empty fruit capsules which persist throughout the winter. Distinguishable from *A. wrightii* by the shorter calyx lobes which are less than half as long as the carpels in fruit. Distinguished from *A. palmeri* in having corollas only about 10.0 mm (0.4 in.) long (15.0-25.0 mm (0.6-1.0 in.) in *A. palmeri*), a more paniculate (branching) inflorescence and longer stem hairs mostly reflexed. *A.*

parishii has only a superficial resemblance to *A. palmeri*. *A. sonorae* is usually single-stemmed and has carpels with 1.0 mm (0.04 in.) long tips. *A. reventum* is usually single-stemmed.

ILLUSTRATIONS:
Color photo of flower (Van Devender et al. 1991:5)
Color photo of leaf (Van Devender et al. 1991:6)
Line drawing. USFWS.

TOTAL RANGE: Presently known from 84 populations in 17 mountain ranges (Van Devender et al. 1994). Plants found from Bagdad to Nachopouli Canyon, Sonora, Mexico.

Kearney et al. (1960:1060) refer to locality at Mercury Mine in Mazatzal Mountains, collection by Eastwood in 1929. Confusion in his field notes as to collection site location. Identification needs verification. This location disjunct from Tucson area populations and in questionable habitat. T. Van Devender searched area in September, 1991. Did not find appropriate habitat (Van Devender et al. 1994). Identification of the Little Shipp Wash specimen (coll. P Schneider) confirmed by T. Van Devender who relocated a few scattered plants in field, September, 1991. Presence of this small population disjunct from Tucson Mountain area populations suggest plant may also occur in other scattered localities.

First collected in Mexico in 1992 in five localities in the Municipios de Hermosillo(2) and Guaymas (3) (Van Devender et al. 1994).

RANGE WITHIN ARIZONA: Maricopa County: Superstition Mountains; Pima County: Santa Catalina, Rincon, Silverbell, and Tucson Mountains; Pinal County: Mineral Hills, Superstition, Picacho, Tortolito, and Dripping Springs Mountains; Santa Cruz County: Santa Rita and Tumacacori Mountains; Yavapai County: Little Shipp Wash and Cottonwood Creek near Bagdad. Sabino Canyon.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Herbaceous perennial.

PHENOLOGY: Flowers open only from 3:30 to 4:30 pm only when sunny. If it clouds over, flowers close. A relatively weak spring flowering is followed by a longer late summer-fall bloom. Plants can flower spring through fall, in response to rain. Plants are expected to be self-fertile; flowers do not have to open to produce seed.

BIOLOGY: Plants "may occasionally live 8 to 10 years although most plants in a population may be less than 5 years in age" (T. Van Devender, C.D. Bertelsen and J.F. Wiens 1994). Individual plants appear to come up each year. In 1990, in Pontatoc Canyon (Santa Catalina Mountains), 13 plants found in area about 1.5 meters square. Of these, 3 were mature plants estimated to be at least 2 years old, 2 were about 1 year old, and 8 were very

small plants that probably germinated that year. This is only "concentration" of new seedlings known. Arizona-Sonora Desert Museum germinated seeds, had at least 4 mature plants in 1991. Seeds seem to germinate along areas where water has flowed (e.g. along trails). Seedlings seem to do best when they grow at base of rocks in full sun (Bertelsen 1990). Two growth forms: summer, elongate from a basal rosette; winter, basal rosette dies back. Persistent (dead fruits stay on plants good part of year).

Under water stress, leaves fold along midvein. In extreme drought, portions of leaves dry, die and fall off. This may give remaining portion of leaf roundish appearance. Plant responds rapidly to available moisture.

HABITAT: Mesic situations in full sun within higher elevation Sonoran desertscrub. On rocky hillsides, cliff bases, canyon bottoms, lower side slopes and ledges of canyons among rocks and boulders. Slopes can exceed 45°. In riparian zones, occurs on flat secondary terraces but typically not in canyon bottoms. Often found near trails, probably due to the influence of the trail on the light, heat and water of the micro-habitat.

Santa Rita's - desert grassland on slate. South of Hermosillo volcanics to coast of Sonora.

Likes rocky substrate. Higher bajadas or low in washes. Little Shipp Wash northernmost location. Some Mojave plants. (Desert tortoise habitat). Lot of grasses. To Silver Bells, Tucson.

ELEVATION: In Arizona: 1,720 to 4,900 feet (525-1495 m). In Mexico: 394 to 1,952 feet (120-595 m).

EXPOSURE: Usually in canyons with southern or western exposure; plants prefer a southern exposure even when in east- or west-facing canyons. Fifty percent of sites on slopes of 45% or more.

SUBSTRATE: Bouldery, rocky shallow soils. Found on rhyolite, granite, gneiss and Pleistocene alluvium. Granite, rhyolite, limestone, slate at cliff base.

PLANT COMMUNITY: Lower Sonoran desertscrub, transition zone of Upper Sonoran grassland communities, and Sonoran deciduous riparian forest to Arizona Upland Desertscrub.

POPULATION TRENDS: Plant widespread. Status survey conducted from 1991 to 1994 discovered numerous new populations in several mountain ranges in south-central Arizona and central Sonora. This is substantial expansion of known range with much unsurveyed potential habitat between known sites. Population numbers appear to increase in wet years and decline in dry years (Van Devender and Bertelsen 1994). Bertelsen (1990) stated half of 94 plants known to him in 1990 germinated in last two years. Areas where this observation made seemed to have greater than average rainfall.

Total of 270 plants located in Arizona during 1991. Of these, 199 (73%) were in Santa Catalina Mountains. Bertelsen reports that the same plants were only 38% of their height in 1990 (1990 was a relatively dry year). Of the 199 plants, 150 plants were less than 20.0 cm (8.0 in.) tall. Of all the plants, 57-63% were non-reproductive. Largest population in Ventana Canyon, Santa Catalina Mountains (Bertelsen 1991).

Populations appear to be cyclical: between 1992 and 2000, six populations I have monitored on at least a yearly basis in the Rincon, Tucson, and Santa Catalina Mountains declined 80 to 95%, most likely because of drought (Bertelsen 2000).

Bertelsen (2000) reports, two populations in Mexico (Batamonte and Cerro Yeso) have been eliminated because of the spread of buffel grass (*Pennisetum ciliare*), which has burned several times.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None (USDI, FWS 1996)
[C2 USDI, FWS 1990, 1993]

STATE STATUS: Salvage Restricted (ARS, ANPL accessed 2011)
[Salvage Restricted (ARS, ANPL 1993)]

OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 1990, 1999, 2007)
Bureau of Land Management Sensitive (USDI, BLM AZ 2005, 2008, 2010)

MANAGEMENT FACTORS: Potentially mining and related activities. Recreation; some plants immediately adjacent to existing trails subject to trampling by people who wander from trail. Plants must be considered during trail maintenance activities. Livestock trampling and habitat degradation due to livestock overuse. Bertelsen (1991) noted that everywhere plant found, immediate area not heavily grazed; sites very steep. Palatability unknown but expected to be highly desirable to cattle. Deer and rabbits appear to browse plants. Trampling by bighorn sheep has occurred in Silverbell Mountains, but sheep do not appear to eat plant.

In Arizona, no real threats. Grows on steep habitat, eliminating grazing pressures. Freezing or light fires do not hurt plant. However, Sonoran conditions different: buffelgrass, introduced for grazing, and thornberry are threats.

CONSERVATION MEASURES TAKEN: Bertelsen has had some trails diverted in the Santa Catalina Mountains.

SUGGESTED PROJECTS: Some trail diversions may be necessary. Education of organizations and businesses such as the Coronado National Forest trail crew, Southern

Arizona Hiking Club and Canyon Ranch Resort, as well as signs warning of rare plant presence and importance of remaining on trails might help. Studies to determine seed dispersal (by birds?) and duration of seed viability in the soil.

LAND MANAGEMENT/OWNERSHIP: BLM - Safford and Tucson Field Offices; NPS - Saguaro National Park; USFS - Coronado and Tonto National Forests; State Land Department; Tucson Mountain County Park; Private.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Dave Bertelsen - Tucson, Arizona.
Renee Rondeau - Tucson, Arizona.
Tom van Devender - Arizona-Sonora Desert Museum, Tucson.
John Wiens - Arizona-Sonora Desert Museum, Tucson.

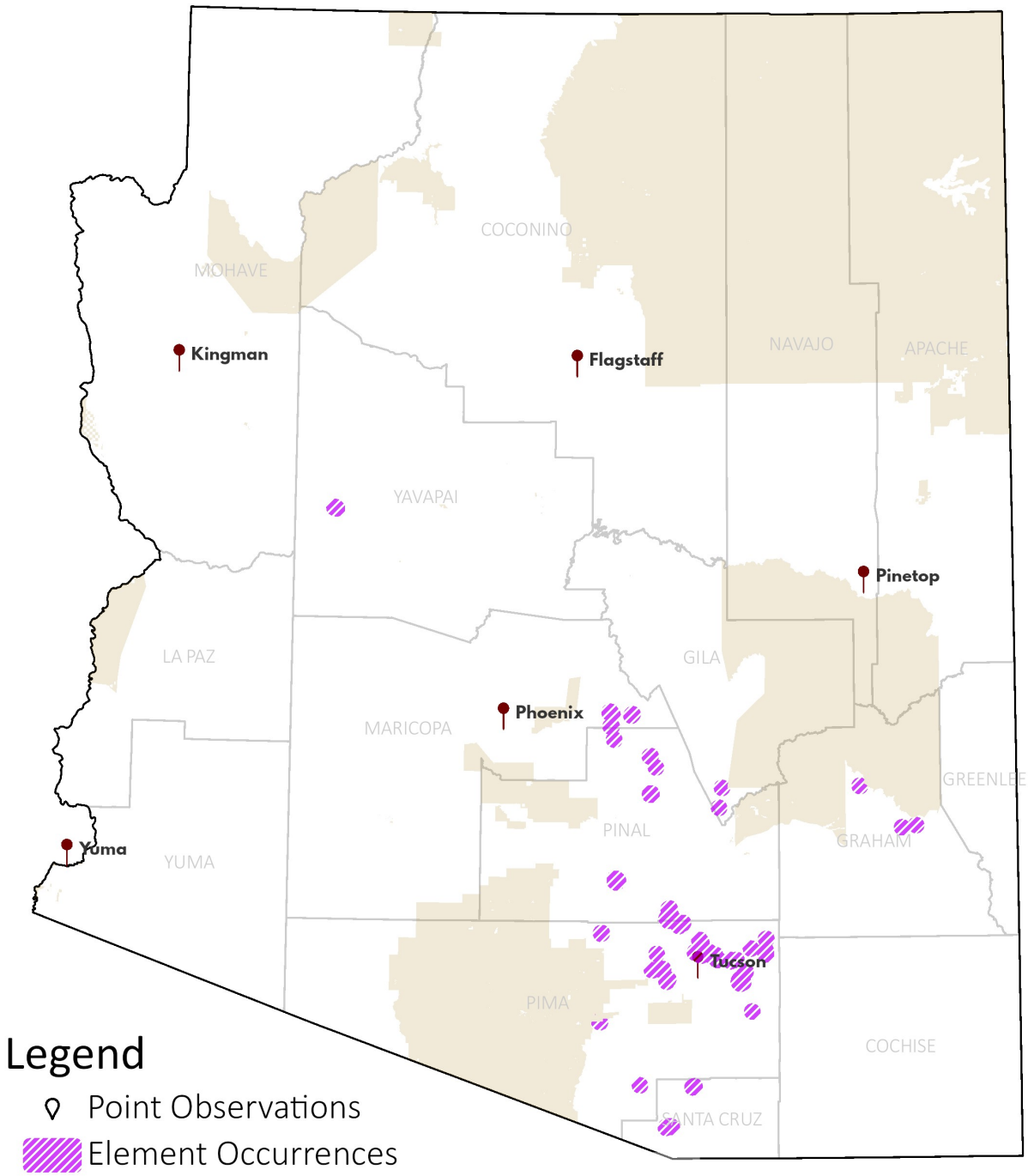
ADDITIONAL INFORMATION:

Plant known by several names creating confusion. Plant collected as tortoise food at Little Shipp Wash under a different name and Desert Botanical Garden also had specimens with other names.

Revised: 1990-11-21 (SR)
1991-10-10 (BKP)
1991-12-05 (SR)
1992-09-21 (BKP)
1994 10-14 (PLW)
1997-07-28 (SMS)
2000-03-23 (CDB)

Abutilon parishii

Pima Indian Mallow



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

0 50 100 Kilometers

ARIZONA GAME & FISH

Point Observations are not guaranteed to have been thoroughly quality controlled. Element Occurrence data represent areas where a population occurs.

Heritage Data Management System
2018-02-08

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDCAC0E053
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Pediocactus peeblesianus* (Croizat) L. Benson var. *peeblesianus*
COMMON NAME: Peebles Navajo Cactus, Navajo pincushion cactus, Navajo Cactus, Navajo Plains Cactus
SYNONYMS: *Navajoa peeblesiana* Croizat *Echinocactus peeblesianus* (Croizat) L.D. Benson, *Toumeya peeblesiana* Marshal, *Utahia peeblesiana* (Croizat) Kladiwa
FAMILY: Cactaceae

AUTHOR, PLACE OF PUBLICATION: *Pediocactus peeblesianus* L.D. Benson, Cactus and Succulent Journal [U.S.] 34(2): 58. 1962. *Navajoa peeblesiana* Croizat, Cactus and Succulent Journal {U.S.] 15(6): 89, f. 42. 1943.

TYPE LOCALITY: USA: Arizona: Navajo County: Holbrook, hill behind the plant quarantine inspection station (The statement on the label of the type sheet in the Herbarium of the U.S. Field Station, Sacaton, AZ [now housed at the University of Arizona Herbarium] attributes the finding of the taxon to Mr. Whittaker of the Arizona Highway Department).

TYPE SPECIMEN: HT: ARIZ 137135. J. Whitman Evans at Holbrook, AZ, 1939. IT: DES.

TAXONOMIC UNIQUENESS: Eight species of *Pediocactus*, occurring from the Columbia River Basin, Great Basin, Rocky Mountains, and Colorado Plateau. Six of these species, including *P. peeblesianus*, are restricted endemics. There are two recognized varieties of *P. peeblesianus* including var. *peeblesianus* and var. *fickeiseniae*; both occur in Arizona.

DESCRIPTION: Non-technical: A small, solitary or rarely clustered, globose cactus to 2.5 cm (1.0 in.) in height and 1.5 to 2.5 cm (0.6-1.0 in.) in diameter. The four (3-5) spongy-fibrous radial spines form a twisted cross and there are no central spines. The yellow to yellow-green flowers are up to 2.5 cm in diameter, often larger than and hiding the smaller plant below. The small fruits dry and turn tan at maturity. During dry weather, the plants retract into the soil.

Technical: Stem(s) obscure, solitary or rarely clustered somewhat glaucous, obovoid, globose, ovoid-cylindroid, or depressed-globose, often with only the summit protruding above ground largely retracted into the soil during dry weather. Up to 2.5 cm long, 1.5 to 2.5 cm in diameter; areoles circular; spines nearly covering the surface of the stem but not obscuring it;

central spine none. The upper radial spine often longer than the others and up to 7.5 mm long; surface of the spine and the tissues beneath remarkably spongy-fibrous; radial spines usually 4 but in some areoles sometimes 3 or 5, recurring with the appearance of a cross. The flower is about 1.5 to 2.5 cm in diameter; petaloid perianth parts yellow to yellow-green, usually with a median band of green or pale pink, filament whitish of pale green, anthers yellow; style cream color, stigmas 6-8. Fruit greenish, changing to tan and drying at maturity, without surface appendages or with 1 or a few scales on the upper portion, subcylindroidal but broader above, 6-9 cm long, 4.5-7.5 mm in diameter, both circumscissle and opening along a full-length dorsal slit. Seeds are black to dark gray, obliquely obovoid 2.5 mm long, 1.5-2.0 mm broad, 1 mm thick; hilum slightly curved (Benson 1962, 1969, in A. Phillips et al. 1979).

AIDS TO IDENTIFICATION: *Pediocactus peeblesianus* var. *peeblesianus* has no central spines and four (3-5) spines arranged in a twisted cross while *Pediocactus peeblesianus* var. *fickeiseniae* has a prominent central spine and six (to 7) spreading radial spines.

ILLUSTRATIONS: Black and white photos, color photo, line drawing (Benson 1982: Figs. 805-807, pp. 767-768).
Black and white photo (K. Heil et. al. 1981).
Black and white photo (Benson 1969[1981]: Fig. 8.5, p. 186).
Line drawing (USFWS 1984).
Line drawing (USFWS *in* Falk, Jenkins et al., 2001)
Color photos of plant and habitat (Falk, Jenkins et al., 2001)
Color photo (USFWS, Arizona E.S. accessed 2003 from http://arizonaes.fws.gov/Peebles%20Navajo%20Cactus%2020Photo%20a.jpg).
Color photo (Peter Warren, *in* Kelly and McGinnis 1994)

TOTAL RANGE: Arizona endemic. Little Colorado River watershed at approximately 1,700 to 1,750 m elevation from near Joseph City to the Marcou Mesa region northwest of Holbrook, Navajo County, Arizona.

RANGE WITHIN ARIZONA: See "**Total Range**."

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Globose succulent perennial.

PHENOLOGY: Flowers in April and early May; fruits immediately thereafter from May to June.

BIOLOGY: *Pediocactus p.* var. *peeblesianus* grows in a harsh environment which is sparsely vegetated, and retracts into the soil during dry weather when water is unavailable. According to Falk, Jenkins et al. (2001), "monitoring has revealed fluctuations in flowering and fruiting success, and plant numbers. Seedling germination and establishment occur at

intervals correlated with favorable amounts of precipitation. Growth rates are slow and reproduction does not occur until the plants are > 8 years old."

HABITAT: Exposed sunny situations in weakly alkaline, gravely soils of the Little Colorado paleochannels (Taylor 2008). Stewart et al. (1972) narrowly described their habitat as gravelly alluvium derived from the Shinarump Member of the Chinle formation, occurring on gently sloping hills to flat hilltops, in desertscrub and grassland. However, 2002 surveys by Al Burch (BLM Geologist and Minerals & Renewable Resources Group Manager) and John Anderson (BLM State Botanist) found, "although some plants were loosely consolidated pebble to cobble gravels that occur uncomformably on top of the indurated Shinarump, many occurrences were stratigraphically above the Shinarump in weakly alkaline, very course sand to cobble gravel deposits that unconformably overlie the finer grained facies of the Chinle Formation. The gravels can occur in swales, on ridges, or, at some localities, as gravel caps on buttes."

ELEVATION: 5,100 - 5,650 feet (1556-1723 m).

EXPOSURE: All aspects; slopes from 0 to 30 degrees.

SUBSTRATE: Gravelly soils with an alkaline pH of around 8.15 (Stewart et al. 1972). Previously described as occurring only in the Shinarump conglomerate of the Chinle formation by Stewart et al. (1972), Burch (*in* Taylor 2008) believes most of the gravels that host *Pediocactus p.* var. *peeblesianus* are remnants of bars and terraces of Little Colorado paleochannels.

PLANT COMMUNITY: Plains and Great Basin Grassland biotic community, near the ecotone and transition of the Great Basin Desertscrub community (Brown and Lowe 1980). Associated plants include: *Amsonia peeblesii* (Peebles' blue-star), *Artemisia bigelovii* (flat sagebrush), *Artemisia tridentata* (big sagebrush), *Atriplex canescens* (four-wing saltbush), *Atriplex confertifolia* (shadscale), *Chrysothamnus nauseosus* (rabbit-bush), *Coryphantha* (*Escobaria*) *vivipara* (common pincushion cactus), *Ephedra cutleri* (Cutler's jointfir), *Ephedra torreyana* (Torrey's Mormon tea), *Eriogonum corymbosum* (crispleaf wild-buckwheat), *Gutierrezia sarothrae* (broom snakeweed), *Hilaria jamesii* (James galleta), *Juniperus sp., Opuntia spp., Rhus trilobata* (Skunkbush sumac), *Sclerocactus whipplei* var. *whipplei* (Whipple's fishhook cactus), and *Zinnia grandiflora* (Rocky Mountain zinnia).

POPULATION TRENDS: The historic and present range of this plant, are assumed to be similar. Known from 5 small populations in a tiny area of northern Arizona, where it is restricted to a specific, gravelly soil type (NatureServe 2003). Approximately 1,000 plants are known to exist and although plots have been established and monitored, no definite conclusions have been made concerning trends on the population dynamics of the taxon. The population that is left in the wild is sought by collectors and threatened by off-road vehicles, urban development, and continued gravel pit operations. Gravel quarrying has destroyed as much as one-forth of the potential habitat in the area. (NatureServe 2003).

"The extremely limited geographic distribution, restricted gene pool, and low number of individuals make *P. peeblesianus* var. *peeblesianus* vulnerable to extinction. Reproduction may be insufficient to maintain long-term populations" (Arizona Game and Fish Department 1998, in U.S. Fish and Wildlife Service, International Affairs 2003).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: LE (USDI, FWS 1979, without Critical Habitat)
[PE USDI, FWS 1976]

STATE STATUS: Highly Safeguarded (ARS, ANPL 1999)
[Highly Safeguarded (ARS ANPL, 1993)]

OTHER STATUS: Most Critically Endangered (USDI, CITES Appendix I 1996)
[Most Critically Endangered (CITES, Appendix I 1983)]
[CITES 1975]
Endangered (IUCN, 1998)

MANAGEMENT FACTORS: Extremely limited geographic distribution, restricted gene pool, and low number of individuals make this taxon vulnerable to extinction. Reproduction may be insufficient to maintain long-term populations. Threats include gravel mining, urban development, off-road vehicle traffic, road construction, and "cactus collecting." In addition, trampling of plants and habitat disturbance caused by livestock grazing and rock/petrified wood collectors also poses a possible threat.

PROTECTIVE MEASURES TAKEN: Protected from illegal international trade by the Convention on International Trade of Endangered Species of Fauna and Flora (CITES). Protected by the Arizona Native Plant Law. Also protected by the Endangered Species Act of 1973, as amended in 1982, and by the Lacey Act, as amended in 1981.

SUGGESTED PROJECTS: Continue to monitor populations and habitat; protect populations on private and federal lands; withdraw habitat from mineral entry; prohibit ORV use in existing habitat; prevent livestock grazing in existing and potential habitat in spring and completely in known areas of high density cactus populations; study the ecological requirements of this cactus; develop public education program to enhance awareness and support for the preservation of this cactus; develop successful methods of propagation to provide nursery stocks to reduce collection pressures; consider introducing/reintroducing nursery grown stock to natural habitat; enforce existing laws and regulations.

LAND MANAGEMENT/OWNERSHIP: BLM - Safford Field Office; Private.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

John Anderson – BLM State Botanist, State Office, Phoenix, Arizona.
Reggie Fletcher - USFS Regional Ecologist, Albuquerque, New Mexico.
Dr. Art Phillips III - Private Consultant, Flagstaff, Arizona.
Dr. Barb Phillips - USFS Zone Botanist, Coconino National Forest, Flagstaff, Arizona.

ADDITIONAL INFORMATION:

Revised: 1998-09-11 (DJG)
2004-01-22 (SMS)
2009-01-05 (SMS)

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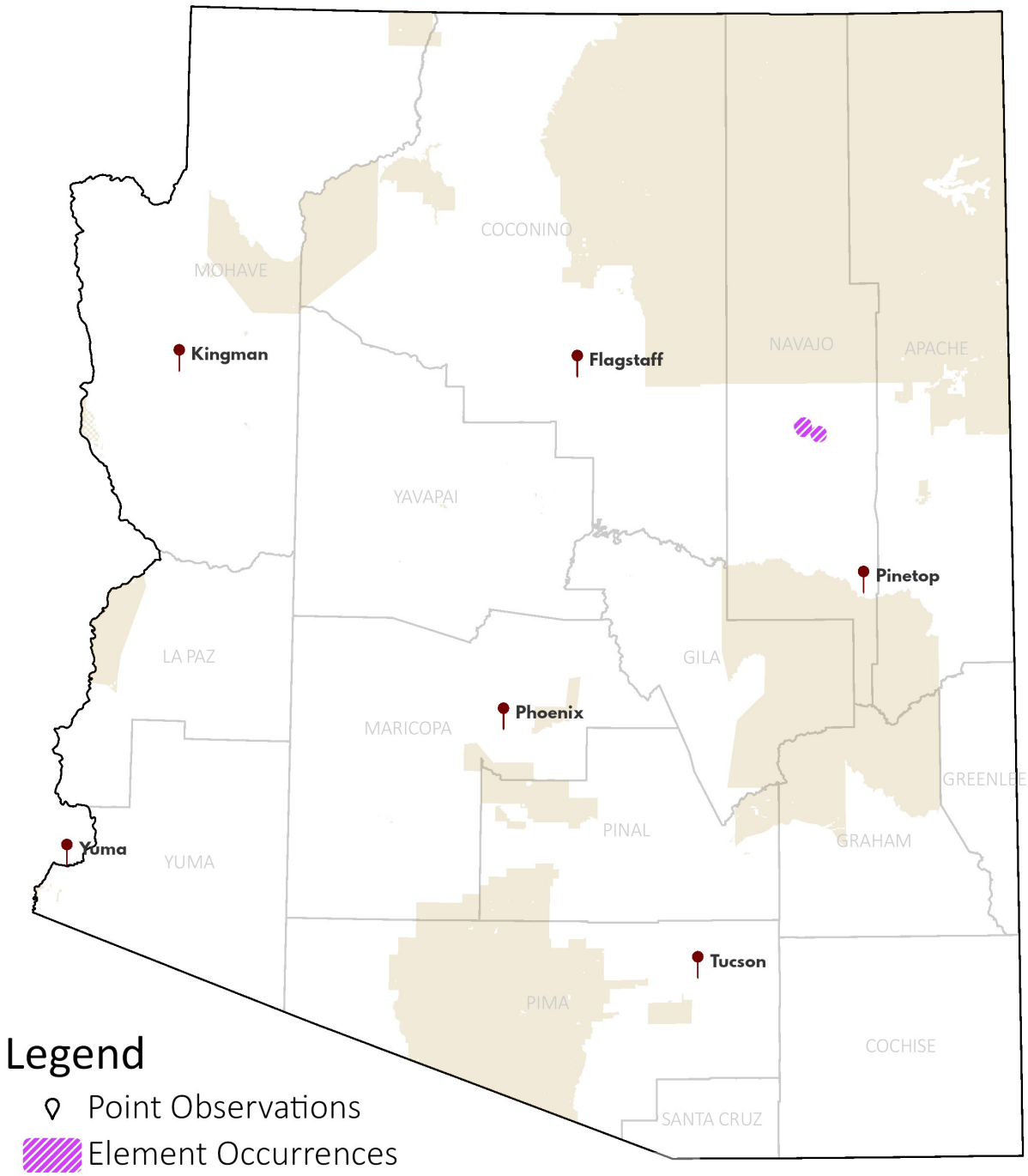
Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

Pediocactus peeblesianus var. peeblesianus

Peebles Navajo Cactus



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

0 50 100 Kilometers

ARIZONA GAME & FISH

Point Observations are not guaranteed to have been thoroughly quality controlled. Element Occurrence data represent areas where a population occurs.

Heritage Data Management System
2018-02-08

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **ElementCode:** DCAC040C1
Data Sensitivity: YES

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Coryphantha scheeri* var. *robustispina*
COMMON NAME: Pima Pineapple Cactus; Scheer's Strong-spined Cory Cactus
SYNONYMS: *Mamillaria robustispina*; *Cactus robustispinus*; *Coryphantha robustispina*; *Coryphantha*
FAMILY: Cactaceae

AUTHOR, PLACE OF PUBLICATION: L. Benson. 1969. The Cacti of Arizona. p. 25.

TYPE LOCALITY: South side of Babuquibari (Baboquivari) Mountains in Sonora, Mexico.

TYPE SPECIMEN: MO. A. Schott, 1856.

TAXONOMIC UNIQUENESS: Species split into three varieties: var. *valida* (southeastern Arizona to Texas and Chihuahua, Mexico), var. *scheeri* (Mexico), and var. *robustispina* (south central Arizona) (Benson, 1969).

DESCRIPTION: Hemispherical cactus, adults measuring 10.0-46.0 cm (4.0-18 in.) tall, 8.0-18.0 cm (3.0-7.0 in.) in diameter. **Strong straw-colored central spines form cluster, one per areole**, measure up to 3.0 cm (1.2 in.) long. Central spine 2.0 mm (0.08 in.) in diameter, curved or hooked at **abruptly narrowing tip**. **Radial spines number 6** in young plants, increasing to **10-15** in older plants. Vary from 19.0-23.0 mm (0.76-0.92 in.) long with upper ones more slender. Areoles covered densely with deciduous wool which disappears at maturity. **Tubercles grooved along upper surface**. Stems can branch and clumps can form. Silky yellow flowers, coral color on edges, have narrow floral tube. Green fruit ellipsoid, succulent and sweet. Brown or black seeds finely veined or netted.

AIDS TO IDENTIFICATION: May be confused with juvenile *Ferocactus*. However, *Ferocactus* spines flattened, have transverse ridges, in contrast with round cross-section of *Coryphantha* spines. Also, areoles of *Coryphantha* are on tubercles (bumps) with grooves along upper surface, while areoles of *Ferocactus* are on ridges (ribs).

ILLUSTRATIONS: Line drawing (USFWS).
Line drawings of plant in flower, and fruit. (Benson, 1982: Fig. 858, p. 821).
Color photos (http://home.earthlink.net/~ironwing/pimapineapplecactus.html)

TOTAL RANGE: South-central Arizona and north-central Sonora, Mexico

RANGE WITHIN ARIZONA: Southeastern Arizona. Known range bounded by Santa Cruz County, Santa Rita Mountains (east); Pima County, Baboquivari Mountains (west), Tucson (north), Arizona-Mexican border (south).

SPECIES BIOLOGY AND POPULATION TRENDS

PHENOLOGY: Flowers in mid-July with onset of summer rains.

GROWTH FORM: Succulent Perennial

BIOLOGY: Plants very sparsely distributed. Densities can be lower than 1 plant per 4 acres. Seeds are viable; asexual reproduction (offsets) very important. Pollinated by small white and black bees. Fruit set and seed production very high in 1988 (Mills 1991). Obligate outcrossers. Bloom together one day a year (midday). Pollinated

by honeybees (see "Suggested Projects" p. 3). Widely scattered plants in Coronado may produce fruit within 5 years (Falk 1994). Plants shrunk but no erosion "pedestaling." Tap and lateral roots out to 1.5 meters.

Highest density on mid to low slope areas of Green Valley Ranch. At Buenos Aires National Wildlife, large amounts Lehmann lovegrass (LL), no *C.s. robustispina* which prefers open patches in snakeweed.

HABITAT: Ridges in semidesert grassland and alluvial fans in Sonoran desertscrub. Desert Botanical Garden (1999) reports that "Plants are found on alluvial hillsides in rocky, sandy soils.... habitat type is primarily desert grassland...."

ELEVATION: About 2,300 - 5,000 feet (702 - 1,525 m).

EXPOSURE: Flat ridgetops with little slope

SUBSTRATE: Soils are mostly rocky loams. "No soil analysis has been done" (Mills 1991).

PLANT COMMUNITY: Lower Sonoran Desertscrub and Semi-desert Grassland (dominated by *Acacia constricta* (white-thorn acacia), *Prosopis velutina* (velvet mesquite), *Gutierrezia microcephala* (thread snakeweed), *Ambrosia deltoidea* (triangle-leaf bursage), and various other cacti and grasses)

POPULATION TRENDS: Downward due to loss and degradation of habitat

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: LE (USDI, FWS 1993)
[C1 USDI, FWS 1990]
[C1 USDI, FWS 1985]
[C1 USDI, FWS 1980]
[PTN-T USDI, FWS 1975]

STATE STATUS: Highly Safeguarded (ADA 1993, 1999)

OTHER STATUS: None (FS Sensitive USDA, FS Region 3 1999)
[Forest Service Sensitive USDA, FS Region 3 1990]

MANAGEMENT FACTORS: Limited range and sparse distribution. Loss of habitat due to urban development, off-road vehicle use, road construction, agriculture, and mining; habitat degradation due to livestock grazing; alteration of habitat due to aggressive non-native grasses; and illegal collecting; range management practices that cause surface disturbances such as ripping and imprinting.

Management Needs:

1. Improved livestock management.
2. Education regarding Arizona Native Plant Law and cactus theft.
3. Surveys to delimit range, particularly in Mexico.
4. Studies to determine if transplantation as mitigation measure is successful.
5. Initiate demographic monitoring to determine if "populations" are stable.
6. Set aside several preserves large enough to sustain viable populations.

Management Implications: At Buenos Aires National Wildlife Resource, firebreak constructed around plant, then prescribed burn done. Plants survived. "Grandfather" had 24 fruits.

Species range includes very little federal land (<5-10%). Bureau of Land Management (BLM) has population in Coyote Mountains, Mendoza Canyon; just south of Tucson area. Small isolated tracts of BLM land critical in survival of species.

Habitat loss: do not trade out isolated parcels of BLM land. Green Valley core of species range, has highest density. 13 plants observed, more than 60% Lehmann lovegrass (LL) cover dead, less than 60% LL robust to moderate.

Central Arizona Project causing:

1. Loss of habitat. TASRI reservoir will destroy 1 square mile of habitat.
2. Grazing in Coyote Mountains.
3. Exotic plants and grasses such as LL can form monotypic stand and burn 3 times hotter than native grasses. If LL burned, does not disappear but returns in stronger condition. LL NOT problem in Animas Valley, New Mexico.

Dilemma: native grasses need fire but if area burned, aids LL, *C.s. robustispina* not adapted to fire. Burn issues also affected by housing and air quality. *C.s. robustispina* does not have good future in this area.

CONSERVATION MEASURES TAKEN: Arizona-Sonora Desert Museum holds seeds. Exported seeds to Royal Botanical Gardens at Kew in 1989. S. Mills also has seeds.

SUGGESTED PROJECTS: Evaluate base for exchange property with Coronado National Forest (see "Management Needs" above). Marked pollen test planned to determine pollination mechanism. Honeybees and solitary bees known as pollinators (see "Biology"), however, high levels of fruit set found in both dense and sparse populations. Other mechanisms may be involved.

LAND MANAGEMENT/OWNERSHIP: BIA - San Xavier Reservation and Tohono O'Odham Nation; BLM - Tucson Field Office; BOR - Phoenix Area; FWS - Buenos Aires National Wildlife Refuge; USFS - Coronado National Forest; State Land Department; City of Tucson; Private.

SOURCES OF FURTHER INFORMATION

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Scott Mills - SWCA, Tucson, Arizona.
Sue Rutman - Organ Pipe Cactus National Monument, Ajo, Arizona.
Alan Zimmerman - Tucson, Arizona.

ADDITIONAL INFORMATION:

Revised: 1990-12-27 (SR)
1991-10-20 (BKP)
1991-12-04 (SR)
1994-12-23 (DBI)
2001-12-12 (SMS)

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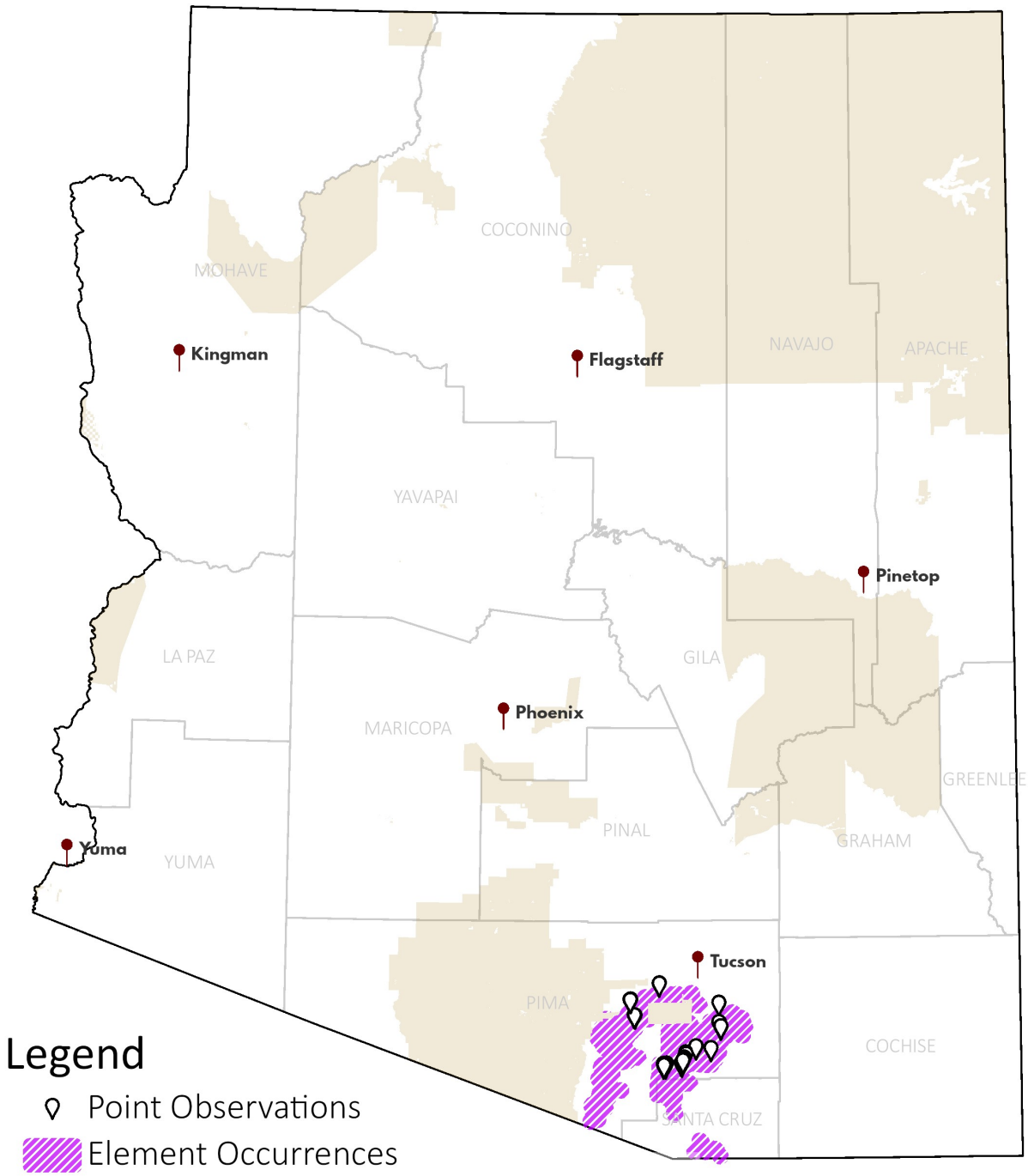
Arizona Game and Fish Department. 2001. *Coryphantha scheeri* var. *robustispina*. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 5 pp.

Coryphantha scheeri var. robustispina

Pima Pineapple Cactus



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

0 50 100 Kilometers

ARIZONA GAME & FISH

Point Observations are not guaranteed to have been thoroughly quality controlled. Element Occurrence data represent areas where a population occurs.

Heritage Data Management System
2018-02-08

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDAST530T1
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Hymenoxys ambigens* var *ambigens*
COMMON NAME: Pinaleno Mountain Plummera
SYNONYMS: *Plummera ambigens* Blake
FAMILY: Asteraceae

AUTHOR, PLACE OF PUBLICATION:

TYPE LOCALITY:

TAXONOMIC UNIQUENESS:

DESCRIPTION: Perennial (?) herb, taller than *Hyemenoxys richaresoni*; leaves alternate, divided into filiform lobes; heads very small, cymose-panicled, radiate, yellow, the rays 2 to 5, disk flowers 6 to 7, hermaphrodite but sterile; rays achenes obovoid, plump, about 15-ribbed & villous.

AIDS TO IDENTIFICATION:

ILLUSTRATIONS:

TOTAL RANGE: Lower slopes of the Pinaleno Mnts, Graham County, Arizona.

RANGE WITHIN ARIZONA: See "**Total Range**."

SPECIES BIOLOGY AND POPULATION TRENDS

PHENOLOGY: July to October

GROWTH FORM: PH

BIOLOGY:

HABITAT: Stony, sterile soil

ELEVATION: 5,000 - 7,000 ft

EXPOSURE:

SUBSTRATE:

PLANT COMMUNITY:

POPULATION TRENDS:

SPECIES PROTECTION AND PRESERVATION

ENDANGERED SPECIES ACT STATUS:
STATE LIST STATUS:
OTHER STATUS:

MANAGEMENT FACTORS:

CONSERVATION MEASURES TAKEN:

SUGGESTED PROJECTS:

LAND MANAGEMENT/OWNERSHIP:

SOURCES OF FURTHER INFORMATION

LITERATURE CITATIONS:

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Steve Bingham

ADDITIONAL INFORMATION:

Revised: 1989-11-09(???)

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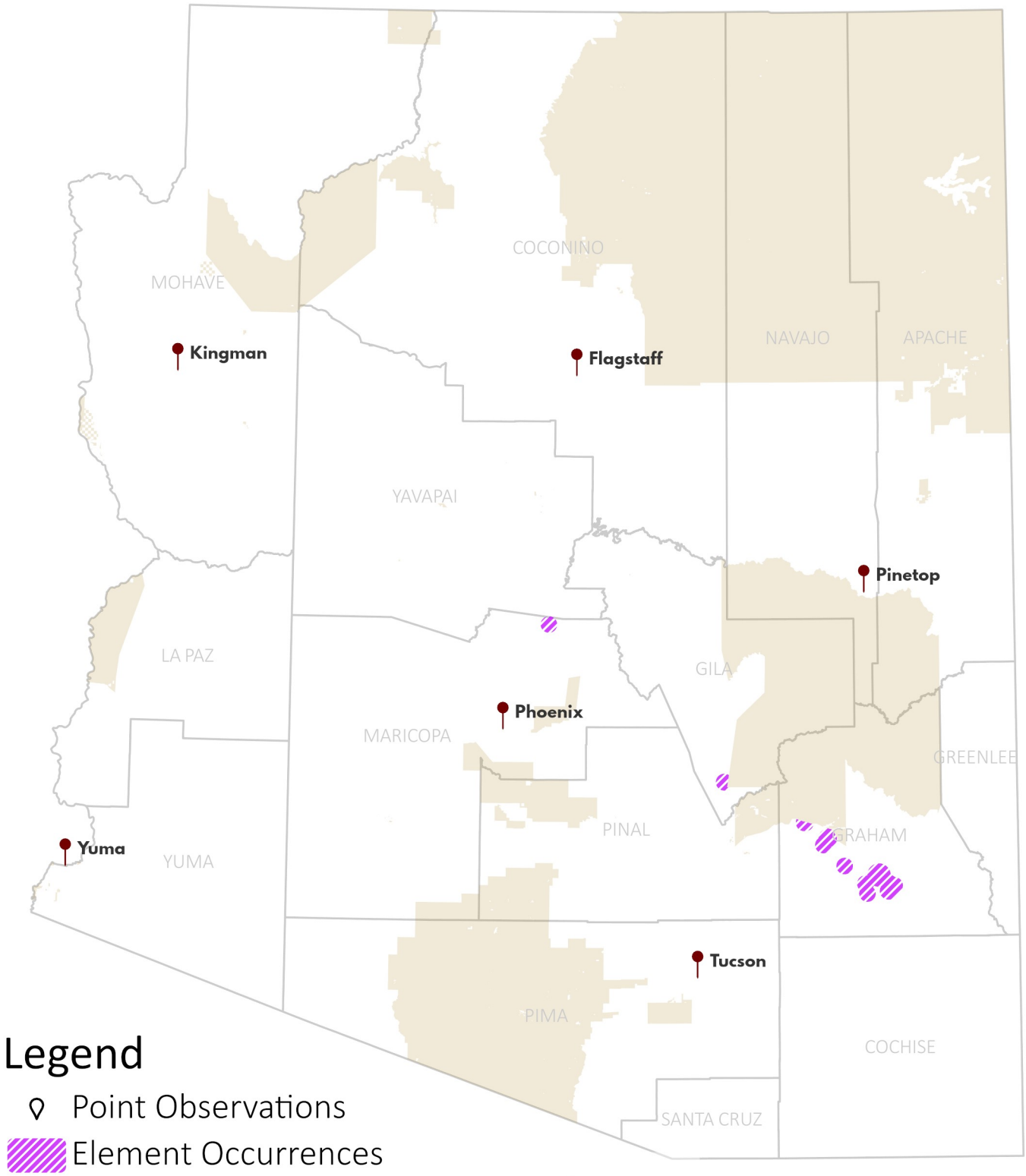
Hymenoxys ambigens var. ambigens

Pinaleno Mountain Rubberweed



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

Kilometers

0 50 100

ARIZONA GAME & FISH

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Heritage Data Management System
2019-06-13

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDAST3M3C0
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Erigeron pringlei*
COMMON NAME: Pringle's Fleabane
SYNONYMS:
FAMILY: Asteraceae (Compositae)

AUTHOR, PLACE OF PUBLICATION: A. Gray, Proc. Amer. Acad. Arts. 17: 210. 1882.

TYPE LOCALITY: Mt. Wrightson, Santa Rita Mountains, Santa Cruz County, Arizona. Clefts of ledges and cliffs, 8,500 - 9,400 feet.

TYPE SPECIMEN: HT: US 15162. C.G. Pringle, 6 June 1881. IT: NY 168512.

TAXONOMIC UNIQUENESS: A 1990 revision of the *E. pringlei* by Guy Nesom at the University of Texas at Austin split the species into four taxa: *E. pringlei, E. heliographis, E. saxatilis*, and *E. anchana*. All are restricted to mountains within Arizona. Each species is morphologically as well as geographically distinct. "The four species of the *E. pringlei* group might be treated as geographic entities within a single species, where they would be given formal status as varieties. The differences among them however, are consistent with the degree of difference found among other groups of similar, closely related species of North American *Erigeron* traditionally recognized as distinct" (Nesom 1990).

The populations of *E. pringlei* found in central Arizona are somewhat larger than the plants from the Santa Rita Mountains. There appears to be no other morphological features that would clearly distinguish these populations, although these disjunct populations probably have been isolated for long periods of time and some accumulated differences might be expected. The long branches of the central Arizona plants show strong similarity to *E. anchana*. However, the exact pattern of relationship between them or any species of the *E. pringlei* group is not clear. (Nesom 1990).

DESCRIPTION: Herbaceous perennial with a thick taproot with several thick, nearly woody caudex branches 1-2(-7) cm long. The persistent petioles (leaf bases) from the growth of the previous year and the caudex branches give the plant a very "rough" appearance. **Stems usually unbranched**, 4-16 cm (1.6-6.3 in) long, sparsely to moderately short strigose (with stiff, straight, appressed hairs). Basal leaves are spatulate and long petiolate, 2-6 cm long, the **leaf blades apically 3-lobed to pinnatifid**, 4-10 mm wide. Flower heads single, at top of leafy stem, small, 5-6 mm wide, with white petals (lavender before open, and then fade) and yellow disk. Phyllaries (bract segments) in 3-4 strongly graduated series, often

purplish. Ray flowers 20-35, ligules white to pinkish, sometimes with a midstripe beneath, reflexing. **Pappus of the achene of 11-16 bristles**, about 2 mm long. (Nesom 1990).

AIDS TO IDENTIFICATION: The small size (mostly less than 15 cm tall), persistent petioles (leaf bases) from the growth of the previous year and stout, nearly woody caudex identify the *E. pringlei* group. The lobed basal leaves and rose- to purple-tinged phyllaries and ligules of *E. pringlei* are distinct from the entire leaves and white ray flowers of *E. kuschei*. The petiole of *E. anchana* is longer than *E. pringlei*, being twice as long as the length of the leaf; the pappus bristles are more numerous in *E. anchana* (19-26); and orange resinous veins are present on the phyllaries and disc corollas of *E. anchana*.

ILLUSTRATIONS: Line drawing (USFWS)
Color photo of specimen (NYBG *in* http://scisun.nybg.org:8890/searchdb/owa/wwwcatalog.detail_list?this_id=4386088)

TOTAL RANGE: Central and Southern Arizona, including the Santa Rita Mountains in Santa Cruz County, the Mescal and Mazatzal mountains in Gila County, the Pinaleno Mountains in Cochise County, and in areas of Graham and Yavapai counties.

RANGE WITHIN ARIZONA: See "**Total Range**."

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Herbaceous perennial.

PHENOLOGY: Flowers May - August (-September).

BIOLOGY: Probably a fairly long-lived plant able to deal with drought conditions.

HABITAT: Rock crevices or ledges on boulders and vertical rock faces, in mesic situations near springs and in shaded canyons.

ELEVATION: Santa Rita Mountains: 7,300 - 9,250 feet (2227 - 2821 m). Mescal, Mazatzal, and Sierra Ancha mountains, and Black Mesa: 3,800 - 6,640 feet (1159 - 2025 m).
Pinaleno Mountains: 9,320 feet (2843 m).

EXPOSURE: Various.

SUBSTRATE: Igneous or metamorphic granites, along with Limestone (including travertine), Quartzite, and Rhyolite.

PLANT COMMUNITY: Ponderosa pine community. Associates include not only ferns, lichens and mosses, but: Cottonwood Mtn - *Fraxinus velutina* (velvet ash), *Quercus gambelii*

(Gambel Oak), and *Pinus ponderosa* (Ponderosa Pine); Santa Rita Mountains – *Draba* sp., *Heuchera* sp. (alumroot), *Petrophytum caespitosum* (rock spiraea), and *Thalictrum fendleri* (Fendler meadowrue); Mescal Mountains – *Arabis* sp. (rockcress), *Heuchera* sp., *Perityle ciliata* (fringed rockdaisy), and on adjacent slopes *Holodiscus dumosus* (bush oceanspray), *Ptelea trifoliata* ssp. *angustifolia* (common hoptree), *Quercus chrysolepis* (canyon live oak), *Q. gambelii* (Gambel oak), and *Thalictrum fendleri*. (Phillips 1991).

POPULATION TRENDS: Bingham (1979) reported that an *E. pringlei* population in the Mescal Mountains (still considered *E. pringlei*) was "...the most common perennial on the cliff faces and minor ledges in this area. Hundreds of individual plants were observed..." He also noted that threats were relatively non-existent and the plants appeared to be reproducing.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None (USDI, FWS 1996)
[3C (USFWS Region 2 List, 1992)]
[C2 (USDI, FWS 1990)]
[C2 (USDI, FWS 1985)].

STATE STATUS: None

OTHER STATUS: Not Forest Service Sensitive (USDA, FS Region 3 1999)
[Forest Service Sensitive, USDA, FS Region 3 1990]

MANAGEMENT FACTORS: Few if any threats. Populations, including some, which are rather large, are mostly inaccessible. Possible impacts are from recreation, road construction, and collection from botanists (at sites near trails).

CONSERVATION MEASURES TAKEN:

SUGGESTED PROJECTS: Map occupied and potential habitat (definitive habitat, easily recognized); monitor numbers of plants at known sites.

LAND MANAGEMENT/OWNERSHIP: BIA - San Carlos Reservation; BLM - Tucson Field Office; USFS - Coconino National Forest (Sierra Ancha Experimental Forest), and Coronado and Tonto National Forests.

SOURCES OF FURTHER INFORMATION

REFERENCES:

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Reggie Fletcher - Regional Ecologist, USFS Region 3, Albuquerque, New Mexico.

Dr. Steve McLaughlin - University of Arizona, Tucson.

Dr. Guy Nesom - University of Texas, Austin.

Dr. Barbara G. Phillips - Zone Botanist, Coconino National Forest, Flagstaff, Arizona.

ADDITIONAL INFORMATION:

There are about one-half dozen known sites where *E. pringlei* is currently found in the Santa Rita Mountains and more are expected to be found; however, access is very difficult and the plants are considered to be "uncommon" within appropriate habitat (Steve McLaughlin, Coronado Plant Workshop, 1991).

Revised: 1990-11-26 (SR)
1991-10-19 (BKP)
1992-09-22 (BKP)
1998-01-08 (SSS)
2004-08-20 (AMS)
2004-10-01 (SMS)

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDPGN08520
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Eriogonum ripleyi*
COMMON NAME: Ripley wild-buckwheat, Ripley's wild-buckwheat, Frazier Wells wild, buckwheat, Frazier well buckwheat
SYNONYMS:
FAMILY: Polygonaceae

AUTHOR, PLACE OF PUBLICATION: J.T. Howell, Leaflets of Western Botany 4(1): 5-7. 1944.

TYPE LOCALITY: Thirteen miles southwest of Fraziers Well, western Coconino County, Arizona.

TYPE SPECIMEN: HT: CAS 311,671. H.D. Ripley and R.C. Barneby 5226, 13 May 1943.

TAXONOMIC UNIQUENESS: Very large genus, 200-300 species mainly in western North America. Fifty-four species listed by Lehr (1979) as occurring in Arizona. Related to *E. bicolor* and *E. pulchrum* in the *E. microthecum* group.

"The most remarkable characteristic of the Ripley Buckwheat is the bractless flowering stems and the resulting inflorescence which is essentially composed of a single terminal involucre... arrangement of the leaf fascicles with the involucres extending out from these on slender peduncles represents another extreme in the reduction of the inflorescences... trend is not seen in other species in the *E. microthecum* complex although it is hinted at in *E. bicolor*." From J.L. Reveal (1971).

DESCRIPTION: Low herbaceous perennial subshrub with numerous branches, 5-20 cm (2-8 in.) tall, tuft- or mound-forming with trailing stems, rooting at the nodes. Leaves narrowly lance-shaped, 2-6 mm long, densely covered with wooly hair on the underside, with downrolled leaf margins. Single terminal involucre on slender terminal branches. Petals are white with a red-brown center strip, 3.5-4.6 mm long.

AIDS TO IDENTIFICATION: Species differs from other *Eriogonums* in Arizona in that it is a low, heavily branched, mat-forming sub-shrub with short linear leaves. It roots at nodes giving an arching appearance distinguishing it from other *Eriogonums* in its area. *Eriogonum ripleyi* is similar to *E. ericifolium* var. *ericifolium* and *E. caespitosum*, however, the reduction of its inflorescence to a single terminal involucre is distinctive. *E. ripleyi* is very difficult to differentiate from the more thinly stemmed *E. microthecum* which may occur in the same vicinity as *E. ripleyi*. *E. ripleyi* is very similar to *E. ericifolium* var. *thornei* of San Bernadino County, California. When not flowering, it is hard to see because it blends in with soil.

ILLUSTRATIONS: Line drawing (USFWS).
Line drawing (M.S. 90, *in* Falk, Jenkins et al. 2001)
Color photos (Marc Baker, *in* Falk, Jenkins et al. 2001)
Color photo of habitat (USFS, *in* Falk, Jenkins et al. 2001)

TOTAL RANGE: Known from five widely separated localities in central to northwestern Arizona, where it seems to be restricted to white, calcareous substrates.

RANGE WITHIN ARIZONA: Near Horseshoe Lake and Chalk Mountain, Maricopa and Yavapai counties; near Cottonwood, Yavapai County; and southwest Coconino County and adjacent Mohave and Yavapai counties. Frazier Wells on Hualapai Indian Reservation in Coconino County.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Perennial subshrub/forb.

PHENOLOGY: Dicot flowering plant, that flowers April – June.

BIOLOGY: Where stems contact the soil, they will root at the nodes. Leaves become tightly inrolled and reddish when under drought or dormant conditions; plants will look very different. They are very obvious when they are producing abundant flowers in the spring.

HABITAT: In Tertiary lakebeds on well-drained powdery soils derived from limestone, sandstone, or volcanic tuffs and ashes (Falk, Jenkins et al., 2001). NatureServe (2003) states that *E. ripleyi* is found on calcareous ridge tops or chalky carbonate Verde formations at 1045 m; and among pinyons at 1830 m.

ELEVATION: 2,000 - 6,000 feet (610 - 1830 m). Based on unpublished records from the HDMS (AGFD accessed 2003), elevation ranges from 2,100 – 5,500 ft (641-1678 m).

EXPOSURE:

SUBSTRATE: Heavily calcareous soils (Tertiary limestone/gypsiferous lakebed deposits at Frazier's Well, Hualapai Reservation), sandy clay soil on the edge of sandstone mesas, and volcanic tuffs and ashes and redeposited limestone to chalky clay.

PLANT COMMUNITY: Creosotebush community of the Sonoran Desertscrub, and Pinyon-Juniper Woodland of the Great Basin Conifer Woodland.

POPULATION TRENDS: The Horseshoe Lake and Cottonwood populations each have thousands of plants.

This shrubby buckwheat is remarkable for its distribution in widely disjunct sites on different substrates (Phillips, 1999 draft).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None (USDI, FWS 1996)
[C2 USDI, FWS 1980]
[PTN-T USDI, FWS 1975]

STATE STATUS: Salvage Restricted (ARS, ANPL 1999)
[Salvage Restricted (ARS, ANPL 1993)]

OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 1999)

[Forest Service Sensitive (USDA, FS Region 3 1990)]

MANAGEMENT FACTORS: Found in a small range in a specific substrate. Threats include degradation of habitat due to impacts associated with livestock grazing; construction of reservoirs, roads, and recreational development; off-road vehicle traffic; mining. Another threat includes the collection of these plants in the Horseshoe Lake area, for use in gardens.

CONSERVATION MEASURES TAKEN: Most of the Cottonwood population is in Verde Valley Botanical Area.

SUGGESTED PROJECTS: Expand Verde Valley Botanical Area; increase survey efforts for new populations; continue monitoring of known populations.

LAND MANAGEMENT/OWNERSHIP: BIA - Hualapai Reservation; USFS - Coconino, Prescott and Tonto National Forests; Arizona State Land Department; Private.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Mark Baker - Chino Valley, AZ.
Clair Button - Bureau of Land Management (previously Botanist, Phoenix District, Arizona).
Dr. Barbara Phillips - U.S. Forest Service, Coconino National Forest, Flagstaff, AZ.
Dr. Arthur Phillips, III, Flagstaff, AZ.

ADDITIONAL INFORMATION:

Phillips and Phillips (1991) indicate that based on the preference of *Eriogonum ripleyi* for specific soil associations there are large areas of potential habitat.

It had been suggested that this species may have some limited value in landscaping.

Revised: 1990-10-16 (SR)
1992-02-16 (BKP)
1992-09-15 (BKP)
1995-04-27 (DBI)
1997-04-08 (BGP)

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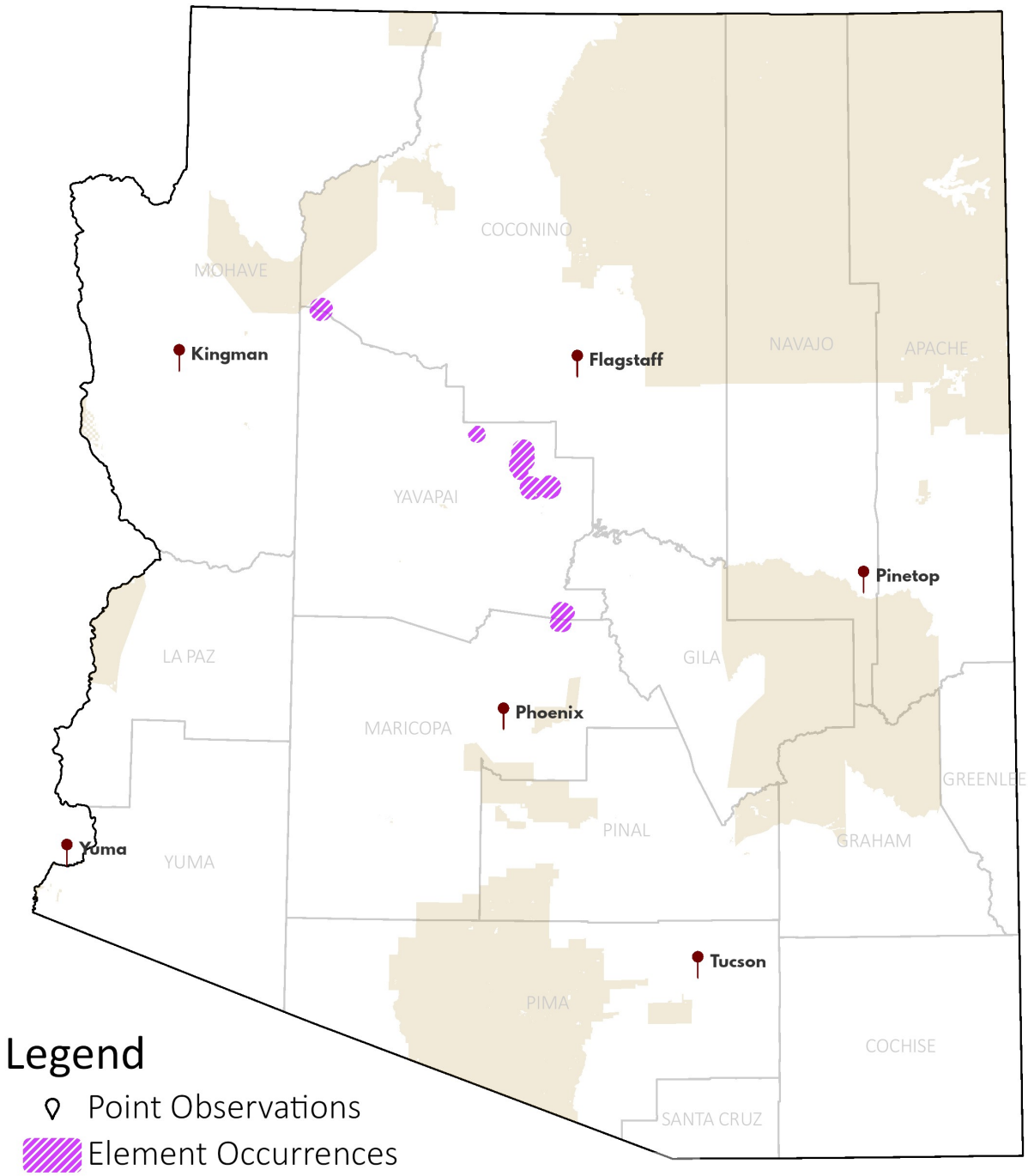
Eriogonum ripleyi

Ripley Wild-buckwheat



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

0 50 100 Kilometers

ARIZONA GAME & FISH

Point Observations are not guaranteed to have been thoroughly quality controlled. Element Occurrence data represent areas where a population occurs.

Heritage Data Management System
2018-02-08

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDFAB1L010
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Errazurizia rotundata* (Wooton) Barneby
COMMON NAME: Roundleaf Errazurizia, round dunebroom, roundleaf dunebroom, round-leaf dune-broom
SYNONYMS: *Parryella rotundata* Wooton, *Dalea nummularia*
FAMILY: Fabaceae

AUTHOR, PLACE OF PUBLICATION: *Errazurizia rotundata* (Wooton) Barneby, Leaflets of Western Botany 9(13-14): 210. 1962. *Parryella rotundata* Wooton, Bull. Torr. Bot. Club 25(8): 457. 1898.

TYPE LOCALITY: "… at a point about five miles north of Winslow, Navajo County, Ariz., June 29, 1892, in reddish soil." Wooton s.n. 4267 m.

TYPE SPECIMEN: HT: US-735142. E.O. Wooton s.n., 29 Jun 1892.

TAXONOMIC UNIQUENESS: *Errazurizia rotundata* is only known from north-central Arizona. It was originally described in 1898 as *Parryella rotundata* by E.O. Wooton based on a specimen that he collected from north of Winslow in 1892. It was transferred to the genus *Errazurizia* by R.C. Barneby of the New York Botanical Garden in 1962. (Van Devender 1980). Species *rotundata* is the only species in the genus *Errazurizia*.

DESCRIPTION: Low, clonal, aromatic woody shrub, up to 35 cm (13.8 in) tall, and 1 m (3.28 ft) or more in diameter. Herbage is strigulose-canescent, with many prominent orange or purple, prickle shaped glands. Leaves 3-13 cm (1.18-5 in) long, with 29-61 broadly oblong-ovate to orbicular leaflets. Spikes short, 6-14 flowered, the axis not over 2 cm long in fruits. Calyx tube prominently 10-ribbed and glandular in the intervals. Flowers 5 mm long with only a pale yellow banner (fading to reddish) and no keels or wings. The pod is an ovoid-ellipsoid that is slightly compressed and 9-11 mm long. (Van Devender 1980; Falk et al. 2001).

AIDS TO IDENTIFICATION: Before leafing out in the spring, this plant must be distinguished from similar looking *Parryella filifolia*, which may grow on nearby dunes (Phillips et al. 1981). "The Arizona species most closely resembles *E. benthami* in its twiggy fruticose habit of growth, short flower-spikes, and filiform glandless style; but the stigma is here minute and punctiform, the corolla is either reduced to the banner or more commonly altogether suppressed, and the stamens are greatly exserted, the filaments of the ripe anthers becoming almost twice the length of the calyx." (Barneby 1962).

ILLUSTRATIONS:
B&W of plant and parts (Barneby 1977)
B&W drawing (*in* Falk et al. 2001).
Color photos of plant and habitat (*in* Falk et al. 2001).
Color photo of type (Wooton, US-735142, *in* http://ravenel.si.edu/botany/types//fullRecords.cfm?myFamily=)

TOTAL RANGE: Arizona.

RANGE WITHIN ARIZONA: Thought to be endemic to the Little Colorado River (LCR) drainage, Coconino and Navajo counties, Arizona. Particularly Painted Desert, Echo Cliffs, Wupatki Basin, middle LCR drainage, and northwest of Winslow. Collected in Maricopa County by R.K. Gierisch in 1977 (ASC-31101).

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Perennial shrub/subshrub.

PHENOLOGY: Flowers from early April to mid-May, and sets fruit from May to June.

BIOLOGY:

HABITAT: A very aromatic shrub growing in large soil-binding clumps in sandy areas. "Occurs in exposed sites in several types of outcrops ranging from sandy soils in sandstone, gravelly soils in calcareous outcrops, to deep, alluvial cinders in sandstone breaks." (Falk et al. 2001). Van Devender (1980) reports "*Errazurizia rotundata* is found…on rocky hilltops and ledges on red or white sandstone and sandy areas nearby."

ELEVATION: 4,620 - 5,200 ft (1409-1585 m).

EXPOSURE: Northeast facing slopes.

SUBSTRATE: Found in sandy soils in sandstone, gravelly soils in calcareous outcrops, and deep alluvial cinders in sandstone breaks.

PLANT COMMUNITY: Great Basin desertscrub with widely spaced shrubs. Associated species include: *Artemisia* (sagebrush), *Atriplex canescens* (four-wing saltbush), *Chrysothamnus* (rabbit-bush), *Ephedra torreyana* (Torrey's Mormon-tea), *E. viridis* (Green Mormon-tea), *Fallugia paradoxa* (Apache-plume), *Gutierrezia* (snakeweed), *Hilaria* (=*Pleuraphis*) *jamesii* (James's Galleta), and *Sporobolus flexuosus* (mesa dropseed).

POPULATION HISTORY AND TRENDS: Unknown.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: Salvage Restricted (ADA, ANPL 1993, 1999)
OTHER STATUS: Bureau of Land Management Sensitive (USDI, BLM AZ 2000, 2005, 2008, 2010).
Group 3 (NNDFW, NESL 2008)
[Group 4 (NNDFW, NESL 2001, 2005)]

MANAGEMENT FACTORS: Most of the known localities for *E. rotundata* are in badly overgrazed areas (Van Devender 1980). This shrub is well adapted to reduce wind erosion and is sometimes planted for this purpose. It also provides shade and protection for annuals by creating a microhabitat within its branches. (Phillips et al. 1981).

Several reasons for endangerment of this species include: naturally rare; restricted habitat; heavy over-grazing; off-road vehicle disturbance.

PROTECTIVE MEASURES TAKEN: Only one population has some protection due to its location on the Wupatki National Monument.

SUGGESTED PROJECTS: Search additional areas for new populations.

LAND MANAGEMENT/OWNERSHIP: BIA – Navajo Nation; BLM – Safford Field Office; NPS – Wupatki National Monument; State Land Department; Private.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

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Arthur M. Phillips – Botanist, Colorado
Barbara G. Phillips – Zone Botanist, USFS, Flagstaff, AZ.
Tom Van Devender – Botanist, Tucson, AZ

ADDITIONAL INFORMATION:

Revised: 2002-05-23 (SMS)
2005-05-05 (SMS)

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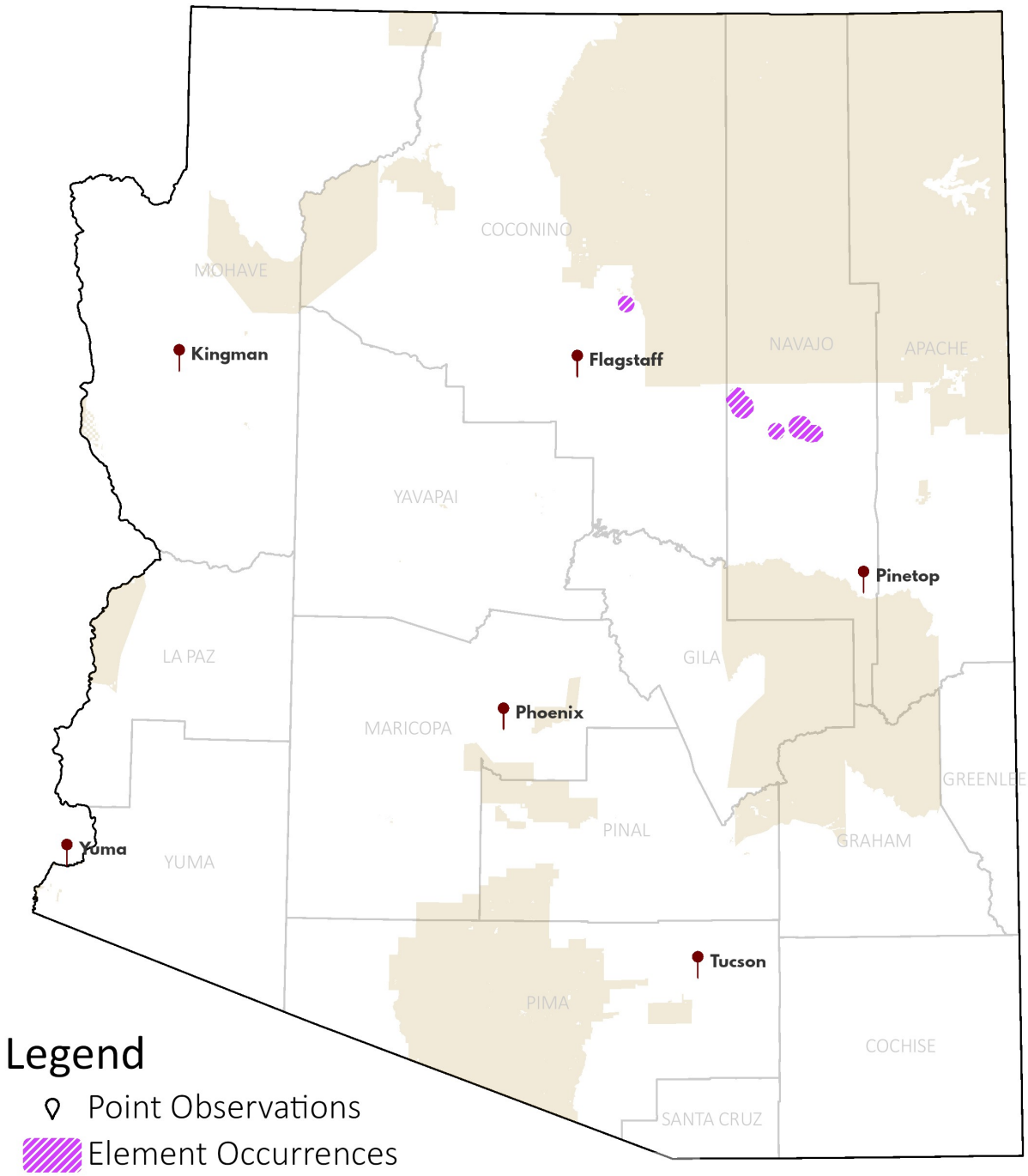
Errazurizia rotundata

Roundleaf Errazurizia



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

0 50 100 Kilometers

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Point Observations are not guaranteed to have been thoroughly quality controlled. Element Occurrence data represent areas where a population occurs.

Heritage Data Management System
2018-02-08

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDAST700D2
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Perityle gilensis* var. *salensis*
COMMON NAME: Gila Rock Daisy, Fish Creek Rock Daisy, Salt River Rock Daisy
SYNONYMS: *Laphamia gilensis* ssp. *longibolus*
FAMILY: Asteraceae

AUTHOR, PLACE OF PUBLICATION: A.M. Powell, Sida 5(2): 104-106, f. 7. 1973. *Laphamia gilensis* ssp. l*ongibolus* Niles in the Mem. N. Y. Bot. Gard. 21: 51-54 1970. Appeared in print after the Powell work had been accepted for publication and therefore is nomenclaturally preceded.

TYPE LOCALITY: Salt River Canyon between Globe and Show low, Gila County, Arizona. Collected by Sikes in 8-1969.

TYPE SPECIMEN: HT: SRSC, S. Sikes, 428, 18 August 1969. IT: SMU, TEX.

TAXONOMIC UNIQUENESS: This taxon is considered the same entity as *Perityle gilensis* var. *longilobus* according to Powell and Yarborough (Phytologia 82: 328, 1997; cf. Kartesz 1999). The correct name at the varietal level is var. *salensis* (described in 1973), not var. *longibolus*, as that combination dates from 1997 (whereas at the subspecies level, the latter taxon dates from 1970). The species *gilensis* is 1 of 35 in the genus *Perityle*. Two varieties of *P. gilensis* occur in Arizona, and include var. *gilensis* and var. *salensis*.

DESCRIPTION: The plant is 30-70 cm (11.8-27.5 in) tall and sprawling. It has thick stems, which are upright to hanging. The stems are 40-50 cm (15.7-19.7 in) tall, becoming purple at the base. The dark green leaves are mostly simple and narrow with entire margins. The middle leaves are divided into 2-3 linear lobes with the middle lobe usually being the largest. The leaves are not hairy and they are 3.5-5.5 cm (10 cm max) long. The flowers are born in heads on rather stout stems, the ray flowers number 8-12 and are 1 cm long and are yellow. The central disc flowers are tubular, 5-6.5 mm long and yellow.

AIDS TO IDENTIFICATION: Its long, extremely narrow leaves and trailing habit distinguish this variety. *Perityle gilensis* var. *salensis* is geographically separated from the typical variety and possesses larger structures as well as a different chromosome number.

ILLUSTRATIONS:
Photo of holotype (Powell 1973, pp 104-106)

Black and White Line Drawing (Niles 1970, pp 52)
Herbarium Mounts: http://swbiodiversity.org/seinet/taxa/index.php?tid=13678.

TOTAL RANGE: Salt River Canyon between Show Low and Globe, Gila County, Arizona.

RANGE WITHIN ARIZONA: See "**Total Range**."

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Herbaceous perennial subshrub or forb/herb.

PHENOLOGY: Flowering July to August, sets seed in mid August. Also reported August to October and spring – fall (Fletcher 1978).

BIOLOGY:

HABITAT: Grows on nearly inaccessible crevices on cliff faces, ledges, rock outcrops; igneous canyon walls.

ELEVATION: 3,000 – 3,800 ft (914-1159 m), based on actual collection records.

EXPOSURE: All plants noted to date have been on a northern exposure.

SUBSTRATE: Igneous bluffs, the parent material has been noted as sandstone and sedimentary, too.

PLANT COMMUNITY: Transition between oak-juniper woodland (*Quercus-Juniperus*) and mountain mahogany-oak scrub (*Cercocarpus-Quercus*) in Interior Chaparral of the scrub formation. Dominant associated species include *Haplopappus spinulosus* (iron plant golden weed), *Opuntia phaeacantha* (prickly pear), *Nolina* sp. (beargrass), and *Peucephyllum schottii* (pigmy-cedar). (Phillips III et al., 1980). Other species in vicinity include scrub oak, *Celtis*, *Ponderosa*, and *Chilopsis*.

POPULATION HISTORY AND TRENDS: Unknown. There is a single known occurrence, with two adjacent source features. Most collection records notes state the plant is scarce or rare. NatureServe considers the variety to be critically imperiled. The author however (A. Michael Powell, in a letter to AGFD HDMS dated January 10, 1980) states that he does not believe the plant is threatened. Many species of *Perityle* have very restricted occurrences.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None (USDI, FWS 1986)
[3C USDI, FWS 1985]
[3C USDI, FWS 1980]
[PE USDI, FWS 1976]

STATE STATUS: None

OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 2013)
[Forest Service Sensitive USDA, FS Region 3 1999]

MANAGEMENT FACTORS: None specified.

PROTECTIVE MEASURES TAKEN: Naturally protected by its isolated habit in cracks and crevices of near vertical to overhanging cliffs.

SUGGESTED PROJECTS: A survey of the Salt River above and below known collections is recommended for a proper evaluation of this species.

LAND MANAGEMENT/OWNERSHIP: USDI Bureau of Indian Affairs (San Carlos and Fort Apache Indian Reservations). Possibly on USDA Forest Service lands (Tonto National Forest).

SOURCES OF FURTHER INFORMATION

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Dr. Michael Powell, Professor Emeritus and Director of the Sul Ross Herbarium, Alpine, TX

A.M. Phillips – Private consultant, Flagstaff, AZ.

ADDITIONAL INFORMATION:

Revised: 2002-12-20 (AMS)
2003-02-14 (SMS)
2019-11-13 (BDT)

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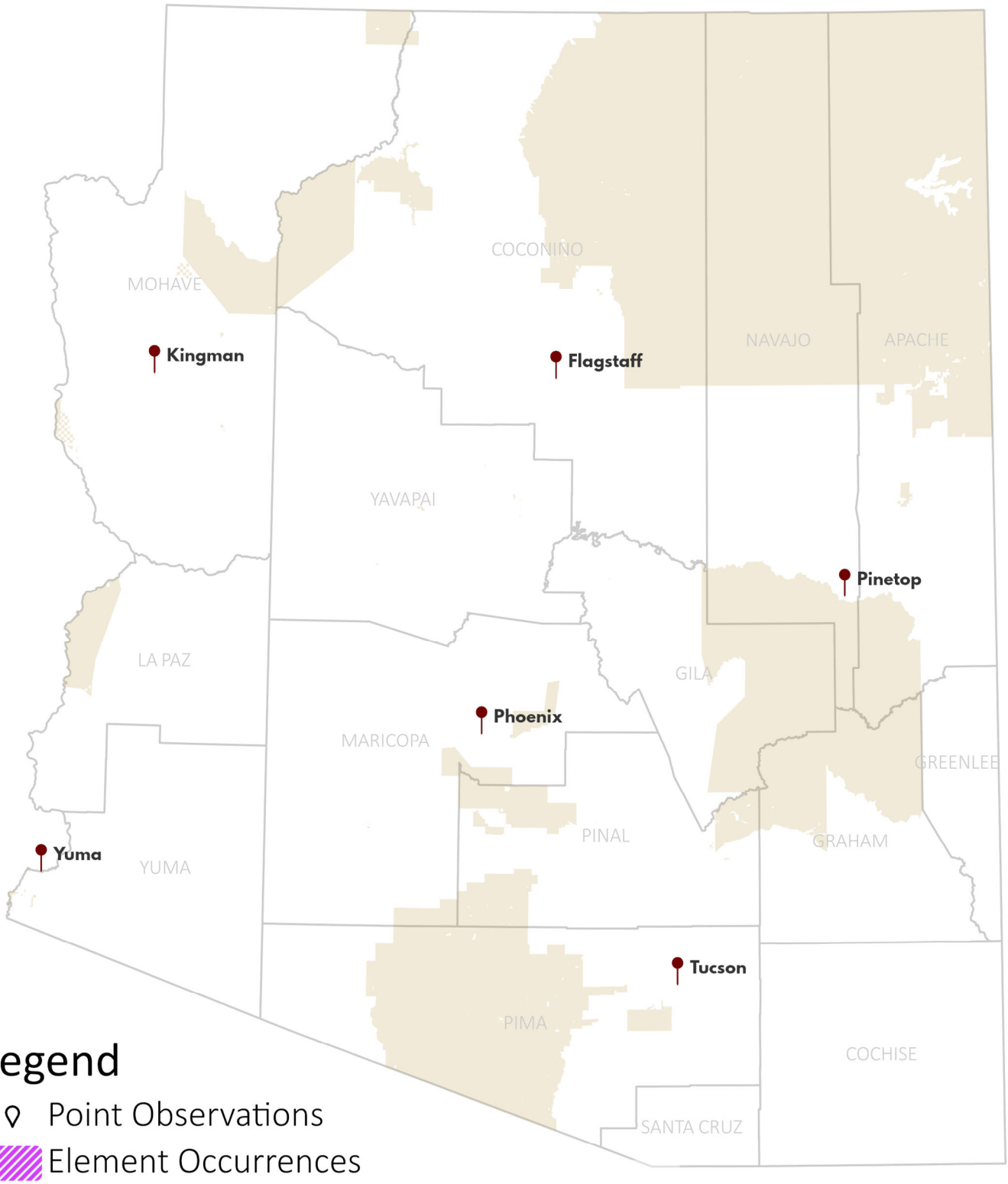
Perityle gilensis var. salensis

Salt River Rock Daisy



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

0 50 100 Kilometers

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences.

Heritage Data Management System
2019-06-13

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDPGN08760
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Eriogonum terrenatum* Reveal
COMMON NAME: San Pedro River wild buckwheat
SYNONYMS:
FAMILY: Polygonaceae

AUTHOR, PLACE OF PUBLICATION: Reveal, Phytologia. 86(3): 144. 2004.

TYPE LOCALITY: San Pedro Riparian National Conservation Area, west of San Pedro River, Cochise County, Arizona, United States of America.

TYPE SPECIMEN: HT: NY-803682. J.L. Reveal 8417 et al., 20 October 2003. IT: ARIZ, ASC, ASU, B, BM, BRY, CAS, COLO, GH, ID, K, MARY, MICH, MO, OSC, RENO, RM, RSA, TEX, UC, UNLV, US, UTC, WTU.

TAXONOMIC UNIQUENESS: Eriogonum terrenatum is part of the subgenus Eriogonum subg. Eucycla, and in the geographic region of Arizona and New Mexico, it is 1 of 28 species of Eriogonum (FNA 1993+).

DESCRIPTION: Erect to sprawling woody shrub, not scapose, 1 - 4(-5) x (1-)2 - 6(-9)dm, floccose to subglabrous or tomentose, greenish. Stems spreading or erect, without persistent leaf bases, up to 2 times the height of the plant; caudex stems absent; flowering stems erect or nearly so, slender, solid, not fistulose, 0.5-3 cm, thinly tomentose. Cauline leaves fasciculate, the leaf-blades linear-oblanceolate or linear-elliptic, 3 - 8(-11) x (0.5-)1 - 2 mm, densely white-tomentose abaxially, thinly floccose to glabrous and greenish adaxially, margins rolled; petioles 0.5-1 mm, glabrous. Inflorescences cymose, compact, 1-3 x 1-3 cm; branches dichotomous, thinly tomentose; bracts 3, scalelike, triangular, (0.5-)1-2 mm. When present, peduncles are erect, 1-8(-11) mm, thinly tomentose. Involucres solitary, campanulate, 3-4.5 x 2.5-3.5 mm wide, thinly tomentose to subglabrous; teeth 5, erect, 0.5-1.2 mm. Flowers are white, glabrous, 3.5-4.5(-5) mm; tepals dimorphic, those of the outer whorl broadly cordate, 2-3 mm wide, rounded apically, those of the inner whorl oblanceolate, 1-2 mm wide, united 1/3 their length; stamens exserted, 3.5-4.5 mm; filaments pilose basally. Achenes trigonous, light brown, 4-4.5 mm, glabrous. (Reveal 2004; FNA 1993+).

AIDS TO IDENTIFICATION: In *Eriogonum terrenatum*, flowers are 3.5-4.5(-5) mm; involucres campanulate, 2.5-3.5 mm wide; plants 1-4(-5) dm; found in Cochise and Pima

counties, Arizona. Whereas, the flowers of *E. pulchrum* are 1.5-2(2.5) mm; involucres narrowly turbinate, 1-1.5 mm wide; plants 0.8-1.2(1.5) dm; found in Apache, Coconino, northeast Mohave, Navajo, and northern Yavapai counties, Arizona. (FNA 1993+).

ILLUSTRATIONS:

Color photos of plant and habitat (James L. Reveal, *in* http://www.life.umd.edu/emeritus/reveal/pbio/eriog/erioeucy/terrenatum.html)
Color photo of Isotype (Reveal et al., US-3459687, *in* http://ravenel.si.edu/botany/types/fullRecords.cfm?myFamily=)
Color photo of Isotype collection (Reveal et al., MO-4472202, *in* http://mobot.mobot.org/cgi-bin/search_vast)
Color photo (Liz Makings, ASU Vascular Herbarium, *in* http://seinet.asu.edu/collections)
Color photo (Marc Baker, ASU Vascular Herbarium, *in* http://seinet.asu.edu/collections)
Color photos of collections (ASU collection records 138242, 138243, 246151, *in* http://seinet.asu.edu/collections)

TOTAL RANGE: Endemic to Arizona, confined to two geographically separate areas, one in Pima County and the other in Cochise County.

RANGE WITHIN ARIZONA: See "**Total Range**."

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Perennial woody shrub.

PHENOLOGY: Flowers summer-fall (Aug-Nov).

BIOLOGY: Can be propagated by seed when ripe or in spring, or by half-ripe cuttings in late summer.

HABITAT: Gravelly soil in *Larrea tridentata* (creosote bush) and *Acacia constricta* communities. In Pima County, the plant is restricted to clayey outcrops of the Pantano Formation, whereas in Cochise County, the plant is confined to the eroded, clay slopes and flats of the Saint David Formation.

ELEVATION: 3,520 – 3,914 ft (1073-1193 m). Per FNA (1993+), elevation ranges from 3,281-3,937 ft (1000-1200 m).

EXPOSURE:

SUBSTRATE: Gravelly clayey outcrops, slopes and flats. Also found in calcarious soil.

PLANT COMMUNITY: Creosote bush communities; *Acacia constricta* dominated Chihuahuan Desert Scrub. Associated species include: *Acacia constricta* (Mescat acacia), *Acacia* sp., *Dyssodia papposa* (fetid dogweed), *Ephedra trifurca* (long-leaf Mormon-tea), *Juniperus* sp. (juniper), *Koeberlinia spinosa* (crown of thorns), *Krameria* sp. (ratany), *Larrea tridentata* (creosote bush), *Menodora* sp., *Prosopis velutina* (Velvet mesquite), *Psilostrophe* sp. (paper-flower), *Sporobolus wrightii* (Wright's dropseed), *Thymophylla acerosa* (prick-leaf dogweed), *Yucca elata* (soaptree yucca), and *Zinnia* sp. (SEINet accessed 2006).

POPULATION HISTORY AND TRENDS: Unknown.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: None
OTHER STATUS: Bureau of Land Management Sensitive (USDI, BLM AZ 2005, 2008, 2010)

MANAGEMENT FACTORS:

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS:

LAND MANAGEMENT/OWNERSHIP: BLM – Tucson Field Office; State Land Department; Private.

SOURCES OF FURTHER INFORMATION

REFERENCES:

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USDI, Bureau of Land management Region 2. 2010. Arizona BLM Sensitive Species List.
U.S. National Herbarium Type Specimen Register (US). http://ravenel.si.edu/botany/types/fullRecords.cfm?myFamily=. Accessed: 4/12/2006.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

Dr. James L. Reveal – Professor Emeritus, University of Maryland. Also Cornell University.
John Anderson – Bureau of Land Management, State Office, Phoenix, Arizona.

ADDITIONAL INFORMATION:

Revised: 2006-04-20 (SMS)

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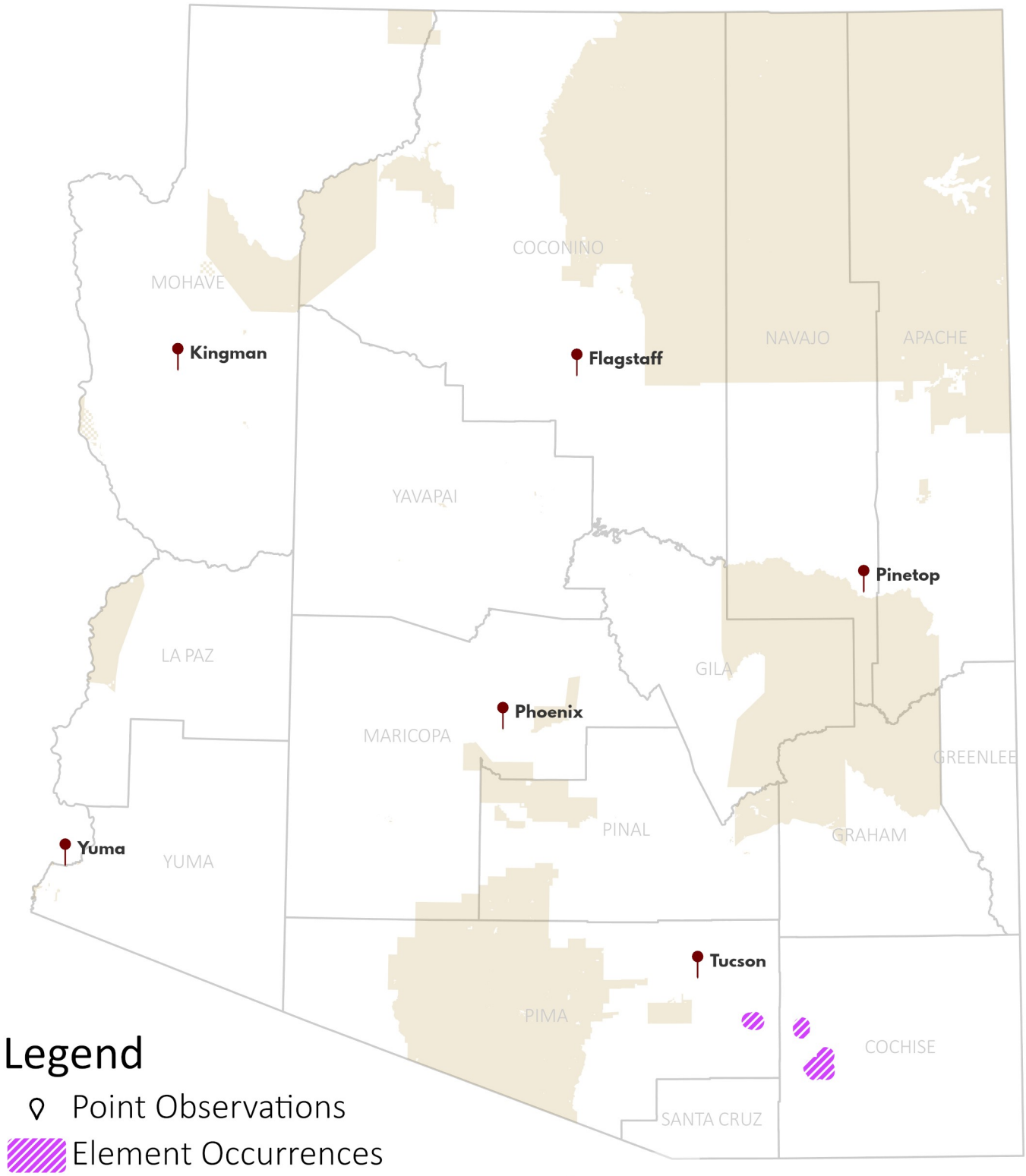
Eriogonum terrenatum

San Pedro River Wild Buckwheat



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

Kilometers

0 50 100

ARIZONA GAME & FISH

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences.

Heritage Data Management System
2019-06-13

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDAST3M580
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Erigeron anchana*
COMMON NAME: Mogollon Fleabane, Sierra Ancha Fleabane
SYNONYMS: *Erigeron pringlei* Gray (in part)
FAMILY: Compositae

AUTHOR, PLACE OF PUBLICATION: G. Nesom, Phytologia. 69(3): 227-235. 1990.

TYPE LOCALITY: Devils Chasm, Sierra Ancha Mountains, Gila County, Arizona. Scattered on granite cliff face near canyon bottom, 3,600 feet. 7 August 1981.

TYPE SPECIMEN: HT: ARIZ 232654. G. Yatskievych, Windham & Hevly, 81-305. 7 August 1981. IT: TEX.

TAXONOMIC UNIQUENESS: A 1990 revision of *E. pringlei* by Guy Nesom at the University of Texas at Austin, split the species into four taxa: *E. pringlei, E. heliographis, E. saxatilis*, and *E. anchana*. All are restricted to mountains within Arizona. Each species is morphologically as well as geographically distinct. "The four species of the *E. pringlei* group might be treated as geographic entities within a single species, where they would be given formal status as varieties. The differences among them however, are consistent with the degree of difference found among other groups of similar, closely related species of North American *Erigeron* traditionally recognized as distinct" (Nesom 1990). *E. anchana* is the largest of the "*pringlei*" complex, and is 1 of 171 species in the genus *Erigeron*.

The long branches of the central Arizona populations of *E. pringlei* show strong similarity to *E. anchana*. However, the exact pattern of relationship between them or any species of the *E. pringlei* group is not clear (Nesom 1990).

DESCRIPTION: Perennial herb from a thick taproot, with somewhat woody caudex. Plants with several crowded, thick, caudex branches 2.0-3.0 cm (0.8-1.2 in.) long. Persistent leaf bases from previous year's caudex branches, gives plant a very "rough" appearance. Stems are 7-22 cm (3-9 in) long (up to 15 cm long in Falk & Jenkins et al. 2001), ascending to somewhat pendant, usually with a few branches above the middle. Stems and leaves are nearly glabrous to sparsely pubescent. Basal leaves entire, obovate, 2-3 cm (0.8-1.2 in.) long, 4-8 mm wide, cauline leaves (born on the stem) only smaller. Flowers are small heads 5-7 mm wide, with ray flowers white to lavender in color, and disc flowers with orange-resinous veins; rays flowers 24-36. Involucral bracts in 3-4 series, often purplish, and also with

orange-resinous veins; pappus of 19-26 persistent bristles, the longest 2.3-2.6 mm. (Nesom 1990, Falk & Jenkins et al. 2001).

AIDS TO IDENTIFICATION: The small size (mostly less than 15.0 cm [6.0 in.] tall), persistent petioles (leaf bases) from the growth of the previous year, and stout, nearly woody caudex identifies the *E. pringlei* group. The purple-tinged phyllaries and ligules of *E. anchana* distinguish it from *E. kuschei.* The petioles of *E. anchana* are twice as long than *E. pringlei*. The pappus bristles are more numerous in *E. anchana* (19-26), and the orange-resinous veins are also unique to *E. anchana*.

ILLUSTRATIONS: Line drawing (B. Dennis, in Falk & Jenkins et al. 2001)
Color photos (Barb Phillips, in Falk & Jenkins et al. 2001)

TOTAL RANGE: Known mainly from the mountains of central Arizona, Gila County, including the Sierra Ancha, Pine, Mazatzal, and Mescal mountains. One location from the Superstition Mountains in Pinal County. The Sierra Ancha's are the center of their range.

RANGE WITHIN ARIZONA: See "**Total Range**."

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Herbaceous perennial.

PHENOLOGY: Flowers May-July, sometimes to November.

BIOLOGY: Probably a fairly long lived plant able to deal with drought conditions.

HABITAT: Granite cliff faces, chaparral through pine forests (Falk & Jenkins et al. 2001). Rock crevices or ledges on boulders and vertical rock faces, usually in canyons.

ELEVATION: 3,500 - 7,000 ft. (1068 - 2135 m).

EXPOSURE: All aspects of 20-90 degrees.

SUBSTRATE: Igneous or metamorphic granites. Also can be found on limestone (including travertine), quartzite, and rhyolite.

PLANT COMMUNITY: Chaparral; pinyon/juniper woodland; pine-oak forest. Dominant associated species include: *Abies concolor* (white fir), *Acer grandidentata* (bigtooth maple), *Acer negundo* (boxelder), *Alnus oblongifolia* (Arizona alder), *Amorpha californica* (stinkingwillow), *Anisicanthus thurberi* (birdshade), *Celtis reticulata* (paloblanco), *Cheilanthes* sp. (lipfern), *Cimicifuga arizonica* (Arizona bugbane), *Cornus stolonifera* (red-osier dogwood), *Cynodon dactylon* (Bermudagrass), *Erigeron saxatilis* (rock fleabane),

Fraxinus pennsylvanica ssp. *velutina* (velvetskirt ash), *Galium* sp. (bedstraw), *Juglans major* (Arizona walnut), *Juniperus* sp. (Juniper), *Maurandya* sp. (lizard tail), *Pachystima myrsinites* (mountain-lover boxleaf), *Penstemon* sp., *Phleum pratense* (blue timothy), *Platanus wrightii* (Arizona sycamore), *Pseudotsuga menziesii* (Douglas-fir), *Quercus gambelii* (gambel oak), *Quercus* sp. (oak), *Robinea neomexicana* (New Mexico locust), *Rubus* sp. (berry), *Salix* sp. (willow), *Sambucus* sp. (elder), *Setaria* sp. , *Smilicina* sp. (Solomon-plume), *Solidago* sp. (goldenrod), and *Toxicodendron rydbergii* (poison-ivy).

POPULATION TRENDS: Apparently *E. anchana* is locally abundant in the Sierra Ancha Mountains, the center of its distribution (Nesom 1990).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None (USDI, FWS 1996)
[C2 USDI, FWS 1993]

STATE STATUS: None

OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 1999)

MANAGEMENT FACTORS: Occurs on relatively inaccessible rock cliffs. Potential impacts from trails and recreation.

CONSERVATION MEASURES TAKEN: Tonto Natural Bridge State Park protects one population.

SUGGESTED PROJECTS: Survey potential habitat in Santa Theresa and Galiuro mountains. Map occupied and potential habitat (definitive habitat, easily recognized); monitor numbers of plants at several sites.

LAND MANAGEMENT/OWNERSHIP: USFS - Tonto National Forest; Arizona State Parks - Tonto Natural Bridge State Park; Private. Not known from the Coronado National Forest, but potentially in the Santa Theresa and Galiuro mountains.

SOURCES OF FURTHER INFORMATION

REFERENCES:

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Steve McLaughlin - University of Arizona, Tucson.
Guy Nesom - University of Texas, Austin.
Barb Phillips - Coconino National Forest, Flagstaff, Arizona.

ADDITIONAL INFORMATION:

E. heliographis: above 8,250 feet on rocks within mixed conifer forest.
E. anchana: cliffs and rocks from about 3,500 to 7,000 feet in various vegetation types.
E. saxatilis: About 4,400 to 7,000 feet in canyons along the Mogollon Rim.
E. pringlei: cliffs and rocks from about 5,500 to 9,200 feet.

E. pringlei would include the type specimen and other plants from the Santa Rita Mountains and mountains of central Arizona. *E. heliographis* is a diminutive form found at high elevations in the Pinaleno Mountains. *E. saxatilis* is a rare form collected from Oak Creek Canyon and Little Eden Mountain near Flagstaff. Most other sub-Mogollon Rim populations would be called *E. anchana*. The latter includes populations from Sierra Anchas, Pine, Mazatzal and Mescal mountains, and Pine Canyon (Tonto Bridge).

Revised: 1991-11-05 (PLW)
1992-09-23 (BKP)
1997-07-28 (SMS)
2003-10-09 (SMS)

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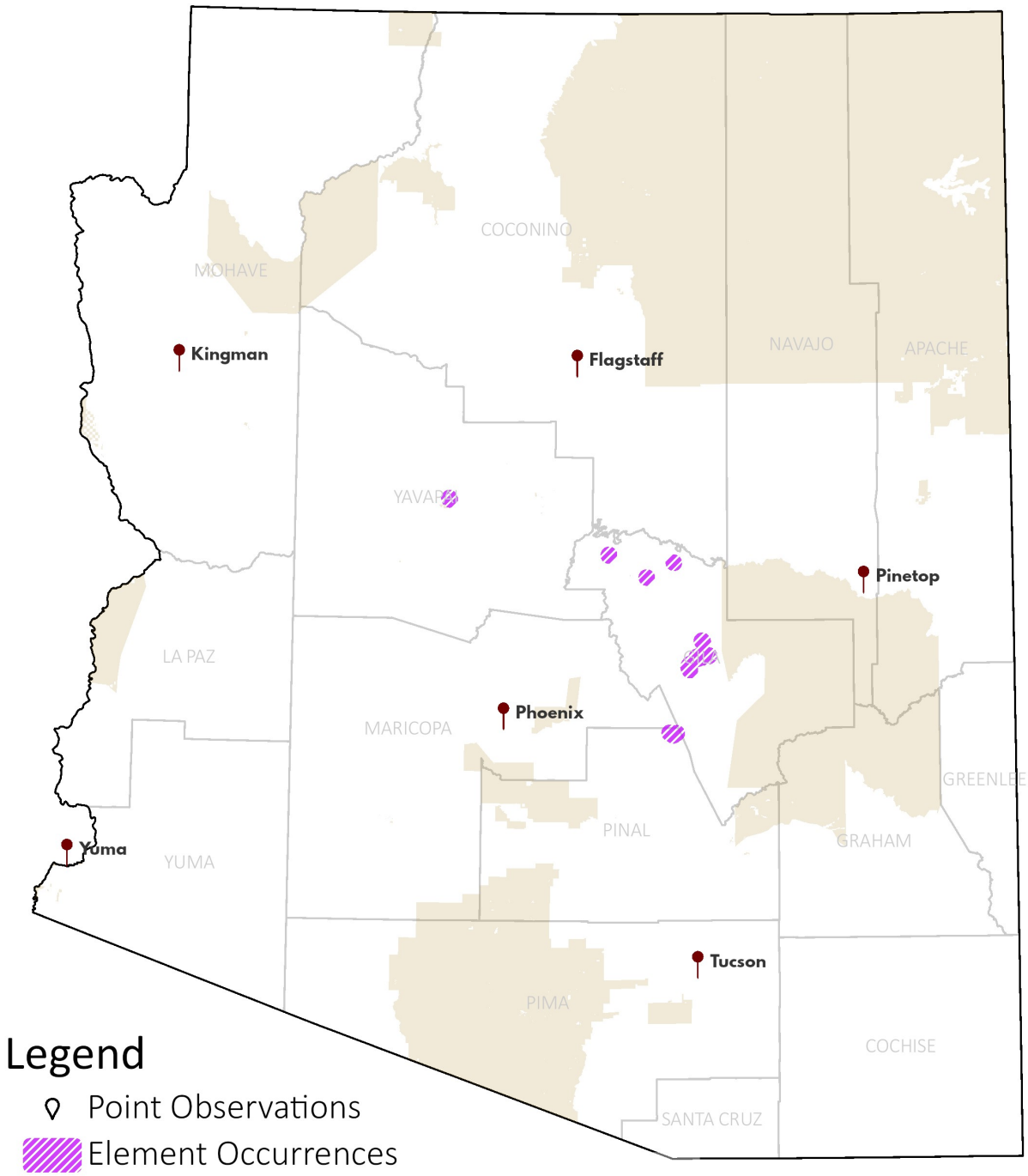
Erigeron anchana

Mogollon Fleabane



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

0 50 100 Kilometers

ARIZONA GAME & FISH

Point Observations are not guaranteed to have been thoroughly quality controlled. Element Occurrence data represent areas where a population occurs.

Heritage Data Management System
2018-02-08

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PMORC1C050
Data Sensitivity: YES

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Hexalectris warnockii*
COMMON NAME: Texas Purple Spike, Texas Crested Coralroot
SYNONYMS:
FAMILY: Orchidaceae

AUTHOR, PLACE OF PUBLICATION: Ames and Correll, Botanical Museum Leaflets 11(1): 8. 1943.

TYPE LOCALITY: Blue Creek Canyon, Chisos Mountains, Brewster County, Texas.

TYPE SPECIMEN: Warnock, B. H. (#2597).

TAXONOMIC UNIQUENESS: There are 9 species in the genus *Hexalectris*, 4 of which occur in Arizona.

DESCRIPTION: Perennial saprophyte from slender rhizome, with erect, leafless dark-reddish stem up to 30.0 cm (1.0 ft.) tall. Inflorescence of up to 7 **rich reddish purple flowers (distinctive characteristic)**, no green. Sepals and petals deep purple or maroon, 1.5-2.0 cm (0.6-0.8 in.) long). Dorsal sepal 17.0 mm (0.68 in.) long and 3.0 mm (0.12 in.) wide. Petals oblanceolate to linear-spatulate; lip (lowest) white with 3 lobes, broadly oval, 14.0 mm (0.56 in.) long and wide, lateral lobes pale pink (Correll and Johnston 1970 state "veined with purple"). Capsules 1.5 cm (0.6 in.) long and 0.5 cm (0.2 in.) wide. Coleman (1999), reports "sepals and petals purple; lip, three lobed, lateral lobes curl upwards, mostly purple from heavy veining, central lobe white with five ridges down the center crested with yellow, apex with purple spot and wavy margins."

AIDS TO IDENTIFICATION: *Hexalectris warnockii* flowers later than all other *Hexalectris* species in Arizona. *H. warnockii* differs from *H. spicata* in having fewer flowers per spike (less than 8) and with the lip crests scalloped and more or less divided. *Corallorhiza wisteriana* is about the same height, but flowers are much smaller, lip is entire and without ridges; and blooms earlier in late spring and early summer (Coleman 1999).

ILLUSTRATIONS:
B&W photos of plant in habitat (Luer, 1975: figs.1-3, p.274).
B&W photos of flower (Luer, 1975: figs.4-5, p.274).
Color photos (M. Wilson, SEINet)

TOTAL RANGE: Western Texas (Chisos and Davis mountains; Fern Canyon near Alpine; and 75 miles west of Austin), New Mexico, southeastern Arizona, Coahuila, Sonora and Baja California, Mexico (Catling 2004). An observation uploaded to iNaturalist from 2019 also puts this species in Monterrey, Mexico, which is a range expansion in Mexico (iNaturalist 2020).

RANGE WITHIN ARIZONA: Cochise County: Chiricahua Mountains, Rhyolite Canyon, Chiricahua National Monument (for a long time, this was sole site); Mule Mountains (Wentworth 1982, Catling 2004); and two sites in the Huachuca Mountains (Oversite and McClure Canyons). The Mule Mountain locality is based on a photograph (slide) confirmed by Ron Coleman, sent to him by Wentworth (Wentworth 1982, Baker 2003, Catling 2004, SEINet 2020).

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Herbaceous Perennial

PHENOLOGY: Spikes emerge in late July to early August; flowers open in early to mid-August. Individual plants usually do not bloom in successive years (Coleman 1999).

BIOLOGY: Like other members within *Hexalectris*, *H. warnockii* is fully mycoheterotrophic. For most of the year, the plant is underground, only emerging aboveground in the form of a flowering spike. Kennedy and Watson showed that *H. warnockii* is a morphologically distinct lineage within *Hexalectris* (2010), and, as is the emergent pattern with fully mycoheterotrophic plants, *H. warnockii* associates strictly with fungal members of Thelephoraceae (other members within this genus associate with other fungal families) (Kennedy et al. 2011). Floral morphology also sets *H. warnockii* apart from all other members of *Hexalectris.*

HABITAT: In humus beneath rocks and fallen oaks along streambeds.

ELEVATION: 5,000 - 7,000 feet (1525 - 2135 m).

EXPOSURE: Shady canyon bottoms up to slope in oak-mixed conifer leaf litter.

SUBSTRATE: Rich humus soil. Quartzite in Oversight Canyon, McClure Canyon probably quartzite also (Warren 1994).

PLANT COMMUNITY: Mixed oak woodland. Forest cover is mostly silverleaf oak with some pines, madrones, and manzanita (Coleman 1999).

POPULATION TRENDS: Unknown. The plants that were observed in 1992 on the Coronado National Forest have not been seen during subsequent searches from 1995 through 1999

(Coleman 2002). The IUCN lists this species as globally Endangered, with less than 250 individuals worldwide (Goedeke et al. 2015).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None (USDI, FWS 1996)
[Category 2 (USDI, FWS 1993)]

STATE STATUS: Highly Safeguarded (ARS, ANPL accessed 2011)
[Highly Safeguarded (ARS, ANPL 1993)]

OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 2013)
[Forest Service Sensitive (USDA, FS Region 3 1999, 2007)]
Bureau of Land Management Sensitive (USDI, BLM AZ 2017)
[Bureau of Land Management Sensitive (USDI, BLM AZ 2005, 2008, 2010)]

MANAGEMENT FACTORS: Protect from collection. Protect from maintenance activities at Chiricahua National Monument (one site next to management headquarters). Probably not of concern to BLM. This plant found at higher elevations in leaf litter. Coleman stated that this species is "one of the most difficult of southwestern orchids to see", which may lend to its patchy distribution (2002). Fruit set is also rare in this species.

PROTECTIVE MEASURES: One of the four localities in Arizona is within the Chiricahua National Monument, and another is on Fort Huachuca; this offers some protection to the plants located there.

SUGGESTED PROJECTS: Survey and monitor known populations to determine status. Survey locality on Coronado National Forest as it was not found between 1995 and 1999 (Coleman 2002). Get information about Texas populations. Targeted surveys within southern Arizona may yield new localities, as has been the case for *H. colemanii* and *H. arizonica*.

LAND MANAGEMENT/OWNERSHIP: BLM - Tucson Field Office; DOD Fort Huachuca Military Reservation; NPS - Chiricahua National Monument; USFS - Coronado National Forest.

SOURCES OF FURTHER INFORMATION

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Steve McLaughlin - University of Arizona, Office of Arid Lands Studies, Tucson.
Jackie Poole - Texas Parks and Wildlife Department.

ADDITIONAL INFORMATION:

Revised: 1991-10-30 (PLW)
1991-11-13 (SR)
1994-12-14 (DBI)
1998-01-08 (SSS)
1998-12-04(DJG)
2001-12-21 (SMS)
2020-08-07 (TME)

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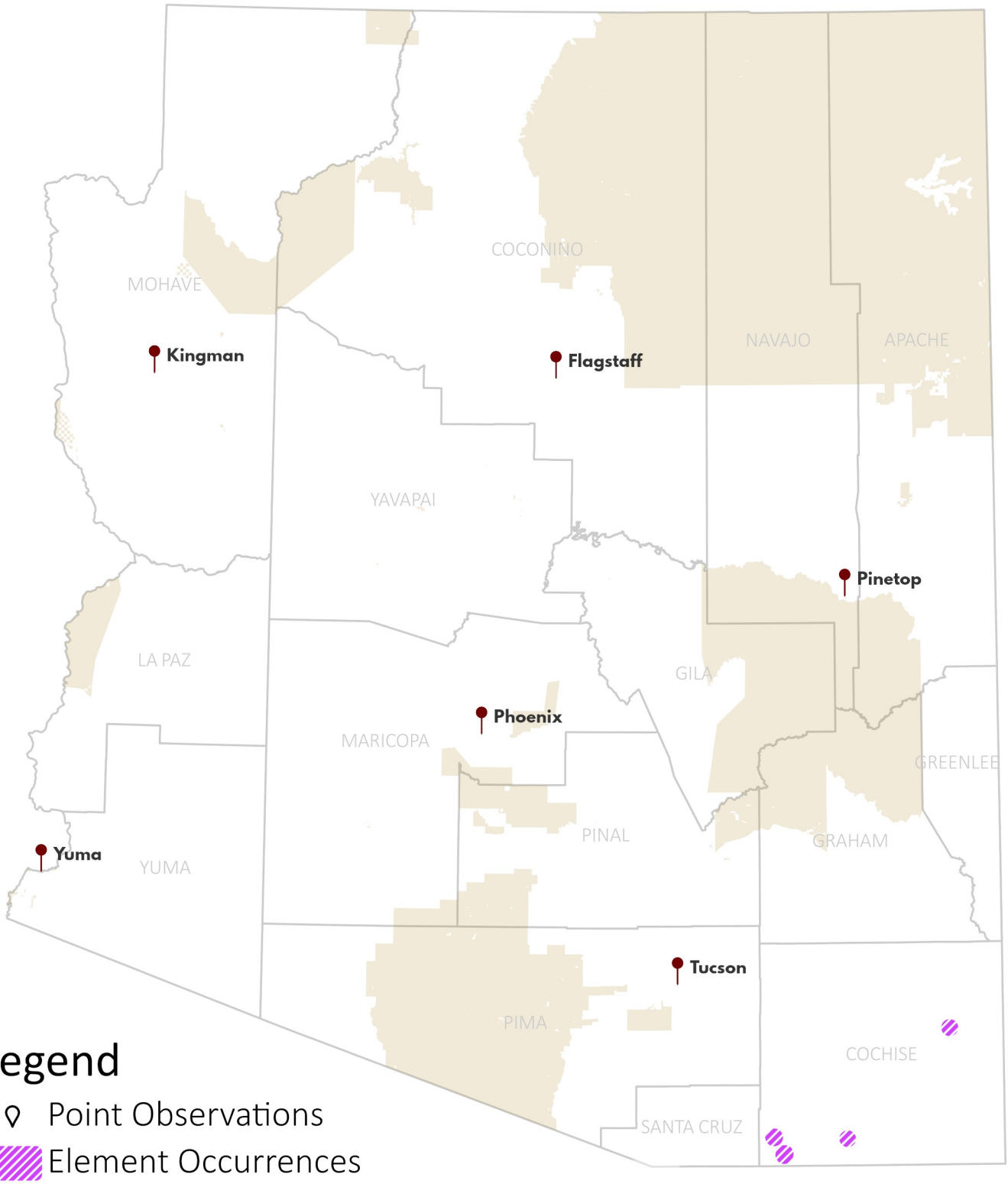
Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

Hexalectris warnockii

Texas Purple Spike



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

Kilometers

0 50 100

ARIZONA GAME & FISH

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences.

Heritage Data Management System
2019-06-13

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PMAGA010W0
Data Sensitivity: YES

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Agave delamateri*
COMMON NAME: Tonto Basin Agave, Rick's Agave
SYNONYMS: *Agave* sp. nov. /ined
FAMILY: Agavaceae

AUTHOR, PLACE OF PUBLICATION: Hodgson, W.C. and L. Slauson, Haseltonia 3: 133-140, f. 1-5. 1995.

TYPE LOCALITY: Arizona, Gila County, Foothills of the Sierra Ancha Mountains, above Tonto Basin, 5.25 miles E of Hwy. 188 and Punkin Center, 500-700 yards SE of FSR 71.

TYPE SPECIMEN: ASU 20608 (Isotype). Wendy C. Hodgson #5478. July 7, 1989.

TAXONOMIC UNIQUENESS: The species *delamateri* is 1 of 25 in the genus *Agave*. There are another 23 subspecies or varieties. Fourteen of the species are found in Arizona, and eight are only found in the state.

This species was first discovered by Susan McKelvey in the 1920's and rediscovered by Rick Delamater in 1988. It was not formally described until 1995 by Wendy Hodgson and Liz Slauson. "*Agave delamateri* appears to be most closely related to *A. fortiflora* and *A. palmeri*" (Hodgson and Slauson 1995). *Agave delamateri* separated from *A. palmeri* and *A. fortiflora* by distinct distribution and flower morphology and measurements (Hodgson and Slauson 1995). *Agave delamateri* may be another species disseminated further north by man (Hodgson 1994). It hybridizes with *A. chrysantha* in Yavapai County, Arizona (ARPC 2001).

DESCRIPTION: Large, suckering perennial succulent with very tall, open, unfruited flower stalk 4.5 – 6 m (14.75-19.7 ft) tall. Dense rosette of bluish-gray/green leaves with purple/maroon tinge, erect, conspicuously incurved at apex, about 50.0 - 74.0 cm (20.0 - 29.0 in.) long, 7.0 - 9.0 cm (2.8 - 3.6 in.) wide; conduplicate (U-shaped folding one leaf around the next younger leaf). Marginal teeth on leaves are straight to recurved, to 6.0 mm (0.24 in.) long, slender, dark brown or gray in color; terminal spine to 3.5 cm (1.4 in.) long. Inflorescence is broadly paniculate with 12 – 27 widely spaced, long branchlets on the upper half of stalk; without fruits ("naked"). Lateral branches, perpendicular to main flowering stalk. Flowers robust, 4.7-7.0 cm (1.85-2.76 in) long, pale cream tinged with light green, in clusters of 14 - 20. The outer tepals are ovate, longer and narrower than inner tepals, light cream-green with maroon-rust, rugose, hooded tips. The filaments are inserted in the tube at the same level. Closed appearance.

AIDS TO IDENTIFICATION: "*Agave delamateri* is distinguished from *A. fortiflora* and *A. palmeri*, by its numerous rhizomatous offsets, easily cut leaves, and 1-, not 2-seriate filaments. It further differs from *A. fortiflora* in having glaucous purple-tinged leaves, greenish-ochroleucous, apically rusty-maroon tepals and slightly flattened, maroon rather than strap-shaped, yellow filaments. In addition, it differs from *A. palmeri* in having broadly lanceolate, apically **incurved** rather than lanceolate or linear-acuminate straight leaves, more numerous lateral branches in the inflorescence, and in its wider perianth tube and longer tepals" (Hodgson and Slauson 1995). *Agave palmeri* has similar teeth but leaves are more linear, splay out, and not erect. *Agave delamateri* can be confused with *A. chrysantha*, which has leaves 5.0 - 10.0 mm (0.2 - 0.4 in.) long, splayed out and larger marginal teeth. Inflorescence branches of *A. chrysantha* are ascending, not perpendicular. Flower similar to *A. palmeri*, but longer. At a distance, look for isolated stalks not eaten by livestock. Distribution of these species is also distinct.

ILLUSTRATIONS:

Black and White Drawing (Hodgson and Slauson 1995: Fig. 1, P. 131).
Photos (Hodgson and Slauson 1995: Fig. 3-5, Pp. 133-134).
Black and White line drawing (ARPC 2001).
Color photos of plant and habitat (ARPC 2001).
Color photos, plant and habitat: http://swbiodiversity.org/seinet/taxa/index.php?tid=1466.
Color photos: http://www.naturesongs.com/vvplants/tontoagave1.html.

TOTAL RANGE: Small geographic area in Central Arizona.

RANGE WITHIN ARIZONA: Two primary distributions centers: north and northwest, and southeast of Roosevelt Lake in west-central Gila County and northeast Maricopa County, and the Verde Valley from Camp Verde to Cottonwood in northeast Yavapai County.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Perennial succulent.

PHENOLOGY: Inflorescences begin to emerge in May and early June, and mature in late June through July with flowers on the lowermost lateral branches opening first. This plant is monocarpic with synchronized flowering. Flowers usually abort early. Seed capsules and seeds are not known. No bulbils produced. The Tonto Basin Agave reproduces by pups formed at the base of the parent plant.

BIOLOGY: Occurs as isolated clones. Flowers in summer, with flowers usually aborting early. Flower and fruit development may be inhibited due to climatic conditions. Anthers will not emerge from sepals if season has been dry. Produces rhizomatous off-sets prolifically. Virtually no variation among individual plants. As with most *Agaves*, *A. delamateri* is probably self-incompatible. Clones may be hundreds of years old.

As with other Agaves, roots are shallow and spreading to derive maximum benefit from light rains and other habitat conditions that limit moisture to upper soil layers. The outwardly radial arrangement of leaves intercepts rainfall and conducts it toward the base and roots of the plant center. A thick waxy cuticle covering the leaves conserves moisture. Nighttime opening of leaf stomates also prevents water loss through transpiration during the hotter daylight hours.

The naked flowering stalk is rarely eaten by cattle or wildlife.

HABITAT: Usually found atop benches (often high benches), at edges of slopes, and on open hilly slopes in desert scrub, overlooking major drainages and perennial streams, from 2,350-5,100 ft (725-1554 m) elevation. Occasionally found in chaparral or juniper-grassland. Found in direct or indirect association with archaeological features, including multi-room foundations and also above check dams and linear alignments. As with most *Agaves*, *A. delamateri* requires a well-drained soil, being susceptible to root-rot.

ELEVATION: 2,190 to 5,150 ft. (668 - 1570 m), based on AGFD, HDMS records accessed in 2019.

EXPOSURE: Usually south and southwest facing slope edges (atop benches); also on northeast facing gentle slopes.

SUBSTRATE: Cobbly and gravelly, deep and well-drained soils. These often occur on conglomerate benches in the Tonto Basin area, including limestone soils.

PLANT COMMUNITY: Arizona Upland Subdivision of Sonoran Desertscrub. Associates include *Carnegiea gigantea, Prosopis, Juniperus, Gutierrezia, Fouqueria splendeus, Calliandra eriophylla, Menodora scabra, Echinocereus fasciculatus* (both var. *fasciculatus* and *bonkerae*), *Erodium cicutarium*, and occasionally *Rhus trilobata, Opuntia engelmannii, Canotia holacantha, Yucca baccata*, and *Psilostrophe*. A few sites occur in Interior Chaparral and Great Basin Conifer Woodland as defined by Brown (1982).

POPULATION TRENDS: The greatest concentration of sites occurs near the northwest end of Roosevelt Reservoir in an area referred to as Tonto Basin, situated between the Sierra Ancha and Mazatzal Mountains (Hodgson and Slauson 1995). Approximately 70 plants are known from the Tonto Basin. In all, 90 clones are known, all in direct or indirect association with Mogollon or Salado agricultural and settlement features, suggesting cultivation by pre-Columbian people (DBG 2001). As of 2019, the AGFD HDMS has records of 94 occurrences. The species is considered to be imperiled by NatureServe (2019).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None (USDI, FWS 1996)
[C2 under *Agave* sp. nov./ined (USDI, FWS

1990, 1993)]

OTHER STATUS: Highly Safeguarded (ARS, ANPL 2016)
[Highly Safeguarded (ARS, ANPL 1993)]
Forest Service Sensitive (USDA, FS Region 3 2013)
[Forest Service Sensitive USDA, FS Region 3 1990, 1999]

MANAGEMENT FACTORS: *Agave delamateri* is known only from in and around archaeological sites in the Tonto Basin and Verde Valley in the Sonoran Desert in Arizona. It was cultivated during pre-Columbian times when various traits were selected for by the people managing the crop which lead to divergence from its closest wild ancestor (Parker et al. 2007). Referred to as a 'cultigen,' this species is only from approximately 90 clones, does not reproduce sexually and has lower genetic diversity compared to other Agaves. It is threatened by urban sprawl, creation of reservoirs, recreation activities, road improvements and realignments, and a fungus transported by the snout agave weevil (NatureServe 2019).

The arid conditions of May and June can cause physiological stress. Another threat is the snout agave weevil which spreads a fungus which can damage plants. The lack of asexual reproduction and low genetic diversity (Parker et al. 2007) can be problems in among themselves but also make the species more vulnerable to climate change as it occurs in the desert.

CONSERVATION MEASURES TAKEN: The species is classified as "Highly Safeguarded" under the Arizona Native Plant Law, and is listed as a "Sensitive Species" by the USDA Forest Service. Under Arizona Law, it can not be collected or moved without a special permit and the sensitive species status means that the plant must be considered in forest management plans.

SUGGESTED PROJECTS: Expand surveys, on upper cobbly benches by Verde Valley and tributaries; San Carlos Indian Reservation near Gila and upper Salt rivers; especially near archaeological sites along major drainages, including southern Arizona and the Coronado National Forest. Map individual plants within a clone and monitor survival of these plants for population trends; determine evolutionary origin.

LAND MANAGEMENT/OWNERSHIP: BIA – San Carlos Reservation; USFS – Coconino, Prescott, and Tonto National Forests; NPS – Montezuma Well NM; Private.

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Threatened Species; Notice of Review. Proposed Rule. Federal Register 61(40):7596-7613.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

Wendy Hodgson - Desert Botanical Garden, Phoenix, Arizona
Liz Slauson - Desert Botanical Garden, Phoenix, Arizona

ADDITIONAL INFORMATION:

Desert Botanical Garden (Phoenix) conducted pollination studies (using pollen from other clones) which was unsuccessful.

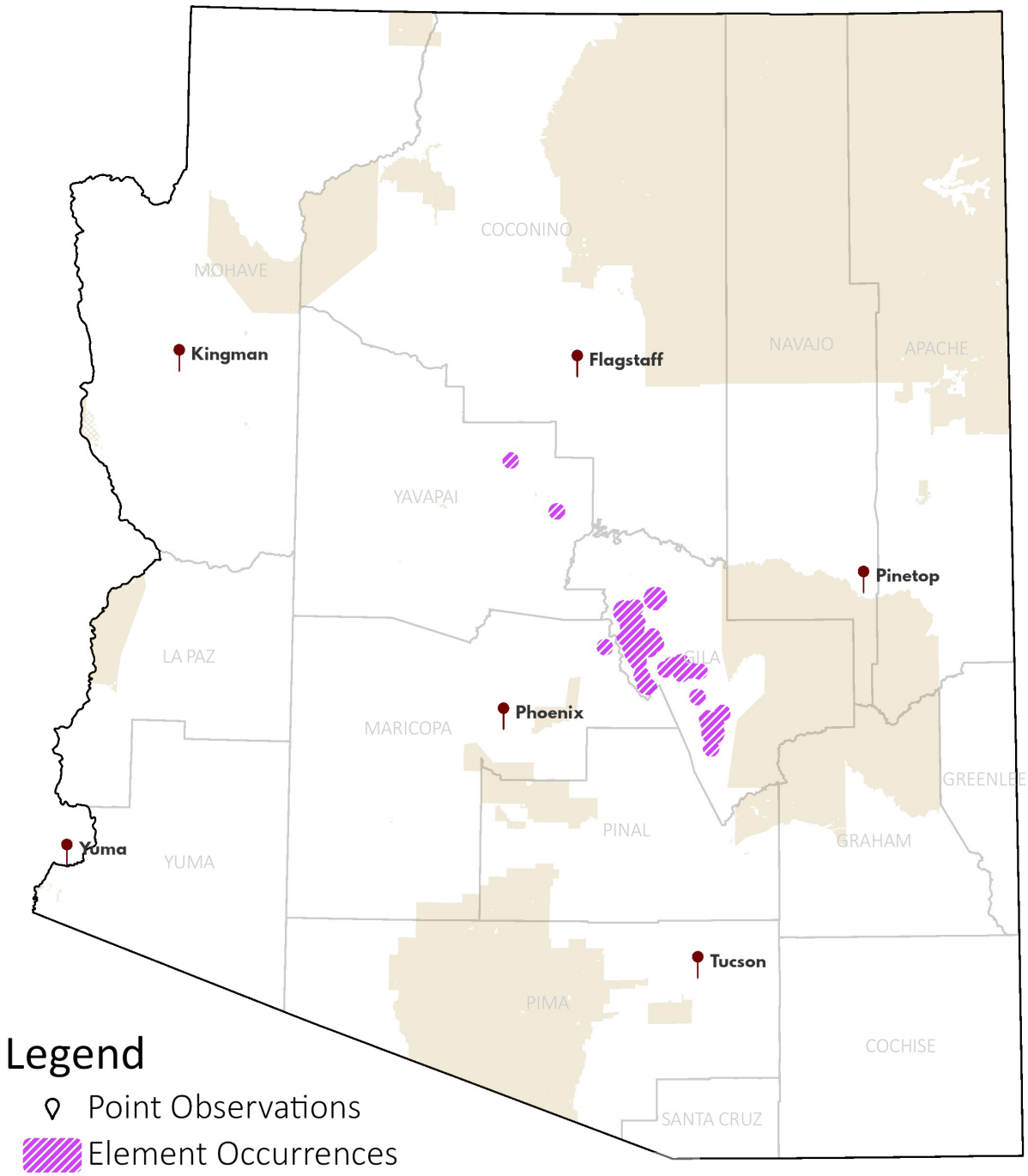
Hodgson (Special Status Plant Workshop, Verde Valley April 17, 1993) suggested that these plants (like *A. murpheyi*) were grown during pre-Columbian times, but were grown on benches above drainages where check dams and alignments were found for growing more drought-intolerant crops. This occurrence of cultivation, was believed to have been grown by Hohokam and Salado cultures for food, fiber, and trade (ARPC 2001)

This species originally found by Susan McKelvey. Trelease wanted to call it *A. repanda*.

Revised: 1990-12-06 (SR)
1991-10-18 (BKP)
1992-09-15 (BKP)
1995-02-28 (WCH)
1997-04-08 (BGP)
1997-04-21 (SMS)
2003-05-08 (SMS)
2019-10-24 (BDT)

Agave delamateri

Tonto Basin Agave



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

0 50 100 Kilometers

Point Observations are not guaranteed to have been thoroughly quality controlled. Element Occurrence data represent areas where a population occurs.

Heritage Data Management System
2018-02-08

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDAST8H274
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Packera neomexicana* var. *toumeyi* (Greene) D.K. Trock & T.M. Barkl.
COMMON NAME: Toumey groundsel
SYNONYMS: *Senecio neomexicanus* var. *toumeyi* (Greene) T.M. Barkley, *Senecio toumeyi* Greene.
FAMILY: Asteraceae

AUTHOR, PLACE OF PUBLICATION: *Packera neomexicana* var. *toumeyi* (Greene) D.K. Trock & T.M. Barkl, SIDA, Contributions to Botany (1998). 385-387. *Senecio neomexicanus* var. *toumeyi* (Greene) T.M. Barkley, North Amer. Flora Series 2, 10: 91. 1978. *Senecio toumeyi* Greene, Pittonia 3: 349. 1898.

TYPE LOCALITY: Arizona: Chiricahua Mountains. Toumey in 1896.

TYPE SPECIMEN: HT: ND-G. Toumey s.n., no date.

TAXONOMIC UNIQUENESS: Between 2,000 and 3,000 species of this genus found worldwide, approximately 120 taxa in temperate North America, about 26 species in Arizona. Epple (1995) reports 24 species of *Senecio* in Arizona.; *P. neomexicanus* is one of the most widely distributed and abundant. The *var. toumeyi* is generally found at higher elevations in the Chiricahua and Pinal mountains than *var. metcalfei* or *mutabilis.* Kartesz (1998, in NatureServe 2004), "considers it questionably distinct taxonomically".

DESCRIPTION: Herbaceous perennial, 2-4(0.5-7) dm (8-16[2-28] in) tall, with a single stem or loose clusters, commonly with an erect caudex or creeping rootstock; frequently abruptly stooling into several close rosettes. Herbage is permanently lanate tomentose, with the upper surface of the leaf blades glabrescent. Basal leaves often purplish beneath, petiolate, ovate to obovate, 2-6(1-9) cm long and 1-3(0.5-4) cm wide, about 1.5 times longer than wide, the petiole about 1-2 times as long as the blade. Cauline leaves are not well developed. Inflorescence a terminal corymbiform or subumbelliform cyme of 3-12(-20) heads, sometimes subtended by (2-)3-5 smaller cymes arising from the axils of the middle cauline leaves. The principal involucral bracts are about 13 or 21 in number, 4-7 mm long, green or yellowish but not black tipped. Ray florets about 8 or 13, the ligules 4-10 mm long. Achenes are lightly pubescent to hirtellous (especially along the angles), or glabrous.

AIDS TO IDENTIFICATION: Generally higher elevations in the Chiricahua and Pinal mountains than var. *metcalfei* or *mutabilis.*

ILLUSTRATIONS: Color photo of *Packera neomexicanus* (Rickett 1970).
Color photo of the species *P. neomexicanus* (L.E. Epple 1995: pl. 433).

TOTAL RANGE: At the full species level, *P. neomexicanus* is perhaps the most abundant *Senecio* in the southwest region. It is widespread in New Mexico, Colorado, Arizona and Mexico (Rickett 1970). The variety *toumeyi* is only found in Arizona.

RANGE WITHIN ARIZONA: Chiricahua and Huachuca mountains in Cochise County. Also reported from the Pinal Mountains in Gila County.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Herbaceous perennial.

PHENOLOGY: April to August for the species.

BIOLOGY:

HABITAT: Most commonly found in oak chaparral, and sometimes in pine forest.

ELEVATION: Throughout Arizona, the species *P. neomexicanus* is found from 3,000 to 9,000 feet (915-2,745 m). A specimen of the variety *P. n.* var. *toumeyi*, was collected in 1973 in the Chiricahua Mts. at 5,200 ft (1586 m). Based on unpublished record in the Heritage Data Management System (AGFD, accessed 2004), the var. *toumeyi* ranges from 5,500 – 9,200 ft (1676-2805 m).

EXPOSURE:

SUBSTRATE: Loose rocky soil in coniferous woodlands.

PLANT COMMUNITY: Coniferous woodlands.

POPULATION TRENDS: Unknown.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: None
OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 1999)

MANAGEMENT FACTORS:

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: Biology, habitat, and distribution studies needed.

LAND MANAGEMENT/OWNERSHIP: USFS - Coronado National Forest.

SOURCES OF FURTHER INFORMATION

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USDA, NRCS. 2004. The PLANTS Database, Version 3.5 (http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

Revised: 1999-11-22 (RHB)
2000-02-08 (LBK)
2004-05-06 (SMS)

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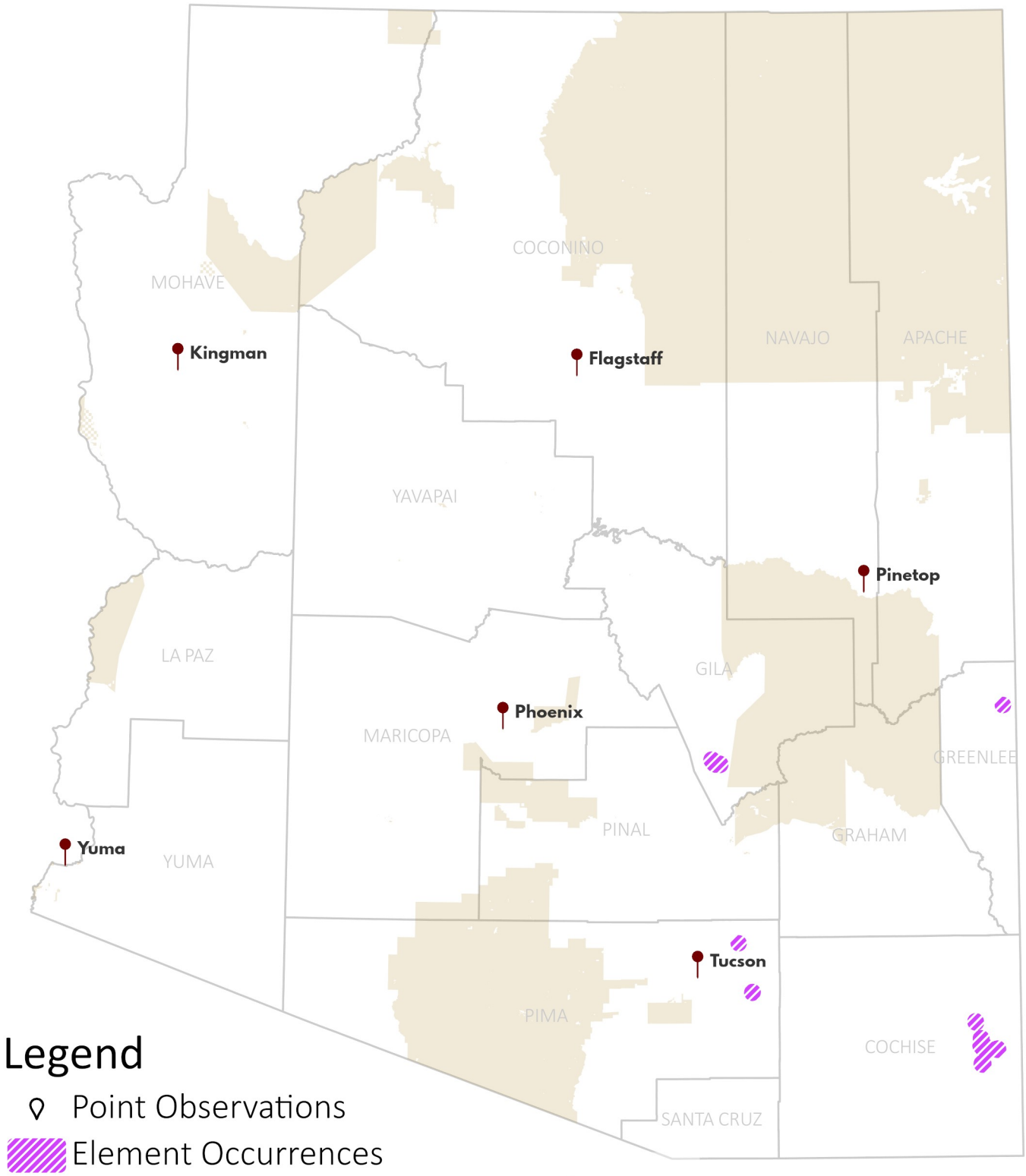
Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

Packera neomexicana var. toumeyi

Toumey Groundsel



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

Kilometers

0 50 100

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences.

Heritage Data Management System
2019-06-13

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDCUC0S010
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Tumamoca macdougalii* Rose
COMMON NAME: Tumamoc globeberry, Tumamoc globe-berry
SYNONYMS:
FAMILY: Cucurbitaceae

AUTHOR, PLACE OF PUBLICATION: J.N. Rose, Contributions from the U.S. National Herbarium. 16(1): 21, pl. 17. 1912.

TYPE LOCALITY: USA: Arizona: Pima County: Tumamoc Hill near Desert Laboratory, Tucson.

TYPE SPECIMEN: HT: US-591589. D.T. MacDougal s.n., 31 July 1908.

TAXONOMIC UNIQUENESS: The genus *Tumamoca* contains only 2 species, with *T. macdougalii* being the only one that occurs in the United States. This species is apparently related very closely to *Ibervillea sonorae*, which does not occur in Arizona (Toolin 1982).

DESCRIPTION: A very cryptic perennial vine (except when fruit is ripe) in the gourd family. It grows from a partially subterranean caudex (tuberous root), with slender, glabrous annual stems and grasping tendrils; stems die back after fruiting. Roots are 5-15 cm (2-6 in) long, united into a woody crown with a short stem. The lacy, glabrous leaves have three main lobes, each with secondary lobes, 2-4 cm long, mostly narrow, linear, the tips mucronate; when the foliage is touched, a fetid smell is given off. Flowers are pale yellow to greenish yellow, united below their middle, with male and female organs born in separate flowers; male flowers outnumber female flowers. Male flowers in racemes of 2-6 flowers, the perianth lobes narrowly lanceolate, to 5 mm long. Female flowers have shorter lobes, and are born singly in axils. Fruits succulent, berry-like, pale green with darker stripes becoming yellow, then turning red when ripe, resembles tiny round watermelons. Seeds 2 to several per fruit, 7 mm long, quadrate, tubercular-rugose. (Toolin 1982, Shreve and Wiggins 1964, Rose 1912, Reichenbacher and Associates 1990, DBG 1999, CPC 2004).

AIDS TO IDENTIFICATION: This species is similar to *Ibervillea sonorae,* which overlaps the range of *T. macdougalii* in Mexico but not in Arizona. *T. macdougalii* differs from *I. sonorae* in having monecious flowers, stamens borne on a slender floral tube, and a cluster of tuberous roots rather than a single globose tuber (Toolin 1982). Also, the seeds of these two species are different in shape and markings, with the seeds of *T. macdougalii* larger in size (Rose 1912).

ILLUSTRATIONS:
Line drawing (USFWS).
Line drawing of plant and parts (Rose 1912: Pl. 17).
Photos of plant, leaves and fruit (HDMS and USFWS file slides).
Color photo of flower (Lynda Pritchett-Kozak CPC-4354, *in* http://centerforplantconservation.org/)
Color photo (Arizona-Sonora Desert Museum 1996-2003, *in* http://www.desertmuseum.org/programs/ifnm_floragallery.htm)

TOTAL RANGE: Southern Arizona and Mexico (Sinaloa and Sonora).

RANGE WITHIN ARIZONA: Extreme southern Pinal and Maricopa counties, widespread in Pima County.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Perennial vine.

PHENOLOGY: This species is dormant during winter and early spring. Some growth can occur in April-June (depending on tuber size), but most growth occurs in response to summer rains. Most flowers appear in August, fruits appear August-September. Sometimes flowering may begin in July, if significant monsoon moisture comes early. Above ground growth is killed by first frost, usually in November (Reichenbacher and Associates 1990).

BIOLOGY: Flowers reach anthesis at night and are pollinated by one or more species of moth (Reichenbacher and Associates 1990). As winter progresses, plants wither leaving a shriveled vine and white-gray woody stem above ground. Over-winters as subterranean tuber, with no living parts above ground. Many birds the eat seeds and fruits including cardinals, thrashers, Gila woodpeckers and Gambel quail. Rodents and rabbits are suspected of browsing the plant. Javelinas have been known to dig up and eat the moisture-rich tuber-like roots of this species (USDI 1993).

As of 1999 (DBG 1999, CPC 2004), the "Desert Botanical garden has only 47 field-collected seeds, and 9 plants from seed in cultivation. These nine plants have produced 68 seeds over the course of 10 years. Plants flower profusely, but evidently are not pollinated readily. Hand pollination does not appear to enhance fruiting. The plants do not appear to tolerate transplanting, or disturbance to roots. Plans are in effect to enhance the seed collection through field collections and improved hand pollination techniques on cultivated plants."

HABITAT: This species occurs in xeric situations, in the shade of a variety of nurse plants along gullies and sandy washes of hills and valleys in Sonoran desertscrub and Sinaloan thornscrub communities (Reichenbacher and Associates 1990).

ELEVATION: Below 3,000 feet (915 m).

EXPOSURE: Various aspects, but apparently always in shrub shaded situations; slopes <5-10%.

SUBSTRATE: Ranges from sandy soils of valley bottoms to rocky soils of upper bajada slopes (Reichenbacher and Associates 1990). Rocky alluvium from andesitic basalts (Reichenbacher 1984, ARIZ 283174).

PLANT COMMUNITY: This species occurs in a wide variety of vegetation types including Arizona Upland and the Central Gulf Coast subdivisions of the Sonoran Desertscrub Biotic Community, Lower Colorado River Valley, and the Plains of Sonora, as defined by Brown (1994). It also occurs in the Sinaloan Thornscrub Biotic Community, as defined by Brown (Reichenbacher and Associates 1990). Associated species include: *Acacia constricta* (mescat acacia), *Ambrosia deltoidea* (triangle bursage), *Carnegia gigantea* (Saguaro cactus), *Cercidium* (=*Parkinsonia*) spp. (paloverde), *Cercidium floridum* (=*Parkinsonia florida*, blue paloverde), *C. microphyllum* (=*P. microphylla*, little-leaf paloverde), *Fouquieria splendens* (Ocotillo), *Ambrosia dumosa* (white bursage), *A. deltoidea* (triangle bursage), *Jatropha cardiophylla* (Sangre-de-cristo), *Krameria grayi* (white ratany), *Larrea tridentata* (creosote bush), *Lycium* sp. (desert-thorn), *L. brevipes* (=*L. richii*, Baja desert-thorn), *L. californicum* (California desert-thorn), *Olneya tesota* (ironwood tree), *Opuntia pheacantha* (New Mexico prickly-pear), *O. versicolor* (staghorn cholla), *Prosopis glandulosa* (honey mesquite), *P. juliflora* (mesquite), *Stenocereus alamosanus*, *S. thurberi* (Organ Pipe-cactus), and *Zinnia pumila* (=*Z. acerosa*, desert zinnia). According to Reichenbacher (1984, in CPC 2004), "it is believed that species such as *Larrea* and *Ambrosia* act as nurse plants, providing shade to *T. macdougalii*." In Oct 1988, it was collected (ASU 155741, Marc Baker) in *Prosopis-Cercidium* wash through *Atriplex* flat with *A. polycarpa* (many-fruit saltbush), *Aristolochia* sp. (Dutchman's-pipe), *Sarcostemma* sp. (twinevine).

POPULATION TRENDS: Monitoring from 1986-1990 showed several populations to be stable. According to NatureServe (2004), there were 78 known U.S. populations in 1992, and many populations in Sonora, Mexico. In addition, new surveys in 1991 in Sonora, Mexico indicates this species to be much more common and widespread than previously thought. In 1993, because of its wide range, non-specific habitat requirements and known populations, this species was delisted (USFWS 1993).

SPECIES PROTECTION AND PRESERVATION

ENDANGERED SPECIES ACT STATUS: None (USDI, FWS 1996)
[3C USDI, FWS 1993]
[LE USDI, FWS 1986]
[C1 USDI, FWS 1980]

STATE STATUS: Salvage Restricted (ARS, ANPL accessed 2011)
[Salvage Restricted (ARS, ANPL 1993, 1999)]

OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 2007)
[Forest Service Sensitive (USDA, FS Region 3 1985, 1990, 1999)]
Bureau of Land Management Sensitive (USDI, BLM 2000, 2005, 2008, 2010)

MANAGEMENT FACTORS: Threats include urbanization, farming, overgrazing, recreation, habitat conversion, javelina (eating tubers), off-road vehicle use, and pesticides. These threats are very unlikely to threaten the species over its entire range. The large range of *T. macdougalii* and the extreme remoteness of much of the habitat in Mexico and Arizona seem to suggest that this species is secure over significant portions of its range for the foreseeable future (USDI 1993). In 1990, Reichenbacher estimated that only 2-3% of *T. macdougalii* habitat had been lost to agriculture and urbanization. The habitat loss that has occurred has mostly been concentrated around major watercourses and urban areas such as Hermosillo, Sonora and Tucson, Arizona (Reichenbacher and Associates 1990).

NatureServe (2004) reports that much of its former range has been modified by agricultural development (near Carbo, Sonora, and in the Avra Valley, Pima County, Arizona) and urban expansion (west side of Tucson, Arizona). Additional threats include grazing (livestock trampling plants located under trees which offer shade), and collection. Plants may have been lost when the Central Arizona Project aqueduct was constructed in 1986.

CONSERVATION MEASURES TAKEN: During construction of the Central Arizona Project, Tucson Aqueduct, a 32 hectare (80 acre) "*Tumamoca* preserve" was purchased by the Bureau of Reclamation. A total of 403 plants that were in the path of the aqueduct were transplanted to this "preserve." Though the plants experienced high initial mortality, recruitment is occurring in the transplanted population and a prediction matrix estimates that around the year 2000, the number of plants will be 125% of their original number (Reichenbacher and Perrill 1991). This species is listed "sensitive" by the USFS and the BLM. The Arizona Native Plant Law also lists it as "Salvage Restricted".

SUGGESTED PROJECTS: There is a critical need for pollination biological studies, additional surveys, investigation into population demographics and vegetation, and germination and establishment requirements (CPC 2004). Plants are found in desert grassland areas that may receive periodic fires, thus studies related to fire, need to be conducted. Continue to collect seeds that represent the genetic diversity of the species for ex situ storage. Tracking by agencies should continue; Reichenbacher has monitored the Sabino Canyon population since 1984. Continue to search for new occurrences of this species in areas subject to development, and other disturbances.

LAND MANAGEMENT/OWNERSHIP: BIA - San Xavier Reservation and Tohono O'Odham Nation; BLM; DOD - Sahuarita Bombing Range; NPS - Saguaro National Park and Organ Pipe Cactus National Monument; USFS - Coronado National Forest; State Land Department; Private.

SOURCES OF FURTHER INFORMATION

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Arizona Revised Statutes, Chapter 7. 1999. Arizona Native Plant Law. Appendix A.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Frank Reichenbacher - Southwestern Field Biologists, Tucson, Arizona.
Sue Rutman - Organ Pipe Cactus National Monument, Ajo, Arizona.
Tom Van Devender - Arizona-Sonora Desert Museum, Tucson, Arizona.

ADDITIONAL INFORMATION:

Revised: 1981(ANHP)
1992-12-10 (SSS)
1994-12-09 (DBI)
1997-10-24 (SMS)
2000-01-10 (DJG)
2004-07-08 (SMS)

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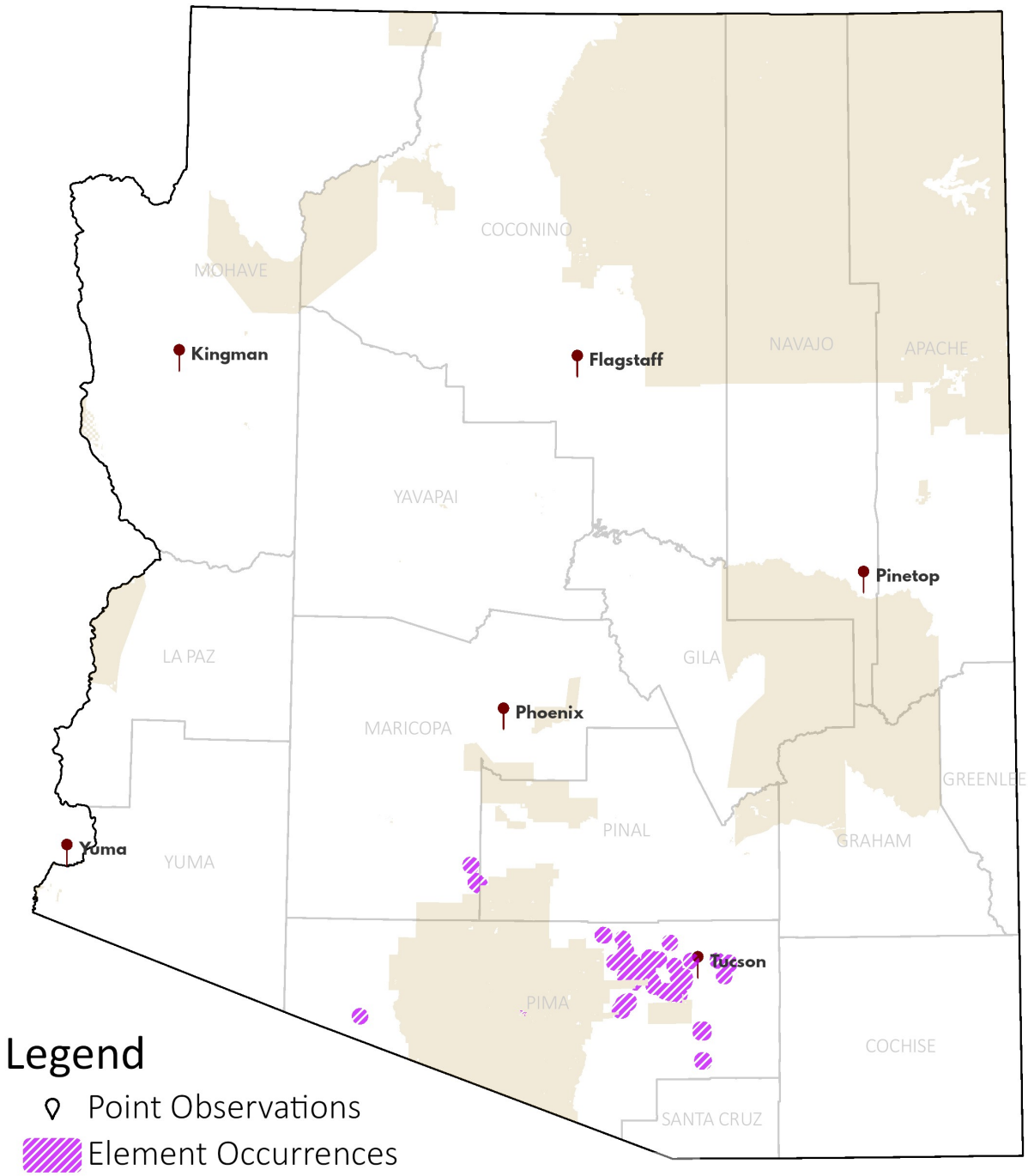
Tumamoca macdougalii

Tumamoc Globeberry



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

0 50 100 Kilometers

ARIZONA GAME & FISH

Point Observations are not guaranteed to have been thoroughly quality controlled. Element Occurrence data represent areas where a population occurs.

Heritage Data Management System
2018-02-08

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDFAB5L0R0
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Pediomelum verdiensis*
COMMON NAME: Verde Breadroot
SYNONYMS: *Pediomelum verdiense*
FAMILY: Fabaceae

AUTHOR, PLACE OF PUBLICATION: Welsh, Stanley Larson and Max Howard Licher. Western North American Naturalist 70(1): 9-18, f. 1 [map], 2. 2010.

TYPE LOCALITY: Arizona: N of Camp Verde: White Hills, elevation 3445 feet.

TYPE SPECIMEN: BRY (SN), holotype, M. Licher (#1911). April 18, 2008.

TAXONOMIC UNIQUENESS: The genus *Pediomelum* was created in 1919 by P.A. Rydberg to accommodate those North American plants that were previously assigned to *Psoralea* L, which was originally described from South Africa (Welsh and Licher 2010). NatureServe (2015) presents 24 species and another eight varieties of *Pediomelum* that occur in the U.S. and Canada. Eight of the species and three varieties are found in Arizona. Three of the species: *P. ockendonii*, *pauperitense* and *verdiensis* are of limited geographical distribution and are found only in Arizona. Welsh and Licher (2010) identify ten species within the State and there are some different taxonomic assignments at the species level between these two treatments.

DESCRIPTION: Acaulescent to short caulescent, 4.5–9 (15) cm tall, from slender, subterranean caudex branches arising from deep-seated ellipsoid to narrowly tapering tuberous roots; aboveground stems lacking or with very short internodes and more or less obscured by leaf bases and stipules, less commonly with internodes elongated (pseudo-peduncles) 0.5–6.5 cm long, spreading white-hairy; leaves (3) 5-foliolate; petioles 2–7.5 (10) cm long, with hairs appressed-ascending; leaflets 8–23.5 mm long, 7–16.5 mm wide, obovate to broadly so, gray green, densely strigose, and obscurely punctate beneath; green to yellow green, thinly strigose overall (more densely canescent along veins above and on the lower surface), obviously punctate above; stipules scarious, 4–16 mm long, connate and without leaf otherwise on lowermost nodes of caudex, adnate to petiole base and bilobed on foliage leaves above, the upper ones densely white strigose; peduncles 0.5–2 (6) cm long, spreading or spreading-ascending white-hairy; inflorescences (cymose) with branches mainly 5–7-flowered, 1.5–2.5 cm long; pedicels 3–3.5 (5) mm long, filiform; bracts elliptic, 5–8 mm long; flowers (9.8) 10–11.3 mm long, the banner purple or suffused with pale purple, the wings and

keel dark purple; calyx (9) 10–11 mm long (11.7 mm in fruit), the tube (3) 3.5–4.8 mm long (from end of strongly gibbous-saccate base to the sinus between the 2 lateral teeth), the lower tooth elliptic, (4.5) 6.0–8.2 (9.2 in fruit) mm long and 2.0–3.5 mm wide, the upper teeth lance-elliptic to lance-subulate or oblanceolate, 4.2–6.5 (7.3) mm long and 1.5–2.3 mm wide; pods included in the calyx; seed 4.2–4.8 mm × 2.8–3 mm, gray brown with purple mottling (Welsh and Licher 2010).

AIDS TO IDENTIFICATION: The following summary was taken from Welsh and Licher (2010):

- Leaflets mainly greenish on both sides, or if contrasting, pale beneath and green above, the upper surface also strigose to pilose;
- Plants acaulescent or short-caulescent; leaflets typically pale beneath; flowers mostly >10 mm long; plants variously distributed;
- Calyx lobes subequal to moderately unequal, the lower one not-much enlarged; seeds smooth;
- Calyx tube mainly 2.5–4.5 mm long; flowers 7.3–13.5 mm long; plants of north central Arizona and SW Utah;
- Petioles with hairs appressed ascending or ascending; peduncles ascending- to spreading-hairy; lateral and upper calyx teeth lance-elliptic to lance-subulate or narrowly oblanceolate to oblong-attenuate;
- Pedicels 3–3.5 (5) mm long; bracts 5–8 mm long; seed 4.2–4.8 mm long, flowers (9.8) 10–11.3 mm long, banner purple or suffused with purple, not strongly contrasting with wings and keel; plants known from Tertiary Verde Limestone Formation in Yavapai Co., Arizona……*P. verdiense*

ILLUSTRATIONS:

Photos: http://swbiodiversity.org/seinet/taxa/index.php?taxon=Pediomelum%20verdiense.

TOTAL RANGE: see Range within Arizona

RANGE WITHIN ARIZONA: Centered around vicinity of Camp Verde, but one collection occurs more than 30 miles upstream along the Verde River; all within Yavapai County.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Perennial herb, with caudex and tuberous root.

PHENOLOGY: Flowers collected in May in Arizona.

BIOLOGY:

HABITAT: High desert scrub on Verde limestone substrate, also compacted roadsides.

ELEVATION: Based on Arizona collections: 3200 – 4350 feet (975-1325m).

EXPOSURE: Open and sunny; low angle south facing slope.

SUBSTRATE: Verde formation limestone, sandy ridges.

PLANT COMMUNITY: Desert scrub with widely scattered Juniper. Associated plants: *Yucca elata, Psorolea mephitica, Lotus mearnsii, Polygala rusbyi, Lepidium thurberi, Opuntia phaeocantha major* (?), *Ephedra torreyana, Gutierrezia sarothrae,, Juniperus, Baileya multiradiata, Sphaeralcea, Coryphantha vivipara, Delphinium scaposum, Dichelostemma capitatum, Gaillardia pinnatifida, Gilia opthalmoides, Heliomeris longifolia var. annua, Hilaria mutica, Larrea tridentate, Melanpodium leucanthum, Plantago Patagonia, Prosopis velutina.*

POPULATION HISTORY AND TRENDS: Unknown for Arizona. There are five known collection sites for this endemic Arizona species which was only described in 2010. The earliest collection was 1961. Although NatureServe ranks *P. verdiensis* critically imperiled due to the very limited, known distribution, two of the collections noted that the plant was locally frequent. This may suggest that at least some populations have a good estimated viability and might be stable.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None.
STATE STATUS: None.
OTHER STATUS: Forest Service Sensitive (USDA FS Region 3 2013)

MANAGEMENT FACTORS: None specified.

PROTECTIVE MEASURES TAKEN: Only the recent (2013) inclusion of this species as a USDA Forest Service Sensitive species in Prescott, Coconino and Tonto National Forests in Arizona.

SUGGESTED PROJECTS: None specified.

LAND MANAGEMENT/OWNERSHIP: USDA Forest Service, both Coconino and Prescott National Forests; USDI BIA Camp Verde Indian Reservation; private land.

SOURCES OF FURTHER INFORMATION

REFERENCES:

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Max Licher, Architect Associate Curator, Deaver Herbarium, Northern Arizona University, Flagstaff.

ADDITIONAL INFORMATION:

Revised: 2015-05-05 (BDT)

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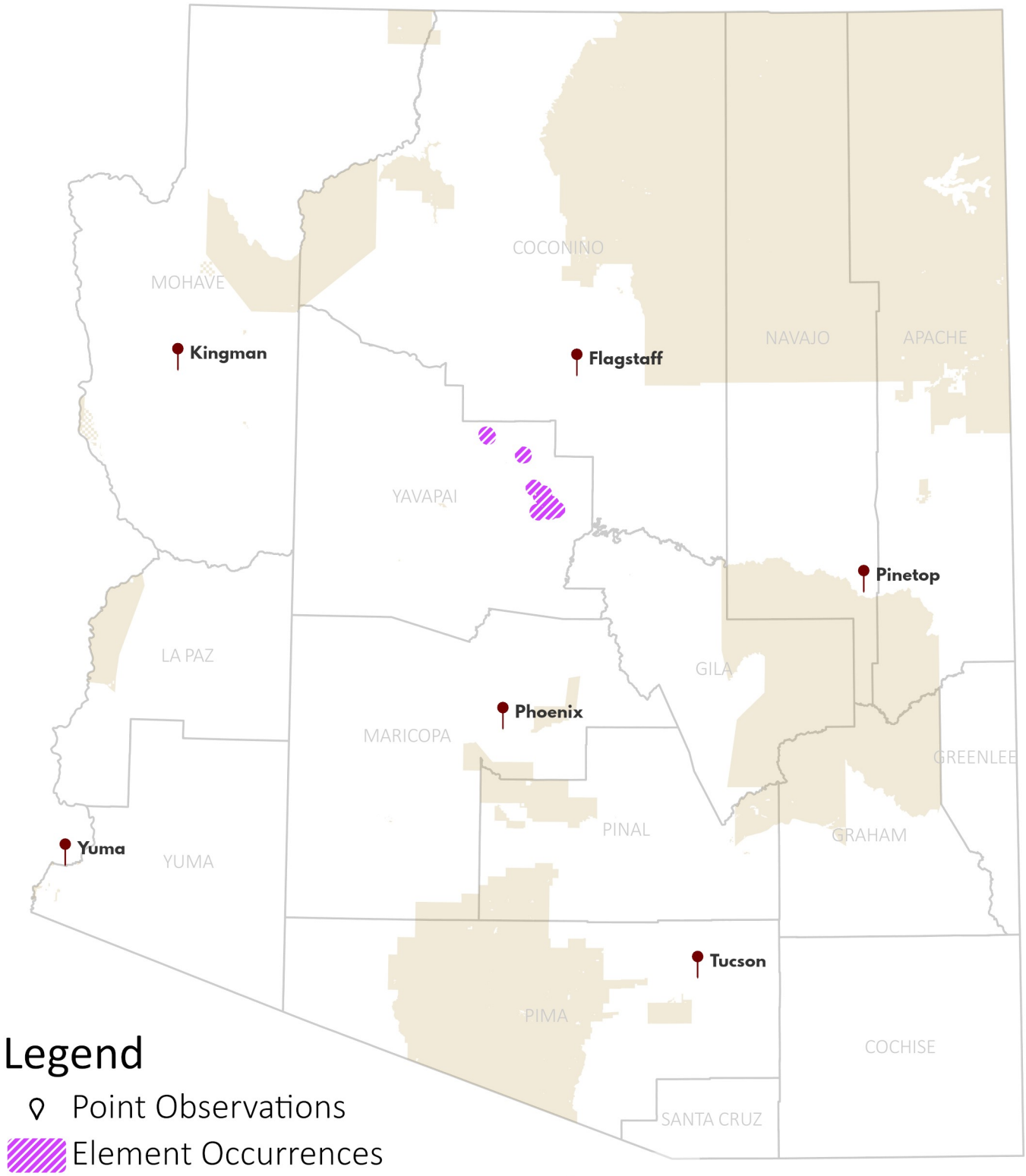
Pediomelum verdiensis

Verde Breadroot



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Kilometers

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ARIZONA GAME & FISH

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Heritage Data Management System
2019-06-13

Arizona Game and Fish Department Wildlife Species Abstracts and Maps

Common Name (*Scientific Name*)

Amphibians

Arizona toad (*Anaxyrus microscaphus*)

Chiricahua leopard frog (*Rana chiricahuensis*)

Great Plains narrow-mouthed toad (*Gastrophryne olivacea*)

Lowland leopard frog (*Lithobates yavapaiensis*)

Northern leopard frog (*Lithobates pipiens*)

Plains leopard frog (*Lithobates blairi*)

Sonoran green toad (*Anaxyrus retiformis*)

Western barking frog (*Craugastor augusti cactorum*)

Birds

American dipper (*Cinclus mexicanus*) - map

American peregrine falcon (*Falco peregrinus anatum*)

Arizona Bell's vireo (*Vireo bellii arizonae*)

Arizona Botteri's sparrow (*Peucaea botterii arizonae*) - map

Arizona grasshopper sparrow (*Ammodramus savannarum ammolegus*)

Bald eagle (*Haliaeetus leucocephalus*)

Broad-billed hummingbird (*Cynanthus latirostris*) - map

Cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*)

California black rail (*Laterallus jamaicensis coturniculus*)

California condor (*Gymnogyps californianus*)

California condor (*Gymnogyps californianus*) - map

California least tern (*Sternula antillarum browni*) - map

Clark's grebe (*Aechmophorus clarkia*)

Common black hawk (*Buteogallus anthracinus*)

Desert purple martin (*Progne subis Hesperia*)

Elf owl (*Micrathene whitneyi*) - map

Ferruginous hawk (*Buteo regalis*)

Flammulated owl (*Psiloscops flammeolus*)

Gilded flicker (*Colaptes chrysoides*) - map

Golden eagle (*Aquila chrysaetos*)

Le Conte's thrasher (*Toxostoma lecontei*) - map

Lewis's woodpecker (*Melanerpes lewis*) - map

MacGillivray's warbler (*Geothlypis tolmiei*) - map

Mexican spotted owl (*Strix occidentalis lucida*)

Northern goshawk (*Accipiter gentilis*)

Olive-sided flycatcher (*Contopus cooperi*) - map

Pacific wren (*Troglodytes pacificus*) - map

Pinyon jay (*Gymnorhinus cyanocephalus*) - map

Red-faced warbler (*Cardellina rubrifrons*) - map

Southwestern willow flycatcher (*Empidonax traillii extimus*)

Sulphur-bellied flycatcher (*Myiodynastes luteiventris*) - map

Swainson's hawk (*Buteo swainsoni*)

Western burrowing owl (*Athene cunicularia hypugaea*)

Western grebe (*Aechmophorus occidentalis*) - map

Western yellow-billed cuckoo (distinct population segment) (*Coccyzus americanus*)

Yellow-eyed junco (*Junco phaeonotus*) - map

Yuma Ridgeway's rail (*Rallus longirostris yumanensis*)

Yuma Ridgeway's rail (*Rallus longirostris yumanensis*) - map

Fish

Bluehead sucker (*Catostomus discobolus*)

Colorado pikeminnow (nonessential experimental) (*Ptychocheilus lucius*)

Desert pupfish (*Cyprinodon macularius*)

Desert sucker (*Catostomus clarki*)

Gila chub (*Gila intermedia*)

Gila longfin dace (*Agosia chrysogaster chrysogaster*)

Gila topminnow (including Yaqui) (*Poeciliopsis occidentalis*)

Gila topminnow (including Yaqui) (*Poeciliopsis occidentalis*) - map

Little Colorado spinedace (*Lepidomeda vittata*)

Little Colorado spinedace (*Lepidomeda vittata*) - map

Little Colorado sucker (*Catostomus* sp.)

Loach minnow (*Tiaroga cobitis*)

Razorback sucker (*Xyrauchen texanus*)

Razorback sucker (*Xyrauchen texanus*) - map

Roundtail chub (*Gila robusta*)

Sonora sucker (*Catostomus insignis*)

Speckled dace (*Rhinichthys osculus*)

Spikedace (*Meda fulgida*)

Invertebrates

A Caddisfly (*Wormaldia planae*)

Arizona cave amphipod (*Stygobromus arizonensis*)

Bylas springsnail (*Pyrgulopsis arizonae*)

Fossil springsnail (*Pyrgulopsis simplex*)

Fossil springsnail (*Pyrgulopsis simplex*) - map

Gila tryonia (*Tryonia gilae*)

Milk Ranch talussnail (*Sonorella micromphala*)

Milk Ranch talussnail (*Sonorella micromphala*) - Map

Netwing midge (*Agathon arizonicus*)

Netwing midge (*Agathon arizonicus*) - map

Parker's cylloepus riffle beetle (*Cylloepus parkeri*)

Parker's cylloepus riffle beetle (*Cylloepus parkeri*) - map

Richinbar talussnail (*Sonorella ashmuni*) - map

Roosevelt talussnail (*Sonorella rooseveltiana*) - map

Sierra Ancha talussnail (*Sonorella anchana*) - map

Sonoran talussnail (*Sonorella magdalenensis*)

Verde Rim springsnail (*Pyrgulopsis glandulosa*)

Verde Rim springsnail (*Pyrgulopsis glandulosa*) - map

Mammals

Allen's lappet-browed or big-eared bat (*Idionycteris phyllotis*)

Arizona myotis (*Myotis occultus*)

Banner-tailed kangaroo rat (*Dipodomys spectabilis*)

Black-tailed prairie dog (*Cynomys ludovicianus*)

Brazilian free-tailed bat (*Tadarida brasiliensis*)

California leaf-nosed bat (*Macrotus californicus*)

Cave myotis (*Myotis velifer*)

Fringed myotis (*Myotis thysanodes*)

Fringed myotis (*Myotis thysanodes*) - map

Greater western mastiff bat (*Eumops perotis californicus*)

Gunnison's prairie dog (*Cynomys gunnisoni*) - map

Jaguar (*Panthera onca*)

Lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*)

Mexican gray wolf (*Canis lupis baileyi*)

Mexican long-tongued bat (*Choeronycteris mexicana*)

Ocelot (*Leopardus* [*Felis*] *pardalis*)

Pale Townsend's big-eared bat (*Corynorhinus townsendii pallescens*)

Sonoran pronghorn (*Antilocapra americana sonoriensis*)

Spotted bat (*Euderma maculatum*)

Western red bat (*Lasiurus blossevillii*)

Western yellow bat (*Lasiurus xanthinus*)

Reptiles

Arizona striped whiptail (*Aspidoscelis arizonae*)

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AAABB01110
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Anaxyrus microscaphus*
COMMON NAME: Arizona Toad
SYNONYMS: *Bufo microscaphus*
FAMILY: Anura: Bufonidae

AUTHOR/PLACE OF PUBLICATION: Frost, D. R., R. W. McDiarmid, and J. R. Mendelson III. 2008. Anura: Frogs. IN B. I. Crother (ed.), Scientific and Standard English Names of Amphibians and Reptiles of North America North of Mexico, pp. 2-12 SSAR Herpetological Circular 37.

TYPE LOCALITY: "Territory of Arizona, Upper Colorado River" Mohave County, Arizona.

TYPE SPECIMEN: USNM 4106 and 4184.

TAXONOMIC UNIQUENESS: Seventeen bufonids in the United States, divided into several species-groups. *A. microscaphus* placed within *A. americanus* species-group. Of the six species within the *A. americanus* group, two are in the southwest, *A. microscaphus* and *A. woodhousei.* Two subspecies of *A. microscaphus* exist in the United States: *A. m. microscaphus* and *A. m. californicus* and one in Mexico, *A. m. mexicanus*.

DESCRIPTION: (For *A. microscaphus*) - rather stocky toad 5.08-8.25 mm (2.0-3.25 in.) long, uniformly warty with a light-colored stripe across the head and eyelids. Oval-shaped widely separated parotoid glands, pale toward front. Dorsum varies in color from greenish gray, buff, brown, or salmon, with the color blending with the surrounding soil and rocks. Usually having a light area in the middle of the back and on each sacral hump. Buff coloring below, often lacking spots. Cranial crests absent or very weak (Stebbins 1985).

AIDS TO IDENTIFICATION: *A. microscaphus* usually has little or no dorsal dark spotting. The skin tends to be relatively smooth. The parotoids are elongate and nearly parallel. Male's throat is not dark.

ILLUSTRATIONS: B&W drawing (Stebbins 1985: plate 12)
Color photo (Behler and King 1979: plates 223 & 235)
Color photo (Wildherps web site)
Color photo (Livingunderworld web site)

TOTAL RANGE: South central Utah at Arizona border (Sullivan 1991), southwestern Utah and southern Nevada southward into Mexican highlands of Durango and Chihuahua (Webb 1972).

RANGE WITHIN ARIZONA: East to west central Arizona, canyons and flood plains south of the Mogollon Rim, but also found in East Clear Creek (see Sullivan 1993, fig. 1 for map). Occurs in Apache, Coconino, Gila, Graham, Greenlee, La Paz, Maricopa, Mohave, Navajo, and Yavapai counties.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Adults nocturnal except during the breeding season. Paratoid glands secrete a viscous white poison that when in contact with the mouth of a predator causes inflaming of the throat and causes nausea, irregular heart beat, and in extreme cases, death. Vocal is a pleasing musical trill raising in pitch at first and then ending abruptly after 10 seconds.

REPRODUCTION: Breeds February-July (earlier at lower elevations) but may be abroad until September. Breeding not dependant on rainfall as with many other species. Egg strands are laid on bottom of pools.

FOOD HABITS: Arthropods, some snails.

HABITAT: Rocky streams and canyons in the pine-oak belt. Also occurs in lower deserts e.g. Agua Fria River area. (See Sullivan 1993 for map, Fig. 1).

ELEVATION: Near sea level to around 8,000 feet (2,440 m). Based on records from the Heritage Data Management System, elevation ranges from 480-8400 ft (146-2560 m) (AGFD, unpublished data accessed 2002).

PLANT COMMUNITY: Upland desert and evergreen woodland.

POPULATION TRENDS: Hybridization with Woodhouse toad has been thought to be a threat in dammed aquatic systems. Apparently stable at other localities, but no good documentation anywhere.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: SC (USDI, FWS 1996)
[C2 USDI, FWS 1994]
[C2 USDI, FWS 1991]
[C2 USDI, FWS 1989]

STATE STATUS: 1B (AGFD SWAP 2012)

OTHER STATUS: Status Removed (USDA, FS Region 3, 2013)
[Forest Service Sensitive, USDA, FS Region 3 1999 and 2007]

MANAGEMENT FACTORS: Water diversions and manipulations (e.g. dams), heavy grazing in riparian areas.

PROTECTIVE MEASURES TAKEN: Arizona fishing license required to take open season amphibians.

SUGGESTED PROJECTS: Periodic surveys at historical localities.

LAND MANAGEMENT/OWNERSHIP: BIA – Fort Apache, Hualapai, San Carlos, and Yavapai-Apache Reservations; BLM – Arizona Strip, Kingman, Phoenix, and Safford Field Offices; FWS – Havasu and Bill Williams National Wildlife Refuges; USFS – Apache-Sitgreaves, Coconino, Prescott, and Tonto National Forests; State Land Department; AGFD - Alamo Wildlife Area and Page Springs Fish Hatchery; Alamo Lake State Park; Lake Pleasant County Park; TNC – Hassayampa River Preserve; Private.

SOURCES OF FURTHER INFORMATION

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Brian Sullivan - Arizona State University (West), Phoenix, Arizona.

ADDITIONAL INFORMATION:

Hybridizes with *Anaxyrus woodhousei* along Virgin River and in central Arizona.

Revised: 1992-12-17 (SSS)
1995-03-28 (MJS)
1997-03-03 (SMS)

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Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AAABH01080
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Lithobates chiricahuensis* (Platz and Mecham, 1979)
COMMON NAME: Chiricahua Leopard Frog
SYNONYMS: *Rana chiricahuensis* Platz and Mecham, 1979
FAMILY: Anura: Ranidae

AUTHOR, PLACE OF PUBLICATION: Platz and Mecham. 1979. Copeia 1979:383-390.

TYPE LOCALITY: "Herb Martyr Lake (elev. 1768 m), 6 km W of Portal, Coronado National Forest, Cochise County, Arizona," USA.

TYPE SPECIMEN: HT: AMNH 100372. J.E. Platz, 10 September 1971.

TAXONOMIC UNIQUENESS: *Lithobates* is a large genus; the name of the genus was recently changed from "*Rana*" to "*Lithobates*". Once thought to be a single species, the *Pantherana* clade (informally termed as *Rana pipiens* complex) contains 30 species within Middle and North America and 7 species within Arizona (6 native and 1 introduced), (Hills 1988; Hillis and Wilcox 2005). The Mogollon Rim form of the Chiricahua leopard frog in central and east-central Arizona and west-central New Mexico, are disjunct from those in southeastern Arizona, and southwestern New Mexico and Mexico. In 2004, genetic analysis (mtDNA sequences) was used by Goldberg et al. to investigate the phylogenetic relationship of *Rana subaquavocalis* and *Lithobates chiricahuensis* from localities throughout their Arizona range. Hillis and Wilcox (2005), suggests that the Mogollon Rim populations may be referable to *R. fisheri* (a species described from southern Nevada, and considered extinct by many authors). They go on to state that "*Rana fisheri* appears to have been closely related to the Mogollon Rim populations of "*R. chiricahuensis*" based on morphological similarity, and the name *R. fisheri* may be applicable to these Mogollon Rim leopard frogs." If this is the case, then these disjunct populations would be separated by about 250 miles, which brings into question the genetic history of the other ranids found in between.

The *Rana subaquavocalis* samples from the Goldberg et al. (2004) study were on a short branch within the southern Arizona clade of *Lithobates chiricahuensis*. The results are consistent with the hypothesis that *chiricahuensis* and *subaquavocalis* are conspecific. (NatureServe 2006).

DESCRIPTION: A medium to large, stocky frog with adult lengths snout to vent from 5.0-13.5 cm (2.0-5.4 in); US Fish and Wildlife (USFWS) report 54 to 120 mm (2.1 to 4.7 in). A distinctive pattern on the rear of the thigh consists of small, raised, cream-colored spots or

tubercules on a dark background; the dorsal spots are generally smaller and more numerous than in other leopard frogs. The upper lip stripe is faint or absent in front of the eye, and the head and back are often green in coloration. Dorsolateral folds are broken toward the rear of the body, deflected medially (angling inward); skin is relatively rough on the back and the sides. The eyes are higher on the head and more upturned than other Arizona leopard frogs. The hind feet are webbed, and males have a swollen and darkened thumb base. The venter is a dull whitish or yellowish color, while gray mottling usually occurs on the throat and sometimes on the chest. The groin and lower abdomen are often yellow. (USFWS 2008). Platz (1988) notes that the "posterior surfaces of thighs have numerous small papilla, each surrounded by cream colored skin...adults have mottled venter and males along southern Arizona border have vestigial oviducts."

AIDS TO IDENTIFICATION: *Lithobates chiricahuensis* is similar to the northern leopard frog (*R. pipiens*), but stockier, with a more rounded head, shorter limbs, and slightly upturned eyes (Stebbins 1985). The call is a "snore" of unusually high pulse rate (about 34 pulse/sec at 22^{o} C). The call is often a single note lasting 1-3 seconds (depending on temperature), which is intermittently repeated and terminated by a "tail" produced by slight change in pitch (Frost and Platz 1983; Platz and Mecham 1984; USFWS accessed 2011)).

Lithobates chiricahuensis is sympatric with three members of the *R. pipiens* complex including the northern (*R. pipiens*), lowland (*R. yavapaiensis*), and plains (*R. blairi*) leopard frogs. Mecham (1968c, cited by Sredl *in* Lannoo 2005) found that in east-central Arizona, northern leopard frogs predominate in meadow-like habitats and Chiricahua leopard frogs predominate in rocky streams. In the Sulphur Springs Valley of southeastern Arizona, Frost and Bagnara (1977, cited by Sredl *in* Lannoo 2005) found plains leopard frogs to predominate in non-permanent and most semi-permanent tanks and sloughs, while Chiricahua leopard frogs predominate in permanent tanks and streams. Physically, *Rana pipiens* has a complete supralabial stripe and complete uninterrupted and undeflected dorsolateral folds, and adults have green pigment in the groin region, while males possess vestigial oviducts. Male *Lithobates chiricahuensis*, unlike *R. yavapaiensis*, possess prominent vestigial oviducts (Platz 1988).

ILLUSTRATIONS:

Color drawing (Stebbins 1985: plate 15)
Color photo (Degenhardt et al. 1996: plate 24)
Color photos (Brennan and Holycross 2006: p. 46)
Color photo (J. Rorabaugh, USFWS 2005: p. 41)
Color photos of frog and egg mass (William Leonard 2003, *in* AmphibiaWeb at http://amphibiaweb.org/cgi-bin/amphib_query?)
Color photo of egg mass (William Leonard 2003, *in* http://calphotos.berkeley.edu/cgi/img_query?)
Color photo (Suzanne L. Collins 2001, *in* CNAH 1994-2006 at http://www.naherpetology.org/detail.asp?id=1160)

Color photos of northern and southern forms (Tom Brennan, *in* J. Rorabaugh at AZ PARC 2006 http://www.reptilesofaz.com/Turtle-Amphibs-Subpages/h-r-chiricahuensis.html)
Color photos (Erik F. Enderson at http://www.arts.arizona.edu/herp/RACH.html)
Color photos (Brad Moon 1990 and 2003, at http://calphotos.berkeley.edu/cgi/img_query?)
Color photo of tadpole (Ronn Altig 1998 at http://calphotos.berkeley.edu/cgi/img_query?)

TOTAL RANGE: **Current:** The species current range is similar to its historical range, but is not well represented in many areas now, and has disappeared from some drainages and mountains ranges. At the time of listing (2002), the frog was likely extant at an estimated 87 and 31-41 localities in Arizona and New Mexico respectively. In 2008, it was estimated that the frog was extant at 49 and 30-35 localities in Arizona and New Mexico, respectively. This represents extirpation from 82-84 percent of its historical localities in the U.S. The status of the 34 collections in Mexico is poorly known. (USFWS 2008).

Historical: A total of 298 and 182 localities historically known for the species in Arizona and New Mexico, respectively. An additional 34 localities are known from Sonora and Chihuahua, Mexico. (USFWS 2008).

Mountain regions of central and southeastern Arizona, southwestern New Mexico, south into the Sierra Madre Occidental to Western Jalisco, Mexico from 1066-2408 m (3500-7900 ft), (Platz and Mecham 1979; Sredl et al. 1997).

RANGE WITHIN ARIZONA: Arizona range is divided into two areas, the northern population (Mogollon Rim population), which extends from montane areas in central Arizona, east and south along the Mogollon Rim to montane parts of west-southwestern New Mexico. The second population is located in the mountains and valleys south of the Gila River in southeastern Arizona and southwestern New Mexico, and extends into Mexico (adjacent Sonora) along the eastern slopes of the Sierra Madre Occidental.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: *Lithobates chiricahuensis* is a highly aquatic habitat generalist. Adults become active in February (Jennings 1988, 1990), and eggs are laid in spring and sporadically through the summer and fall. Males usually call above water, but may also advertise below water (Degenhardt et al. 1996). Their call consists of a 1-3 second long, low-pitched, hollow snore (Brennan and Holycross 2006). Home ranges for males (dry season mean = 161.0 m^2; wet season mean = 375.7 m^2) tend to be larger than those for females (dry season mean = 57.1 m^2; wet season mean = 92.2 m^2). Post-metamorphic Chiricahua leopard frogs are generally inactive from November through February; however, a detailed study of wintertime activity or habitat use has not been done. Although microsites for these hibernacula have not been studied, they likely over-winter near breeding sites. (Sredl, *in* Lannoo 2005). Life span and age at first reproduction are unknown, although preliminarily, skeletochronology of

Chiricahua leopard frogs indicate that they can live =/< 6 years (Durkin 1996, cited by Sredl *in* Lannoo 2005).

In 1998, chytrid fungus (see Additional Information) was first identified in amphibian populations in Arizona. Chytridiomycosis was documented in *Lithobates chiricahuensis* as early as 1992. As of 2000 (Sredl 2000, in Lannoo, 2005), "one salamander species, Sonoran tiger salamanders (*A. tigrinum stebbinsi*), seven species of ranid frogs (Rio Grande leopard frogs [*R. berlandieri*], plains leopard frogs, American bullfrogs, Chiricahua leopard frogs, Ramsey Canyon leopard frogs (now considered Chiricahua), Tarahumara frogs, and lowland leopard frogs), and one treefrog (Canyon treefrog), have been affected by this fungus. All outbreaks have been a cool season phenomena, and the pathogen is well distributed in central and southeastern Arizona (Sredl et al., 2000)." (Sredl *in* Lannoo 2005). The fungus may be responsible for some of the declines seen in their populations in Arizona and New Mexico.

Common predators of adults and juveniles include the non-native American bullfrog (*R. catesbeiana*), native and non-native fishes, garter snakes (*Thamnophis* sp.), great blue herons (*Ardea herodias*), and mammals including rats, coyotes, gray foxes, raccoons, ringtail cats, coatis, black bears, badgers, skunks, bobcats, and mountain lions. Tadpoles are likely preyed upon by aquatic insects, crayfish, native and non-native fishes, garter snakes, great blue herons, and other birds. (Sredl, *in* Lannoo 2005). Anti-predator mechanisms of adult and juvenile Chiricahua leopard frogs include hopping into water (Frost and Bagnara 1977, cited by Sredl *in* Lannoo 2005), and the unusual ability to profoundly darken their ventral skin under conditions of low albedo (reflectance) and low temperature (Fernandez and Bagnara 1991 and Fernandez and Bagnara 1993, cited by Sredl *in* Lannoo 2005). This trait is thought to aid in escape from predators by reducing the amount of attention that bright flashes of white ventral skin would bring in the clear, swift moving streams they inhabit (low albedo environments). Vegetation, undercut banks, root masses, and other cover sites would probably be important retreats from predators.

REPRODUCTION: At high elevation, *Lithobates chiricahuensis* breeds in late May through August (Zweifel 1968; Frost and Platz 1983). At lower, warmer localities, breeding occurs from mid-February through June and sporadically until September (Frost and Bagnara 1977; Frost and Platz 1983) and October. Scott and Jennings (1985) did not note a difference in the time of breeding and different elevations, but did find a relationship between the time of breeding and water temperatures at sites in New Mexico (Jennings 1988, 1990). Proximate cues that stimulate mating are not well studied, but oviposition has been correlated with rainstorms (Fernandez 1996) and changes in water temperature (Platz 1993).

Egg masses have been reported in all months, but reports of oviposition in June are uncommon (Sredl *in* Lannoo 2005). This may be due to lower water levels and higher temperatures before the summer rainy season begins. Females deposit 300-1485 eggs in spherical masses attached to submerged vegetation, suspended within 5 cm of the surface (Jennings and Scott 1991). Zweifel (1968b cited by Sredl *in* Lannoo 2005) noted the water temperature range for *Lithobates chiricahuensis* embryos was 12.0-31.5 ºC, while in New

Mexico R.D.J. (personal observations, cited by Sredl *in* Lannoo 2005) noted water temperatures ranged from 12.6 ºC at a stock tank to 29.5 ºC recorded at a warm spring. Eggs take approximately 14 days to hatch (Platz 1993), and larvae metamorphose in 3-9 months (Jennings 1988, 1990). Tadpoles are known to over-winter (Frost and Platz 1983).

An observation by Field and Groebner (2005) also documents that breeding can occur at higher elevations in ponds fed by warm springs. On February 21, 2002, they discovered two egg masses in a 0.2 ha spring fed pond at 2546 m (8350 feet) near Three Forks in Apache County. The masses were situated near a spring vent and the water temperature was 18° C. Temperatures 6 m away were 14°. Air temperature was 15° C with snow still on the ground and thin ice was present along the edges of the pond.

FOOD HABITS: Adults eat arthropods and other invertebrates (Stebbins 1985; Degenhardt et al. 1996). Larvae are herbivorous and likely eat available food items including algae, organic debris, plant tissue, and minute organisms in the water (Marti and Fisher 1998). Stomach analyses of other members of the leopard frog complex from the western United States show a wide variety of prey items, including many types of aquatic and terrestrial invertebrates (e.g., snails, spiders, and insects) and vertebrates (e.g., fish, other anurans [including conspecifics], small birds; Stebbins 1951). Field et al (2003) report observing an adult frog capturing and apparently consuming a hummingbird.

HABITAT: Historically: An inhabitant of cienegas, pools, livestock tanks, lakes, reservoirs, streams, and rivers at elevations of 1,000 – 2,710 m (3,281-8,890 ft) in central, east-central, and southeastern Arizona; west-central and southwestern New Mexico; and in Mexico, northwestern Sonora and the Sierra Occidental of northwestern Chihuahua.

Currently: They are often restricted to springs, livestock tanks, and streams in the upper portions of watersheds where non-native predators either have yet to invade or habitats are marginal. Distribution and habitat use in Mexico are poorly unknown.

ELEVATION: Elevations range from 1,000-2,710 m (3,281-8,890 ft) (Platz and Mecham, 1979; Sredl et al., 1997; USFWS 2008).

PLANT COMMUNITY: Wide variety of permanent and semi-permanent aquatic systems in oak, mixed oak and pine woodlands, but also chaparral, grassland, and desert habitats (Mecham 1968; Zweifel 1968; Frost and Bagnara 1977; Scott and Jennings 1985; Stebbins 1985; Sredl and Saylor 1998). Vegetation associated with egg masses includes: *Potamogeton* sp., *Rorippa* sp., *Echinochloa* sp., and *Leersia* sp. (Sredl *in* Lannoo 2005).

POPULATION TRENDS: Statewide decline. Local abundance appears to fluctuate greatly. Historically it occurred at 298 sites in Arizona, 182 in New Mexico, and an additional 34 in Mexico (USFWS 2008), which includes both northern and southern populations. Where present, populations are few, small, and widely scattered. The most serious threats to this species include predation by non-native organisms, especially bullfrogs, fishes, and crayfish;

and an introduced fungal skin disease (chytridomycosis or "Bd") that is killing frogs and toads around the globe (USFWS 2008). Possibly some disappearances from historical sites represent natural fluctuations rather than long-term declines caused by human impacts, but in most areas disappearances appear to reflect real, on-going declines. (USFWS 2000).

According to the 2004 Assessment (Santos-Barrera et al.) in 2006 IUCN Red List, "Listed as Vulnerable because of an observed population decline, estimated to be more than 30% over the last three generations, inferred from a shrinkage in distribution due to habitat destruction and degradation, and the effects of exotic species, disease, and unknown factors. The generation length is estimated to be five years."

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS:
LT under genus *Lithobates* with Critical Habitat (USDI, FWS 2012)
[PT under genus Lithobates with proposed Critical Habitat (USDI, FWS 2011)]
[LT under genus *Rana* (USDI, FWS 2002)]
[PT USDI, FWS 2000]
[C USDI, FWS 1996]
[C1 USDI, FWS 1994]
[C2 USDI, FWS 1991]

STATE STATUS:
1A (AGFD SWAP 2012)
WSC (AGFD, WSCA in prep)
[State Candidate AGFD, TNW 1988]

OTHER STATUS:
Not Forest Service Sensitive (USDA FS Region 3 2007)
[Forest Service Sensitive USDA, FS Region 3 1988, 1999]
Determined Threatened (Secretaría de Medio Ambiente 2000, 2010)
[Listed Threatened, Secretaría de Desarrollo Social 1994]
VU (Santos-Barrera in et al. IUCN Red List 2006)

MANAGEMENT FACTORS: Most serious threats to this species include an introduced fungal skin disease (Chytridomycosis (chytrid)), predation by non-native species, especially bullfrogs, fishes (e.g. sport fish) and crayfish. Other threats include drought, floods, wildfires, degradation and destruction of habitat, water diversions and groundwater pumping, disruption of metapopulation dynamics (relationships among populations of frogs), an increased chance of extirpation resulting from small numbers of populations and individuals, and environmental contamination. (USFWS 2008). The chytrid fungus has also infected 8 other

amphibians including six other ranid frogs, causing mass die-offs and local extirpations (Sredl et al. 2000).

PROTECTIVE MEASURES TAKEN: Chiricahua leopard frogs are a closed season species. Collection of leopard frogs requires a specific or similar permit (Arizona Game and Fish Department 2001). *Lithobates chiricahuensis* has been listed as threatened under the Endangered Species Act of 1973 (USDI, FWS 2002), with a Draft Recovery Plan released in April 2006 (USFWS 2005).

U.S. Fish and Wildlife designated Critical Habitat throughout much of their range in Arizona and New Mexico, while re-confirming the Threatened status under the new taxonomy *Lithobates* (USFWS, 2012).

SUGGESTED PROJECTS: Priority research topics include identification of the importance of disease, pesticides and other contaminants, climate change, UV radiation, fire management, and possibly other threats to the status and recovery potential of the Chiricahua leopard frog.

Life history studies needed include those on breeding migrations; proximate cues that stimulate mating; hatching time of egg masses; age and size at reproductive maturity (which are poorly known); juvenile habitat preference and use; and comprehensive studies on the feeding behavior or diet of Chiricahua leopard frog larvae or adults.

Additional studies are need on the mechanisms by which Chiricahua leopard frogs survive the loss of surface water; relationship between Chiricahua leopard frogs and non-native predators; wintertime activity or habitat use - these frogs likely over-winter near breeding sites, although microsites for these hibernacula have not been studied; and additional behavioral and morphological work to accompany the genetic work that has been done to separate the northern population to its own specific (species) level.

LAND MANAGEMENT/OWNERSHIP: BLM – Tucson Field Office; USFS - Apache-Sitgreaves, Coconino, Coronado, and Tonto National Forests; USFWS – Buenos Aires and San Bernardino National Wildlife Refuges; State Land Department; AGFD - Cunningham Tracts and Sipe White Mountain Wildlife Area; TNC – Canelo Hills Cienega and Muleshoe Ranch Preserves; Audubon Research Ranch; Private.

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ADDITIONAL INFORMATION:

Lithobates is from Greek and is composed of two words, 'litho' meaning 'stone', and bates 'to walk'. The species name *chiricahuensis* New Latin (NL) and references the type locality, the Chiricahua Mountains, Arizona. The former genus name *Rana* (true frog) is Latin, and probably mimics how the Romans heard their call. (Beltz, 2006).

"Chytridiomycosis is a recently recognized cutaneous infection of both wild frogs and toads (Berger et al., 1998; Bosch et al., 2000) and captive frogs (Pessier et al., 1999) caused by the fungal agent *Batrachochytrium dendrobatidis*. … Clinical signs include lethargy, abnormal posture, loss of the righting reflex, and death (Daszak et al., 1999). The infection results in a severe diffuse dermatitis characterized by epidermal hyperplasia, hyperkeratosis, and variable degrees of cutaneous ulceration and hyperemia." (Bradley et al., 2002).

Recovery Criteria (USFWS 2005): The Chiricahua leopard frog will be considered for delisting when the following quantitative criteria are met in each Recovery Unit (RU):

1. At least two metapopulations located in different drainages (defined here as USGS 10-digit Hydrologic Units) plus at least one isolated and robust population in each RU exhibit long-term persistence and stability as demonstrated by a scientifically acceptable population monitoring program.
2. Aquatic breeding habitats, including suitable, restored, and created habitats necessary for persistence of metapopulations and isolated populations identified in criterion 1, are protected and managed in accordance with the recommendations in this plan.
3. The additional habitat needed for population connectivity, recolonization, and dispersal is protected and managed for Chiricahua leopard frogs, in accordance with the recommendations of this plan.
4. Threats and causes of decline have been reduced or eliminated, and commitments of long-term management are in place in each RU such that the Chiricahua leopard frog is unlikely to need protection under the ESA in the foreseeable future.

Revised: 1993-08-23 (SSS)
1995-03-28 (MJS)
1997-03-03 (SMS)
1997-11-13 (SMS)
1999-12-20(DJG)
2001-05-14 (SMB)
2006-11-09 (SMS)
2011-10-31 (SMS)
2015-10-07 (BDT)

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AAABE01020
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Gastrophryne olivacea*
COMMON NAME: Western narrow-mouthed toad, Great Plains narrow-mouthed toad
SYNONYMS: *Engystoma olivaceum*, *Microphyla mazatlanensis*, *Microhyla olivacea, Gastrophyne carolinensis olivacea* and *mazatlanensis*
FAMILY: Microhylidae

AUTHOR, PLACE OF PUBLICATION: E. Hallowell, "1856" 1857. Proc. Acad. Nat. Sci. Phila. 8:238-253.

TYPE LOCALITY: Not designated. "…originally described as *Engystoma olivaceum* by Hallowell (1856[1857]), who did not designate a type locality. The type locality was later restricted to "Kansas, Geary Co., Ft. Riley" by Smith and Taylor (1950b) and to "vicinity of Lawrence, Kansas" by Schmidt (1953)." (Degenhardt, Painter and Price, 1996).

TYPE SPECIMEN: Not designated. "Although no type specimen was designated, ANSP 2745, a female collected by Dr. Hammond in Kansas, is likely the Holotype. No date of collection was provided (Nelson, 1972a)." (Degenhardt, Painter and Price, 1996).

TAXONOMIC UNIQUENESS: The species *olivacea* is 1 of 27 in the genus *Gastrophryne*, 2 of which occur in the United States. In Arizona, only one subspecies is recognized, which is *G. o. mazatlanensis*, the Sinoloan Narrow-Mouthed Toad.

DESCRIPTION: A small toad with a relatively stout body (oval shaped) that tapers to a narrow, pointed, flattened head; there is no visible tympanum. They are 0.8 - 1.5 inches (2-3.8 cm) long from snout to vent, with females usually larger than males. The smooth, tough body skin forms a fold along the back of the head. Eyes are small, resembling black, glass beads. The legs are short, with no webbing between the toes, and a single spade on each hind foot. The forelegs are slender when compared to the stout, stubby hind legs. The dorsal coloration is olive-brown, light tan, or grayish, with at least a few dark spots. Distinct bars or blotches are usually present across the thigh and calf. The underside is usually immaculate, but strongly mottled in some Arizona upland populations. Males have a dark vocal sac during the breeding season. Sexually mature males have a dark, distensible throat pouch. The young have distinctive, dark, leaflike pattern on back, fading with age. Tadpoles have a soft mouth disc instead of horny jaws, and a single spiracle that opens mid-ventrally rather than on the side as in other anurans; the tail tip is dark.

AIDS TO IDENTIFICATION: Absence, or near absence of pattern make this an easy frog to identity. Never has a "V" on back or marks on belly, like *Gastrophryne carolinensis*.

Its mating call can often be confused with *Anaxyrus retiformis*, and has been described as a high pitched buzz that lasts about 3.5 seconds and ends abruptly (Enderson 2000). Tadpoles have a characteristic habit of floating motionlessly at the waters' surface (Enderson 2000).

ILLUSTRATIONS:

Color drawing (Stebbins 1985)
Color photo (Behler and King 1979, reprint 1992: Plate 221)
Color photos (Erik Enderson *in* THS 2000, http://www.arts.arizona.edu/herp/frog11.html).
Color photo of tadpole (Ronn Altig 1998, AmphibiaWeb)
Color photo (Allen Blake Sheldon, *in* eNature.com)
Color photo (David Cannatella, *in* http://www.lifesci.utexas.edu/research/)
Color photo (Colorado Herpetological Society, http://coloherp.org/geo/species/spegaol.php)
Color photo of male adult (Degenhardt et al. 1996: Plate 20)

TOTAL RANGE: Southern Nebraska, southeastern Colorado, and southern Arizona to Nayarit, Durango, and San Luis Potosi, Mexico. Specifically, the eastern subspecies is found from southeastern Nebraska and Missouri south through most of Texas to western Chihuahua, Durango, and San Luis Potosi. The western subspecies extends from southern Arizona and eastern Sonora, south along the Pacific Coast of Mexico to Nayarit.

RANGE WITHIN ARIZONA: From Santa Cruz County, north to Maricopa County and west to near Ajo in western Pima County. It has also been found in Santa Rosa Valley and the vicinity of Lake St. Cloud, Pinal County. Throughout much of its range in Arizona, they are sympatric with *Smilisca fodiens* and *Anaxyrus retiformis*.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: An inconspicuous little nocturnal toad that is most active at night after spring and summer rains. During these wet periods, males can be heard giving their breeding calls, which from a distance, has been likened to the "baaing" of sheep and, in closer proximity, to the buzzing of honey-bees. In southern ranges, they may be active all year. Migrates variable distances between breeding pools and adjacent nonbreeding terrestrial habitats. Secretive, hiding in burrows or under bark, in rotten logs, under rocks, or in crevices near a water source during the day. Narrowmouth toads share burrows with tarantulas, lizards, moles, and many other creatures. When handled, they exude a potent toxin that can cause severe nasal reactions and burning of the eyes (Enderson 2000). The toxin appears to kill other amphibians and may be a protective mechanism.

REPRODUCTION: Rainfall stimulates breeding. The male grasps the female from behind and "glues" himself to her back with a viscous skin secretion, which insures a good connection. A colonial breeder that lays about 600 eggs, which are deposited in a film at the water's surface, and are fertilized as they are laid. In Arizona, eggs are laid around July. Narrowmouth toads develop quickly, metamorphosing from egg to toad in 24-50 days. Males may breed more

than once annually. Toads are sexually mature in 1-2 years. (Wallace 1996, NatureServe 2002).

FOOD HABITS: Adult toads eat almost entirely ants. Their tough skin and fold of skin across their neck, probably afford protection from ant bites and stings. Larvae eat suspended matter, organic debris, algae, and plant tissue.

HABITAT: In Arizona, from mesquite semi-desert grassland to oak woodland, in the vicinity of streams, springs and rain pools. They are more terrestrial than aquatic in habits. They can be found in deep, moist crevices or burrows, often with various rodents, and under large flat rocks, dead wood, and other debris near water.

ELEVATION: Sea level to around 4,100 ft. (1,251 m). In Arizona, ranges from 1,400 – 4,700 ft (427-1434 m) (AGFD, unpublished data, accessed 2003).

PLANT COMMUNITY: Madrean evergreen woodland, semi-desert grassland, and Sonoran Desert scrub.

POPULATION TRENDS: Unknown

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None

STATE STATUS: 1C (AGFD SWAP 2012)
None (AGFD, WSCA in prep)
[State Candidate AGFD, TNW 1988]

OTHER STATUS: Bureau of Land Management Sensitive (USDI, BLM AZ 2008, 2010)
None (USDA, FS Region 3 2013)
[Forest Service Sensitive USDA, FS Region 3 2007]
None (USDA, FS Region 3 1999)
[Forest Service Sensitive USDA, FS Region 3 1988]
Determined Subject to Special Protection (Secretaria de Medio Ambiente 2000, 2010)
[Listed Rare, Secretaría de Desarrollo Social 1994]

MANAGEMENT FACTORS: Limited distribution, and the fact that the United States populations are on the extreme northwestern edge of its range (and the northern extreme for the Arizona subspecies), is a concern. The species is sedentary and would probably continue

to be associated with a particular site if weather conditions were favorable. Threats may include habitat loss and degradation (AGFD In prep).

PROTECTIVE MEASURES TAKEN: Arizona fishing license required to take any amphibians.

SUGGESTED PROJECTS:

LAND MANAGEMENT/OWNERSHIP: BIA – San Xavier and Tohono O'odham Reservations; BLM – Phoenix Field Office; NPS – Organ Pipe Cactus National Monument; USFS – Coronado National Forest; State Land Department; Private.

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ADDITIONAL INFORMATION:

The scientific name *Gastrophryne olivacea* comes from the Greek *gaster* (=belly) and *phryne* (=toad), possibly referring to the pot-bellied appearance, and from the Latin *oliva* (=olive), referring to the general coloration (Wallace, 1996).

Revised: 1992-11-13 (SSS)
1995-07-18 (MJS)
2003-04-24 (SMS)
2013-11-08 (BDT)

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AAABH01250
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Lithobates yavapaiensis (Rana yavapaiensis)*
COMMON NAME: Lowland leopard frog, Yavapai leopard frog
SYNONYMS: *Lithobates yavapaiensis* (Platz and Frost, 1984), *Rana pipiens* complex (lowland form)
FAMILY: Anura: Ranidae

AUTHOR, PLACE OF PUBLICATION: Platz and Frost, 1984. Copeia, 1984: 940-948.

TYPE LOCALITY: "Tule Creek (elev. 670 m), 34º 00', 112º 16', Yavapai County, Arizona", USA.

TYPE SPECIMEN: HT: AMNH 117632. J.E. Platz, 25 August 1971.

TAXONOMIC UNIQUENESS: *Lithobates (*formerly *Rana)* is a large genus, including Old and New World species (Stebbins 1985). The *Lithobates pipiens* complex was recently separated and contains nearly 30 species in North America and 7 species within Arizona (6 native and 1 introduced) (Hillis 1988). Distinguishing these 7 leopard frogs in Arizona has been problematic, mainly because they are recently described, are similar in appearance, and can inhabit the same locality (Platz and Platz 1973; Platz 1984; Jennings 1988; Jaeger et al. 2001). *L. yavapaiensis* is very similar to *L. onca* (Relict leopard frog); the two may be the same species (Rorabaugh 2006).

DESCRIPTION: A leopard frog of relatively small size, ranging from 1.8-3.4 in (4.6-8.6 cm) SVL; males are smaller than females with maximum lengths of about 2.8 in (7.2 cm) SVL. This is typically a brown frog, although some are green, particularly on the head. Usually there are no spots on the snout. There is often a yellowish wash to the groin area that many times extends onto the posterior venter and underside of the legs. The rear of the thigh has a dark brown and tight reticulate pattern. Adult males lack prominent vocal sacs, and a darkened thumb base. Dorsolateral folds are present, prominent, and lighter in color than the dorsum, broken and inset toward the rear. The upper-lip stripe is incomplete or vague (diffuse anterior to the eye), and the skin is tuberculate. The call is a series of high-pitched chuckles (*tuck-tuck-tuck*) that are not very loud and are similar to that of the Plains (*L. blairi.*) and Relict (*L. onca*) leopard frogs. (Platz 1988; Rorabaugh 2006; Stebbins 2003). The pulse rate is almost as low as that of *L. blairi*, but the repetition rate is faster, 10-16 pulses per second rather than 4-7. They also exhibit short guttural grunting sounds suggestive of rubbing an inflated rubber balloon. (Stebbins 2003).

AIDS TO IDENTIFICATION: *Lithobates yavapaiensis* is similar to *L. chiricahuensis* (Chiricahua leopard frog), but is biochemically distinct. The dorsolateral folds, tuberculate skin, and usually vague upper-lip strip is as in *L. chiricahuensis*, however, *L. chiricahuensis* has a more prominent vocal sac and dark thighs with a scattering of light spots rather than a dark network. (Stebbins 2003). *L. yavapaiensis* is most similar genetically to *L. onca* (Jaeger et al. 2001), and adult *L. onca* have "incomplete, indistinct, dorsolateral folds extending 1/2 to 3/4 of the way down the dorsum, ... shortened legs, an incomplete supralabial stripe, and upper surfaces of the thighs usually spotted rather than barred" (Jennings 1988).

Lithobates yavapaiensis can be distinguished from the 6 other species of leopard frogs within its range. "*Lithobates blairi* has a complete supralabial stripe extending anteriorly to the tip of the snout. *Lana pipiens* has a complete supralabial stripe, complete dorsolateral folds uninterrupted and undeflected in the sacral region. Adult *L. pipiens* may have green pigment in the groin region and males possess vestigial oviducts. The posterior surfaces of the thighs in *L. chiricahuensis* have numerous small papilla, each surrounded by cream-colored skin. Adult *L. chiricahuensis* have a mottled venter, and males along the southern Arizona border have vestigial oviducts. *L. berlandieri* is native to New Mexico and was unintentionally introduced in recent years to southwestern Arizona. Males, unlike *L. yavapaiensis,* possess prominent vestigial oviducts" (Platz 1988).

ILLUSTRATIONS:

Color drawing (Stebbins 1985: plate 15)
Color drawing (Stebbins 2003: plate 17)
Color photo (Randy Babb, *in* AZ PARC 2006 at http://www.reptilesofaz.com/Turtle-Amphibs-Subpages/h-r-yavapaiensis.html)
Color photo (Tom Brennan, *in* AZ PARC 2006 at http://www.reptilesofaz.com/Turtle-Amphibs-Subpages/h-r-yavapaiensis.html)
Color photos (William Flaxington 2004, *in* CalPhotos at http://calphotos.berkeley.edu/cgi/img_query?)
Color photo (Suzanne L. Collins 2001, *in* CNAH at http://www.cnah.org/detail.asp?id=1182)
Color photos of frogs and egg mass (Erik F. Enderson, *in* The Tucson Herpetological Society at http://www.arts.arizona.edu/herp/RAYA.html)
Color photo (Cecil Schwalbe, *in* The Tucson Herpetological Society at http://www.arts.arizona.edu/herp/RAYA.html)

TOTAL RANGE: Currently found in central and southeastern Arizona below the Mogollon Rim, southwest New Mexico (Gila River and Rio San Francisco), and probably northern Sonora and northwestern Chihuahua, Mexico. (Stebbins 2003; Sredl in Lannoo 2005).

Historically, *L. yavapaiensis* ranged from northwestern Arizona through central and southeastern Arizona, southwestern New Mexico, and northern Sonora, Mexico. Populations were also known from southwestern Arizona and southeastern California along the lower Colorado River and in the Coachella Valley (Platz and Frost, 1984; Platz 1988; Jennings 1995; cited by Sredl in Lannoo 2005). Because of the problem with identifying leopard frogs

in southwestern Utah, southeastern Nevada, and extreme northwestern Arizona, this account follows the taxonomy of Jaeger et al. (2000) and considers frogs of the Virgin River downstream into the Black Canyon of the Colorado River below Hoover Dam in Nevada to be relict leopard frogs (*L. onca*). (Sredl in Lannoo 2005). "Vitt and Ohmart (1978) surveyed numerous localities along the lower Colorado River and concluded that populations of leopard frogs, which would now be considered lowland leopard frogs, in that area may be extinct. All post-1980 records from the lower Colorado River and in the vicinity of the Salton Sea have turned out to be Rio Grande leopard Frogs (*L. berlandieri*), which have established themselves in the lower Colorado River and Gila River to Phoenix, Arizona (Plat et al., 1990; Jennings and Hayes, 1994a; Rorabaugh et al., 2004)." (Sredl in Lannoo 2005).

RANGE WITHIN ARIZONA: Found in central and southeastern part of state, with close to 60 % of all localities occurring in Gila, Maricopa and Yavapai counties (central Arizona below the Mogollon Rim). They are now absent from the lower Colorado River, and have declined significantly in southeastern Arizona. (Rorabaugh 2006).

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Where their range overlaps with the Chiricahua Leopard Frog (*L. chiricahuensis*), hybridization may occur. The two frogs hybridize in California Gulch and Big Casa Blanca Canyon, Santa Rita Mountains, Santa Cruz County. (Stebbins 2003).

Size at metamorphosis for *L. yavapaiensis* ranges from 25-29 mm (0.9-1.2 in) SVL (Platz 1988). The smallest males to exhibit secondary sexual characteristics from study sites in Graham and Yavapai counties, Arizona were 53.5 mm (2.1 in) and 56.2 mm (2.2 in) SVL, respectively (Sredl unpublished data). Size at which females reach sexual maturity is not known. Females have a mean asymptotic SVL of 76.4 mm (3.0 in), while that of males is 63.1 mm (2.5 in) (Sredl et al. 1997a).

Preliminarily, skeletochronology of *L. yavapaiensis* indicate that they can live as long as 3 years (Sredl and Fernandez unpublished data). Estimates of survivorship of the adult and juvenile stages appear to follow a seasonal pattern (Sredl et al. 1997a; Sredl in Lannoo 2005), high in the spring and summer and lower in the fall and winter. Within any given year, survivorships were always lowest in the winter. In 3 of 4 years for which there were estimates for all four intervals, wintertime survivorship was by far the lowest; this pattern held for both adults and juveniles. In populations examined, sex ratios generally do not differ from 1:1 (Sredl et al. 1997a).

REPRODUCTION: Reproduction is aquatic. Breeding migrations have not been noted in *L. yavapaiensis* as have been described for some amphibians. In Arizona, frogs breed primarily from January to May, with additional breeding occurring in some populations in summer and early fall after the onset of the summer rains. (Sredl unpublished data; Rorabaugh 2006). Male lowland leopard frogs attract a potential mate by emitting an airborne call

consisting of a series of low pulses lasting 3-8 seconds (Platz and Frost 1984). Proximate cues that stimulate mating in *L. yavapaiensis* are not well studied, although rainfall and water temperature have been mentioned as cues for other leopard frog species in the Southwest. Egg masses have been observed from January through late April and October (Ruibal 1959; Collins and Lewis 1979; Frost and Platz 1983). Females deposit spherical masses attached to submerged vegetation, bedrock, or gravel. Eggs usually are deposited near the surface of the water (Sartorius and Rosen, 2000; cited by Sredl in Lannoo 2005). Clutch size has not been studied in *L. yavapaiensis*. Egg masses have been observed to hatch in the wild in 15-18 days (Sartorius and Rosen, 2000; cited by Sredl in Lannoo 2005). Larvae metamorphose in as little as 3-4 mo or as long as 9 mo, and can overwinter (Collins and Lewis 1979; Sredl unpublished data); size at metamorphosis ranges from 25-29 mm SUL (Platz, 1988 cited by Sredl in Lannoo 2005). Altig et al. (1998) describes the tadpoles of *L. yavapaiensis*.

FOOD HABITS: Adults eat arthropods and other invertebrates (Stebbins 1985; Degenhardt et al. 1996). Larvae are herbivorous and likely eat algae, organic debris, plant tissue, and minute organisms in water (Marti and Fisher 1998). Stomach analyses of other members of the leopard frog complex from the western United States show a wide variety of prey items, including many types of aquatic and terrestrial invertebrates (e.g., snails, spiders, and insects) and vertebrates (e.g., fish, other anurans [including conspecifics], and small birds; Stebbins 1951).

HABITAT: *Lithobates yavapaiensis* inhabit aquatic systems in desert grasslands to pinyon-juniper (Platz and Frost 1984). They are habitat generalists and breed in a variety of natural and man-made aquatic systems. Natural systems include rivers, permanent streams, permanent pools in intermittent streams, beaver ponds, cienegas (=wetlands), and springs, while man-made systems include earthen cattle tanks, livestock drinkers, canals, irrigation sloughs, wells, mine adits, abandoned swimming pools, and ornamental backyard ponds (Platz and Frost 1984; Scott and Jennings 1985; Sredl and Saylor 1998). Most historical localities are small to medium-sized streams and rivers (Jennings 1987; Sredl and Saylor 1998). In lotic habitats, they are concentrated at springs, near debris piles, at heads of pools, and near deep pools associated with root masses (Jennings 1987; Sredl unpublished data).

The role of habitat heterogeneity within the aquatic and terrestrial environment is unknown, but likely important. Shallow water with emergent and perimeter vegetation provides basking habitat and deep water, root masses, undercut banks, and debris piles provide refuge from predators and potential hibernacula (Jennings 1987; Platz 1988; Jennings and Hayes 1994a; Sredl unpublished data). In semi-permanent aquatic systems, *L. yavapaiensis* may survive the loss of surface water by retreating into deep mud cracks, mammal burrows, or rock fissures (Howland et al. 1997). Seim and Sredl (1994) studied the association between juveniles and adult stages and pool size and found juveniles were more frequently associated with small pools and marshy areas while adults were more frequently associated with large pools.

ELEVATION: In Arizona elevation ranges from 480 – 6200 ft (146-2499 m), generally <6200 ft (1951 m) (unpublished records, AGFD, HDMS accessed 2006). Range wide, they

are found from sea level to 1817 m (5,960 ft) (Jennings and Hayes 1994b); or sea level to 5,577 ft (1700 m) as reported by Stebbins (2003).

PLANT COMMUNITY: Lower and Upper Sonoran Desert, grassland, oak and oak-pine woodland (Stebbins 1985). Common overstory at six lowland leopard rd frog sites, observed by Sredl et al. (1997, in Sredl edited by Lannoo 2005), "Consisted of Fremont cottonwoods (*Populus fremonti*), willows (*Salix* sp.), seepwillows (*Baccharis glutinosa*), mesquite (*Prosopis* sp.), and introduced salt cedars (*Tamarix chinensis*). Common ground cover in moist areas included yerba-mansa (*Anemopsis californica*), canyon ragweeds (*Ambrosia ambrosioides*), and arrow-weeds (*Tessaria sericea*). Three-square rushes (Scirpus *americanus*), spike rushes (*Eleocharis* sp.), and introduced Bermuda grass (*Cynodon dactylon*) lined the banks or perimeter of ponds and slackwater pools. The largest, deepest pools had stands of narrow-leafed cattails (*Typha angustifolia*); large ponds in addition to having cattails, had pondweeds (*Potomageton* sp.)."

POPULATION TRENDS: Adequate data is needed to determine status of *Lithobates yavapaiensis* in central Arizona, but populations are thought to be stable (Sredl et al. 1997a). According to NatureServe (2006), "Large numbers of occurrences still exist in central Arizona (the largest portion of United States range) but, apparently extirpated from other portions of range in the southwestern United States; information is not available for Mexico." The species is declining in southeast Arizona and is extirpated from southwestern Arizona (USDI, FWS 1991; Sredl et al. 1997b).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS:
SC (USDI, FWS 1996)
[C2 USDI, FWS 1991, 1994]
[C2 USDI, FWS 1989]

STATE STATUS:
1A (AGFD SWAP 2012)
[WSC, AGFD, WSCA in prep]
[State Candidate AGFD, TNW 1988]

OTHER STATUS:
Bureau of Land Management Sensitive (USDI, BLM AZ 2008, 2010)
Forest Service Sensitive (USDA, FS Region 3 1999, 2013)
[Forest Service Sensitive USDA, FS Region 3 1988]
Determined Subject to Special Protection (Secretaría de Medio Ambiente 2000, 2010)
[Listed Rare, Secretaría de Desarrollo Social 1994]
LC (IUCN Red List 2004)

MANAGEMENT FACTORS: The greatest threats to *L. yavapaiensis* are habitat alteration and fragmentation, accentuated by the introduction of non-native predatory and competitive fishes, crayfishes, and frogs (mainly bullfrogs). (IUCN, Conservation International, and NatureServe 2006). Damming, draining, and the diversion of water have fragmented formerly contiguous aquatic habitats. A chytrid fungus (see Additional Information section) has infected populations of *L. yavapaiensis* as well as six other ranid frogs and two other amphibians causing mass die-offs and local extirpations (Sredl et al. 2000). Habitat fragmentation and water manipulation can lead to local extirpation by disrupting the metapopulation dynamics of lowland leopard frogs in arid landscapes (Jennings and Scott 1991). Other prominent factors are water pollution and heavy grazing.

PROTECTIVE MEASURES TAKEN: *Lithobates yavapaiensis* is a closed season species. Collections of this species are illegal statewide without a scientific collecting or similar permit (Arizona Game and Fish Department 2001).

SUGGESTED PROJECTS: Studies on disease, population and metapopulations, dispersal abilities, habitat reservations, and effectiveness of translocations are needed.

LAND MANAGEMENT/OWNERSHIP: BIA – Fort McDowell and San Carlos Reservations, and Indian Allotments; BLM – Havasu, Kingman, Phoenix, Safford and Tucson Field Offices; NPS – Saguaro National Park; USFWS – Bill Williams and San Bernardino National Wildlife Refuges; USFS - Apache-Sitgreaves, Coconino, Coronado, Prescott, and Tonto National Forests; State Land Department; Alamo Lake State Park; Pima County - Cienega Creek Natural Preserve; Private; TNC – Aravaipa Canyon, Bingham Cienega, Buehman Canyon, Hassayampa River, Muleshoe Ranch, and San Pedro River Preserves, Cascabel Community Management Area, and Lower San Pedro Program; Boyce Thompson Southwestern Arboretum.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

J.E. Platz - Creighton University, Omaha, Nebraska.
Cecil Schwalbe - US Geological Survey, Sonoran Desert Unit, University of Arizona, Tucson.
Mike Sredl - Arizona Game and Fish Department, Phoenix.

ADDITIONAL INFORMATION:

"Chytridiomycosis is a recently recognized cutaneous infection of both wild frogs and toads (Berger et al., 1998; Bosch et al., 2000) and captive frogs (Pessier et al., 1999) caused by the fungal agent *Batrachochytrium dendrobatidis*. … Clinical signs include lethargy, abnormal posture, loss of the righting reflex, and death (Daszak et al., 1999). The infection results in a severe diffuse dermatitis characterized by epidermal hyperplasia, hyperkeratosis, and variable degrees of cutaneous ulceration and hyperemia." (Bradley et al., 2002).

Revised: 1991-02-19 (NML)
1995-03-28 (MJS)
1997-12-24 (SMS)
2001-05-14 (SMB)
2006-10-26 (SMS)

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AAABH01170
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Lithobates pipiens* (*Rana pipiens)*
COMMON NAME: Northern Leopard Frog
SYNONYMS: *Rana pipiens* complex
FAMILY: Ranidae

AUTHOR, PLACE OF PUBLICATION: Schreber 1782. Naturfursher, Halle 18:182.

TYPE LOCALITY: White Plains, New York (Schmidt 1953 *in* Degenhart).

TYPE SPECIMEN: Neotype UMMZ 71365, Fall Creek, Etna, Tompkins County, New York

TAXONOMIC UNIQUENESS: Large genus including Old and New World Species. *Lithobates pipiens* complex recently separated, contains nearly 20 species within North America, 6 species within Arizona (5 native and 1 introduced).

DESCRIPTION: Slim green or brownish, with well-defined, pale-bordered, oval or round dark spots on back, white to cream below. White stripe on upper jaw. Well-defined, pale dorsolateral folds that are continuous and not angled inward. "Voice is "low 'motorboat' or snore like sound interspersed with grunting and chuckling, lasting about 1-5 seconds. Choruses are a medley of moaning, grunting, and chuckling that suggests the sounds made by rubbing a well-inflated rubber balloon. Paired vocal sacs expand over the forelimbs" (Stebbins 1985). There is usually one spot on the head anterior to the eyes. Few or no tubercules on the dorsal and lateral body surface. Mean SVL in males is 68.3 mm (2.7 in) and in females 74.2 mm (2.92 in). The eardrum is without a light center. During breeding season the males have a swollen, darkened thumb base and loose skin between the jaw and the shoulder. Males are usually smaller in size. The tadpole has coarse indistinct mottling on the tail. The distal half of the tail tends to darken approaching metamorphosis.

Color variations include the Burnsi variant, which may be found in either brown or green and does not have any dorsal spots. It has spots or bars on the limbs and may have black stippling on the back and sides. The second variant Kandiyohi, is brown with dashes of white and brown or black. The spots on the back and legs are still discernable, as well as the dorsolateral fold (LeClere).

AIDS TO IDENTIFICATION: *L. pipiens* has a complete supralabial stripe, complete dorsolateral folds uninterrupted and undeflected in the sacral region. Adult *L. pipiens* may have green pigment in the groin region, and males possess vestigial oviducts. The posterior

surfaces of the thighs in *L. chiricahuensis* have numerous small papilla, each surrounded by cream colored skin. Adult *L. chiricahuensis* have a mottled venter, and males along the southern Arizona border have vestigial oviducts. *L. berlandieri* is native to New Mexico and has been successfully introduced in recent years to southwestern Arizona in the Lower Colorado River near Yuma and the Gila and Salt Rivers as far east as Phoenix. Males unlike *L. yavapaiensis*, possess prominent vestigial oviducts (Platz 1988). Brown specimens of the Northern leopard frog differ from pickerel frogs by having round spots scattered randomly about the back, and a greenish wash on the thighs. *Rana catesbeiana* lacks dorsolateral folds and has a plain unicolored dorsum. *Hyla regilla* has toe pads. *Rana boylii* lacks dorsolateral folds and has pale triangle on snout. *Rana mucosa* lacks dorsolateral folds and has yellow on the underside of the legs, smoother skin and dark tipped toes. *Rana aurora* has less distinct dorsolateral folds, spotted with a less uniform pattern, a less pointed snout and red or yellow under the hind legs.

ILLUSTRATIONS: Color drawing (Stebbins 1985: plate 15)
Color photo (Degenhart 1996: plate 25)
Color photo (*In* http://animaldiversity.ummz.umich.edu/media/herp/069.herp.jpg)
Color photo (Hammerson *in* http://coloherp.org/geo/species/sperapi.html)
Color photo of green burnsi phase (Iowa Herpetology *in* http://www.herpnet.net/Iowa-Herpetology/images/Frogs_Toads/N.Leopard_frog_Burnsi.jpg)
Color photo of brown burnsi phase (Iowa Herpetology *in* http://www.herpnet.net/Iowa-Herpetology/images/Frogs_Toads/N.Leopard_frog_Burnsi_B.jpg

TOTAL RANGE: Great Basin Region from northern Arizona, western Nevada and Washington to southern Canada; east to southeast Canada and New Jersey.

RANGE WITHIN ARIZONA: Northern and central Arizona.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Found in a variety of habitats, most cold-adapted of all leopard frogs. May forage far from water, when frightened seeks water in a zigzag pattern of jumps. Like most frogs, leopard frogs are sluggish animals, often staying immobile for long periods of time. Sometimes the males call while underwater. They produce a low-pitched snore often followed by a chuckling noise, or a deep *urr, urr, urr*. They have internal vocal sacs, so their throats do not appear to move when they call. When they move far from a body of water they may absorb dew to keep moist. *Lithobates pipiens* hibernates in deep water. Juvenile leopard frogs often cluster together.

REPRODUCTION: Breeds mid-March to early June. In most areas, sexually mature in 2 years. The male leopard frog identifies the female by their distinctively plump physique. The males, which are usually smaller in size, use their specialized thumbs to clasp females during mating. Mating occurs in the water while the female swims with the male attached to her back. By releasing her eggs, females stimulate milt ejaculation by the male and the eggs are fertilized. A single female may lay 3,000 to 5,000 eggs in one round mass that measures 3-6 in (7.5-15 cm) across. Tadpoles hatch in about a week and metamorphose in about three months. Aquatic larvae have been found to over winter in some areas (TNC 1988).

FOOD HABITS: Small invertebrates; rarely eats small vertebrates. Larvae eat algae, plant tissue, organic debris, and probably small invertebrates (TNC 1988).

HABITAT: Variety of habitats including grassland, brush land, woodland, and forest ranging high into mountains, usually in permanent waters with rooted aquatic vegetation; also frequents ponds, canals, marshes, springs, and streams.

ELEVATION: 0-11,000 ft (0-3353 m) Stebbins 1985. Based on records from the Heritage Data Management System, elevation in Arizona ranges from 2,640-9,155 ft (805-2790 m) (AGFD, unpublished data accessed 2002).

PLANT COMMUNITY: Grassland, brush land, woodland, and forest land.

POPULATION TRENDS:

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None

STATE STATUS: 1A (AGFD SWAP 2012)
[WSC, AGFD, WSCA in prep]
[State Candidate AGFD, TNW 1988]

OTHER STATUS: Bureau of Land Management Sensitive (USDI, BLM AZ 2008, 2010)
Forest Service Sensitive (USDA, FS Region 3 1999, 2013)
[Forest Service Sensitive USDA, FS Region 3 1988]
Group 2 (NNDFW, NESL 2000, 2005, 2008)
[Group 4 (NNDFW, NESL 1994)]

MANAGEMENT FACTORS: Two of the main threats to this species are habitat destruction and pollution. Also they are collected for biological supply houses and fishermen use them for bait.

PROTECTIVE MEASURES TAKEN: Closed season, Arizona Game and Fish Department.

SUGGESTED PROJECTS: Distribution, habitat, population, and life history studies.

LAND MANAGEMENT/OWNERSHIP: BIA – Fort Apache Reservation and Navajo Nation; NPS – Canyon de Chelly national monument, Glen Canyon National Recreation Area, Grand Canyon National Park; USFS – Apache-Sitgreaves, Coconino and Kaibab National Forests; AGFD – Lamar Haines Memorial Wildlife Area; Private.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Mike Sredl - Arizona Game and Fish Department, Phoenix, Arizona.
Randy Jennings - Silver City, NM

ADDITIONAL INFORMATION:

Northern leopard frog coexists, occasionally hybridizing, with Plains leopard frog in southeastern Colorado. Also hybridizes with Chiricahua leopard frog (*Lithobates*

chiricahuensis) in areas of central Arizona and western New Mexico where their ranges overlap (Stebbins 1985).

Leopard frogs are often used for dissection in biology classes. Unfortunately, a well meaning teacher and lab aides may release unneeded animals, perhaps believing it is kinder than outright killing. However, frogs kept in close quarters such as shipping crates and overcrowded aquaria may get a disease called "red-leg" caused by an *Aeromonas* bacteria. Releasing sick frogs infect otherwise healthy local populations and may cause sudden population collapses. During the 1970's in the Chicago Region, Leopard Frogs suffered a severe decline but appear to be rebounding where suitable habitat is still available.

Revised: 1993-08-23 (SSS)
1995-03-22 (MJS)
2002-12-06 (AMS)

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Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AABH01040
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Lithobates (Rana) blairi*
COMMON NAME: Plains Leopard Frog
SYNONYMS: *Lithobates blairi*, *Rana pipiens* complex
FAMILY: Anura: Ranidae

AUTHOR, PLACE OF PUBLICATION: Mecham, et. al. 1973. Occasional Papers the Museum Texas Tech University 18:1-18.

TYPE LOCALITY: 1.6 km west of New Deal, Lubbock County Texas.

TYPE SPECIMEN: Holotype: #131690. University of Michigan Museum of Zoology. Charles Everett, 6 August 1971.

TAXONOMIC UNIQUENESS: Large genus, including Old and New World species. *L. blairi* part of the *L. pipiens* complex from the central United States. No subspecies recognized.

DESCRIPTION: Stocky frog; males smaller than females with the mean SVL in males 64.4 mm (2.5 in), in females 75.5 mm (3 in). Generally pale-colored; light buffy brown to dull green above with brown to olive-green dorsal spots that lack or have very narrow pale borders. Dorsal spots are often arranged in loosely defined longitudinal rows. Whitish stripe on upper lip. White below, sometimes with some fine dark stippling or mottling on throat. Some yellow may be present in groin, on lower abdomen and at base of thighs. Usually a well-defined pale spot in center of eardrum. Dorsolateral folds not continuous (Stebbins 1985), and angled inward toward the rear. Area around the cloaca is covered with tubercles. Part of a third row of upper labial teeth, are present in about half of all large specimens. This row consists of 1-3 labial teeth on either or both side of the beak. There are three lower rows of labial teeth. The lower papillae are usually unpigmented, relatively small, and densely packed lateral to the beak. (Degenhardt, Painter and Price, 1996). The iris is medium-gold in color and lacks dorsal or ventral dark spots (Scott and Jennings, 1985 *in* Degenhardt, Painter and Price, 1996).

AIDS TO IDENTIFICATION: *L. blairi* can be distinguished from *R. pipiens* by its discontinuous dorsolateral folds, the reticulated thigh pattern, and halos surrounding the dorsal spots that are absent or very faint. *L. blairi* can be distinguished from *R. yavapaiensis* by the presence of spots on the nose anterior to the eyes, the presence of a spot on the tympanum, and a complete supralabail stripe. (Degenhardt, Painter and Price, 1996).

ILLUSTRATIONS:
Color drawing (Stebbins 1985: plate 15)
Color photos (Behler and King, 1979: plates 197, 202)
Color photo (Degenhardt, Painter and Price, 1996: plate 22)

TOTAL RANGE: Western Indiana west across central and southern plains to eastern Colorado and New Mexico and southern Texas; isolated population in southeast Arizona.

RANGE WITHIN ARIZONA: Isolated population in southeastern Arizona; western side of Chiricahua Mountains (Turkey Creek, etc.) and adjoining Sulphur Springs Valley.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Primarily a nocturnal frog, although it can be found foraging along the water's edge on cloudy days. Frequents prairie pools, ponds, and streams (including temporary water sources) where water is muddy and shallow at times. Plains Leopard Frog is more drought-resistant than the Northern Leopard Frog. They burrow into mud and leaves of pond and stream bottoms during winter. The voice consists of 2 or 3 guttural notes a second; almost a chuckle. When caught by predators, it issues a loud explosive distress call.

REPRODUCTION: They move from wintering sites to breeding sites in spring. Breeds March through October. Lays clutch of up to a few thousand eggs that are attached to vegetation in shallow still water. Clutches are often laid after heavy rains. Eggs are light gray in color. Hatching occurs in 5-20 days

FOOD HABITS: Arthropods and other invertebrates.

HABITAT: Found mainly around streams, ponds, creek pools, reservoirs, marches or irrigation ditches in prairie and desert grasslands, but also can be found in oak and oak-pine woodland and farmland. Can range into terrestrial habitat near water during wet weather. Often bask on vegetation mats at water's edge.

ELEVATION: Generally 4,060 – 5,880 ft. (1238-1792 m) in AZ; 350 - 8,500 ft. (107 - 2,593 m) rangewide.

PLANT COMMUNITY: Desert grassland, also oak to oak-pine woodlands

POPULATION TRENDS:

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None

STATE STATUS: 1A (AGFD SWAP 2012)
WSC (AGFD, WSCA in prep.)
[State Endangered AGFD, TNW 1988]

OTHER STATUS: None. (USDA, FS Region 3 2013)
[Forest Service Sensitive USDA, FS Region 3 2007]
[None, USDA, FS Region 3 1999]
[Forest Service Sensitive USDA, FS Region 3 1988]
Bureau of Land Management Sensitive (USDI, BLM AZ 2008, 2010)

MANAGEMENT FACTORS:

PROTECTIVE MEASURES TAKEN: Arizona fishing license required for taking any amphibian.

SUGGESTED PROJECTS: Distribution, habitat, population and life history studies.

LAND MANAGEMENT/OWNERSHIP: FWS – San Bernardino National Wildlife Refuge; State Land Department; AGFD – White Water Draw Wildlife Area; Private.

SOURCES OF FURTHER INFORMATION

LITERATURE CITATIONS:

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

R. Jennings - Silver City, NM
Jim Rorabaugh - USFWS, Phoenix
Phil Rosen - University of Arizona, Tucson
Cecil Schwalbe - NPSCPSU/University of Arizona, Tucson
Mike Sredl - AGFD, Nongame Branch, Phoenix

ADDITIONAL INFORMATION:

Coexists with the Chiricahua Leopard Frog at Turkey Creek and elsewhere.
Known to hybridize with other *Rana* in overlapping ranges in Texas.

Revised: 1992-11-06 (SSS)
1995-07-18 (MJS)
1997-04-04 (SMS)
2002-11-20 (RHB)
2002-11-27 (SMS)
2013-11-08 (BDT)

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AAABB01140
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Anaxyrus retiformis*
COMMON NAME: Sonoran Green Toad, Sonora Green Toad, and Pima Green Toad
SYNONYMS: *Bufo debilis retiformis* Sanders and Smith, *Bufo retiformis* Bogart
FAMILY: Anura: Bufoidae

AUTHOR, PLACE OF PUBLICATION: Frost, D. R., R. W. McDiarmid, and J. R. Mendelson III. 2008. Anura: Frogs. IN B. I. Crother (ed.), Scientific and Standard English Names of Amphibians and Reptiles of North America North of Mexico, pp. 2-12 SSAR Herpetological Circular 37.

TYPE LOCALITY: 14.4 miles south of Ajo, Pima County, Arizona, U.S.A.

TYPE SPECIMEN: HT: UIMNH-5847. Hensley & W.L. Burger, Field #449, 1 Aug 1948.

TAXONOMIC UNIQUENESS: Species *retiformis*, is 1 of 21 in the genus *Anaxyrus* in North America, and 1 of 6 in Arizona. Other species of *Anaxyrus* in Arizona include *A. alvarius*, *A. cognatus*, *A. debilis*, *A. microscaphus*, *A. punctatus*, and *A. woodhousii*.

DESCRIPTION: Small flat toad, 1.13-2.25 in (2.85-5.7 cm). Dorsum bright green with a network of black or brownish markings that set off oval spots of green to greenish-yellow. The ventral surface is white and is covered with small, dark-tipped granules. Males have a dark or dusky throat. The large, elongate parotoid glands extend onto the sides; one gland also occurs behind each eye. The dorsal surface is covered with low, black-tipped warts. Larger warts are found along the sides of the body. Warts on the parotoid glands are greatly reduced and tipped with black. The cranial crest is weak or absent. Eggs are yellow with a band of melanin, and are 1.15 mm in diameter (AmphibiaWeb, accessed 2005). (Stebbins 1985, Bebler and King 1992).

AIDS TO IDENTIFICATION: *Anaxyrus retiformis* is similar to the green toad (*A. debilis*), but is bright green above with a network of black or brownish markings that set off oval areas of greenish yellow ground color, where the green toad is mostly green with small black spots. Areas of green within dark network about twice as large as those of *A. debilis*.

ILLUSTRATIONS:
Color drawing (Stebbins 1985: plate 10)
Color photo (Behler and King 1979: plate 251)

Color photo (Collins *in* http://www.livingunderworld.org/gallery/photos/anura/bufonidae/bufo/retiformis/).
Color photo (Nafis *in* http://www.californiaherps.com/noncal/southwest/swamphibians/pages/b.retiformis.html)
Color photo (Enderson and Schwalbe *in* http://www.arts.arizona.edu/herp/BURE.html).
Color photo (Paselk *in* http://www.humboldt.edu/~rap1/Herps/Frogs/043.jpg).

TOTAL RANGE: From south-central Arizona south to west-central Sonora (just north of Guaymas), Mexico.

RANGE WITHIN ARIZONA: South-central Arizona: From Organ Pipe Cactus National Monument east across the Tohono O'Odham Reservation to San Xavier Mission, throughout Pima County, to 9 miles north of Pima/Pinal County line in Santa Rosa Valley, Pinal County. Probably also in Vekol Valley.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: A secretive nocturnal species, the male usually begins calling at nightfall after summer rains. Calls are wheezy sounding and generally last 1 to 3 seconds. Toads have enlarged glands (called the Paratoid glands) on the side of the neck, one behind each eye. These glands secrete a viscous white poison that is smeared in the mouth of any would-be predator, inflaming the mouth and throat causing nausea, irregular heart beat, and in extreme cases, death (National Wildlife Federation 2005). They are inactive in cold temperatures and hot, dry weather. Male Sonoran green toads, like all *Anaxyrus* species, have rudimentary ovaries that can become functional if the testes are damaged or removed.

REPRODUCTION: Breeds with the onset of summer rains, through July-August in rain pools and wash bottoms. Males call at nightfall, usually from grass areas that are close to water sources, but occasionally, from areas farther from water (Stebbins, 2003). Tadpoles hatch at later stage than most *Anaxyrus* spp.

FOOD HABITS: Arthropods.

HABITAT: In Arizona, inhabits rain pools, wash bottoms, and areas near water in semi-arid mesquite-grassland, creosotebush desert, and upland saguaro-paloverde desert scrub.

ELEVATION: In Arizona, 500 - 3,225 ft. (153- 983 m).

PLANT COMMUNITY: Sonoran Desert scrub, in the Arizona upland and lower Colorado subdivisions. In mesquite-grassland, creosotebush desert, and upland saguaro-paloverde desert scrub.

POPULATION TRENDS: Unknown. There are no censuses or surveys estimating population numbers in the United States. Ashton (1976) reported that Arizona populations were stable. In 1993-1994, Sullivan et al. (1996) found this species at almost all historic localities and some new sites in the United States, although surveys were somewhat limited due to access to tribal lands (CITES 2000). Total adult population size is unknown but likely is at least 10,000; information from Mexico is needed to assess current population. Less common on periphery of range: near Organ Pipe National Monument in the west, near Mobile in the north, and in the Altar Valley in the east (NatureServe 2005). Habitat manipulation due to agriculture has resulted in this species replacing *B. kelloggi* to the south and west of Hermosillo, Mexico.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None (USDI, FWS 1996)
[3C USDI, FWS 1989]

STATE STATUS: 1B (AGFD SWAP 2012)

OTHER STATUS: None (USDA, FS Region 3, 1999)
[Forest Service Sensitive USDA, FS Region 3, 1988].
Bureau of Land Management Sensitive (USDI, BLM AZ 2010)
Determined Subject to Special Protection (NORMA Oficial Mexicana NOM-059-SEMARNAT-2010, Secretaria de Medio Ambiente 2000)
Rare [Mexican Fed. End. Species list 1994].

MANAGEMENT FACTORS: There are no known or documented immediate threats to this species. However, other anurans (e.g., ranids) in southern Arizona are experiencing declines due to competition with exotic species (e.g. bullfrogs, sport fish), pathogens (e.g., chytrid fungus), habitat degradation, and possibly airborne toxins (CITES 2000). Also, some consider over-collecting to be a chief threat (especially for females). This species naturally hybridizes with *A. punctatus*, but it is unlikely that this presents a significant concern for the population status.

PROTECTIVE MEASURES TAKEN: Arizona fishing license is required to take any amphibians.

SUGGESTED PROJECTS: Distribution, habitat, population and life history studies needed.

LAND MANAGEMENT/OWNERSHIP: BIA - San Xavier and Tohono O'Odham Reservations; BLM - Phoenix Field Office; FWS - Buenos Aires and Cabeza Prieta National Wildlife Refuges; NPS - Organ Pipe Cactus National Monument; State Land Department; Private. A large number of the occurrences occur on the Tohono O'Odham Reservation.

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ADDITIONAL INFORMATION:

Revised: 1991-02-19 (NML)
1992-11-13 (SSS)
1998-04-03 (SMS)
2005-07-25 (TAB)
2005-08-11 (SMS)

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Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AAABD04171
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Craugastor augusti cactorum* (Taylor, 1939)
COMMON NAME: Western Barking Frog
SYNONYMS: *Eleutherodactylus cactorum* Taylor, 1939; *Eleutherodactylus augusti cactorum*; *Hylactophryne augusti cactorum*
FAMILY: Anura: Leptodactylidae

AUTHOR, PLACE OF PUBLICATION: Taylor, 1939 "1938", Univ. Kansas Sci. Bull., 25(17): 391. (*Eleutherodactylus cactorum*).

TYPE LOCALITY: "km. 226, 20 miles northwest of Tehuacán, [near Cacaloapam,] Puebla", Mexico.

TYPE SPECIMEN: Holotype: EHT-HMS 6383, by original designation; now FMNH 100021, E.H. Taylor and H.M. Smith 6383, adult female collected 30 August 1936, according to Marx, 1976, Fieldiana, Zool., 69: 47.

TAXONOMIC UNIQUENESS: *Craugastor augusti cactorum* is 1 of 4 subspecies of *Craugastor augusti* currently recognized, and the only one that occurs in Arizona. Specifically, this is the only Arizona representative of the family Leptodactylidae, which includes over 500 species of tropical frogs (Rorabaugh, 2008). The other three subspecies of C. augusti that occur outside of Arizona include *C. a. latrans* (New Mexico and Texas), *C. a. augusti*, and *C. a. fuscofemora*. *Craugastor augusti cactorum* is quite similar to *C. a. augusti* in size and pigmentation, however the tympanum diameter to head width ratio is usually smaller in *C. a. cactorum* (Zweifel, 1956; Zweifel, 1967). Recent measurements in Arizona confirmed the small tympanum size (Goldberg and Schwalbe, 2000). *C. a. cactorum* is the smallest of the subspecies in body length (Zweifel, 1956). Differences in call structure, coloration, and mtDNA sequences strongly suggest that barking frogs in Arizona are reproductively isolated from those in New Mexico and Texas. The results indicate that either northern populations are connected via gene flow through southern Mexico (i.e., they are subspecies as currently recognized), or they represent independent lineages as originally described (i.e., western barking frogs, *C. cactorum* in Arizona, and the eastern barking frogs, *C. latrans* in New Mexico and Texas). Discrimination between these hypotheses awaits analysis of barking frog populations in Central Mexico. (Goldberg et al., 2004; NatureServe, 2006; Frost, 1998-2009).

Based on phylogenetic analysis of nuclear and mitochondrial genes by Crawford and Smith (2005), it is inferred that *Craugastor* originated from a single dispersal northward from South

America about 80-60 million years ago. According to Crawford and Smith (2005), the taxonomic change to *Craugastor* "is also supported by the finding that the sister group of *Craugastor* might not even be an *Eleutherodactylus* (Darst and Cannatella, 2004), but rather *Brachycephalus* or another eleutherodactyline genus." Furthermore, they propose a node-based definition of the new genus *Craugastor*, which the AZ Heritage Program accepts, and define it as the crown clade containing the following taxa and their MRCA (most recent common ancestor): *C. augusti*, *C. bocourti* (*alfredi* group), *C. bransfordii*, *C. daryi* (*milesi* group), *C. fitzingeri*, *C. gollmeri*, *C. megacephalus* (*biporacatus* group), *C. mexicanus*, *C. rhodopis*, and *C. ranoides* (*rugulosus* group).

DESCRIPTION: Adults are olive to green-gray to rusty-gray with dark irregularly shaped spots or blotches, often with light edges, dorsally. Juveniles have a prominent light band that darkens with age across the center of their backs, however this has not been observed in Arizona. Rorabaugh (2008) reports that the "small juvenile frogs can look like the adults or may have large black patches on the head and lower body." Their eyes are large and dark brown (Stebbins, 1985; Schwalbe, 1990). Males have dark tympana and during the breeding season, have dark throats, which become mottled in late summer. Females have white throats and pink tympana throughout the year (Goldberg and Schwalbe, 2000). The snout-vent length for the species ranges from 5.0-9.5 cm (2.0-3.8 in) (Stebbins, 1985; Rorabaugh, 2008). At Coronado National Memorial in Arizona, the mean size of females was 8.0 cm, while males were 7.2 cm (Goldberg and Schwalbe, 2000). The frogs have a broad head and short legs, which gives them a squat, toad-like appearance. They have smooth skin and slender, unwebbed toes with prominent tubercles beneath the joints. Although they can make hops from boulder to boulder, they frequently walk in a stilted fashion with their hindquarters and heels off the ground. There is a fold of skin across the back of the head (intertympanic fold) and a circular fold on the belly. Their tympana are semitransparent and smooth (Stebbins, 1985; Schwalbe, 1990).

AIDS TO IDENTIFICATION: The fold of skin on the back of the head and circular fold on the belly, along with the tubercles on the feet, distinguish this species from other Arizona anurans. The distinctive call sounds like a series of small dog barks in 2-3 second intervals in New Mexico and Texas (Zweifel, 1967; Stebbins, 1985) or in Arizona the croak of a raven (Schwalbe, 1997). The juvenile color pattern of a light band across the center of their dark backs is distinctive, but has not been observed in Arizona. The subspecies *C. a. cactorum* can be distinguished from the other subspecies by their smaller tympana (Zweifel, 1956; Goldberg and Schwalbe, 2000). The tympana diameter/head width ratio is usually less than 0.17 (Zweifel, 1956).

ILLUSTRATIONS:

Color drawing (Behler and King 1979: p. 154)
Black and white photo (Bezy et al. 1966: fig. 1, p. 223)
Black and white drawing (Stebbins 1985: pl. 12)
Color drawing (Conant 1975: pl. 45)
Color photo (Schwalbe 1990)
Black and white photo (Zweifel 1956)

Color photos of frog and habitat (Randall Babb, in Wismann 2001)
Color photos (Erik F. Enderson, *in* http://www.arts.arizona.edu/herp/ELAU.html, accessed 2006)
Color photos (Cecil Schwalbe, *in* http://www.arts.arizona.edu/herp/ELAU.html, accessed 2006)
Color photo by Randy Babb (*in* AZ PARC http://www.reptilesofaz.org/Turtle-Amphibs-Subpages/h-c-augusti.html)
Color photos by Tom Brennan (*in* AZ PARC http://www.reptilesofaz.org/Turtle-Amphibs-Subpages/h-c-augusti.html)
Color photo (Suzanne L. Collins, 2004, *in* CNAH at http://www.naherpetology.org/detail.asp?id=1098)

TOTAL RANGE: Southern Arizona (Quinlan, Santa Rita, Patagonia, Huachuca, and Pajarito Mts.) and northeastern Sonora (Sierra El Tigre) south along the Pacific Coast foothills of Western Mexico.

RANGE WITHIN ARIZONA: Known from rocky outcrops in Cochise and southern Pima and Santa Cruz counties, in the mountain ranges of Quinlan, Santa Rita, Patagonia, Huachuca, and Pajarito mountains. According to Rorabaugh (2008), "the species potentially occurs in other southeastern Arizona mountain ranges, and should be looked for in the Peloncillo, Mule, Whetstone, and Baboquivari mountains." There is an unconfirmed old report (Wright and Wright, 1949) of the species from the Sierra Anchas in Gila County, but this was probably a mis-id.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: These secretive frogs are terrestrial and are found in areas with limestone and other rock outcrops. The frog is nocturnal, spending the day under rocks, or in mines, wells, caves, or fissures (Stebbins 1985, Schwalbe 1990, Goldberg and Schwalbe 2000). When threatened, it inflates to several times its normal size. The skin fold on the belly may be useful in helping it to cling to the sides of caves. There is little life history information available. The longest documented lifespan of a wild individual is 5 years as an adult (Goldberg and Schwalbe, unpublished data).

Western barking frogs in Arizona moved up to 50 m from overwintering to calling sites at the beginning of the beginning of the breeding season (Goldberg and Schwalbe 2000, *in* Amphibiaweb 2009). Advertisement calls of frogs from Arizona were significantly longer in duration, higher in frequency, and had longer duration pulses than those of frogs from either New Mexico or Texas; frogs from these later two sites were indistinguishable in these call variables (Goldberg et al., 2004). Their call is ventriloquistic, making them difficult to locate even after they are detected; most are located by their distinctive and loud "*Walk-walk*" or "*Whaa-whaa-whaa-whaa*" call. In Arizona, for only two to four weeks on rainy nights after the start of the summer rains in June-July (Goldberg and Schwalbe, 2004). Frogs call

dependably for only two or three nights following the first heavy monsoon storm of the season (Rorabaugh, 2006 & 2008).

REPRODUCTION: Males begin calling with the onset of the summer rainy season. The large-yolked, unpigmented eggs are laid in moist or rain-filled cracks, fissures, and in caves on land (Stebbins, 1985; Wright and Wright 1949, *in* Goldberg 2003). Clutches contain from 50-76 eggs (Goldberg, accessed 2006). Jameson (1950) hypothesized that male barking frog's guard the egg clutch and maintains the eggs moisture levels by body excretion. However, based on radio-tracking data there is possible parental care of the egg clutch by females, since males move too frequently to guard them (Goldberg and Schwalbe, 2000).

The young undergo direct development within the egg and hatch as small frogs in approximately one month (Stebbins, 1985; Schwalbe, 1990; Schwalbe, 1997), unlike other frogs and toads in Arizona who have an aquatic larval stage. Frogs hatch in about (20-)25 to 35 days (Schwalbe, 1990; Rorabaugh, 2008). Anecdotal evidence from Arizona suggests that one clutch may have hatched in 21 days (Goldberg and Schwalbe, *in* Goldberg 2006).

FOOD HABITS: The diet consists of a variety of invertebrates. Scat analyses and observations of the population inhabiting Coronado National Memorial have yielded the following prey items: field crickets (*Acheta assimilis*), scorpions (*Vaejovis* sp.), silverfish (*Lepisma* spp.), centipedes (*Scolopendra* spp.), kissing bugs (*Triatoma* spp.), short-horned grasshoppers (Acrididae), spiders, ant lions (*Hesperoleon niger*), and longhorned katydids (Tettiganiidae) (Schwalbe, 1990; Schwalbe, 1997; Goldberg and Schwalbe, 2000). In captivity they have eaten cliff chirping frogs (Rorabaugh, 2008).

HABITAT: In Arizona, western barking frogs inhabit outcrops or caves on rocky slopes in often scrubby oak or pine-oak woodlands, within the Madrean evergreen woodlands and woodland-grassland ecotones. These habitats can be characterized by outcrops of limestone, rhyolite, granite, and perhaps other rock types with deep fissures, holes, and caverns where barking frogs can escape climatic extremes (Rorabaugh, 2008). It is strongly associated with Naco Group limestone in the Huachuca Mountains. (Bezy et al., 1966; Goldberg and Schwalbe, 2000; Schwalbe, 1990). Permanent water is not a necessary component of their habitat.

Breeding Habitat: Barking frogs normally call from rock fissures and crevices in the rock outcrops they occupy (Jameson, 1954; Schwalbe et al., 1997; Goldberg and Schwalbe 2000, *in* Amphibiaweb 2009).

ELEVATION: 4,200 – 6,200 feet (1280-1890 m). At Coronado National Memorial in Arizona, individuals were caught from 5,250 - 6,200 ft. (1600-1890 m) (Goldberg and Schwalbe, 2000).

PLANT COMMUNITY: In Arizona, the western barking frog is found within Madrean evergreen woodlands (Bezy et al., 1966; Goldberg and Schwalbe, 2000). The species has

been found in yucca-covered hills, brushy woodlands, open pine forests, juniper-live oak woodland, and low dense clumps of cactus (Stebbins, 1985).

POPULATION TRENDS: The secretive habits of barking frogs make detection of them difficult; their distribution in Arizona is still largely unknown (Amphibiaweb, 2009). At Coronado National Memorial the populations seems to be small, yet the survival rate quite high. Because the populations are estimated to be so small, stochastic events threaten their persistence (Goldberg and Schwalbe, 2000).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None

STATE STATUS: 1B (AGFD SWAP 2012)
WSC (AGFD, WSCA in prep)
[State Endangered AGFD, TNW 1988]

OTHER STATUS: Not BLM Sensitive (USDI, AZ BLM 2010)
[Bureau of Land Management Sensitive, USDI, BLM AZ 2008]
Forest Service Sensitive (USDA, FS Region 3 1999, 2007, 2013)
LC at full species level (Santos-Barrera 2004, *In* IUCN 2006)

MANAGEMENT FACTORS: In order to gain insight into the location and size of populations, call counts should be performed in areas with rocky outcrops during the first two weeks of the summer monsoon season. There is a very small window of opportunity to detect these frogs and visual encounter surveys are inappropriate for this species. Monitoring sites should then be established so that managers can uncover population trends. Damage to habitat patches may heavily impact the survival of this species. In southern Arizona, rocky areas between 5000 and 7000 ft., especially with southeasterly slopes, should not be developed until they have been surveyed for barking frogs at the appropriate time of year (Goldberg and Schwalbe, 2000).

PROTECTIVE MEASURES TAKEN: In Arizona, an Arizona fishing license is required to collect amphibians. Arizona Game and Fish Commission Order 41 allows for the collection and possession of 10 individuals of this species per year.

SUGGESTED PROJECTS: Research into population dynamics is needed, along with information on life history, distribution, population sizes, and population trends.

LAND MANAGEMENT/OWNERSHIP: BIA – Tohono O'odham Nation; BLM – Tucson Field Office; NPS – Coronado National Monument; USFS – Coronado National Forest; Private.

SOURCES OF FURTHER INFORMATION

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Rorabaugh, J. Barking Frog (*Craugastor augusti*) – Amphibians of Arizona. *In* AZ PARC, 2008, http://www.reptilesofaz.org/Turtle-Amphibs-Subpages/h-c-augusti.html. Accessed 10/30/2009.

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Jim Rorabaugh – USFWS, Phoenix, Arizona.

ADDITIONAL INFORMATION:

The specific name *augusti* is in honor of the 19th century French herpetologist August Duméril. Taylor collected the subspecies type specimen in a cactus patch, thus *cactorum*. The trinomal was first used by Zweifel 1956 (Zweifel, 1967). The frogs can be difficult to

find when following the sound of their call and have been called ventriloquists by many (Wright and Wright, 1949; Bezy et al., 1966; Schwalbe, 1990).

As much as 39 and 45 years respectively, have passed between finding specimens of this elusive frog in the Pajarito and Santa Rita mountains. Unless one is in the right place at the right time, this species can be nearly impossible to locate. (Rorabaugh, 2008).

Revised: 1992-12-17 (SSS)
1995-07-18 (MJS)
1998-01-29 (SMS)
2001-02-16 (KJF)
2001-08-07 (CRS)
2006-10-05 (SMS)
2009-10-30 (SMS)

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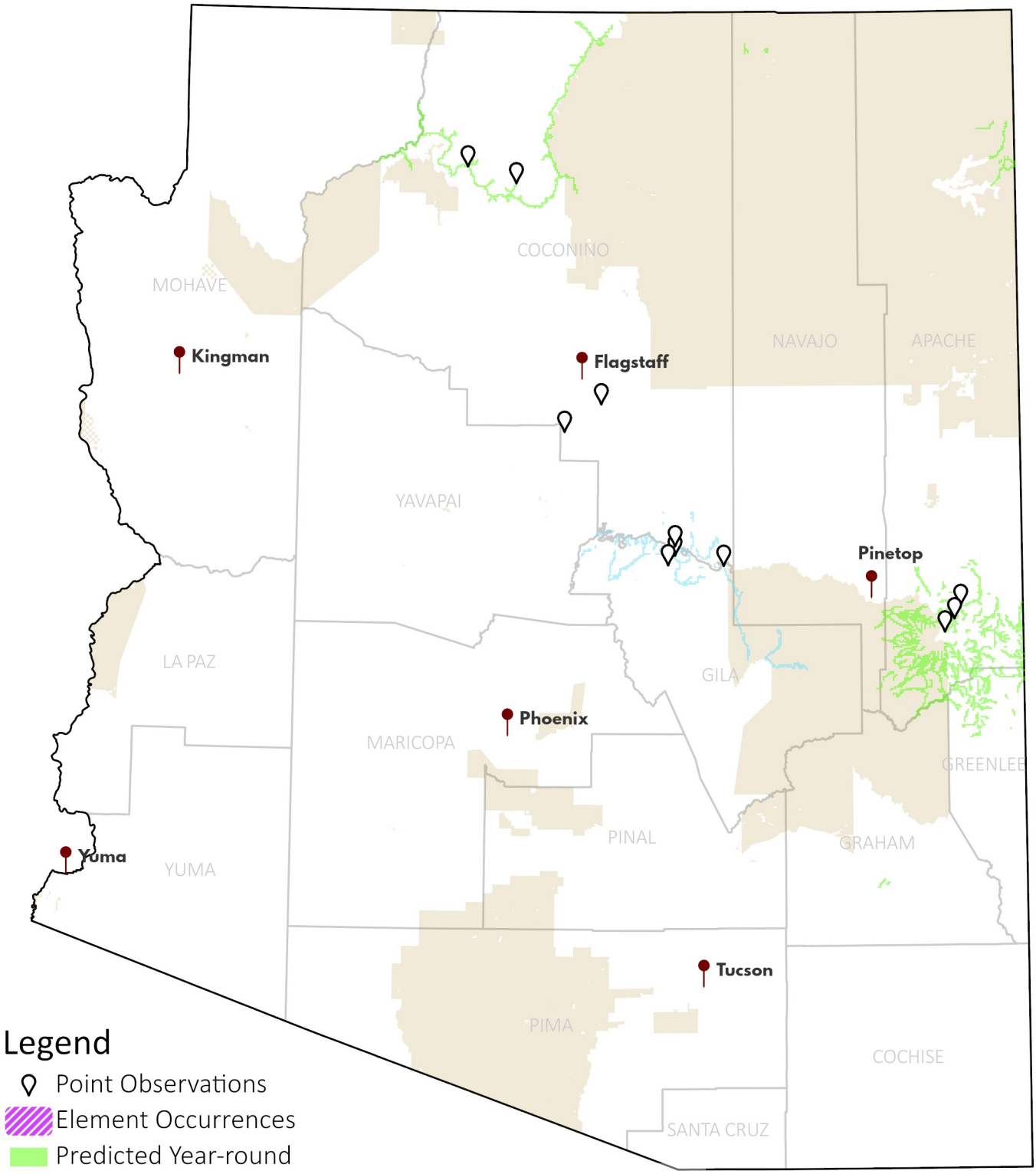
Cinclus mexicanus

American Dipper



Legend

- Point Observations
- Element Occurrences
- Predicted Year-round
- Predicted Winter Only
- Tribal Lands
- Counties

N

0 50 100 Kilometers

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences. Predicted ranges indicate likely habitat suitability, not presence.

Heritage Data Management System
2019-06-12

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** ABNKD06071
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Falco peregrinus anatum*
COMMON NAME: American Peregrine Falcon
SYNONYMS: *Falco anatum*
FAMILY: Falconiformes: Falconidae

AUTHOR, PLACE OF PUBLICATION: *Falco anatum* Bonaparte, Geogr. and Comp. List, 1838, p. 4. New Name for *Falco peregrinus* Wilson, Amer. Orn., vol. 9, 1814, p. 120, pl. 76. *Falco peregrinus* Tunstall, Orn. Brit., 1771, p. 1. (*Ex* Pennant, Brit. Zool., vol. 1, p. 136 = Northamptonshire, England). (AOU 1957).

TYPE LOCALITY: Egg Harbor, New Jersey.

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: Approximately 38 species in genus; at least 18 subspecies worldwide. Most North American peregrines are of three subspecies: *F. p. tundrius, F. p. anatum*, and *F. p. pealei. F. p. anatum* only subspecies known to breed in Arizona.

DESCRIPTION: **Adult:** The plumage of adult peregrines is variable in both color and pattern. Most birds have a dark blue-gray dorsum, and light breast with variably dark barring. Distinctive dark "helmet" covers head to nape of neck, and down side of face in dark malar stripes. Males usually bluer on the back and tend to have less barring on the breast. Pointed wings are 99 cm (39 in) long in males and 117 cm (46 in) in females. Total length of males averages 36-41 cm (14-16 in) and weight of males averages 0.45-0.68 kg (1.0-1.5 lb). Females average 41-46 cm (16-18 in) in total length and weigh 0.72-0.95 kg (1.6-2.1 lb). Females are up to 33 percent longer than males. **Juvenile:** Dark brownish dorsum and "helmet," light underparts are heavily streaked with brown.

AIDS TO IDENTIFICATION: *F. mexicanus* has malar stripes, brown above and exhibits dark axillary patches, but does not have hooded appearance of *F. peregrinus*. *F. columbarius* does not have hooded appearance and is smaller than *F. peregrinus*.

ILLUSTRATIONS:
Color plate (Glinski 1998)
Color plates (Scott 1988)
Color photo (Terres 1980)

TOTAL RANGE: The species *Falco peregrinus* is virtually cosmopolitan and found on every continent except Antarctica. The subspecies *F. p. anatum* nests from central Alaska, central Yukon Territory, and northern Alberta and Saskatchewan, east to the Maritimes and south (excluding coastal areas north of the Columbia River in Washington and British Columbia) throughout western Canada and the United States to Baja California, Sonora, and the highlands of Central Mexico (FWS 1983). The wintering range of *F. p. anatum* includes North America to Central and South America, as far south as Chile (Brown and Amadon 1968). Birds of this subspecies that nest in subarctic areas generally winter in South America, while those that nest in lower latitudes exhibit variable migratory behavior; some are nonmigratory (Yates et al. 1988).

RANGE WITHIN ARIZONA: *Falco peregrinus anatum* breeds in the state wherever sufficient prey is available near cliffs. Areas of spectacular cliffs such as the Mogollon Rim, Grand Canyon and Colorado Plateau, contain most of Arizona's breeding peregrines.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Peregrine falcons have direct flapping flight and vertical "stoops" or plunges in pursuit of flying prey. When intruders are near the eyrie, or when the bird is irritated, several calls are used, with the most common a constant "*kak kak kak.*" During courtship, the nesting call is a whining wail that progresses into a prolonged "*kaak kaak*." This nesting call is used by females to solicit food from the males (Glinski 1998).

These falcons generally mate for life, but will accept a new partner if the current mate dies. Migratory pairs may separate for winter, while resident pairs maintain pair bonds; in Arizona, resident birds are common. Both resident and migratory birds go through courtship rituals every spring. Males court females with aerobatic flight displays and repeated calls; courtship feeding is often used to strengthen the pair bond. Pairs stay together for many years. Females are usually dominant and often aggressive toward their male partner. Once pair-bonded, the male selects several nest sites, from which the female chooses. Nesting sites called eyries, usually consist of a shallow depression scraped into a ledge on the side of a cliff. With greater frequency, these birds are becoming urban in which case ledges on the side of buildings are used. They may select a new nest site along the same cliff face each year or if successful, the same nest site may be used for many years.

Some studies suggest that Peregrine falcons live 4-5 years, others indicate 10-12 years. Birds are sexually mature about age two, although breeding has been documented at one year of age. One clutch of eggs produced per year under normal conditions. A second clutch may be attempted if the first clutch is lost before hatching, or the chicks die in the first few days. Once mature, females usually lay every year until they die.

Studies have shown that mortality in the first year of life can be as high as 60-80%. Commonly, many are lost during initial flight attempts while others are lost during the first migration period. Generally, only one or two of every ten birds reaches maturity.

REPRODUCTION: In Arizona, Peregrine falcons return to breeding areas from mid-February to mid-March. Egg laying occurs anytime from mid-March through mid-May, and even into June at higher elevations, when first attempts at nesting fail. Females lay 3-4 eggs, but as few as 2 and as many as 6 eggs can be produced (Baicich and Harrison 1997). Incubation lasts approximately 32 days. Nestlings move around the nest at around 4 weeks, and fledge at 6 weeks (from May to August) (Glinski 1998). According to Tibbitts (1989), breeding activity typically begins in mid-March with 2-3 eggs typically laid about April 1st, with hatching occurring around the first or second week of May, followed by fledging about the third week of June (Tibbitts 1989). Captive breeding is relatively easy; Peregrine Fund has had good success with hacking captive bred birds into wild in other areas. No captive bred birds are known to have been released in Arizona.

FOOD HABITS: Feeds generally on birds and to a lesser extent preys upon bats. Usually ambushes prey from above by folding wings and diving, sometimes at speeds of up to 200mph (320km/h). Peregrines do not grab the prey in mid air but rather the impact itself is usually deadly. The victim is then allowed to tumble and is either picked up again in mid air, or retrieved from the ground. Average success rate in hunting seems to be in the 20-40% range.

HABITAT: Found in Arizona near cliffs (their preferred habitat) that support sufficient abundance of prey. Optimum peregrine habitat is generally considered to be steep, sheer cliffs overlooking woodlands, riparian areas or other habitats supporting avian prey species in abundance. As Arizona's population grows, peregrines seem to be breeding in less optimal habitat; either small broken cliffs in ponderosa pine forest or large, sheer cliffs in very xeric areas. The presence of an open expanse is critical (Glinski 1998). In urban settings, they are choosing to roosts high up on tall office buildings, where abundant food is present, e.g. pigeons and doves.

ELEVATION: In Arizona, these birds utilize areas from around 400 ft (122 m) along the lower Colorado River, to 9,000 ft (2743 m) along the Mogollon Rim.

PLANT COMMUNITY: Variable. In Arizona, Peregrine falcons are found in areas of Sonoran, Mohave, and Great Basin desertscrub up through areas of Rocky Mountain and Madrean Montane Conifer Forest.

POPULATION TRENDS: The population decline in the 1950's and 1960's in Arizona and rest of U.S. due to DDT contamination has apparently been reversed. In addition to being found in greater numbers, Arizona's peregrines are being found in areas that would have formerly been considered marginal, suggesting that populations may have reached levels saturating the optimal habitat available, and new breeding pairs are forced to breed in sub-optimal areas.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: SC (USDI, FWS 1999)
[LE USDI, FWS 1970]

STATE STATUS: 1A (AGFD SWAP 2012)
[WSC, AGFD, WSCA in prep]
[State Candidate AGFD, TNW 1988]

OTHER STATUS: Bureau of Land Management Sensitive (USDI, BLM AZ 2008, 2010)
Forest Service Sensitive (USDA, FS Region 3, 1999, 2007, 2013)
Group 4, full species level (NNDFW, NESL 2000, 2001, 2005, 2008)
PR, Determined Subject to Special Protection in Mexico (NORMA Oficial Mexicana NOM-059-SEMARNAT-2010).
[Full Species determined Threatened Secretaria de Medio Ambiente 2000]

MANAGEMENT FACTORS: Because they eat at the top of the food chain, Peregrine falcons are subject to accumulation of pesticides or other toxins contained in their prey. At high levels, these chemicals can cause reproductive failure.

PROTECTIVE MEASURES TAKEN: 1994: populations are being monitored, closures at disturbed sites, pesticide contamination monitoring.

SUGGESTED PROJECTS:

LAND MANAGEMENT/OWNERSHIP: In Arizona this species can be found on many lands including the Bureau of Indian Affairs (Fort Apache, Havasupai, Hualapai, and San Carlos Reservations, and the Navajo Nation), Bureau of Land Management (Arizona Strip, Phoenix, and Safford Districts), National Park Service (Glen Canyon and Lake Mead National Recreation Areas, and Chiricahua, Grand Canyon, and Saguaro National Parks), U.S. Forest Service (Apache-Sitgreaves, Coconino, Coronado, Kaibab, Prescott, and Tonto National Forests), U.S. Fish and Wildlife Service (Bill Williams National Wildlife Refuge), The Nature Conservancy (Aravaipa Canyon Preserve), State Land Department, and private lands.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Rich Glinski - Retired, Arizona Game and Fish Department. Currently, consulting.
Tim Tibbitts - National Park Service, Organ Pipe Cactus National Monument, Ajo, Arizona
Troy Corman – Arizona Game and Fish Department, Phoenix.

ADDITIONAL INFORMATION:

Revised: 1991-02-22 (DKW)
1994-04-15 (LZW)
1998-12-31(BAG)
1998-12-31(DJG)
2002-12-03 (RHB)

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Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X…X **(=taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** ABPBW01111
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Vireo bellii arizonae*
COMMON NAME: Arizona Bell's Vireo
SYNONYMS:
FAMILY: Vireonidae

AUTHOR, PLACE OF PUBLICATION: *Vireo bellii*, Audubon, J.J., 1844. Birds Amer., vol. 7, p. 333, pl. 485. *Vireo bellii arizonae*, Ridgway, Proc. Biol. Soc. Washington 16: 107, September 30, 1903.

TYPE LOCALITY: Tucson, Pima County, Arizona.

TYPE SPECIMEN: USNM 098790, complete skin of adult male, collected by E.W. Nelson, March 21, 1884.

TAXONOMIC UNIQUENESS: There are 38 species of vireo's, 12 of which are reported in North America. There are also 25 subspecies. The Arizona Bell's Vireo is 1 of 3 species in Arizona, and the only subspecies in Arizona.

DESCRIPTION: *V.b. arizonae* is a small 4.0-4.75 inch (10-12 cm) bird with drab gray-green plumage above and white to yellow plumage below, with sides and flanks faintly washed with grayish olive-yellow. This bird has a white-eye ring and two pale wing bars, with the lower bar being prominent. The feet and bill are bluish-gray. It has a thickened bill, heavy legs and dark eyes.

AIDS TO IDENTIFICATION: The two wing bars are distinct during flight, otherwise it is indistinct and hard to identify when not singing. Its' song has been likened to someone asking a question and then answering it himself. Its' thickened bill, heavy legs and dark eyes may also be used as identification aides. Distinguished from Warbling Vireo (*Vireo gilvus*) by the wing bar(s) and whitish eye-ring (Peterson 1990).

ILLUSTRATIONS:
Color photo (Terres 1980:913).
Color photo (Phillips 1964:19).
Color drawing of species (National Geographic, 1999: p. 309).
Color drawing of species (Peterson, 1990: p. 285).

TOTAL RANGE: Occurs throughout central and southwestern U.S. Frequents the Colorado River corridor from southern Arizona and California, into Mexico. Rare residents of Clark

County, Nevada, southwestern Utah, and a declining resident along the Colorado, Virgin, and Muddy Rivers and isolated springs. They winter south of the U.S.-Mexico border.

RANGE WITHIN ARIZONA: Central, southeastern and southwestern Arizona. Predominantly along the Colorado River corridor.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: The species is an active, rather secretive bird that flicks its tail. Migrants inhabit breeding areas from early May to late September. The species sings as if through clenched teeth, and consists of husky phrases at short intervals: *cheedle cheedle chee! cheedle cheedle chew!* (Peterson 1990).

REPRODUCTION: They build their nests in low dense vegetation usually less than 5 feet above the ground. Nests are often located near openings within thickets and often near water. The nest diameter is 6.35-7.62 cm (2.5 –3 in), and is comprised of a variety of intricately woven dried grasses and shredded bark, supplemented with spider web or cocoon silk. Three to five white, speckled eggs are laid in small, bowl-shaped nest. Both parents do the incubating of the eggs for 14 days. The young leave the nest 10-12 days after hatching. Both sexes participate in care and feeding of young through post-fledging. Cowbird nest parasitism affects up to seventy percent of all nests. The vireo abandons the nest if parasitized and reproductive success is lowered. Severe weather and predation also affects productivity.

FOOD HABIT: The vireo is an insectivore, feeding on caterpillars, beetles, bees, wasps, and small spiders. This is the only vireo known to eat so many large bulky insects. They move about slowly, taking food from branches and leaves in dense underbrush and shrubs. They are also known to feed on fruit.

HABITAT: Inhabits lowland riparian areas, with willows, mesquite and seepwillows. The vireo prefers dense, low, shrubby vegetation in riparian areas.

ELEVATION: Below 1066m (3500 ft).

PLANT COMMUNITY: Lower Sonoran zone in desert riparian communities.

POPULATION TRENDS: Arizona Bell's vireo is still common in many parts of the state but is drastically reduced in others. North American Breeding Bird Survey data indicate significant survey wide declines averaging 3.2% per year.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: None

OTHER STATUS: Not Forest Service Sensitive in AZ, Sensitive in NM (USDA, FS Region 3 2007) [Forest Service Sensitive (USDA, FS Region 3 1999)]

MANAGEMENT FACTORS: This bird is threatened by loss and degradation of its habitat through human and human-induced activities and by nest parasitism of the brown-headed cowbird. Adverse impacts to vireo habitat result from water projects, severe flooding due to water releases from dams, clearing of land for urban and suburban development and for agriculture, pesticides, human disturbance (e.g., illegal camping), fire in riparian habitat, OHVs, livestock impacts to tree saplings, and invasion of non-native plants (e.g., tamarisk and giant reed). (CDFG 2000).

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: Studies/projects needed include: support the protection of riparian habitat; perform a complete inventory of the Arizona Bell's vireo population throughout Arizona to serve as a baseline and then monitor some samples of the population at fixed intervals; study the reproductive success in areas supporting different densities to assess the effects of cowbird parasitism; and initiate habitat improvements on the National Wildlife Refuges along the Colorado River.

LAND MANAGEMENT/OWNERSHIP:

SOURCES OF FURTHER INFORMATION

REFERENCES:

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

Revised: 2002-02-11 (AMS)
2002-02-26 (SMS)

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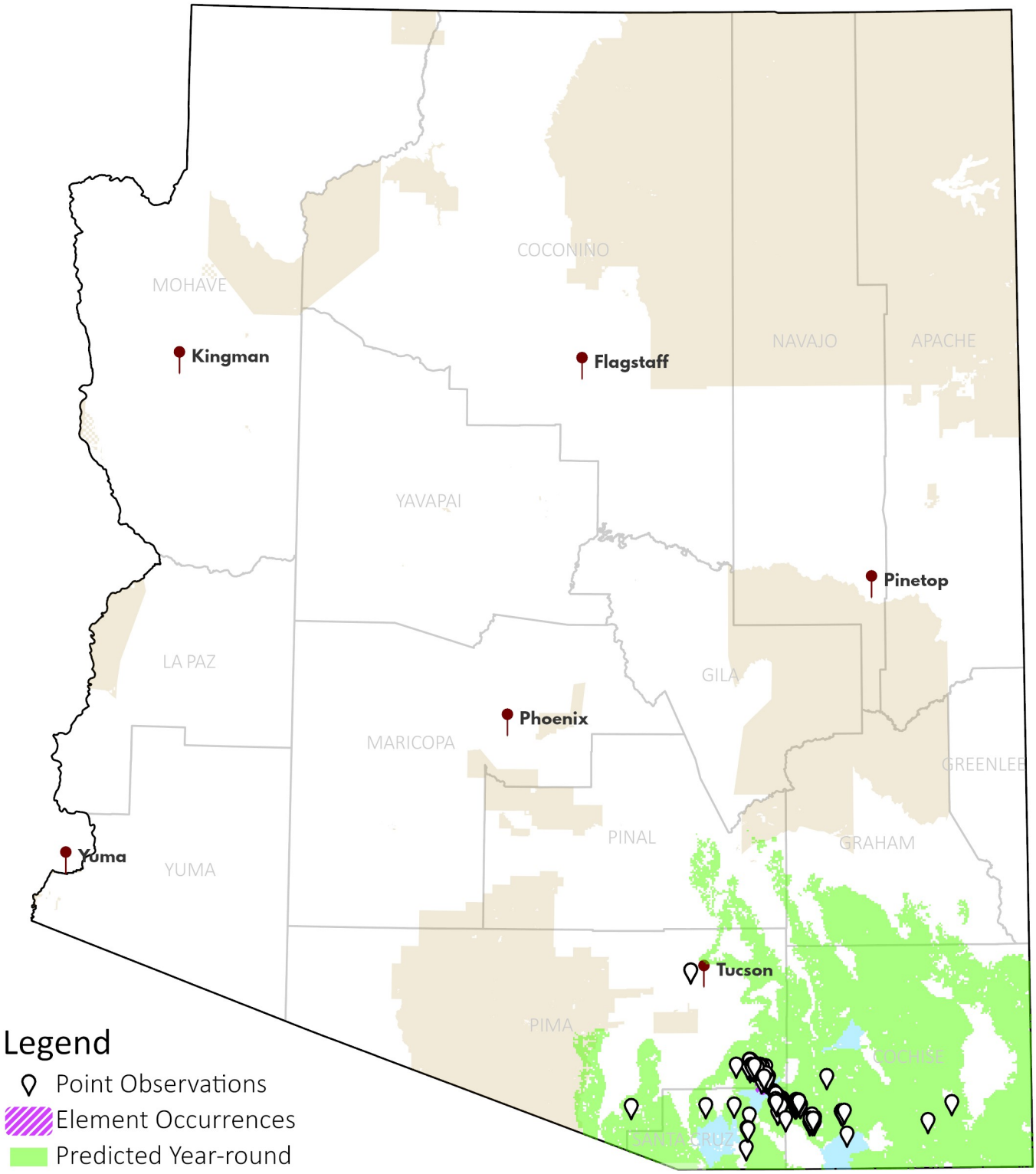
Peucaea botterii arizonae

Arizona Botteri's Sparrow



Legend

- Point Observations
- Element Occurrences
- Predicted Year-round
- Predicted Winter Only
- Tribal Lands
- Counties

N

0 50 100 Kilometers

ARIZONA GAME & FISH

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences. Predicted ranges indicate likely habitat suitability, not presence.

Heritage Data Management System
2019-06-12

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** ABPBXA0021
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Ammodramus savannarum ammolegus*
COMMON NAME: Arizona Grasshopper Sparrow
SYNONYMS:
FAMILY: Emberizidae

AUTHOR, PLACE OF PUBLICATION: H.C. Oberholser. Description of a new Arizona race of the grasshopper sparrow. Proc. Biol. Soc. Washington, 55: 15-16. 1942.

TYPE LOCALITY: Huachuca Mountains at 5,000 feet altitude, 6 miles southeast of Fort Huachuca, Arizona.

TYPE SPECIMEN: Adult male, No. 39783, Cleveland Museum of Natural History, July 3, 1932, collected by Alex Walker, original number 8154.

TAXONOMIC UNIQUENESS: Twelve subspecies recognized (differentiation weak for several subspecies; further study warranted). Four subspecies breed in North America: *A. s. pratensis*, *A. s. perpallidus*, *A. s. ammolegus*, and *A. s. floridanus*. *A. s. ammolegus* is the only subspecies of grasshopper sparrow to breed in Arizona, particularly in the southeast portion; it is also known to winter there. *A. s. perpallidus* winters in western and southeastern Arizona.

DESCRIPTION: For the species: A small and chunky sparrow of open fields, with a short sharp tail and flat head. Dark brown above with buffy breast and sides (adults usually without obvious streaking), and variable amounts of rust; belly is white. Crown dark with a pale central stripe, narrow white-eye ring, and in most adults, a yellow-orange spot in front of the eye. Lengths of 4.5-5.25 in (11-13 cm), mass 14.5-20 g, and a wingspread of 8-8.5 in (20-22 cm). Iris hazel in juveniles and dark to light brown in adults. Legs and feet pale flesh in juveniles, and flesh colored (sometimes-tinged pale-yellow) in adults. Juvenile's sides and pale buff breast are streaked with brown. (Peterson 1990; National Geographic Society 2006).

A. s. ammolegus is similar to *A. s. perpallidus*. Upper parts decidedly paler, with more chestnut or rufous, however with much less, sometimes almost no black on the back; lower parts also lighter and not so dull. (Oberholser 1942).

AIDS TO IDENTIFICATION: Differs from many other sparrows in having both an unstreaked buffy breast (adults) and a short tail. Subspecies vary in overall color from dark Florida race, *Ammodramus savannarum floridanus*, to reddish *ammolegus* of southeastern Arizona. Differs from Le Conte's sparrow (*A. leconteii*) in lacking a buffy-orange eyebrow

and blue-gray ear patch. Adult differs from juvenile Henslow's sparrow (*A. henslowii*) in lacking a yellowish-olive central stripe on the crown. Nelson's Sharp-tailed Sparrow (*A. nelsoni*) has a broad gray central crown stripe, fine blackish streaks on flanks, white braces across the back, and either bright orange supercilium and breast, or dull gray cheek patch and dull yellow supercilium. Juvenile lacks the olive and russet tones of the otherwise similar adult Henslow's sparrow. Immature resembles Baird's Sparrow (*A. bairdii*) but lacks latter's double, dark mustache stripes (Farrand, Jr. 1988).

ILLUSTRATIONS:

Color drawing (Peterson and Peterson, 1990: 323)
Color photos (Farrand, Jr., 1988: 456)
Color drawing (National Geographic, 1999: 409; 2006: 417)
Color photo (http://www.birdsofoklahoma.net/grasshopsparrow.htm)
Color photo of species (Jim Burns, in Corman & Wise-Gervais 2005: 528)
Color photos of the species (Larry Master, in NatureServe 2006)

TOTAL RANGE: Disjunct breeding populations occur in southeastern Arizona, extreme southwest New Mexico, and adjacent northern Sonora and Chihuahua, Mexico (Vickery 1996, Williams 2007 *in* Ruth 2008). Winter range is poorly documented, but thought to extend from southeastern Arizona, southwestern New Mexico, south to Sinaloa and Morelos, Mexico, and Guatemala (Vickery 1996).

RANGE WITHIN ARIZONA: Southeastern (breeding) and southern (wintering) Arizona. In 1987, singing males were heard in the Altar Valley, the Sonoita Grasslands, the San Pedro Valley and the San Bernardino Valley. Historically they also occurred in the Santa Cruz and the Sulphur Springs valleys, but those populations have largely disappeared because of habitat loss or degradation (Strong 1987). According to Corman (*in* Corman and Wise-Gervais 2005), "Atlasers also discovered that they were much more widespread in grasslands of the Sulphur Springs Valley north to Willcox, and in the Buenos Aires National Wildlife Refuge in the Altar Valley than previous literature suggests."

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Unless singing, grasshopper sparrows usually are well concealed in their grassy habitat. Singing birds typically perch above ground, such as on grass stalks or low fences. Voice is a thin dry buzz, *pi-tup zeeeeeeeee*. National Geographic (1999) reports, "Typical song is one or two high chip notes followed by a brief, grasshopper like *buzz*; also sings a series of varied squeaky and buzzy notes." Males sing two completely different, squeaky courtship songs, one short and the other sustained. Around nest, single and double *chip*, *chip-chip* calls by both male and female. Birds vocalize frequently in the early morning before and just after sunrise, but the songs decrease as the temperature rises. They may also sing in the late afternoon, particularly during or immediately after thunderstorms.

Locomotion: walking, hopping, and climbing. When foraging, runs and walks. Female flushed from nest runs in hunched posture giving injury distraction display. Flight differs

depending on time of year, social situation, sex, or destination. During breeding season, male gives wing-flutter display. When flushed, flutter flight is a short distance before dropping into cover; later in breeding season is a "dodging" zigzag movement. More sustained escape flight becomes direct. When flushed in winter, bird usually flies a short distance (<20 m), with habit of twisting tail as it drops down into grass (Vickery 1996).

Average territory size is small, less than 2 ha. Territory boundaries delineated in open habitat by conspicuous song-perches, flight displays, and agnostic interactions. Males sing two different songs and use conspicuous wing displays to maintain exclusive territories. Territorial male chases intruding male from territory, then sings vigorously, flicks wings. Territory defense declines after young fledge. (Vickery 1996).

The species is not known to flock, at any time of year. At night, migrants probably use contact notes. In winter, generally solitary, but within a large (>300 ha) prairie, >100 individuals can be found during peak densities corresponding with migration. In Arizona, stealthy behavior, cryptic plumage, solitary habits, and short escape flights enabled Grasshopper Sparrows to forage far (usually >8 m) from shrub cover (Pulliam and Mills 1977 in Vickery 1996). Mean longevity of banded males in Florida was 2.9 years.

It appears that predation is a minimal threat to these species, however, adults may be taken by hawks, Loggerhead Shrikes (*Lanius ludovicianus*), and also probably mammals and snakes. Nest predators include striped skunks (*Mephitis mephitis*), raccoon (*Procyon lotor*), weasels (*Mustela* sp.), ground squirrels (*Citellus* sp.), foxes (*Vulpes* sp.), cats, feral pigs, and snakes (*Coluber constrictor*, *Elaphe* sp., *Thamnophis* sp., *Lampropeltis* sp., and *Sistrurus* sp.). (Vickery 1999).

REPRODUCTION: The species arrives on their breeding grounds in mid-April and depart for their wintering grounds in mid-September. Throughout most of their range, they are able to produce two broods, one in late May and a second in early July. Frequently re-nest after nest failure. (NatureServe 2001). In Arizona, the peak of *A. s. ammolegus* male singing activity is after the onset of the summer monsoon rains in late June or early July, although birds may occasionally be heard in April or May. Active nests have only been found in July, but it is likely that nesting continues into August and possibly September (Mills 1982 in Strong 1987); Corman (in Corman and Wise-Gervais, 2005), reported males singing from July to early September.

Courtship consists of low fluttering flight by male, silent or with song, the latter answered by female trill; male may chase female while singing (Ehrlich, Dobkin and Wheye 1988). Generally monogamous, with clutch sizes of 4-5 eggs (range 3-6). Eggs ovate, smooth, slightly glossy; generally cream white, sometimes with grayish markings; lightly speckled and spotted with reddish brown; spots generally sharp and well defined, either scattered over entire egg or concentrated toward the large end. Incubation averages 11-13 days for *A. s. pratensis*, *A. s. floridanus*, and *A. s. perpallidus*; probably similar for *A. s. ammolegus*. Female incubates eggs alone. At hatching, young birds are blind, covered with grayish-brown down, and generally precocious, with juvenile plumage generally complete by 10-12 days. Adults and non-parental female attendants perform brooding of nestlings. Nestlings remain in

the nest 8-9 days. Young do not fly when departing the nest, but run through vegetation. Young of first brood have usually dispersed from natal territories when adults are feeding nestlings of second brood. Female ordinarily provides only 4-19 days post fledging parental care before she initiates nest construction of second clutch. Female probably gives limited care to first brood while incubating second clutch; level of care unknown. (Vickery 1996).

Nests are placed on the ground, typically in a slight hollow tucked at the base of a tuft of grass, forb, or shrub. Nests built in 2-3 days by the female, consist of a cup nest domed in the back with overhanging grasses and a side entrance. The nest dome is constructed of grasses and sedges, usually woven into the overhanging grasses and shrub stems. Rim usually level or slightly above ground; inner lining with fine grasses, sedge, sometime hair. Nests not reused. (Vickery 1996; Corman and Wise-Gervais 2005).

FOOD HABITS: Omnivorous. Their diet consists of mostly insects in summer, and grass and weed seeds in winter, especially panic grass (*Panicum* sp.) and sedges (Cyperaceae). Foraging occurs on the ground, although birds may ascend seed stalks to bend them down or discharge their contents (Bison 2000).

HABITAT: For the species, they prefer large expanses of intermediate height grass for nesting. Occupied grasslands in Arizona often include some low, woody shrub component such as scattered young mesquite and mimosa. They nest primarily in semiarid grasslands within the state. (Corman and Wise-Gervais 2005). In southeastern Arizona, their habitat is characterized as having nearly 75% ungrazed grass cover, 5% woody cover, and about 20% bare ground (Bock and Webb 1984, in Corman and Wise-Gervais 2005). Results from surveys conducted in 1986-1987 (Strong 1987) indicate, "They preferred habitat of the Arizona grasshopper sparrow is open grassland between 3800 and 5300 feet. Within this range, the sparrow is limited to areas with moderate to high coverage of medium-height grass and with relatively low shrub coverage. The preferred habitat has grass cover of 42 to 60%, shrub canopy cover of 1 to 8%, and average grass height of 5 to 20 cm. Areas with trees appear to be avoided. Other areas avoided include areas with extremely short or tall grass, low grass cover, or high shrub densities. These habitat requirements are incompatible with extreme over-grazing by cattle, which can lead to grass denudation and mesquite invasion."

ELEVATION: The preferred habitat in Arizona is open grasslands between 3,800 and 5,300 feet (1159-1616.5 m).

PLANT COMMUNITY: Desert grassland and Sonoran desert scrub -- Open to dense vegetation of shrubs, low trees, and succulents, dominated by paloverde (*Cercidium microphyllum*), prickly pear (*Opuntia* sp.), and giant saguaro (*Cereus giganteus*). Chihuahuan Desert Scrub -- Open stands of creosote bush and large succulents (*Ferocactus pringlei, Echinocactus platyaconthus*) in southern New Mexico. Desert Riparian Deciduous Woodland, Marsh -- Woodlands, especially of cottonwoods, that occur where desert streams provide sufficient moisture for a narrow band of deciduous trees and shrubs along the margins. Annual Grasslands, Farms -- Grasslands dominated by wild oat (*Avena* sp.), ripgut brome (*Bromus rigidus*), soft chess (*Bromus mollis*), bur clover (*Medicago hispida*), and

filaree (*Erodium* sp.) with less than 5 percent woody cover. River, Riparian Woodland, (BISON 2000).

POPULATION TRENDS: Per Strong (1987), survey studies conducted in 1986-1987 indicated, "The Sonoita Grasslands and the San Rafael Valley contained the largest Arizona grasshopper sparrow populations in 1987, with densities of 0.66 and 0.85 singing males per hectare, respectively. A brief examination of the Animas Valley indicates that it may support comparable densities. The Altar, San Pedro and San Bernardino valleys support only low numbers of sparrows, which are restricted to local areas of marginal to favorable habitat. In 1986, the grasslands northeast of Cananea (Sonora, Mexico) supported a moderate population."

Given the dependence of the grasshopper sparrow on grasslands, the species has probably declined throughout its historic breeding-range in the western U.S. due to habitat degradation and destruction. A notable source of the latter is overgrazing, which can have an array of negative impacts on this habitat (natural phenomena such as drought can have similar effects). These impacts include the loss of grass-cover, reduction in production of grass-seed, increased erosion, and invasion by species such as mesquite (*Prosopis* sp.) and other woody plants. (BISON 2000).

For the species: North American Breeding Bird Survey (BBS) data indicate a significant population decline (4.4% per year) in North America between 1966 and 1989 (Droege and Sauer 1990); decline was 3.9% per year between 1966 and 1993, and 4.5 % in western U.S. (Peterjohn et al. 1994, in NatureServe 2001, and Vickery 1996).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: 1B (AGFD SWAP 2012)
OTHER STATUS: Bureau of Land Management Sensitive (USDI, BLM AZ 2010)
Forest Service Sensitive (USDA, FS Region 3 2007, 2013)

MANAGEMENT FACTORS: Limiting factors for the Arizona grasshopper sparrow are the loss and degradation of native grassland habitat (USDA, FS 2007). Management needs include reduce cattle grazing in native grasslands to maintain and enhance native grasses; reduce shrub invasion by maintaining natural fire regimes; consolidate housing and protect native grassland open space within housing developments; reduce agricultural (vineyard) development in native grassland. In southwestern Arizona, they avoid recently burned sites >/= 2 years post-burn; prefers shrub cover (Bock and Webb 1984, and Bock and Bock 1992, in Vickery 1996). Most of the Sonoita Plains and grasslands immediately west of the upper San Pedro River, are privately owned and are under pressures for rapid development.

PROTECTIVE MEASURES TAKEN: With The Nature Conservancy's acquisition of the Gray Ranch, protection of the key breeding habitat for Arizona grasshopper sparrows in New Mexico should be ensured (BISON 2000). The species tends to respond quickly to effective habitat management and restoration. Incorporation of grassland bird habitat into regional conservation strategies such as U.S. Department of Agriculture Conservation Reserve Program, are likely to help Grasshopper Sparrow and grassland birds generally (J.R. Herkert pers. comm. in Vickery 1996). Recently (2007) added to the Region 3, US Forest Service Sensitive Animals List.

SUGGESTED PROJECTS: Continued survey's of Arizona breeding and wintering populations, to answer Vickery's (1996) concern (next sentence), and to develop future conservation & management plans for this bird. "Because there are essentially no data on winter mortality and survivorship for this species, it is impossible to adequately determine whether reproductive failure or winter survival has a greater influence on the species' population regulation. Research on winter mortality and survivorship is urgently needed." (Vickery 1996).

LAND MANAGEMENT/OWNERSHIP: BLM – Tucson Field Office, DOD - Fort Huachuca Military Reservation, USFS – Coronado National Forest, USFWS – Buenos Aires National Wildlife Refuge, State Land Department, Private.

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ADDITIONAL INFORMATION:

"Unobtrusive little bird that did not come by its name because of its fondness for grasshoppers, though it is never averse to making a meal of them, but because of its grasshopper-like attempt at song, if song it can be called" (Vickery 1996).

Ammodramus is Greek for "sand runner," and *savannarum* is Latin for "savanna," its typical habitat, and *ammolegus* is Greek for "sand-chooser."

Revised: 2001-03-28 (SMS)
2006-09-15 (SMS)
2010-12-07 (SMS)

Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X…X **(=taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** ABNKC10010
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Haliaeetus leucocephalus* Linnaeus
COMMON NAME: Bald Eagle, American Eagle, White-headed Eagle, White-headed Sea Eagle, Black Eagle, Fishing Eagle, Washington Eagle
SYNONYMS: *Falco leucocephalus* Linnaeus
FAMILY: Accipitridae

AUTHOR, PLACE OF PUBLICATION: Linnaeus, Syst. Nat., ed. 12, vol. 1, 1766, p. 124. Based on The Bald Eagle, *Aquila capitae alba* Catesby, Carolina, vol. 1, p. 1.

TYPE LOCALITY: "in America, Europa = South Carolina."

TYPE SPECIMEN: USNM 151567 (adult male). C.H. Townsend, 22 Jun 1895. Unalaska Island (=Aleutian Islands), Aleutians West Census Area, Alaska, United States. In Proc. Biol. Soc. Washington 11: 145. June 9, 1897.

TAXONOMIC UNIQUENESS: Currently in the Accipitridae family, there are 217 species worldwide, 20 are found in the western world. These include kites, eagles, buteos, accipiters, and harriers. *Haliaeetus leucocephalus*, the bald eagle, is one of three species making up the genus *Haliaeetus*, and one of four species comprising the subfamily Accipitrinae, and the only one indigenous to North America (Peterson 1990).

DESCRIPTION: The bald eagle is a unique species in that it has five distinct plumage phases: Immature, White-belly I, White-belly II, Adult transition, and Adult (Clark and Wheeler 1987). The names of these phases may vary in the literature, but the number of phases will not. Sexes are alike in all plumages.

Natal downs (first 3 weeks): The down is short with hair-like structures among the down and is off-white in color. Eventually the color turns grayish, but white basally. It is dense and is like sheared wool. Feathers first begin to appear on the shoulders, then the head, followed by the lateral underparts, and finally the upper tarsus.

Immature: In the first full plumage, head is uniform dark brown. Beak and cere are dark, and the color of the iris is dark brown. The back and upper wing coverts are tawny brown and contrast with dark flight feathers. White axillary spots and diagonal white lines are present on underwings. The breast is dark brown, while the belly is pale to dark tawny. Some individuals may have white streaking, usually where breast and belly meet. The tail is longer than in subsequent plumage, is broadly rounded, and is sometimes dark, but mostly dirty white.

White-belly I (Basic I Plumage): This phase usually occurs in the first spring when the bird is around 1 year of age. The head is brown, and has a buffy superciliary line, contrasting with a dark brown band extending through the eye and posteriorly. The iris lightens to a light brown or amber, and the beak and cere fade to a slate color (grading to a yellowish buff next to cere). The belly is white with few to many short dark streaks, while the breast is darker forming a distinct bib. Some white feathers appear on the upper wing coverts and back. The upper back has a whitish or buffy brown inverted triangle on an otherwise dark dorsum. New flight

feathers have more whitish areas, while new whitish secondaries have dark tips. The legs and feet are yellow, while the talons are black.

White-belly II (Basic II Plumage): This phase occurs when the bird is 2 years of age. This phase is similar to the 1-year-old phase; however, the superciliary line is larger and whitish, while the dark band behind the eye is narrower. Cheeks and throat are whitish, and the crown is a pale gray-brown. The color of the iris is pale whitish yellow, the cere is yellowish, and the beak has lightened to a horn-color (darkish gray) with a few dirty yellow spots. The dorsum tends to darken, and the inverted light triangle is less prominent. The bib on the upper breast remains distinct (usually). All but 2-3 immature secondaries have been replaced by shorter feathers, while the wing is now narrower than in the immature and white-belly I phases; upperwing coverts are usually all brown, and the wing lining is more or less white.

Adult Transition (Basic III Plumage): At 3 years of age, this highly variable plumage is acquired. The head lightens and the body darkens from the white-belly I phase. Individuals usually acquire an osprey-like dark eye-line. The white on the head does not extend onto the neck, as it does on adult birds; brown flecking does occur on the forehead and crown of the head. The iris is pale yellow in color, and the cere and beak are yellow with dark smudges on beak; the cere may be mottled darkish-yellow. White spots and white diagonal lines on underwings fade. The body feathering is dark brown, but may still have a hint of a lighter inverted triangle on the back. The subadult tail is retained until the spring of the fifth year (4 years of age). It is largely white with some brown flecking proximally, with the brown becoming heavily mottled toward the tips. The legs and feet are yellow, and the talons are black.

Adult (Basic V Plumage): Plumage is acquired at 4 years of age. Head and neck is white, sometimes with a few brown spots or gray flecking around eyes (even in older birds). Beak and cere are bright yellow, and the iris is pale lemon yellow. Body, wing coverts, and flight feathers are dark brown. The tail coverts and tail are white. Although the female is larger than the male, the average body measurements for both sexes are as follows:

Length: 70-90 cm (79); 27-35 in (31)
Wingspread: 180-225 cm (203); 71-89 in (80)
Weight: 2.0-6.2 kg (4.3); 4.4-13.6 lb (9.5)

AIDS TO IDENTIFICATION: The bald eagle is most similar to the golden eagle (*Aquila chrysaetos*). The head of the bald eagle protrudes from the body in flight, more than half the tail length, while the head of a golden eagle protrudes less than half a tail length. The trailing edge of the wing is straighter on bald eagles. Immature and subadult golden eagles have white on the underwing, restricted to the base of the flight feathers. The white on the bald eagles is restricted to the underwing coverts and axillars. Another difference is that perched golden eagles show the golden nape, yellow cere and bicolored beak, while bald eagles have the cere and beak uniformly colored and no golden nape present. In addition, the tarsi of the bald eagles are bare, while the golden eagles' are completely covered with buffy feathers.

ILLUSTRATIONS:

Color drawing (Clark and Wheeler 1987)
B&W photos (Clark and Wheeler 1987:150-151)
B&W drawings (Palmer editor 1988:187, 216)
Color drawing (Peterson 1990:181, 189)
Color drawings (Scott 1987:185, 209)
Color photos (Terres 1980:503-504)

Color photos (Digibird web site, www.digibird.com)
Map of Distribution (Buehler 2000: 01)

TOTAL RANGE: Restricted to North America, mainly Canada and the United States. It is believed to occur in two populations, the first being the northern population, which are those individuals occurring north of the 40th parallel North Latitude. The southern population, are those individuals found south of that latitude (Hildebrandt 1981). It is locally common during the breeding season in Florida; the Chesapeake Bay; Coastal Maine through the Maritime Provinces; Great Lakes; the boreal lake region from Western Ontario to coastal British Columbia; most of Alaska, especially the south eastern coast; Washington south to northern California; and the greater Yellowstone areas of Western Wyoming, south-central Montana, and Eastern Idaho. Small local breeding populations exist along the Gulf Coast of Texas and Louisiana, coastal South Carolina, along the Mississippi River, in central Arizona, and in Baja California, Mexico. Large winter concentrations have been observed along Chilkat River in Alaska, Klamath Basin in Oregon, and along the upper Mississippi River.

According to Larry A. Forbis (Date?), the southwest distribution of this bird includes central Arizona, west-central New Mexico, Baja Peninsula on Isla Cresciente near Almejao Bay, Mexico, and up the coast near Las Tinajas. They have also been found in Sonora, Mexico.

RANGE WITHIN ARIZONA: A small resident population occupies Central Arizona, while a wintering population of bald eagles occupies both Central and Northern Arizona. Historically, bald eagles nested on the Mogollon Rim at Stoneman Lake, Mormon Lake, and Lake Mary. Today, breeding bald eagles in northern Arizona that are not considered part of the Sonoran DPS are found breeding in the following areas: Apache County at Luna Lake, Crescent Lake, SW of Berry Creek Campground, and along Tsaile Creek NW of Black Pinnacle; in Coconino County at Lower Lake Mary S of Flagstaff, and on the Mogollon Rim near Woods Canyon Lake; in Navajo County along Silver Creek SE of Snowflake.

Historically the Sonoran DPS nested at Topock Marsh on the Havasu NWR and the Big Sandy River upstream of the Santa Maria River, in Mohave County. Today, breeding territories occur in Gila County along the Gila River, Roosevelt Lake, Salt River, San Carlos Reservoir, San Pedro River, Sierra Ancha (Dupont Canyon), Tonto Creek, and the Verde River. In Maricopa County, breeding territories are found in the vicinity of Apache, Canyon and Saguaro Lakes, along the Verde River near Fort McDowell, along the Verde River below Horseshoe Reservoir and above and below Bartlett Reservoir, Lake Pleasant, within the City of Mesa along the Salt River, near the confluence of the Gila and Salt Rivers, Canyon Creek, Buckhorn Mtn in the Mazatzal Mtns, and various points along the Salt and Verde Rivers including their confluence. They breed in Mohave County along Burro Creek, at Alamo Lake and below the lake along the Bill Williams River. In Pinal County, breeding territories include several areas of the Gila River, and on the San Pedro River (S of Gila River). Breeding territories in Yavapai County are found at various points along the Verde River, at Lynx Lake and its vicinity in the Bradshaw Mtns, Oak Creek above the confluence with Verde River, and Granite Creek S of Del Rio.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Female bald eagles are slightly larger than males (79-90 inch wingspan versus 72-85). Northern birds are larger than southern birds. Bald eagles can live as long as thirty years, but average closer to fifteen to twenty. They become sexually mature at four to

five years of age. Once paired, bald eagles remain together until one dies, though the survivor will not hesitate to accept a new mate. Hunting area varies between 1,700 and 10,000 acres, but can be smaller if food is abundant. An eagle's lifting weight is about four pounds. As well as hunting for food, they will eat carrion and will steel from others.

Migration: Bald eagles that have nested tend to stay on or near their nesting locality through the year if food is available and the weather is bearable. If they do vacate the area, they go whatever distance is necessary to find adequate food and shelter. There tend to be extensive southern migrations from northern regions, especially of younger birds. Generally, young of northern populations tend to migrate south earlier and return north later than older migrants (Palmer ed. 1988).

Because of the eagle's endangered status, humans have used several techniques to aid in the repopulation of this species. These include; 1) Hacking - the rearing of young birds to independence in areas where the species had ceased to breed, 2) Fostering - when eaglets are put into nests where unproductive adults are present, 3) Translocation - when viable eggs are put into nests where adult birds are unproductive. Hacking has been found to be the most successful, and translocation the least (Palmer ed. 1988).

When eaglets are present, at least one parent remains in constant attendance for the first 2 weeks. Night brooding lasts about 3 to 4 weeks. Both parents may feed the eaglets, but by 6 to 9 weeks of age, the eaglets are well able to tear off pieces of food themselves. Survival of both young at nests containing two eaglets is frequent, and appears to depend on the ability of the parent to provide food. The larger of two eaglets is usually fed first. If food is scarce, it may get all of it resulting in the death of the smaller eaglet. This is termed siblicide and usually occurs at 3 to 8 weeks of age, and occurs more with golden eagles. Later in nest life, parents spend less time near the young. Eaglets, however, see and recognize their parents at a great distance. During this later stage, eaglets spend much time in preening, flight preparation (flapping), hunting and fighting play, and sunbathing. Eaglets attain flight around 10-11 weeks of age, and usually leave the nest a week to 2 weeks later. After dispersal or migration, the usual pattern of birds aged 1 to 3 years, is to return to the general region of their birth (Palmer ed. 1988).

REPRODUCTION: "Bald Eagles are believed to form a lifelong pair bond; if a mate is lost, a replacement is found rather quickly. The female and male of a previously mated pair may arrive on the breeding grounds separately or they may meet during migration and arrive together. Soaring together, billing, stroking each other, joint nest building or repair, sitting together on the nest, and having the male bring food to the female, may enhance bond maintenance. Pairs that are uninhibited (low density of birds in area) can breed as early as 4 years of age. A younger bird of either sex may be acquired as a mate or foster parent to replace a lost mate. A high density of established nesters in an area can inhibit breeding by other reproductive aged pairs. The laying rate is normally 2-5 days after the first egg is laid. Eggs are usually laid in the morning; with incubation, beginning after the first egg is produced. Clutch size ranges from 1-3(2). The eggs are white, rather rough, and without luster. If the first clutch is fails early enough in the breeding season, the female may lay a second clutch after an interval of 4 weeks or more. A date of first clutch varies geographically:

Arizona = Late January to the third week of February
Florida = as early as October
Alaska, Washington, Western Canada = Late April to May

Incubation lasts 35 days, the nestling stage lasts 77 days, and first flight occurs around 112 days." (Palmer ed. 1988)

FOOD HABITS: Their diet in Arizona is comprised mainly of fish (catfish, suckers, and carp; and yellow bass <6 in), followed by small mammals (jackrabbits, cottontails, squirrels, and woodrats), carrion (including large mammals), and avian (normally waterfowl, mainly American coots). To a lesser extent, various herps make be taken such as the Sonora mud and spiny softshell turtles, along with snakes (usually dead). (Grubb 1988). Fish consumption increases in the diet as the nesting season progresses, while the consumption of mammals declines. Bald eagles are opportunistic foragers, and will pirate meals from other raptors such as Ospreys and other eagles. Both parents may feed eaglets, by tearing food, and dropping it into open mouths. By the 4th week, young eaglets have to reach for the food from the adults.

HABITAT: Bald eagles inhabit coastal areas, estuaries, unfrozen inland waters, and some arid areas of the western interior and southwestern portion of the U.S. They like areas with high water-to-land edge, and areas with unimpeded views including both horizontal and vertical aspects. Areas selected for as wintering habitat will have an adequate food supply, and have open water such as river rapids, impoundments, dam spillways, lakes, and estuaries.

They typically have four types of perches. The Guard/Sentry Perch is located in tall trees, cliff and ridge tops, and cliff faces, where the nest can be watched. A Foraging Perch is normally adjacent to or overhanging the river or lake, and is low to moderate in height. The Shade Perch (in warm arid areas) provides adequate shade during warm periods of the year. The Roost Perch is mainly used for resting at night, and is usually sheltered from the elements (e.g. wind); it is near to or possesses a good view of the nest. Bald eagles will use guard and foraging perches for loafing. Communal roosts are common in the winter, and found in areas that provide protection from adverse weather conditions, and may be comprised of several individuals. These include sheltered valleys, forested bottomlands, and coniferous trees.

Breeding habitat of bald eagles in central Arizona occurs mainly within two of the biotic life zones described by C.H. Merriam (1890-1910: in Lowe 1976 and in Hildebrandt 1981):

1) Lower Sonoran Life Zone is from the desert valley surrounding Phoenix upstream into lower portions of the Canyon country of the Salt and Verde Rivers. This habitat is of the saguaro-paloverde community type between 200-800 meters, in valley floors and hillsides.

2) Upper Sonoran Life Zone is characterized by coarse-soiled rocky hillsides, talus and cliffs, and occurs farther upstream in canyons and on the surrounding hillsides. It is composed of desert grassland and transition community types. Lower slopes possess perennial bunch grass, jojoba, cactus, yucca and agave. Middle and upper slopes often grade into the chaparral community type. The habitat type of the upper slopes is pinyon pine.

Nesting habitat as described by Palmer 1988, consists of areas with tall trees (usually old growth) that are taller than surroundings. The type of tree used varies geographically. For example, Engelmann Spruce, Lodge Pole Pine, and Douglas-fir are common trees used in the Rocky Mountains. Ideally, the nest lies below the top of the crown in a live tree, where young are sheltered above from the elements. In treeless areas, the nest is usually on a high place such as a cliff face. Bald eagles nesting in Arizona typically nest on cliff faces, ledges, and pinnacles (Grubb 1985). Cliff nests are generally located within 183.0 m (600.0 ft) of the riverbank and approximately 92.0 m (300.0 ft) above water (USFWS 1982). Both sexes

partake in collection of nest material (limbs, branches, and debris), but actual construction of the nest is thought to be done by the female. The lining consists of finer items, such as sedges, grasses, moss etc. The nest usually measures 0.3-1.0 m high, and 1.0-2.0 m in the top diameter. The cup or cavity measures 14 inches in diameter and 4 inches deep. Continually used nests can become quite large and normally last no more than a few years (Palmer 1988).

ELEVATION: In Arizona, elevation ranges from 460 - 7,930 feet (140 - 2419 m).

PLANT COMMUNITY: Lower and Upper Sonoran Life Zones, including Saguaro-paloverde, desert grassland, chaparral, and pinyon-juniper community types (see discussion in the Habitat section).

POPULATION TRENDS: The population trend in Arizona is up, which coincides with the national trend, and may be due to better census techniques, a greater volunteer bird watching force, and increased public awareness. Coues first documented bald eagles in Arizona in 1866. The first recorded breeding attempt was at Stoneman Lake (southeast of Flagstaff, Arizona) by Mearns in 1890. In the 1930's, bald eagle breeding was observed at Saguaro Lake, Bartlett Dam, and in the Salt River Canyon. In 1986, 11 of the original 25 documented breeding areas were occupied, but 10 new ones were discovered for a total of 21 active breeding areas (Forbis Date?). In 1992, 28 breeding areas were occupied in Arizona, with only 36% successfully fledging young (total of 14 fledged). Productivity in this year may have been down due to the weather; frequent rains and flooding occurred this year (Endangered Species Technical Bulletin 1992).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS:
SC, Sonoran Desert population (USDI, FWS 2011)
[LT, Sonoran Desert DPS (USDI, FWS 2008)]
[LT USDI, FWS 1995]
[LE USDI, FWS 1978]

STATE STATUS:
1A (AGFD SWAP 2012)
[WSC, AGFD, WSCA in prep]
[State Endangered AGFD, TNW 1988]

OTHER STATUS:
Bureau of Land Management Sensitive - DPS (USDI, BLM AZ 2010)
[Bureau of Land Management Sensitive (USDI, BLM AZ 2008)]
Forest Service Sensitive all forests (USDA, FS Region 3, 2007, 2013)
[Forest Service Sensitive (Apache-Sitgreaves, 2000)]
[Forest Service Sensitive (USDA, FS Region 3 1988)]
Group 2 (NESL, 2008)
[None NESL, 2000]
[Group 3 (NNDFG, NESL 1994)]

P, Determined Endangered in Mexico (NORMA Oficial Mexicana NOM-059-SEMARNAT-2010).
Group P (Mexican Federal Endangered Species List, 2000)
[Group P (Mexican Federal Endangered Species List, 1994)]

MANAGEMENT FACTORS: When managing for this species, managers should be aware of possible population declines due to habitat loss, prey loss, and reproductive impairment from pesticides and heavy metals. In addition, they should be aware of potential losses due to illegal shooting, trapping, food poisoning (ingestion of carrion from e.g. poisoned coyotes), electrocution from power lines, collisions, and various accidents.

PROTECTIVE MEASURES TAKEN: In Arizona, the use of "Hacking", fostering (of eaglets), and translocation of eggs should be continued when situations warrant it. In 1978, the Tonto National Forest in Arizona initiated the Bald Eagle Nest Watch Program. This program began with one volunteer, and has grown to 25+ individuals. The three principal goals of this program are bald eagle conservation, data collection on nesting and breeding activities, and education of the public about bald eagles and the sensitivity of these breeding areas. These nest watchers are also important in policing known territories and nest sites.

SUGGESTED PROJECTS: Continued monitoring of the breeding populations in the state.

LAND MANAGEMENT/OWNERSHIP: BIA – Fort Apache, Fort McDowell, and San Carlos Reservations; BLM – Kingman Field Office; USFS – Apache-Sitgreaves, Coconino, Prescott, and Tonto National Forests; USFWS – Havasu National Wildlife Refuge (not since 1979); AGFD – Alamo Wildlife Area and Becker Lake; Lake Pleasant County Park; Private.

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James Driscoll – Arizona Game and Fish Department, Phoenix.
Kenneth Jacobson – Arizona Game and Fish Department, Phoenix.
Teryl Grubb - USDA, Forest Service.

ADDITIONAL INFORMATION:

Used in religious ceremonies by native American Indians particularly Apache, Zuni, Pueblo.

Revised: 1995-03-13 (SMS)
1995-Sum (LZW)
1997-02-27 (SMS)
2002-11-13 (RHB)
2010-12-28 (SMS)
2011-09-02 (SMS)

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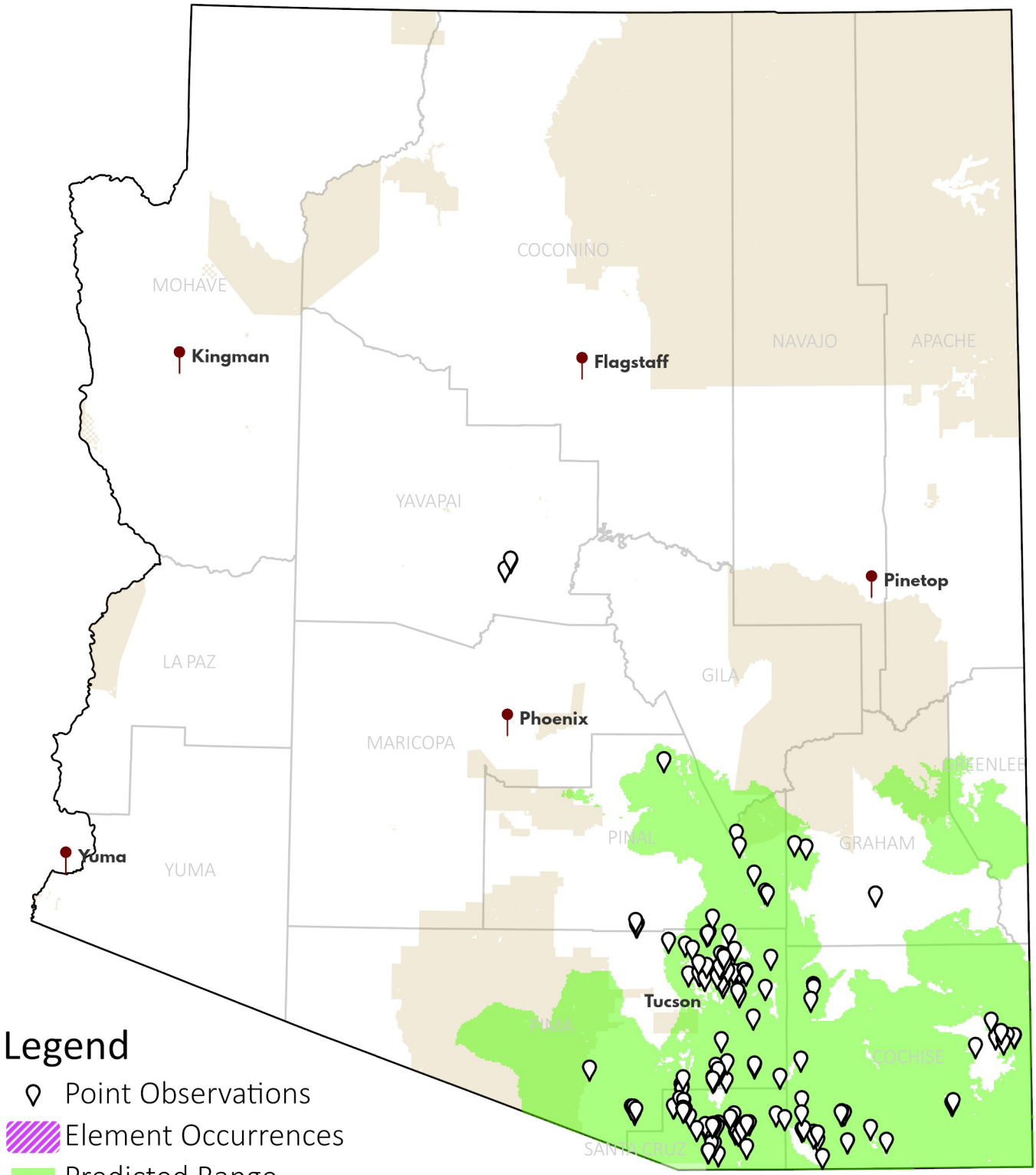
Cynanthus latirostris

Broad-billed Hummingbird



Legend

- Point Observations
- Element Occurrences
- Predicted Range
- Tribal Lands
- Counties

N

0 50 100 Kilometers

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences. Predicted ranges indicate likely habitat suitability, not presence.

Heritage Data Management System
2019-06-12

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** ABNSB08041
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Glaucidium brasilianum cactorum* van Rossem
COMMON NAME: Cactus Ferruginous Pygmy-Owl
SYNONYMS: *Strix brasiliana* Gmelin
FAMILY: Strigidae

AUTHOR, PLACE OF PUBLICATION: Van Rossem. 1937. Proc. Biol. Soc. Washington, 50, Feb. 23, 1937. p.27.

TYPE LOCALITY: Between Guaymas and Empalme, Sonora.

TYPE SPECIMEN: 30225 California Institute of Technology (original number 12940).

TAXONOMIC UNIQUENESS: The subspecies *cactorum* is 1 of 3 subspecies of *Glaucidium brasilianum*, and is the only subspecies that occurs in Arizona. *G. b. ridgwayi* occurs throughout southern Mexico and Central America, and *G. b. brasilianum* is found throughout South America.

DESCRIPTION: A small size owl weighing 2.3-3.1 ounces and measuring 5.8-7.2 in (14.73-18.3 cm) in length, with a 14.3-16.0 in (36.32-40.64 cm) wingspan (Monson *in* Glinski 1998). Females average slightly larger than males. The back and upper coverts are plain light brown, with occasional conspicuous white spots on the upper wing coverts and small, regularly spaced whitish spots on the outer primaries. Both the tail and the flight feathers are duskily barred, the dusky and light bars of the tail evenly spaced. The head and nape are a somewhat paler brown than the back, and have linear whitish streaks. Each side of the nape is decorated with a black blot bordered in white that resembles an eye. The face has a white V and disk. The breast and flanks are heavily streaked with dark reddish brown to blackish marks; sometimes the streaks merge and become almost solid reddish brown. The tarsi is feathered. The eyes are yellow, and the bill is greenish-yellow. (Monson *in* Glinski 1998). Both sexes and immature birds have similar plumage.

AIDS TO IDENTIFICATION: Similar to Northern Pygmy-Owl (*Glaucidium gnoma*). Rufous crown streaked with white. Tail has 7-8 light brown (not white) bars. Their call consists of a "*put-put-put*" note with the "sharp penetrating quality of the whistling note of the cardinal; the rate, however, being about 150 'puts' per minute." Early in season, the male may call "nearly all night and much of the day." (Brandt 1951).

ILLUSTRATIONS:
Color drawing of species (Monson *in* Glinski 1998: plate 36)

TOTAL RANGE: Southern Arizona and southern Texas, south to Guerrero, Nuevo Leon, and Tamaulipas, Mexico.

RANGE WITHIN ARIZONA: The only recent records are from Organ Pipe Cactus National Monument, near Ajo, and suburban Tucson. Historically, fairly common in mesquite bosques throughout central southern Arizona. They have been found south of Tortolita Mts., west of Tortilla Mts., Rincon Mts., Pajarito Mts., Puerto Blanco Mts., Ajo Mts., Santa Catalina Mts., Santa Rita Mts., Tucson area, Gila River near Bonita Creek and San Francisco River, San Pedro River near Dudleyville, and Sonoyta Creek.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: A nonsocial owl that is active mostly at dawn and dusk. This diurnal habit helps separate it from other small owls that dislike light. Vocalizations indicate breeding activity, usually September to April (Monson *in* Glinski 1998; September to March in Millsap and Johnson *in press*). It is normally silent in the summer. The principal vocalization is a rapid, monotonous repeated and shrill hooting (Monson *in* Glinski 1998). The hoots are uttered at the rate of about 2 per second, or 120-150 per minute, and may be repeated as many as 100 times without pause (Monson *in* Glinski 1998). The flight is quick and direct, generally flying short distances from one tree or bush to another. When perching, it usually sits in a leafy paloverde mesquite, or perhaps a cottonwood or willow. The best field identification is its small size and long reddish-barred tail, which is often nervously wagged or twitched. It is unknown whether they remain on their home territory throughout the year.

REPRODUCTION: Nothing is known about the courtship behavior (Monson *in* Glinski 1998). They nest in woodpecker or natural cavities in broadleaf riparian trees or saguaro cacti. Nests usually 10-20 feet up but may be as high as 40 feet and close to the river. No lining material used. Laying commences by 20 April. Three to 4 white, unmarked eggs (1.1 inches long) are laid in the bottom of the cavity. Possibly monogamous mating. Twenty-eight day incubation period, mostly by the female. Young are immobile, downy, and have eyes closed after hatching. Both parents feed the young; the male will also feed the female. Hatching is synchronous but siblings compete for food resulting in size differences. Young fledge in 27-30 days.

FOOD HABITS: A daytime predator that's diet is not well known. It forages in microphyllous woodland, especially well developed mesquite bosque, but also desert washes with mature blue paloverde, mesquite, and ironwood. Small birds, insects (e.g. crickets, scorpions, and caterpillars), lizards, and mammals thought to be their main diet. Prey is snatched from the ground in talons, after a gliding descent from a perch.

HABITAT: In Arizona according to Monson (*in* Glinski 1998), "it has occurred in streamside cottonwoods and willows and adjacent mesquite bosques, usually with saguaros on nearby

slopes. Less often it has been found along dry washes where large mesquite, paloverde, ironwood, and saguaro thrive."

ELEVATION: 1,300 - 4,000 ft (397 - 1,220 m).

PLANT COMMUNITY: Sonoran riparian deciduous woodland, within Arizona upland subdivision and Sonoran desertscrub.

POPULATION TRENDS: Drastic declines in both range and abundance. Sporadic breeding has been documented in recent years in suburban Tucson. Before 1950, they were a fairly common to common resident in low elevation riparian mesquite woodlands ranging north to Phoenix, northwest to Salt-Gila River confluence, west to Cabeza Prieta Tanks, and east to at least Superior (probably to upper Gila River near Safford). They are declining in northern Sonora where they now are absent from many locations described by van Rossem.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS:
SC (USDI, FWS 2006)
[LE (USDI, FWS 1997); Critical Habitat Proposed 11/27/2002, AZ Pop.]
[PE USDI, FWS 1996]
[C1 USDI, FWS 1991]

STATE STATUS:
1B (AGFD SWAP 2012)
[WSC, AGFD, WSCA in prep]
[State Endangered (species level) AGFD, TNW 1988]

OTHER STATUS:
Bureau of Land Management Sensitive (USDI, BLM AZ 2008, 2010)
Forest Service Sensitive (USDA, FS Region 3 1999, 2007, 2013)
Texas Parks and Wildlife Department – Threatened.
None. (NORMA Oficial Mexicana NOM-059-SEMARNAT-2010).
[A (Diario Oficial de la Federacion 1994), listed as full species.]

MANAGEMENT FACTORS: **Likely threats:** degradation and loss of habitat and urban development in saguaro-ironwood forests (near Tucson). **Management needs:** refine breeding survey protocols and conduct surveys; determine habitat needs; manage grazing and other land uses to maintain and enhance important occupied or potentially occupied habitats. (AGFD in prep).

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: Continued statewide status surveys. Refinement of detection protocol, determination of habitat requirements needed.

LAND MANAGEMENT/OWNERSHIP: BIA - Tohono O'odham Nation; BLM - Tucson Field Office; FWS - Buenos Aires and Cabeza Prieta National Wildlife Refuges; NPS - Organ Pipe Catus National Monument and Saguaro National Park; USFS - Coronado and Tonto National Forests; State Land Department; Private.

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S. Russell - University of Arizona, Tucson.
Troy Corman - Arizona Game and Fish Department, Phoenix.
Scott Richardson – USFWS
Marty Teagle - USFWS.

ADDITIONAL INFORMATION:

"The name *Glaucidium* is derived from the Greek *glaux*, which implies that this bird is an owl because it has glaring eyes (Choate 1985); *brasilianum* refers to Brazil, where this small diurnal owl was discovered. The subspecific epithet for the race occurring in Arizona,

cactorum, alludes to cactus, a vegetation that it frequently associates with in the northern portion of its range. The term *ferruginous* refers to the rusty red tail and upper side of the outer vanes of the flight feathers." (Monson *in* Glinski 1998).

Revised: 1992-01-17 (JGH)
1995-03-21 (LZW)
1997-03-05 (SMS)
1998-03-02 (SSS)
2001-06-08 (SMS)

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** ABNME03041
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Laterallus jamaicensis coturniculus*
COMMON NAME: California Black Rail, Pacific Black Rail, Little Black Rail, Farallon Rail, Farallon Black Crake.
SYNONYMS: *Porzana jamaiensis coturniculus*
FAMILY: *Rallidae*

AUTHOR, PLACE OF PUBLICATION: Ridgway, 1874. American Naturalist, 8. No.2. Feb 1874, p.111.

TYPE LOCALITY: The first record of this bird was of a single individual apparently collected on the Farron Islands, California in 1859, more than 20 miles from the closest marsh.

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: Two of the five sub-species of *Laterallus jamaicensis* breed in North America, including *L. j. coturniculus* and *L. j. jamaicensis*.

DESCRIPTION: Smallest North American rail, sparrow-sized, total adult length 10 - 15 cm (3.94-5.91 in); mean mass 29g. Adult generally shades of pale to blackish gray. Top of head darker than surrounding plumage (more evident in females); bill short and black. Underparts from chin to abdomen uniformly colored but lighter on chin and throat. Undertail coverts and flanks streaked with white and dark gray, washed with chestnut. Nape and upper back chestnut. Remainder of dorsum-back, uppertail coverts, and remiges - shades of dark gray, sometimes washed with chestnut or brown with scattered white spots. Spotting extends to wing coverts and secondaries, although much individual variation in amount of spotting. Rectrices brownish gray. Irises of adult shades of bright red, differing from other North American rails. Tarsi and toes grayish brown. Sexually dimorphic in plumage, but sexes similar in size (Eddleman et al 1994). Juveniles similar to adult, but juvenile plumage duller and white spots on back and wings fewer and smaller, white streaks on flanks thinner and less distinct.

AIDS TO IDENTIFICATION: Easily distinguished from similar species in hand and at close range. In flight, might be confused with Yellow Rail *(Coturnicops noveboracensis)* or Sora *(Porzana carolina)*, both of which have short bills for rails, but substantially smaller and darker than both and lacks white wing patches of Yellow Rail (Eddleman et al 1994). California Black Rail is smaller (29g vs 35 g) and brighter colored than the Eastern Black Rail (*L. j. jamaicensis*).

ILLUSTRATIONS:

Color drawing (Robbins et al 1983 p. 105)
Color drawing (Peterson 1990 p. 119)
Color drawing (National Geographic 1999, Third Edition p.147)
Color photograph (Farrand 1988 p.127)
Color photograph (La Tourrette *in* http://elib.cs.berkeley.edu/cgi/img_query?enlarge=8235+3181+2553+0092)

TOTAL RANGE: The California Black Rail only occurs in coastal California, northwestern Baja California, the lower Imperial Valley, and the lower Colorado River in Arizona and California. Whereas its cousin, the Eastern Black Rail is at least partially migratory, wintering in the southern part of its breeding range, the California Black Rail is largely resident (Eddleman et al 1994). A statewide survey conducted in the 1970's suggested that the marshes of San Francisco Bay probably supported the bulk of the Black Rail population in California (Evens, *Unknown*)

RANGE WITHIN ARIZONA: Confined to the extreme southwest part of the state. Locally common in certain *scirpus* marshes along a short stretch of the Colorado River in Yuma Co., from Mittry Lake north to above Martinez Lake. Lower Colorado River populations not detected until 1969, and dynamic nature of wetlands before dam-building there may have precluded occurrence historically (Flores and Eddleman 1991). Others argue that present day populations on lower Colorado River and Salton Trough are relicts persisting from a time when marshes were more extensive (Evens et al 1991). Recently the California Black Rail has been recorded occurring as far north as the Bill Williams River delta.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: More often heard than seen the California Black Rail has a distinctive call chiefly heard in the breeding and at night: male gives a repeated *kik-kee -doo, kik-kik-groo* or *kik-kee-derr*; female *croo-croo-oa* or *whoo-whoo*. Unlike other rails, most vocal in the middle of the night, from one to two hours after sunset to one to two hours before sunrise (Johnson 1991). Because of its sporadic distribution and secretive habits, the Black Rail is of great interest to bird watchers, although much remains to be learned about its life history. Runs mouse-like through marsh vegetation; flies weakly. Seldom seen except when flooded out of salt marshes by high winter tides.

REPRODUCTION: Little information exists regarding pre-nesting behavior, but if calling indicates approximate dates then pairing may occur in late February through July in the California Black Rail. The nest comprises a well woven or loose cup of soft grasses, with green grasses arched above, hiding it from above. Nest is typically in or along the edge of marsh in grasses 18-24 inches in height. Usually completely hidden in thick clump of marsh grass or prickle-weed, and built on mat of dead grasses from previous year (Johnson 1991). A clutch of around 6-8 buff white to creamy white, finely dotted brown eggs are laid (between March and May in Arizona), and are incubated by both parents. The eggs hatch in 16-20 days

and the young leave the nest soon after hatching, being cared for by both parents. Possibly two broods annually.

FOOD HABITS: Limited information available, but probably an opportunistic feeder taking small aquatic and terrestrial invertebrates along with the seeds of aquatic plants. Bill shape suggests generalized feeding methods such as gleaning or pecking at individual items, thus reliance on sight for finding food. Probably a daytime feeder; active throughout the day (Weske 1969). Individuals collected in San Diego Bay, CA, in 1912 had exclusively eaten isopod crustacean *Alloniscus mirabilis* (Huey 1916).

HABITAT: Chiefly, tidal salt marshes, where associated characteristically with heavy growths of pickle weed, (Salicornia). Also occurs in brackish and fresh-water marshes, all at low elevations. Most important hazards to existence on salt marshes appear to be extra high tides. Nests in high portions of salt marshes, shallow freshwater marshes, wet meadows, and flooded grassy vegetation. Uses sites with shallow water, more so than other North American rails (Eddelman et al 1988). Most breeding areas vegetated by fine-stemmed emergent plants, rushes, grasses, or sedges (Todd 1977). Habitat of wintering Black Rails in Arizona differs little from breeding habitat. In Arizona, seems to occupy only narrow belts of shallow-water habitat along shorelines, where emergent and shore side vegetation mix, and when fallen vegetation form mats. Does not thrive where water levels fluctuate widely.

ELEVATION: Occurs from sea level in the coastal bays of northern California, to lower elevations along the Colorado River bordering California and Arizona. Lower Colorado River: 155-475 ft (47.3-145 m).

PLANT COMMUNITY:

POPULATION TRENDS: Again, little is known, but thought to be declining over much of its range. Massive loss of habitat associated with historic and ongoing pressure of agriculture, salt production, and urbanization has drastically reduced Black Rail populations in western U.S. In San Francisco Bay, 95% of tidal marshes present in 1850 had been diked or filled by 1979. Black Rail populations must have suffered concurrent declines and are now confined to most pristine remnants of historical tidal marshes (Evens et al. 1991). Available habitat is probably principal factor regulating populations (Todd 1977).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS:	SC (USDI, FWS, 1996) [C2 USDI, FWS, 1991]
STATE STATUS:	1B (AGFD SWAP 2012) [WSC, WSCA, AGFD in prep]
OTHER STATUS:	Bureau of Land Management Sensitive (USDI, BLM AZ 2008, 2010, 2011)

Not Forest Service Sensitive (USDA, FS Region 3 2007)
[Forest Service Sensitive (USDA, FS Region 3 1999)]
P, Determined Endangered in Mexico, NORMA Oficial Mexicana NOM-059-SEMARNAT-2010)
Threatened Species, (CFG)

MANAGEMENT FACTORS: Not included in list of game species since 1967 and probably rarely taken by hunters before then. Most management factors limited to reviews of population status and compilations of existing information. Principle threats are draining and channelization of wetlands and habitat degradation.

PROTECTIVE MEASURES TAKEN: Benefits from programs to preserve and enhance wetlands; such programs should be encouraged for conservation of Black Rails. Active surveys in both Arizona and California to determine population status.

SUGGESTED PROJECTS: Any recovery plan should include determining effects of development, land-use practices, and wetland modification on Black Rail habitat; and determining more details on basic biology, especially population parameters and ecology during winter.

LAND MANAGEMENT/OWNERSHIP: BLM, FWS, AGFD.

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ADDITIONAL INFORMATION:

Revised: 2001-03-29 (JDC)

2001-04-19 (SMS)
2002-08-28 (AMS)

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** ABNKA03010
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Gymnogyps californianus*
COMMON NAME: California Condor
SYNONYMS: *Vultur californianus*
FAMILY: Cathartidae

AUTHOR, PLACE OF PUBLICATION: *Vultur californianus*, Shaw, 1797. Naturalists' Misc. 9. *Gymnogyps californianus*, Shaw. 1978.

TYPE LOCALITY: Monterey, California, USA. 1792.

TYPE SPECIMEN: Unknown

TAXONOMIC UNIQUENESS: Only extant member of the genus *Gymnogyps*. Four fossil species are known. All condors alive today are descended from 14 "founder" condors (Cohn 1993).

DESCRIPTION: Adults have an average wingspan of 9.8 feet (3.0 m), an average body length of 119.0 cm (47.0 in), and an average width of 274 cm (108.0 in). Adult condors can weigh up to 26 lbs (12 kg). Black in overall coloration, adults have white wing linings and orange heads; immature birds have mottled wing linings and a dusky head. By fledging stage, their wingspan is over 8 feet (2.4 m) long and their weight is between 16 and 20 pounds (7.3-9.0 kg). They soar on flat wings, circling for altitude, before giving one deep wing beat to soar off at great speed in search of large carrion (Scott 1987).

AIDS TO IDENTIFICATION: They are the largest flying land bird in North America. Black in overall coloration, adults have white wing linings, orange head; immature birds wing linings are mottled, head dusky. Larger than a turkey vulture, and turkey vultures lack white on wing linings.

ILLUSTRATIONS:
Color drawing (Scott 1987: 183)
Color picture of egg (Baicich 1997: Plate 27)
Color drawing (Sibley 2000)
Color photos (Vezo 2002)
Color photo (USFWS 2017)
Color AZ range map of Condor Non-essential Experimental Population Area (USFWS 2017)

TOTAL RANGE: In prehistoric times, condors occurred in western North America from Canada to Mexico with isolated populations in New York and Florida. Approximately 10,000 years ago, the Pleistocene extinction wiped out many of the large mammals that condors relied on for food. This loss of large prey naturally reduced their range to the Pacific Coast between British Columbia and Baja California. Recent declines in populations were human induced; poisoning, intentional shootings, habitat destruction and egg collection are examples. Today, California condors occur only in three isolated populations; in coastal central California, northern Arizona and southern Utah, and Baja California in Mexico (Cornell University, 2019).

RANGE WITHIN ARIZONA: Few sight records in 1880s, from southeast to northwest. One observed north of Williams on October 3, 1924 (Monson and Phillips 1981). Reintroduced to the Vermillion Cliffs in December 1996, and to the Hurricane Cliffs in 1998. These populations have been supplemented since, and adults from earlier releases have successfully bred. The AZ populations are considered Non-essential Experimental (10j), and their range covers all of northern Arizona north of I-40 except extreme eastern Arizona.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Life span in wild is likely 50 or 60 years. Their nest is situated either at some distance above bottoms of cliffs or on steep slopes presumably providing air space for birds to approach and leave nests. Using thermal updrafts condors are able to soar to 15,000 feet, fly at 50 mph and travel over 100 miles per day while expending little energy. Condors fly extended distances in the spring and summer. They sun themselves first thing in the morning, to warm up with the suns rising by capturing the sunlight and warmth with extended wings turned to the sun. At watering holes, condors often are observed bathing. Preening and grooming the bare skin on their heads are particularly important because of their carrion diet.

REPRODUCTION: The average age of first reproduction for condors is 8.5 years for females and 9.9 years for males (USFWS 2017). Condors are monogamous, with pair formation taking place in late fall or early winter. During the courtship display, the male stands with his wings partly outstretched, head held down, and his neck arched forward as he slowly turns and rocks from side to side. They also engage in neck wrestling as well as tandem courtship flights. They produce one five-inch long sub-elliptical egg that sits directly on the sand. The egg is smooth with a glossy surface with very fine elongated pits, and is faintly tinted blue. Both parents incubate the egg for 54-58 days. Most eggs hatch from March to May. The nestling is altricial and downy. The down of the first coat is white and the head and neck are bare. The second down is gray and woolly, also extending to head and neck. The nestling slowly feathers between the seventh and twenty-second week. Chicks fledge in approximately six months, generally from October to December. Fledglings are typically dependent on parents through the next fall's breeding period. The pair produces only one chick every other year. A pair may be able to produce young in successive years in optimal conditions where a fledgling is able to join an existing flock, forage is sufficient, and nesting disturbance is low. If the first egg is lost or fails to hatch and it is early enough in the season, the female may lay another and attempt to renest, also referred to as "double-clutching" (USFWS 2017).

FOOD HABITS: A scavenger of large wild (elk, pronghorn, and deer) and domestic animals (cattle and sheep), condors use visual cues to find food, rather than olfactory sense, like vultures. Condor can travel 48-96 miles (80-160 km) per day in search of food (USFWS 2017).

HABITAT: In Arizona, condors roost and nest in steep terrain with rock outcroppings, cliffs, and caves. In California, condors inhabit lower elevations and typically roost in caves or on ledges, but can be found in trees as well. High perches are necessary to create the strong updrafts the bird requires to lift into flight. Open grasslands or savannahs are essential to condors for searching for food. In the recover area the established flock maintains a well-established primary range, within the experimental population area. Generally condors concentrate in southern Utah, using Zion National Park and the Kolob Plateau from spring through fall, and wintering in Arizona, using the Kaibab and Paria plateaus and the Colorado River Corridor west of Marble Canyon. Tracking shows that tagged birds make occasional movements outside of the experimental population area (USFWS 2017).

ELEVATION: 2,000 - 6,500 feet (610-1981 m).

PLANT COMMUNITY: Great Basin Desertscrub and Mohave Desertscrub (Brown, 1982).

POPULATION TRENDS: Increasing. In the 1980's the California condor population declined to just 22 birds. The decision was made to bring all of the wild condors into captivity to begin a captive breeding program. The last wild condor was secured in April of 1987. After several years of a successful captive breeding program in Los Angeles and San Diego, the first two condors were reintroduced to a California wild sanctuary in 1992. In 1992, the Recovery Program began releasing condors back into the wild. Releases in Arizona began in 1996. By the summer of 1998, there were more than 150 condors in existence. In 2001 and 2002, condors in Arizona began breeding but nests were unsuccessful. In 2002, three condor eggs hatched in California but the chicks died before fledging. In August of 2003 the first condor chick in Arizona in more than 80 years was documented. As of 2016, 29 wild-hatched condor chicks had been produced, and 20 of these chicks had died (USFWS 2017).

As of 2010, 73 condors were extant in the Grand Canyon region, the world's total population of California condors was 384, with 186 individuals in free flying populations in Arizona, Utah, California and Mexico (AGFD 2010). As of August 2020, 102 condors were extant in the Grand Canyon experimental population area, and the world's total population was over 500 individuals, with more than half occurring in free flying populations in Arizona, Utah, California, and Mexico (USFWS 2020).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: LE, XN (USDI, FWS 1967), Arizona population is listed as a 10(j) Non-essential, Experimental Population (USDI, FWS 1996).

STATE STATUS: 1 (AZGFD, AWCS 2022)

[1A (AGFD SWAP 2012)]
[WSC (AGFD, WSCA 1996 in prep)]
[Endangered (AGFD, TNW 1988)]

OTHER STATUS:

Bureau of Land Management Sensitive (BLM AZ 2017)
Category P, (Diario oficial de la federacion, 1994, 2010 NORMA Oficial Mexicana NOM-059-SEMARNAT-2010)
Group 4 (NNDFW, NESL 2005, 2008)

MANAGEMENT FACTORS: Lead contamination is the primary factor hindering recovery of the condor (USFWS 2017). Lead poisoning is the primary cause of diagnosed mortality in California condor populations (55% of diagnosed mortalities of condors were due to lead toxicosis) (Church et al. 2006, Chelsey et al. 2009, Hunt et al. 2009, Stroud and Hunt 2009, Finkelstein et al. 2012, Rideout et al. 2012). Lead poisoning occurs mostly in fall and winter months, associated with big-game hunting seasons within condor range. The period of highest lead-associated mortality occurs in December and January due to the latent exposure effect. From 2011 to 2016 59-80% of the population annually had likely recent lead exposure, and 25-42% of the population annually required treatment for lead poisoning. Other diagnosed causes of mortality in California condor populations include predation (24%), shooting (9%), starvation (5%), impaction (3%), collisions (3%) and infection (1%) (USFWS 2017).

Historic threats included shooting, egg collection, quill collection, and ceremonial use. Current threats include collisions with human-made structures, electrocution on powerlines, and poisoning from lead, DDT, cyanide, and anti-freeze.

PROTECTIVE MEASURES TAKEN: A Recovery plan was completed in 1974, and revised in 1996. Critical habitat is designated in California. The Arizona population of California condors is listed as a 10(j) Non-essential, Experimental Population, allowing the reintroduced population to be managed with greater flexibility than fully endangered populations. The bounds of the experimental population are defined by Interstate 40 to the south, Highway 191 on the east, Interstate 70 to the north, and Interstate 15 to Highway 93 to the west (USFWS 1996).

Captive-bred birds are vaccinated against West Nile Virus before release, and wild-hatched birds are vaccinated when trapped for health checks. Before release, captive-bred birds undergo aversive conditioning to electrical structures and are outfitted with radio or GPS transmitters. Dairy calf carcasses are deposited at the release sight every three to four days. This provides food for newly-released condors and facilitates trapping of individuals to replace transmitters and collect blood for lead analysis. If blood-lead level is high, the bird is removed for treatment. Birds which exhibit a lack of avoidance of humans are hazed in an effort to use negative stimuli to move them away from potentially harmful situations. If undesired behaviors cannot be corrected, condors are returned to the captive flock (USFWS 2017).

AGFD and UDWR have implemented voluntary big-game lead reduction programs within the range of the condor. In Arizona, this effort began in 2003, and is a combination of targeted educational outreach, a free non-lead ammunition program within the range of the condor, and a gut pile raffle to incentivize removal (Sullivan et al. 2007, Sieg et al. 2009). Since 2007, 80-90% of big-game hunters in the Arizona portion of the condor range have participated in lead reduction programs, and the percentage of Utah hunters participating has been 78-90% since 2013. Pre-program this percentage was estimated at less than 5% (USFWS 2017). However, although the amount of lead available to condors in Arizona and Utah has significantly decreased, there has been no corresponding reduction in lead exposure rates among condors (Green et al. 2008, Stieg et al. 2009). Modeling based on the California population predicted that if only 0.5% of carcasses are contaminated, there is an 85-98% probability that an individual condor would feed on a contaminated carcass over a 10-year period (Fickelstein et al. 2012). Future projects include expanded outreach to small game, fur bearer, and predator/varmint hunters in an attempt to reduce the amount of lead introduced into the environment (USFWS 2017).

A partnership was formed among the U.S. Fish and Wildlife Service, Bureau of Land Management, National Park Service, U.S. Forest Service, Arizona Game and Fish Department (AGFD), Utah Division of Wildlife Resources (UDWR), The Peregrine Fund, Navajo Nation, Kaibab Band of Paiute Indians, and Arizona Center for Nature Conservation/Phoenix Zoo. Collectively, these agencies, tribes, and organizations form the Southwest Condor Working Group (SCWG). The SCWG operates under a Memorandum of Understanding which provides framework for cooperation and participation among SCWG members. The cooperators meet or confer regularly each spring and fall and with less formal communications throughout the year as needed (USFWS 2017). Additionally, this working group works to secure additional funding for condor outreach and management, and multiple cooperators participate in educational outreach. AZGFD's California Condor Coordinator works with The Peregrine Fund biologists on day-to-day management.

SUGGESTED PROJECTS: The recovery strategy for the California condor in the experimental population area continues to focus on; releasing captive-bred condors to the wild, minimizing condor mortality factors, including the effects of lead ammunition, maintaining habitat for condor recovery through management and protection of nesting and roosting areas, and implementing condor information and education programs (USFWS 2017). To reclassify the condor to threatened, there must be at least two non-captive populations which must each comprise at least 150 individuals, contain at least 15 breeding pairs, and be self-sustaining with positive population growth. Each population must be spatially distinct and contain individuals descended from each of the 14 founders (USFWS 1996).

LAND MANAGEMENT/OWNERSHIP: BIA – Navajo Nation; BLM - Arizona Strip Office; NPS - Grand Canyon National Park; USFS - Kaibab National Forest (north and south of the Grand Canyon) Hopi Reservation (Hopi Tribe).

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Tim Hauck, The Peregrine Fund, Marble Canyon, AZ.
Chris Parish, The Peregrine Fund, Marble Canyon, AZ.
Allen Zufelt, Condor Program Coordinator, Arizona Game and Fish Department, Flagstaff, AZ.

ADDITIONAL INFORMATION:

The following is a 2008 informative piece by Chad Olson with the National Park Service.

Grand Canyon breeding ground for condors
By Chad Olson NPS
Wildlife Extra.com
December 15, 2008

Two California condor chicks fledged from their nests in the Grand Canyon in December, bringing the world's population of endangered California condors now flying free in the wild to 169. This is the first time since the few remaining condors were taken into captivity in the 1980's that there are more free flying condors than are in captivity for breeding purposes.

"This shows that we are making real progress in bringing this ecologically significant bird back from the brink of extinction," said Bill Heinrich, who oversees the condor recovery program for The Peregrine Fund. "I am thrilled that these two chicks appear to be doing well and I hope they will survive to become productive members of the flock."

327 condors alive today - 158 in captivity

Currently, the total number of California Condors is 327, with 158 in captivity. Of the 169 condors in the wild, 67 are in Arizona and 83 are in California. There also are 19 California Condors flying free in Mexico. The goal is to produce at least 150 members in each of the U.S. populations, including at least 15 breeding pairs.

8 chicks in California

The Peregrine Fund breed condors at its World Center for Birds of Prey in Boise and releases them to the wild in northern Arizona. Eight wild condor chicks also hatched this year in California, where a geographically separate population is being produced by zoos, along with The Peregrine Fund.

Condor facts
• Prior to reintroduction, the last wild condor in Arizona was sighted just south of the Grand Canyon in 1924.
• Condors reach maturity at about six years of age. They usually produce one egg every other year.
• Recovery and reintroduction cooperators include The Peregrine Fund, Arizona Game and Fish Department, Utah Division of Wildlife Resources, Bureau of Land Management, National Park Service and U.S. Fish and Wildlife Service.

Just 22 left in 1980's
California Condors are some of the world's rarest birds. Their numbers had dropped to just 22 individuals when the recovery program began in the 1980s. Because condors eat carrion, they help fulfill the role that scavengers play in the environment by consuming dead animal carcasses that might otherwise spread disease and foul land and water resources.

Grand Canyon
The Grand Canyon chicks, which hatched in May, were produced by two sets of condor parents nesting in the canyon's remote ledges and caves. The chicks were first observed testing their wings with short flights in September and October. One of the chicks was produced by the same adult pair that in 2003 hatched the first wild condor chick in the Grand

Canyon in more than 100 years. The other chick belongs to first-time parents. The adult female is the last bird remaining from the group that was released when the Arizona recovery program began in 1996.

This month's fledglings make a total of nine wild chicks hatched in the Grand Canyon since 1996. Eight are still alive.

Condor in the Grand Canyon. Credit Grand Canyon NP.

Lead poisoning
The largest survival challenge facing the two new chicks and all condors is lead poisoning from lost or un-retrieved remains of animals that have been shot with lead ammunition. The Peregrine Fund works with the Arizona Game and Fish Department and local hunting groups on an awareness campaign that has produced a dramatic increase in the number of hunters using copper bullets or other non-lead alternatives in condor country, with a corresponding drop in condor deaths due to lead poisoning.

"We are grateful to all the hunters who are valued partners in restoring California Condors to their historic range," Heinrich said.

Every condor tested twice a year for lead
Nevertheless, every condor must be captured twice each year and tested for lead poisoning. Because they are social eaters, it is possible for just one carcass to poison several birds. Condors are treated with chelation, a process that removes lead from a bird's body, and re-released to the wild. None treated this year have yet died from lead poisoning.

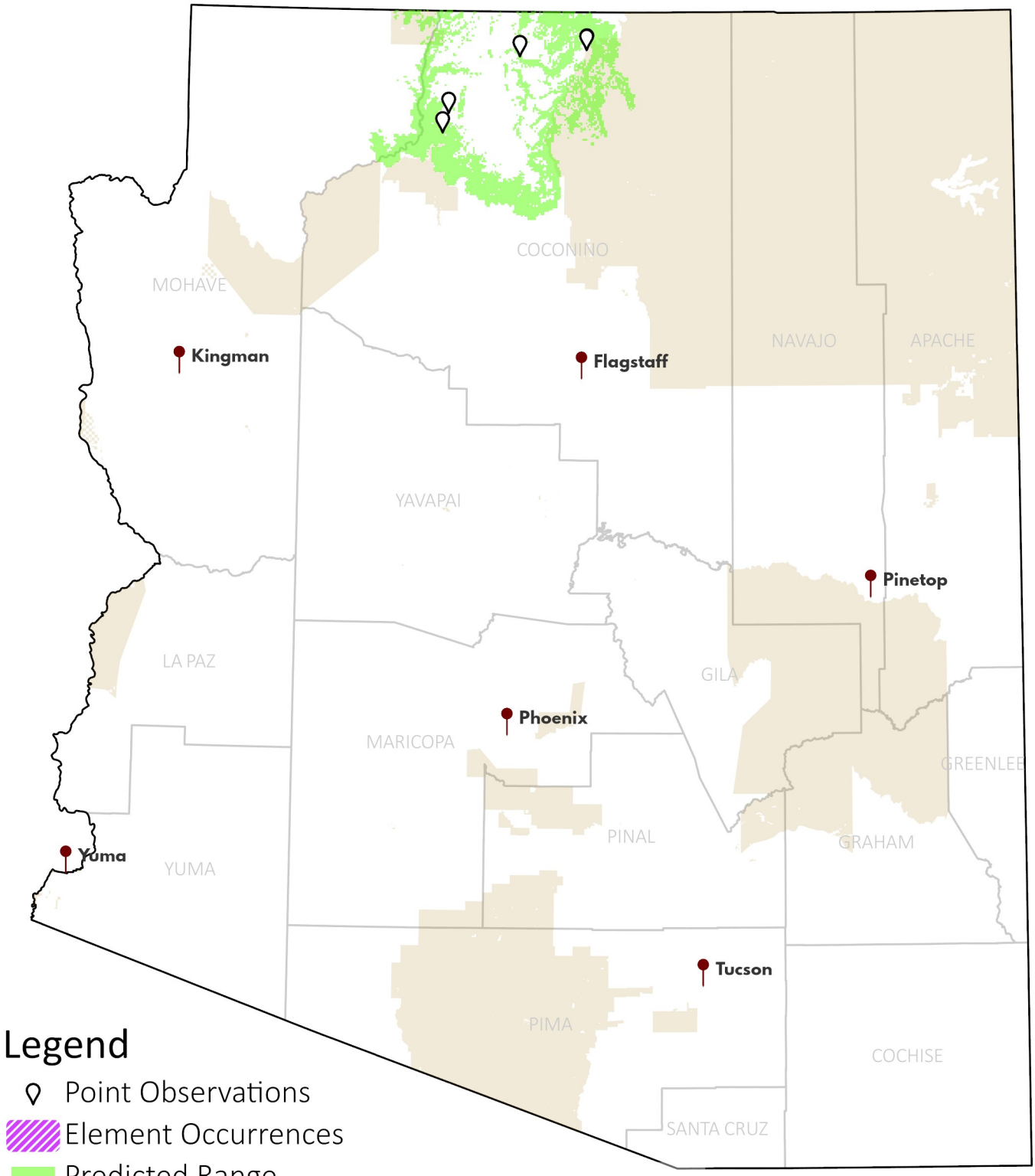
"Until we significantly reduce the amount of lead they are exposed to, we will never have a self-sustaining population of condors," Heinrich said. "We look forward to the day when they no longer need us to survive."

Revised: 1995-05-25 (DBI)
1997-02-27 (SMS)
2004-07-02 (AMS)
2004-07-06 (ASR)
2004-07-08 (AMS)
2004-07-08 (ASR)
2008-12-18 (SMS)
2021-02-24 (KSL)
2022-12-29 (MBL)

Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X…X **(=taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

Gymnogyps californianus

California Condor



Legend

- Point Observations
- Element Occurrences
- Predicted Range
- Tribal Lands
- Counties

N

Kilometers

0 50 100

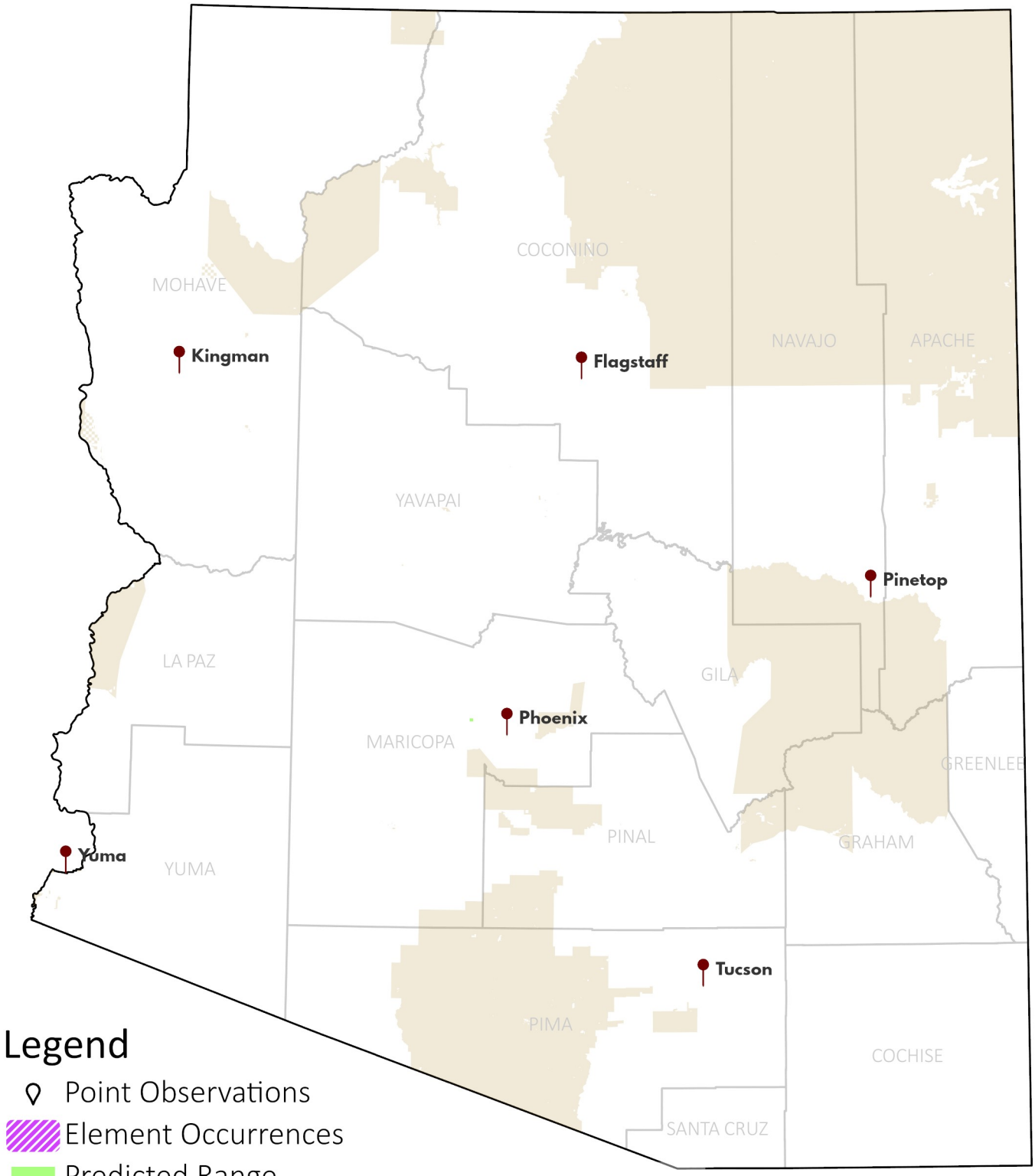
Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences. Predicted ranges indicate likely habitat suitability, not presence.

Heritage Data Management System

2019-06-12

Sternula antillarum browni

California Least Tern



Legend

- Point Observations
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Heritage Data Management System
2019-06-12

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** ABNCA04020
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Aechmophorus clarkii*
COMMON NAME: Clark's Grebe
SYNONYMS: *Podiceps clarkii*
FAMILY: Podicipedidae

AUTHOR, PLACE OF PUBLICATION: Lawrence, *In* Baird, Cassin, and Lawrence, Rep. Expl. And Surv. R.R. Pac. 9: LIV, 895, 1858.

TYPE LOCALITY: Laguna de Santa Maria, Chihuahua, Mexico. J.H. Clark, 18--, Pacific Railroad Survey, California Line.

TYPE SPECIMEN: USNM A09930, Adult female (complete skin), J.H. Clark (field no. 30), 18--.

Other Cotypes include: USNM A04498, Immature female (complete skin), J.S. Newberry, Nov. 1855 (San Pablo Bay, Solano Co., California, U.S.A., Pacific Railroad Survey, California Line). USNM A09931, Immature male (complete skin), A.L. Heermann, 18—(Santa Barbara, Santa Barbara Co., California, U.S.A., Pac. Railroad Surv., CA. Line).

TAXONOMIC UNIQUENESS: There are 20 species in this family with 6 being in North America. They have no known relatives but were once thought to be related to loons. *Aechmophorus clarkii* was formerly included in *A. occidentalis* (AOU 1985, 1998 *in* NatureServe), where they were considered to be a single species with different color forms. The two species are difficult to separate, but differ in both maculation and their calls. Hybrids between the two species do occur, although both species commonly breed side by side with little interbreeding. Biological and distribution information about the two species is mixed in the literature.

DESCRIPTION: Clark's Grebe is 25 in (63.5cm) tall with the sexes being similar. Their wingspan is 24 in (61cm) and they weigh 3.1lbs. (1,400 g). This grebe is large and long necked, with a long yellow to orange yellow bill and a red eye. They have a black crown and nape with a white chin, throat, face and belly. The white face includes the eye. There is a narrow black stripe on their hind neck. Their bills have tooth-like or saw-like edges as in ducks. They have a dark blackish-brown back and wings with white secondaries. Their feet are set far back on their body, and their lobed toes are partially webbed. In flight, grebes resemble small ducks but have very short tail feathers and steer by extending their feet behind them. Grebes fly with a dip in their slender necks.

AIDS TO IDENTIFICATION: The Western Grebe (*A. occidentalis*) and the Clark's Grebe are identical in their summer form. On the Western Grebe, the black of the crown extends down and through the eye, but does not reach the top of the eye in Clark's Grebe. The bill of the Western Grebe has a green tinge that is absent in Clark's Grebe. Loons (*Gavia*) are larger with longer bodies and larger, darker bills. Horned Grebes (*Podiceps auritus*) and Eared Grebes (*P. nigricollis*) are smaller with much shorter bills that are never yellow. Red-necked Grebe (*P. grisegena*) is smaller without the bold black and white neck pattern.

ILLUSTRATIONS:

Color photo (Weber *in* http://birding.about.com/library/fg/blfg-aechmophorusclarkii.htm)
Color photo (Danzenbaker *in* http://www.avesphoto.com/website/NA/species/GRBCLK-1.htm)
Color photo (LaTourrette in http://www.birdphotography.com/species/clgr.html
Color photo (Nearctica. *In* http://www.nearctica.com/birds/loons/Aocci.htm)
Color picture (National Geographic Society 1987)

TOTAL RANGE: Breeds from Washington to Wyoming, south to California, Arizona, New Mexico and Mexico (south to Guerrero and Puebla). Rarely across southern Canada and the northern tier states, from British Columbia and Montana west to Manitoba and Minnesota. Rare in north, equally common as Western Grebe in south. Winters along the Pacific coast from central California, south to Mexico; sometimes inland in California, Arizona and New Mexico. A resident in interior Mexico, and parts of California, Arizona and New Mexico.

RANGE WITHIN ARIZONA: Mohave and La Paz counties. Along the Colorado River year-round, and breeds at Topock Marsh and Topock Gorge in Havasu National Wildlife Refuge.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Diurnal. Their call is a *kr-r-rick*. The call is doubled in the Western Grebe, but single in Clark's Grebe. Mink is a predator of nesting adults in some areas. Raccoons also take adults and eggs. Eggs may be taken by other birds (e.g. crows, ravens) from the nest after human interference.

REPRODUCTION: The breeding season begins mid-May and usually ends by late August. The mating ritual is distinctive. The members of the couple paddle in an upright posture side by side across the lake with the neck bent at a distinctive angle. Both parents share in the nest building, which is a part of their courtship. Nest is a floating platform of rotten vegetation built up from the bottom in tall plants, tule, and reeds, growing in water on the edge of large stretches of open water and is anchored to vegetation. It is usually well concealed by growing plants. Nests on dry land where water has receded after breeding began. Colonies include tens to hundreds of nests. There are usually 3-4 eggs and they are long elliptical to sub elliptical, smooth but not glossy. They are greenish or buffish when first laid, becoming white, then nest stained. 58x39 mm. The

eggs are laid at daily intervals. The incubating is done by both sexes beginning with the first egg, and lasts 23 days. The nestling is like the Western Grebe at hatching, though feet are pink in some individuals, and between 20-50 days feathering appears snow white. Bare skin patch on head of young flushed, is dark red when begging or in distress. The young leave the nest at hatching, carried on parent's back and tended by both parents. They may even dive with them on their back when alarmed. At nests on dry land, the young are transported to water under the wings of the female.

FOOD HABITS: Their diet consists of fish, aquatic insects, amphibians, crustaceans and mollusks. Grebes dive and swim rapidly below the surface as they chase aquatic insects and small fish. Their pointed bill is thrust forward in feeding. Grebes usually dive about 20 ft below the surface and stay underwater about 30 seconds. Grebes do not regurgitate pellets of indigestible food parts, as do most meat eating birds. Feathers are molted on the flanks and breasts year round and swallowed during preening to replenish the stomach lining. Parents begin feeding feathers to their chicks within three days of hatching.

HABITAT: Marshes, lakes and bays. In migration and winter also sheltered seacoasts, less frequently along rivers. Nests among tall plants growing in water on edge of large areas of open water.

ELEVATION: 440 - 480 ft (134-146m).

PLANT COMMUNITY: Unknown

POPULATION TRENDS: Unknown

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None

STATE STATUS: WSC (AGFD, WSCA in prep)
[State Candidate AGFD, TNW 1988]

OTHER STATUS: None, USDA FS Region 3, 2013
Not BLM Sensitive (USDI, BLM AZ 2010)
[Bureau of Land Management Sensitive (USDI, BLM AZ 2008)]
[Forest Service Sensitive USDA, FS Region 3 2007]
Group 4 (NNDFW, NESL 2001, 2005, 2008)

MANAGEMENT FACTORS: Gregarious behavior makes it highly susceptible to oiling mortality in wintering areas. Vulnerable to disturbance of nesting colonies. They are threatened by

habitat degradation from seasonal recreational use of backwaters and coves used for breeding. The nests are relatively fragile and are unable to withstand the repeated assault by waves produced by fast moving boats. Small chicks are frequently separated from parents and die from exposure if adults crash-dive to avoid motorboats or other sources of sudden disturbance. If the colony is approached suddenly, fewer nests are covered before parents depart, which may cause overheating of eggs on hot, sunny days.

PROTECTIVE MEASURES TAKEN: Havasu National Wildlife Refuge (NWR) has instituted a 15-mile no-wake zone for boats in the Topock Gorge area. They can also be found on the Bill Williams NWR.

SUGGESTED PROJECTS: Surveys to determine the number of Clark's grebes in Arizona needs to be performed.

LAND MANAGEMENT/OWNERSHIP: USFWS – Bill Williams and Havasu National Wildlife Refuges.

SOURCES OF FURTHER INFORMATION

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

Grebe breast feathers were once used in the millinery trade to decorate women's hats, a practice long ago discontinued when law protected grebes.

Aechmophorus clarkii: from the Greek *aichme*, meaning spear, and *phorus*, meaning thrower (the pointed bill is thrust forward in feeding). The specific epithet *clarkii* honors J. H. Clark, who collected the type specimen.

Revised: 2003-02-21 (AMS)
2013-11-14 (BDT)

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Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of**

abstract). X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** ABNKC15010
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Buteogallus anthracinus* Deppe
COMMON NAME: Common black-hawk, Lesser black hawk, Mexican black hawk, crab hawk, Sparrowhawk Black Crab seller, Sparrowhawk Crab seller, Aguililla-negra menor (Spanish)
SYNONYMS: *Falco anthracinus, Buteogallus anthracinus anthracinus*
FAMILY: Accipitridae

AUTHOR, PLACE OF PUBLICATION: W. Deppe, Preis-Verz. Saugheth. Vog…Mexico. Pp: 3. 1830.

TYPE LOCALITY:

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: The species *anthracinus* is 1 of 5 within the genus *Buteogallus*, and is divided into 3 subspecies, *B.a. bangsi*, found on Cuba and Isle of Pines; *B.a. utilensis* farther south on islands in the Gulf of Honduras and *B.a. anthracinus* from northern South America to the southwestern United States (Schnell et al. 1986).

DESCRIPTION: A medium to large-sized hawk with broad rounded wings, and a hooked beak. The length is 20-22 inches (51-56 cm), wingspan 40-50 inches (102-127 cm), and a weight of 1.4-2.9 lbs (0.6-1.3 kg). As with most other raptor species, Common Black-hawks are sexually dimorphic, with the females being larger than the males. Adults are uniformly blackish except for the white 1-3 inch-wide median band on the short broad tail, which is the most distinctive identification mark for this species. The small white base of primaries, are not always visible. The sexes are similar and cannot be distinguished in the field with certainty except by behavioral differences, although many females have a longer light patch in the malar region below the eye. The iris of the eyes is brown. The cere (fleshy covering at the top of the beak), legs and facial skin are orange yellow to yellow; the bill tip is black.

Unlike most raptor hatchlings, which are covered with white down, Common Black-hawk chicks are reddish brown on the dorsal areas of the head, body, and wings and have a brownish black patch extending through eye. Immature plumage is dark brown dorsally; the breast and throat regions are yellowish tan and heavily streaked with dark brown wedge and diamond shaped blotches. They have a buff line over the eye, a dark eye-line, a buff cheek and a dark vertical stripe running down the face. The iris is medium-dark brown, similar to

the adult's. Again, the tail provides a useful identification mark with its five to seven dark bands alternating with very light (sometimes white) bands; broad terminal band is dark. This plumage is generally retained for about 1 to 1.5 years before the black adult feathers begin to emerge.

AIDS TO IDENTIFICATION: The white 1-3 inch-wide median band on the tail of adults is the most distinctive identification mark for this species. The Common Black-Hawk is slightly smaller than the Red-tailed Hawk (*Buteo jamaicensis*) but has wider wings and a shorter tail. In flight, the whitish patch at the base of the primaries, are smaller and less distinct than on the Black Vulture (*Coragyps atratus*). Distinguished from the Zone-tailed Hawk (*Buteo albonotatus*) by broader wings; broader tail with different pattern; more extensive yellow under eye.

ILLUSTRATIONS:

Line drawings (Robbins et al. 1981:76)
Line drawings (Scott 1987:198)
Color drawing of egg (Baicich 1997)
Color drawing (Sibley 2000)
Color photos (Vezo *in* Glinksi 2002)
Color drawing (*In* http://www.percevia.com/explorer/db/birds_of_north_america_western/obj/441/target.aspx)
Color photo (*In* http://www.damisela.com/zoo/ave/otros/falcon/)
Color photo (*In* http://www.puntoverde.org/aves/Buteogallus_anthracinus)

TOTAL RANGE: From northern South America and Guyana, to Central America, throughout Mexico, to the southwestern United States, including Arizona, southwest New Mexico, western Texas, and southern Utah. Arrives in the U.S. to breed (northernmost breeding populations) as early as March-April, leaving by mid-October. Individuals occasionally overwinter in Arizona and New Mexico. Northernmost populations of N Mexico and S United States leave breeding area for the winter, while other populations are not known to migrate, and are presumed to be sedentary.

RANGE WITHIN ARIZONA: Arrives in breeding areas as early as March-April, migrating south across the border for the winter by mid-October. The breeding range is along remote streams draining the Mogollon Rim (central Arizona), the big Sandy and Virgin rivers drainages (northwestern Arizona), and the upper Gila River drainages (eastern Arizona).

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: This species is thought to be long-lived. A nestling banded in 1977 was recovered 13 years and 6 months later. The voice of this hawk is unlike that of any other North American raptor. During the nesting season, the call is a load and hoarse piercing whistle, lasting three to four seconds and composed of about seven or eight notes that increase

abruptly in intensity, then progressively decrease. The most commonly heard call is a nasal, high-pitched, cry alarm. The flight pattern alternates between strong flapping flight and gliding.

REPRODUCTION: Defends small territory, used year after year by returning individuals. The male selects the nest site and carries the nesting material to the female who builds the nest. The nest is initially a small structure built on branches and smaller twigs, in palmettos, cypresses, pines, cottonwoods, sycamores, and other trees. Cottonwoods (79%) and sycamore (11%) were the dominant tree species used for nests in Arizona and New Mexico (Millsap 1981, Schnell 1994, Scovill 1995, *In* Boal no date) (See list of other tree species used below). Nests are typically built 60-120 ft above the ground, and are lined with twigs and some green leaves; nests usually built within 500 feet of permanent flowing water. Up to four copulations per day occur as the egg laying period approaches. The eggs are laid about one month after arrival (Schnell et al. 1986). The eggs have a granular surface, and the color is grayish white to greenish white, heavily speckled with brown blotches of varying shades and sizes; size measures 57 x 45 mm (2.5 x 1.5 in). Clutch size ranges between 1 to 3 eggs; usually 2 in Arizona. If the first clutch is lost the second clutch may only contain one egg. Incubation is reportedly about 38 days, by both sexes. In Arizona, 75% of clutches hatched latter half of May (one in late July). Young are tended by both sexes, with the first flight at 6-7 weeks, becoming independent in another 1.5-2 months. The male rarely brings food directly to the incubating female.

FOOD HABITS: Land crabs, amphibians, fishes, reptiles, and crayfish most common foods, although they may supplement their diet with small mammals and insects. Hunts primarily from perch, often near ground such as low branches, downed trees, exposed roots, and prominent rocks; also walks on sandbars and mud flats in search of crabs or stranded fish.

HABITAT: Obligate riparian nester, dependent on mature, relatively undisturbed habitat supported by a permanent flowing stream. Streams are less than 30.0 cm deep, of low to moderate gradient with many riffles, runs, pools and scattered boulders or lapped with branches. Groves of trees are preferred over single trees. Throughout its range, they generally inhabit coastal lowlands of mixed savannah, dunes, ponds, lagoons and grasslands with a source of water nearby.

ELEVATION: 1,750 - 7,080 ft. (533-2158 m), based on HDMS records (AGFD, unpublished records, accessed 2004).

PLANT COMMUNITY: "Riparian communities include the cottonwood-willow series (1224.53) of the Sonoran Riparian Deciduous Forest (<1,200 m elev.), the cottonwood-willow series (1223.21) and mixed broadleaf series (1223.22) of the Interior Southwestern Riparian Deciduous Forest (1100-1800 m elev.), and the cottonwood-willow series (1222.31) and mixed broadleaf series (1222.32) of the Rocky Mountain Riparian Deciduous Forest (1700-2300 m elev.)." (classifications from Brown et al. 1980, Boal no date).

Populus spp. (cottonwood) and *Platanus wrightii* (sycamore) are the dominant tree species used for nesting in Arizona and New Mexico. Other tree species used for nesting include *Alnus oblongifolia* (alder), *Fraxinus velutina* (ash), *Juglans major* (Arizona walnut), *Salix gooddingii* (Goodding willow), *Quercus emoryi* (Emory oak), *Pinus ponderosa* (ponderosa pine), *Pseudotsuga menziesii* (Douglas fir), and *Prosopis* spp. (mesquite) (Boal no date).

POPULATION TRENDS: Unknown. Black-hawks seem to be self-sustaining in North, Central, and South American populations, but the species exhibits a low reproduction rate.

The U.S. breeding population was estimated at about 220-250 pairs in the mid 1970's with most pairs (80-90%) occurring in Arizona (Schnell et al. 1988, in Boal no date). A survey conducted in Arizona and New Mexico in the 1980's found a minimum of 200 pairs (80-90% in AZ). A review of nesting records in natural heritage programs from Arizona, New Mexico, and Utah, and other agency and organization databases, indicated 150 breeding areas in Arizona, 35 in New Mexico, 1 in Utah, and as many as 10-20 pairs in Texas (Boal and Mannan 1996, in Boal no date). More recent information suggests 60-80 pairs in New Mexico (New Mexico Game and Fish 1996, in Boal no date). The Aravaipa Canyon population in Arizona, has provided baseline information since 1975. According to NatureServe (2004), "in 1994 the U.S. population was thought to be stable but precarious. Range-wide trends are unknown. Breeding population in south Texas declined in the early 1900's, and those in adjacent Mexico declined after 1958."

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None

STATE STATUS: WSC (AGFD, WSCA in prep)
[State Candidate AGFD, TNW 1988]

OTHER STATUS: None, USDA FS Region 3, 2013
Not BLM Sensitive (USDI, BLM AZ 2010)
[Bureau of Land Management Sensitive (USDI, BLM AZ 2008)]
Forest Service Sensitive (USDA, FS Region 3 1988, 1999, 2007)
Listed Threatened (Secretaria de Desarrollo Social, 1994)
Threatened (Texas)

MANAGEMENT FACTORS: Greatest threat is alteration and elimination of riparian habitat through clearing, water diversion, diking and damming, and lowering of the water table by underground pumping. At least 95% of the riparian habitat in the southwestern United States have been lost, altered, or degraded. They are vulnerable to disturbance and contamination of riparian prey species.

PROTECTIVE MEASURES TAKEN: Conservation depends on maintaining vital regions of riparian habitat, like Aravaipa Canyon Preserve in Arizona, which are free of disturbance and development. (Steinwand 2001).

SUGGESTED PROJECTS: Protect and enhance frog and fish populations near nest sites. Regenerate gallery forest trees by periodic suppression or elimination of livestock grazing. Increase prey sources. Implement monitoring schedule of breeding black hawks to determine trends in the population. Determine the source of recruitment in the United States population. A comprehensive study to resolve the confused systematics and nomenclature in the *Buteogallus* complex is needed. Also needed is an intensified banding program. No detailed information is available on pair bonding, territoriality, or most aspects of this species' social behavior.

LAND MANAGEMENT/OWNERSHIP: BIA – Fort Apache and San Carlos Reservations; BLM – Kingman, Phoenix, Safford, and Tucson Field Offices; NPS - Montezuma Castle National Monument and Saguaro National Park; USFS - Apache-Sitgreaves, Coconino, Coronado, Prescott, and Tonto National Forests; State Land Department; Red Rock State Park; City of Safford; TNC - Aravaipa Canyon, Buehhman, Muleshoe Ranch, and Patagonia-Sonoita Creek Preserves; Private.

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ADDITIONAL INFORMATION:

Revised: 1995-01-19 (DBI)
1999-10-04 (SSS)
2005-01-28 (AMS)
2005-03-24 (SMS)
2013-11-14 (BDT)

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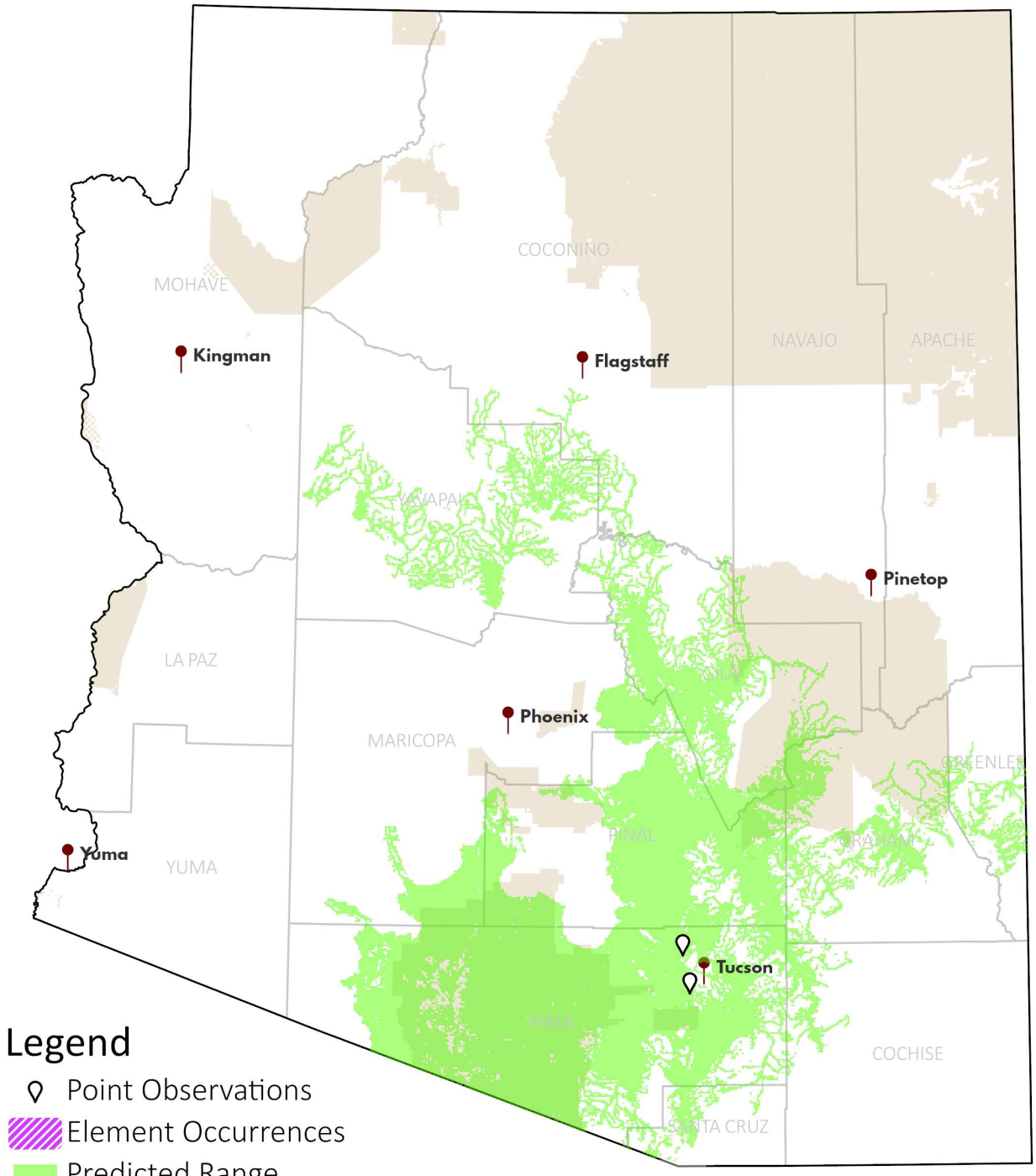
Progne subis hesperia

Desert Purple Martin



Legend

- Point Observations
- Element Occurrences
- Predicted Range
- Tribal Lands
- Counties

N

0 50 100 Kilometers

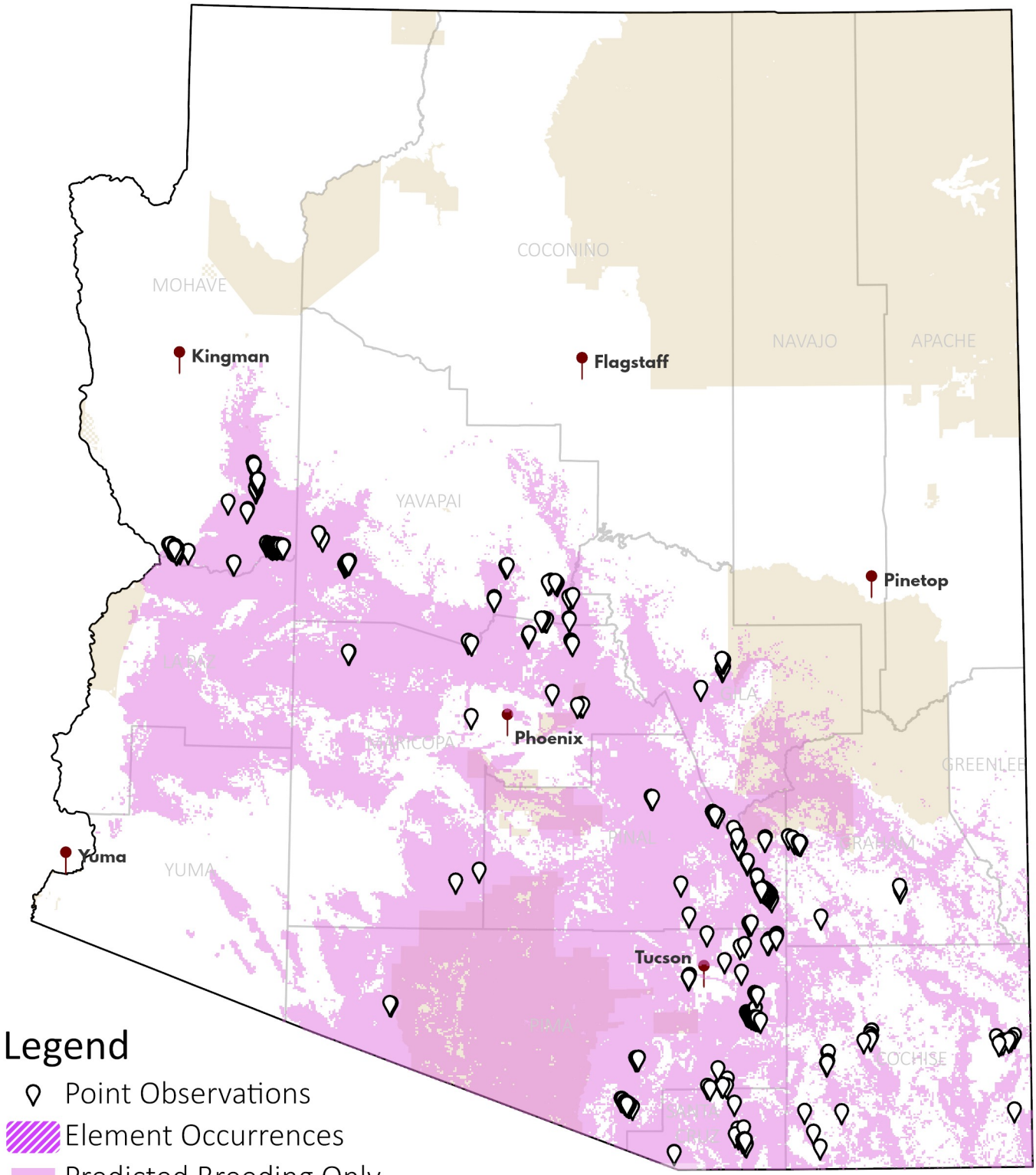
ARIZONA GAME & FISH

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences. Predicted ranges indicate likely habitat suitability, not presence.

Heritage Data Management System
2019-06-12

Micrathene whitneyi

Elf Owl



Legend

- Point Observations
- Element Occurrences
- Predicted Breeding Only
- Tribal Lands
- Counties

N

0 50 100 Kilometers

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences. Predicted ranges indicate likely habitat suitability, not presence.

Heritage Data Management System
2019-06-12

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract

Element Code: ABNKC19120
Data Sensitivity: YES

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Buteo regalis*
COMMON NAME: Ferruginous Hawk
SYNONYMS: Ferruginous rough-legged Hawk
FAMILY: Accipitridae

AUTHOR, PLACE OF PUBLICATION: Gray, 1844, Buteo regalis was coined by G.R. Gray in 1844 (Sharpe 1874).

TYPE LOCALITY: A Ferruginous Hawk shot on 24 Dec 1836 near Monterey, CA, was incorrectly named *Falco ferrugineus*. The specimen held by the British Museum was collected on an unknown date but prior to 1841 in the vicinity of Real del Monte, Hidalgo, Mexico.

TYPE SPECIMEN: The Type Specimen is held by The British Museum, London, England.

TAXONOMIC UNIQUENESS: Monotypic species, no subspecies recognized. One of 25 species in genus *Buteo*, 1 of 13 North American species in genus.

DESCRIPTION: Although no subspecies are recognized, there are dark morphs that grade in color from brownish black to reddish brown. Adults are usually entirely white in front from the breast up through the side of the head, where light gray grades from the top of the head and down the back. The rusty shoulder patches contrast to the gray back. Immature birds are browner over the entire back and lack the rusty shoulder patches. The tail of both adults and young are lighter at the base and slightly barred or, in older birds, washed with rusty brown. This raptor was once called the "Ferruginous Rough-legged Hawk" for the tarsus that is "roughed" with feathers all the way to the toes. In adults, this feathering is rust colored and is visible in flying birds as a V when the legs are held together. Seen from below, flight feathers lack barring. The large gape, thought to be used for thermoregulating, gives this bird a large head compared with other buteos. (Glinski 1998). A crow-sized bird with lengths of 23-25 inches (58-63 cm), wingspan of 53 inches (135 cm), and weights of 2.2-4.5 lbs.

AIDS TO IDENTIFICATION: Robust broad winged hawk with large head, wide gape, and full chest. Overhead typical adults show a dark V formed by the rufous thighs (Peterson 1990). The typical color is lighter, and the Ferruginous Hawk often appears to be a big white

bird when viewed from a distance, a good field mark. Not to be confused with the pale morph of the Red Tailed Hawk (*B. jamaicensis fuertesi*), which lacks white patches in wing, has more rounded wings, and vague dark-headed pattern. Rough-legged Hawk (*B. lagopus*) frequently hovers, has band on tail, and is heavily marked below. Swainson's Hawk (*B. swainsoni*) has similar shape but lacks wing patches.

ILLUSTRATIONS:

Color drawing (Peterson 1990:177)
Color drawing (Glinski 1998: Plate 21)
Color drawing (National Geographic 1999:119)
Color photos (Farrand, Jr. 1988:9, 228)

TOTAL RANGE: No records outside the Americas. Primarily found in the western states of North America, southern Canada and down into central Mexico. Breeds form se. Alberta s. Saskatchewan, and extreme sw. Manitoba, south through central and w. portions of N. and S. Dakota between the Great Plains and Rocky Mountains all the way south to northern Arizona and New Mexico. The winter range is primarily from central Mexico north through the southwestern and mid-western United States.

RANGE WITHIN ARIZONA: Currently: breeds in northern Arizona on the Colorado Plateau, otherwise from September to April, can be seen in virtually any part of Arizona with open environs, particularly in agricultural fields and native grasslands (Glinski 1998). Historically: uncommon but widely distributed summer resident of the grassy plains of northern Arizona, and a local and irregular summer resident in southeastern Arizona (Phillips et al 1964). In 1915 observed at deep wells, west of the Chiricahua Mountains, Cochise County.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: In flight, the Ferruginous Hawk holds its wings in a slight dihedral, which encourages a rolling motion that stabilizes lift in open areas, where winds can interfere with flight. They give harsh alarm calls, *kree-a* or *kaah*, chiefly in breeding season. On wintering grounds in Arizona when birds are approached while perched, may give a shrill *keeerrrrr* (Glinski 1998). Often hovers when hunting or soars in a dihedral. Perches in trees, on poles, and on the ground. Before the elimination of bison (*Bison bison*) in the west, its nests were often partially constructed of bison bones and wool (Bechard et al 1995).

REPRODUCTION: Today this hawk uses nest substrates ranging from cliffs, trees, utility structures, and farm buildings to haystacks and even ground level. Both members of pair build or refurbish nest; male brings most material to the nest, whereas female spends more time arranging materials and forming nest bowl (Bechard et al 1995). Nests are usually quite large and bulky made up of coarse sticks, and frequently contain cow dung. In Arizona, courtship has been observed as early as the first week of March. From 2 to 5 (usually 3 to 4) eggs are laid and incubation begins in late April or early May. Both sexes incubate but the

female takes over the significant portion of the task as the incubation period progresses. Incubation period is estimated between 32-33 days (Palmer 1988). Young typically first leave the nest at 38-50 days; males (smaller in size) leave as much as 10 days before females (Bechard et al 1995). Ferruginous hawks generally are erratic breeders and for unknown reasons, shift nesting territories. The species appears to be especially sensitive to human disturbance during the breeding season, especially during incubation (Hall et al, 1988).

FOOD HABITS: The primary prey of the Ferruginous hawk are rabbits (*Lepus* sp.), ground squirrels (*Spermophilus* sp.), and pocket gophers (*Thomomys* sp.). In the Southwest, limited information suggests prairie dogs (*Cynomys* sp.) and rabbits are important (Glinski 1998). Populations and the reproduction of this hawk can fluctuate with the availability of these prey. In winter Ferruginous hawks typically aggregate where ground squirrels and especially prairie dogs are numerous. They are "sit-and-wait" hunters, and groups of 5 to 10 birds will often perch in and around prairie dog towns (Bechard et al 1995). May also take birds such as Meadow larks. When locusts or Jerusalem crickets are swarming it takes large numbers. Snakes may also be taken (Brown et al 1968).

HABITAT: In Arizona, the open scrublands and woodlands, grasslands, and Semidesert Grassland in the northern and southeastern parts of the state are the potential haunts of breeding Ferruginous Hawks. During winter, they select the same areas, along with agricultural areas statewide; it does not use cultivated lands for nesting , however (Glinski 1998). Avoids high elevation, forest interior, and narrow canyons. In general, the Ferruginous hawk breeds in open areas with little topographic relief. Hunting areas are typically open grasslands, preferably those dotted with suitable low hills or short trees, which serve as perches (Hall et al 1988).

ELEVATION: In Arizona, 3,500 ft - 6,000 ft (1067.5-1830 m).

PLANT COMMUNITY: Occurs in grasslands, sagebrush (*Artemesia* spp.) country, saltbush (*Atriplex* sp.) grease-wood (*Sacobatus vermiculatus*) shrublands, and the periphery of western pinyon (*Pinus*)-juniper (*juniperus*) and other forests (Olendorf 1993).

POPULATION TRENDS: Since 1990, about 5,842-11,330 individuals estimated for the entire North American population (Olendorff 1993). Other estimates of population numbers: 14,000 individuals for the population in the grassland of the Great Plains alone (Schmutz et al.1992). Considered declining in several areas, but no data available on percent declines or reasons for declines. Apparent declines during 1980s within core breeding range, suggested by vacancy of many historic nests. Between 1979 and 1992, populations stable in Arizona, Colorado, Idaho, Kansas, Montana, Nebraska, N. and S. Dakota, Texas, Washington, and Saskatchewan (Olendorff 1993). During this period, population increases of up to 50% or more apparently occurred in Oregon, Wyoming, Alberta, ad Manitoba. Declines in past 10 years confirmed only in n. Utah and e. Nevada (Olendorff 1993).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: SC (USDI, FWS 1996)
[C2 USDI, FWS 1994]

STATE STATUS: 1B (AGFD SWAP 2012)
[WSC. WSCA, AGFD in prep]
[Threatened, TNW, AGFD 1988]

OTHER STATUS: None, USDA FS Region 3, 2013
[Forest Service Sensitive USDA, FS Region 3 2007]
Bureau of Land Management Sensitive (USDI, BLM AZ 2008, 2010)
Group 3 (NNDFW, NESL 2000, 2005, 2008)
PR, Determined Subject to Special Protection in Mexico. (NORMA Oficial Mexicana NOM-059-SEMARNAT-2010)

MANAGEMENT FACTORS: The detrimental effects of human activity on the species encompass; shooting and trapping, egg collecting, pesticides and other contaminants, collisions with stationary or moving objects, disturbance at nest site, and degradation of habitat through habitat loss and fragmentation. In prairie Canada, where the Ferruginous Hawk's breeding range has been reduced by 50%, apparently healthy populations remain in areas where ranching is the dominant land use.

PROTECTIVE MEASURES TAKEN: Artificial nest platforms are particularly useful in increasing populations in previously occupied areas where available trees have died and fallen, in large areas that have been converted from tree/shrub communities to grass/shrub communities, or where availability of nest sites is a limiting factor (Olendorff 1993). Effective conservation measures, beyond addressing single limiting factors, must address conservation at its roots through ecosystem considerations (Bechard et al 1995).

SUGGESTED PROJECTS: Studies to determine breeding needs and impacts of various human activities on breeding birds.

LAND MANAGEMENT/OWNERSHIP: BIA, State Land Department, Private.

SOURCES OF FURTHER INFORMATION

REFERENCES:

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

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ADDITIONAL INFORMATION:

Revised: 2001-02-21 (JDC)
2001-03-13 (SMS)
2013-11-14 (BDT)

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** ABNSB01020
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Otus flammeolus*
COMMON NAME: Flammulated Owl, Flammulated Screech Owl, Flammulated Scops Owl, Tecolote ojo oscuro [Spanish]
SYNONYMS:
FAMILY: Strigidae

AUTHOR, PLACE OF PUBLICATION: *Otus flammeolus*, Kaup, in Jardine, Contrib. Ornithol. (1852) p. 111. 1853. *Scops* (*Megascops*) *flammeola,* Kaup, 1852. in Jardine, Contr. Orn. (1853) p. 111.

TYPE LOCALITY: Mexico.

TYPE SPECIMEN: Unknown

TAXONOMIC UNIQUENESS: Monotypic species. Subgenus: *Scops* (*Megascops*) *flammeola*

DESCRIPTION: Species is monotypic. A small sized owl (second smallest in North America), but like most owls, the female is larger than the male. The body is 6.75 in (17 cm) long, wings average 5.0-5.7 in (12.7-14.5 cm), tails 2.1-2.6 in (5.3-6.6 cm), and the wingspan ranges between 14 –19 in (36-48 cm). They are the only small North American owl with dark irises. They have small ear tufts, and the beak is gray-brown. The adult plumage is characterized by a grayish white facial disk bounded on the outside by a cinnamon-colored band that is narrow in the lower parts and wide above the eye. The facial disk is divided by a V-shaped band of white feathers (eyebrows) that diverges from the beak and terminates at a pair of ear tufts. The back is primarily brown mixed with gray. Ninepipes (accessed 2005) reports that dorsally, owls are mottled gray with distinct rusty colored shoulder spots, creating a line from the shoulder down across the side of the wing. The breast is grayish white with buffy areas irregularly barred with black, becoming lighter toward the lower breast and legs. The larger dorsal wing coverts have large cinnamon orange and buff spots that form a bright "flame" stripe across the shoulder. The tail feathers are gray with narrow buffy stripes. The plumage coloration serves as a camouflage that helps blend with bark of the trees were they roost (Grindrod 2005). (Glinski 1998).

There are two distinct color phases: gray and red/brown. Gray in the northern parts of the breeding range and red/brown in the southern. The facial disk coloration corresponds to the

color phase. Note: Third coloration phase, the red-phase, is still under debate on whether it is another phase that occurs.

Nestlings are initially covered with snowy white down, with pinkish-gray bills and feet, and have dark blackish brown iris (Johnsgard 2002). Within ten days (Reynolds 1998), the upper parts of the juveniles are horizontally barred with gray and dusky colors, and the under parts have a dull white or grayish-white base with a rusty-gray or grayish-rust color. Replacement of the juvenal plumage begins around the eyes several days after fledging. Some of the juvenal plumage still remains on the back and breast six weeks after fledging. (Glinski 1998).

AIDS TO IDENTIFICATION: *Otus flammeolus* is one of four owl species that have dark eye coloration, the other three being the Barn Owl (*Tyto alba*), the Spotted Owl (*Strix occidentalis*), and the Barred Owl (*Strix varia*). However, the dark brown eyes are found in no other small owl. The ear tufts are short compared to the screech-owls. *O. flammeolus* differs from other *Otus* and *Megascops*, in that they are lacking a typical trill song, and it has short tufts and an incomplete facial disk beginning at the ears and ending at the moustache.

ILLUSTRATIONS: Illustration and Color photo (Johnsgard, 2002).
Colored drawing (Richard Sloan, in Glinski 1998: Plate 31)
Color Photos (*In* http://www.owlpages.com/species.php?genus=Otus&species=flammeolus)
Calls and Photos (*In* http://www.owling.com/Flammulated.htm)
Color Photos (*In* http://www.peregrinefund.org/Explore_Raptors/owls/flammula.html).
Color Photo: (Brian Currie *in* http://www.utahbirds.org/birdsofutah/BirdsD-K/FlammulatedOwl.htm).
Color Photos (*In* http://www.fosbirds.org/gallery/FlamOwl.html)
Color Illustration (Joe Thornbrugh *in* http://fwp.state.mt.us/fieldguide/mediaDisplay.aspx)
Color Illustrations (Sibley, 2000).

TOTAL RANGE: Breeds from southern British Columbia south to southern California, Arizona, New Mexico, Texas, and central Mexico. Winters from central Mexico south to the highlands of Guatemala and El Salvador, with rare individuals wintering in southern Arizona, New Mexico, and southern California.

RANGE WITHIN ARIZONA: In Arizona, they are so tied to yellow pine and mixed conifer forests that simply identifying mountains containing these forests will specify most of the range. These mountain ranges include the Bradshaw, Chiricahua, Hualapai, Huachuca, North Kaibab, Pinaleno, Rincon, Santa Catalina, Santa Rita, and White mountains. Rare individuals winter in southern Arizona. (Glinski 1998).

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: *Otus flammeolus* are nocturnal/crepuscular, singing mostly on moonlit nights. The many vocalizations of the Flammulated Owl are soft and ventriloquistic. The best-known song, the territorial song, is the monotonous *boop-boop-boop-boop* (with two to four seconds between notes) used when establishing territories and attracting mates. With the exception of a loud scolding call resembling a harsh cat's meow, given by both sexes when their nestlings or fledglings are threatened, all the other vocalizations are very soft (Glinski 1998). They are highly migratory, and may be consider by some to be the most migratory species of North American owls. Migration behaviors are poorly understood for the various subspecies (McCallum 1994). The species has been recorded to live up to 7-8 years of age (NatureServe 2005). Individuals occupy same breeding territory in successive years. Territory size (5.2 square kilometers) usually remains the same from year to year, even if adjacent territories are unoccupied.

REPRODUCTION: Monogamous mating. *O. flammeolus* nests in tree cavities in or adjacent to mature or old-growth stands. Commonly nests in abandoned Pileated Woodpecker (*Dryocopus pileatus*) and/or Northern Flicker (*Colaptes auratus*) tree holes, usually 15-40 feet above ground. No nest lining is added, thus they lay their eggs on remnant material in the hole. *O. flammeolus* lay 3-4 faintly cream colored eggs from about mid-April through July; eggs are about 1 inch long. Incubation, which is performed mostly by the female, lasts 21-22 days, but up to 26 days has been recorded; the male feeds the female during incubation. Owlets are born altricial (downy), and with their eyes closed. Young are tended by both sexes. Broods fledge over two nights, however, young fledging on the same night stay together. The young fledge at 21- 25 days, staying within 100 yards of the nest and being fed by the adults for the first week (Ashley 2004). Broods then separate into two parts, each tended by one adult. Day roosts remain within 300 feet of nest for two weeks. Young owls are independent about four weeks (46-57 days) after fledging.

FOOD HABITS: *O. flammeolus* are entirely insectivores and the majority of foraging happens during dusk and dawn; nocturnal moths are especially important during spring and early summer (Ashley 2004). They prefer to forage in yellow pine and/or Douglas-fir, with these forest types apparently supporting their favored Lepidopteron prey (McCallum 1994b in Montana). As summer progresses and other prey become available, Lepidopteron larvae, Orthopteran, Arachnids, and Coleopteran are included in their diet. Breeding diet primarily consists of flying insects captured around trees in flight by sallying from a perch. They also glean other arthropods on trees and occasionally on the ground.

In Colorado, Flammulated Owls used four foraging tactics. Hawk-gleaning, consisting of flying from a perch to capture a resting arthropod. Hover-gleaning, which consists of flying from a perch to glean arthropods from adjacent tree crowns while hovering. The drop-pounce, used in middle to late summer by adults and fledglings, consists of dropping from a lower perch to pounce on arthropods on the ground. Hawking, which is the least-used tactic, consists of owls flying from a perch to capture flying insects in the air. (Glinski 1998).

HABITAT: In Arizona, they are found primarily in mixed conifer, pine, and pine-oak habitats, but they also occur locally in woodlands of pinyon-juniper, oak, and cypress. To see a Flammulated Owl in Arizona, go in early May through early July to a south-facing slope in the upper part of the ponderosa pine zone that has large, old ponderosa pine trees mixed with Douglas fir and/or white fir and plenty of snags. (Glinski 1998). *O. flammeolus* are also present where the oaks or pines are large and dense at the lower edge of the so-called transition (warm-temperate forest) zone, as it enters the "Upper Sonoran" (hot desert) zone (Johnsgard 2002). Throughout its range in North America, they primarily nest in dry coniferous forests composed of one or more species of yellow pine mixed with other conifer species and often with oak or quaking aspen (Glinski 1998).

ELEVATION: 5,000 - 8,000 ft. (1525 - 2440 m).

PLANT COMMUNITY: Throughout its range in North America, they nest in dry coniferous forests composed of one or more species of yellow pine mixed with other conifer species, and often with oak or quaking aspen. In Arizona, they are found in mixed conifer, pine, and pine-oak forests, but also can be found locally in woodlands of pinyon-juniper, oak, and cypress. (Glinkski 1998).

POPULATION TRENDS: Unknown. *O. flammeolus* have a slow reproductive rate, which may add to a decline in populations. According to NatureServe (2005), total population numbers are unavailable. Still relatively common in appropriate habitats, which offers reason for optimism, but since its habitat has declined and population trends and adult survivorship are unknown, the species deserves conservation attention. In British Columbia, the estimated breeding population is at least 1200 to 1500; total population probably exceeds 3000. Many sources also say common in some areas while almost completely absent in others.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: None
OTHER STATUS: None (USDA, FS Region 3 1999)
Forest Service Sensitive [USDA, FS Region 3, 1988]
Group 4 (NNDFW, NESL 2001, 2005)
Special Concern, on schedule1 [Canada SARA].

MANAGEMENT FACTORS: It appears that they require the presence of oaks in pine forest; not found in cut-over forests. Maintaining habitat in landscapes that contain a greater proportion of open canopy yellow pine and/or dry Douglas-fir stands, and greater proportions

of mature and old growth stands may be especially important to owls (NatureServe 2005). Managing for open physiognomy of preferred forest types to restore pre-settlement strands structures (for example, through thinning, selective harvest and controlled burning) would benefit this species (NatureServe 2005). Insecticides may have an effect on these owls. This species depends on other cavity nesters to excavate its cavities, so a loss of some of these species would have a major impact.

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: Studies need to be performed that would help determine life history factors, productivity, survivorship, habitat, and population status.

LAND MANAGEMENT/OWNERSHIP:

SOURCES OF FURTHER INFORMATION

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

The population extending from the Hualapai Mountains east across the Mogollon Plateau, and from the Bradshaw Mountains east to the New Mexico border north of the Gila River, may be a unique subspecies that is as yet undescribed.

The common and scientific names of the Flammulated Owl, are derived from a Latin word for "flame" (*flammula*), reflecting the red-orange plumage of its facial disk and body (Glinski 1998).

Revised: 1992-01-24 (JGH)
2005-07-25 (TAB)
2005-08-11 (SMS)

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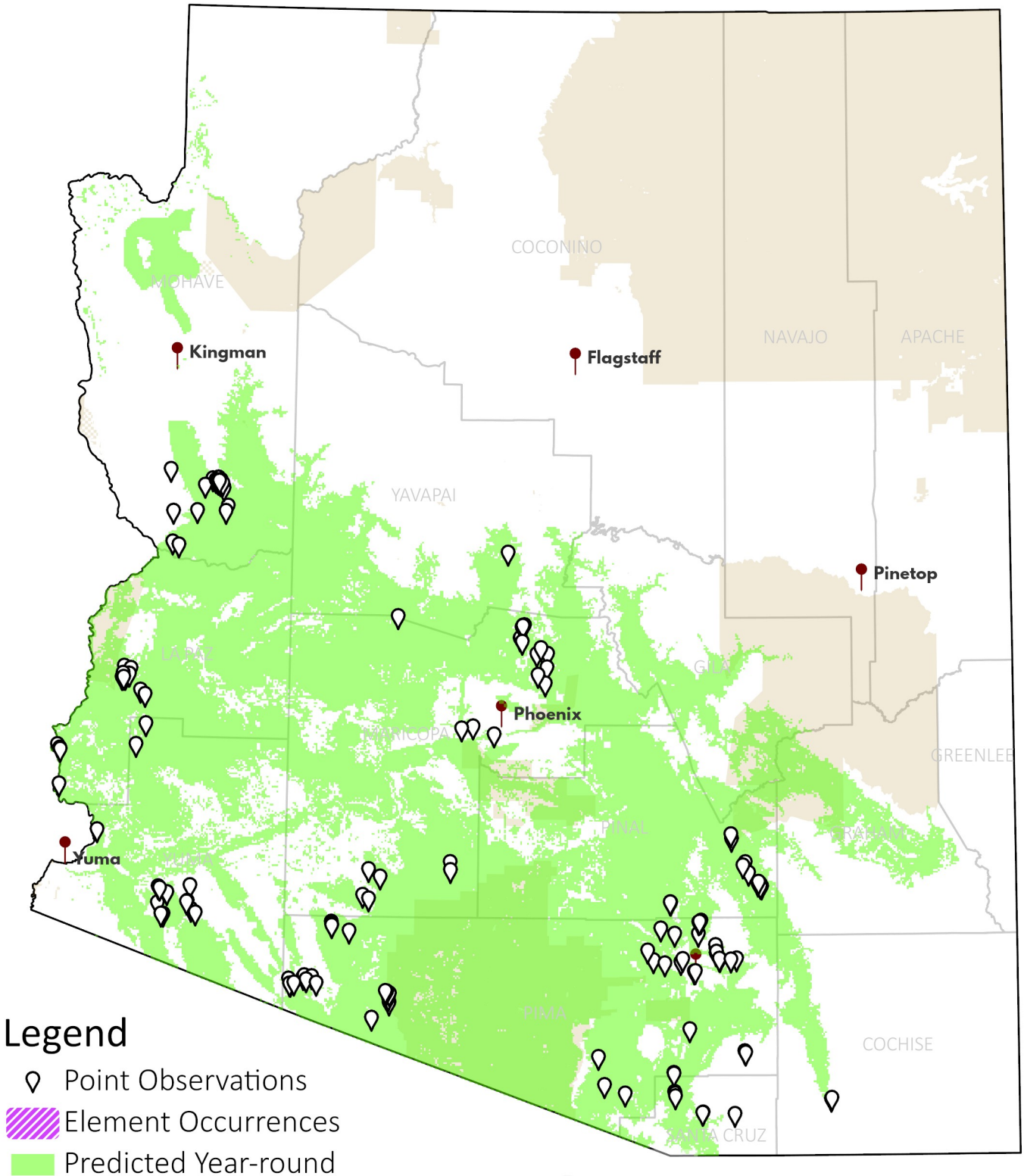
Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp

Colaptes chrysoides

Gilded Flicker



Legend

- Point Observations
- Element Occurrences
- Predicted Year-round
- Tribal Lands
- Counties

N

0 50 100 Kilometers

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences. Predicted ranges indicate likely habitat suitability, not presence.

Heritage Data Management System
2019-06-12

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:**
ABNKC22010 **Data**
Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Aquila chrysaetos*
COMMON NAME: Golden Eagle, American War Bird, Bird of Jupiter, Black Eagle, Brown Eagle, Calumet bird, Calumet Eagle, Canadian Eagle, Gray Eagle, Jackrabbit Eagle, King of Birds, Mountain Eagle, Ring-tailed Eagle, Royal Eagle, War Bird, White-tailed Eagle
SYNONYMS:
FAMILY: Accipitridae

AUTHOR, PLACE OF PUBLICATION: C. Linnaeus, Syst. Nat. 8vo, pp.4+824 (Syst. Nat. ed. 10, p.88). 1758.

TYPE LOCALITY:

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: Six to 20 species in genus. Only one subspecies in North America, *A.c.canadensis*.

DESCRIPTION: A very large raptor with mostly brown plumage and golden wash on the back of the head and neck. The bill is mostly horn colored, their tail is faintly banded and their eyes are dark brown. Their wings are long and rounded and they have slow powerful wing beats that are often alternated with gliding or soaring. The legs are feathered down to their toes. Immatures have white at the base of the primaries and a white tail with a dark terminal band. The eagle's total length is 30- 40 in (76-102 cm) and their wingspan is 80-88 in (203-224 cm). Their weight averages between 9-12.5 lbs (4-5.6 kg).

AIDS TO IDENTIFICATION: The Golden Eagle differs from the bald eagle in lacking a white head in adults and in lacking a white spotting on the underwing coverts in immatures.

ILLUSTRATIONS: Color Drawing (National Geographic, 1987: p 184)
Color Drawing (Robbins, 1983: p 78)

TOTAL RANGE: Contiguous North America, Canada south to central Mexico, Northern Russia, Siberia, British Isles, Northern Africa, Asia minor, Persia, southern Tibet, Korea and Japan. This outline represents the combined ranges of several subspecies, only one of which (*A. c. canadensis*) is found in North America.

RANGE WITHIN ARIZONA: Arizona.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: The Golden Eagle's territory size in several areas of the western U.S. averaged 22-55 sq miles (57-142 sq km). Northernmost populations withdraw southward for the winter (some individuals may remain in the north) and they return to their northern breeding areas in March-April. They tend to vacate hot deserts during the summer. They can dive at tremendous speeds at a prey animal or in play, traveling in its stoop at an estimated speed of 150-200 m.p.h. Their flight speed during gliding and flapping is 28-32 m.p.h.

REPRODUCTION: The dates for laying the eggs vary depending on the location but for California to Texas the peak is late February to March. The clutch size is 1-3, rarely 4 (usually 2). The incubation period is about 43-45 days and is done mostly by the female. The eggs are dull, white spotted and blotched or freckled with brown or red brown. The young can fly at 60-77 days and the parents care for them for another 30+ days. The older stronger eaglet will often kill smaller nest mates and adults do nothing to prevent it. The family units sometimes stay together for several months. They typically first breed in their fourth or fifth year. Lifelong monogamy may be the rule, though some apparent exceptions have been recorded.

The distance between active nests almost never less than .5 mile (0.8km). The nest can be 8-10 ft (2.4-3 m) across and 3-4 ft (.9-1.2 m) deep, as the site allows. The nest is made from a foundation of sticks, weeds, brush, roots, twigs, lined with soft mosses, lichens, down, and fur. The pair often adds leafy green branches to the nest. Other nests may be a mere scrape on a shelf or a cliff with a circle of branches surrounding it. Their courtship display is similar to that of the Buteos. It consists mainly of spectacular flight maneuvers, spiral sailings in ever-rising circles in which the birds frequently come together and then drift apart.

FOOD HABITS: The Golden Eagle is a carnivore that feeds mainly on small mammals like rabbits, marmots and ground squirrels. They may also eat insects, snakes, birds, juvenile ungulates and carrion. They can fast for days between feedings. They hunt while soaring or from their perch and they may hunt cooperatively. They commonly hunt in the early morning and early evening.

HABITAT: They are usually found in open country, in prairies, arctic and alpine tundra, open wooded country and barren areas, especially in hilly or mountainous regions. They nest on rock ledges, cliffs or in large trees. The pair may have several alternate nests and they may use the same nests in consecutive years or shift to alternate nest used in different years. In Arizona they are found in mountainous areas and are virtually vacant after breeding in some desert areas.

ELEVATION: In western mountains, nests were built at elevations between 4,000-10,000 ft (1219-3048 m).

PLANT COMMUNITY:

POPULATION TRENDS: In eastern North America they are reappearing in some sites in historic nesting range but they may be decreasing in northeastern U.S. A decline has also been noted in parts of its' range in Canada.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: 1B (AGFD SWAP 2012)
OTHER STATUS: Bureau of Land Management Sensitive (USDI, BLM AZ 2010)
A, Determined Threatened in Mexico (Secretaira de Medio Ambiente, Proyecto de Norma Oficial Mexicana 2010)
P, Determined Endangered in Mexico (Secretaira de Medio Ambiente, Proyecto de Norma Oficial Mexicana 2000)

Group 3 (NESL, NNFW 2000, 2008)

MANAGEMENT FACTORS: They are moderately threatened range-wide as their habitat lends itself to alternate uses. They are susceptible to power line electrocution, poison intended for other species, occasional shootings and habitat loss to agriculture and suburban land uses. And they are extremely sensitive to human disturbance during the nesting period.

PROTECTIVE MEASURES TAKEN: They are protected in National Parks and by similarity under the Bald Eagle Protection Act.

SUGGESTED PROJECTS:

LAND MANAGEMENT/OWNERSHIP: BIA – Navajo Nation, San Carlos Reservation and Hopi Reservation; Bureau of Land Management; NPS - Glen Canyon National Recreation Area and Wupatki National Monument; USFS – Coconino, Coronado, Kaibab, Prescott and Tonto National Forests; State Land Department; Private.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

Revised: 2002-07-27 (AMS)

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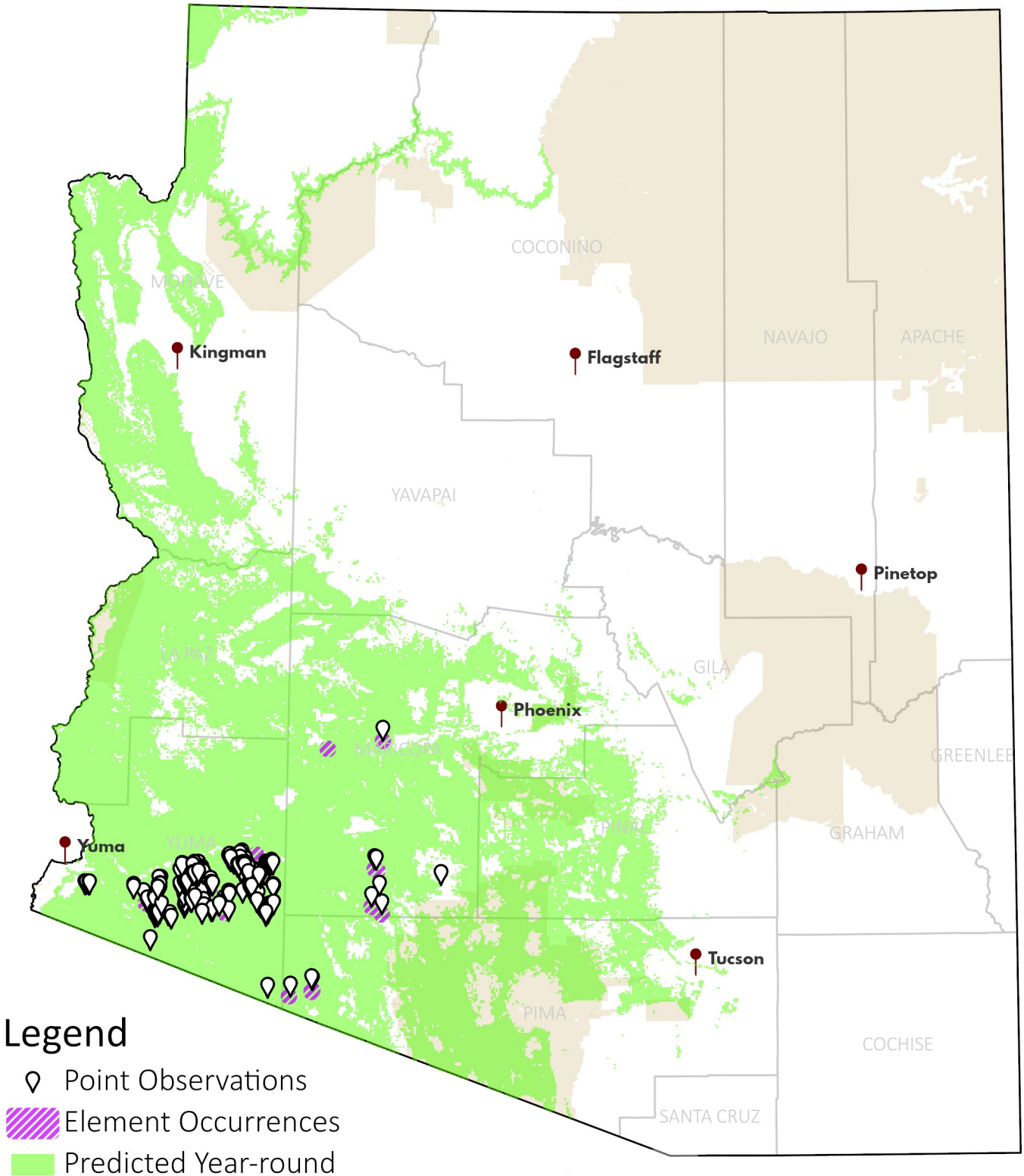
by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

Toxostoma lecontei

LeConte's Thrasher



Legend

- Point Observations
- Element Occurrences
- Predicted Year-round
- Tribal Lands
- Counties

N

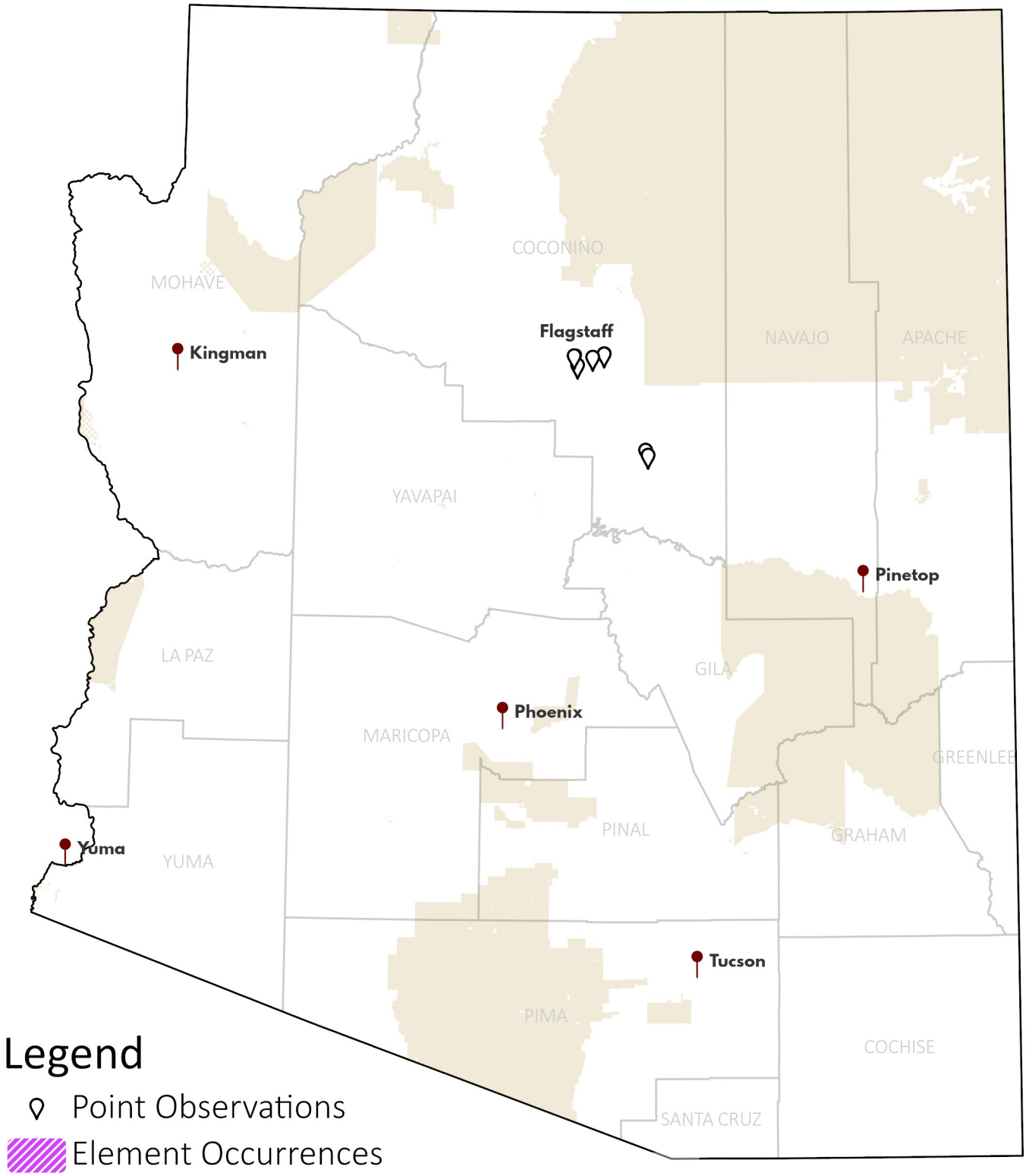
0 50 100 Kilometers

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences. Predicted ranges indicate likely habitat suitability, not presence.

Heritage Data Management System
2019-06-12

Melanerpes lewis

Lewis's Woodpecker



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

Kilometers

0 50 100

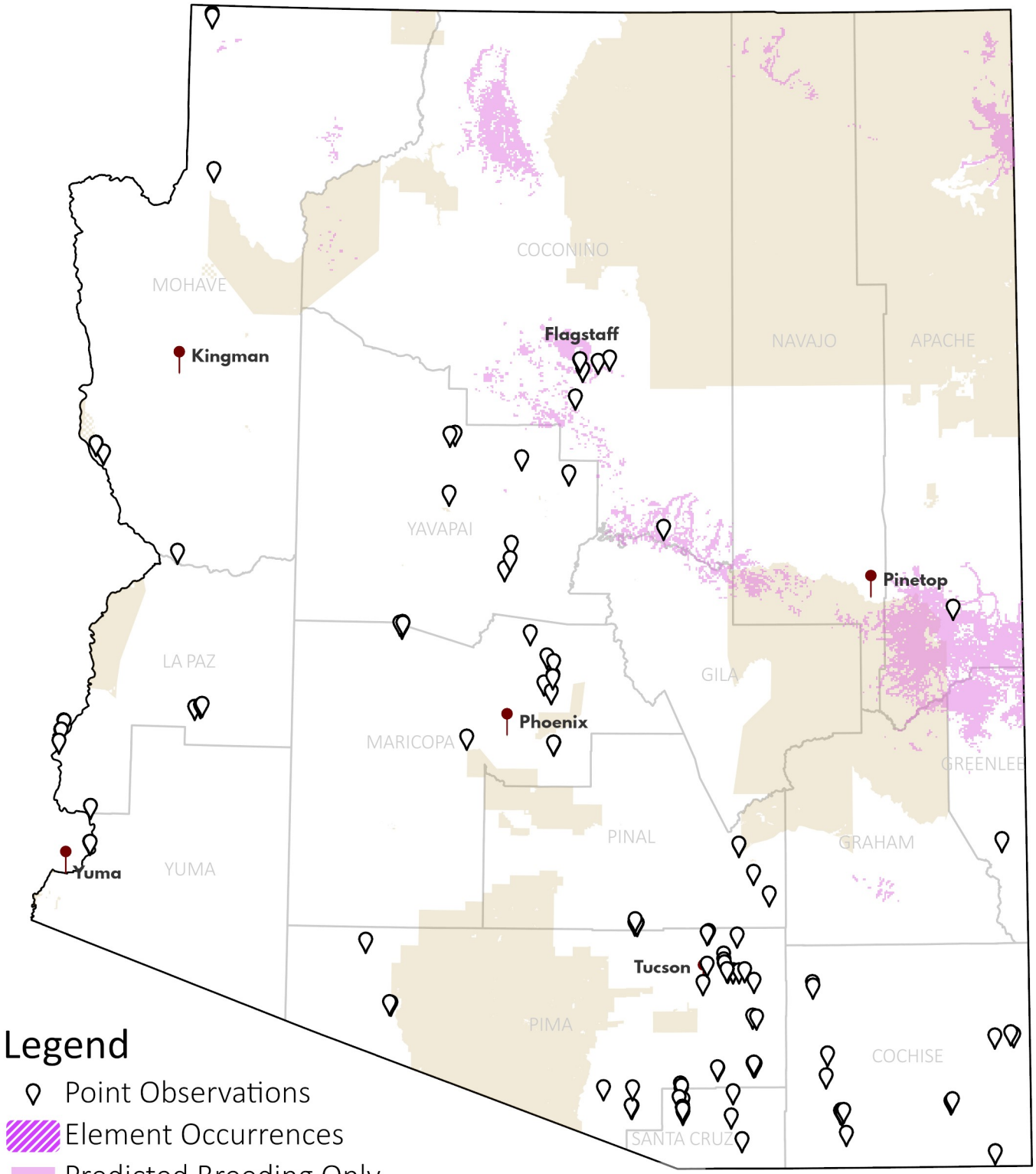
ARIZONA GAME & FISH

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences.

Heritage Data Management System
2019-06-12

Geothlypis tolmiei

MacGillivray's Warbler



Legend

- Point Observations
- Element Occurrences
- Predicted Breeding Only
- Tribal Lands
- Counties

N

0 50 100 Kilometers

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences. Predicted ranges indicate likely habitat suitability, not presence.

Heritage Data Management System
2019-06-12

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** ABNSB12012
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Strix occidentalis lucida* (Nelson) Ridgway
COMMON NAME: Mexican Spotted Owl
SYNONYMS: *Syrnium occidentale lucidum* Nelson, *Strix occidentalis huachucae* Monson and Phillips
FAMILY: Strigidae

AUTHOR, PLACE OF PUBLICATION: Nelson. 1903. Descriptions of new birds from southern Mexico. Proc. Biol. Soc. Wash. 16: 151-160.

TYPE LOCALITY: Mount Tancitaro, Michoacan, Mexico.

TYPE SPECIMEN: *Syrnium occidentale lucidum*: USNM 185269 (complete female adult skin). E.W. Nelson 9179 and E.A. Goldman, 27 Feb 1903.

TAXONOMIC UNIQUENESS: The Mexican Spotted Owl (MSO), *Strix occidentalis lucida*, is 1 of 3 subspecies in the species *S. occidentalis*. The other 2 subspecies include the Northern Spotted Owl (*S. o. caurina*) and the California Spotted Owl (*S. o. occidentalis*). Based on genetic work, the MSO may represent a distinct species because of geographical isolation from the Northern and California spotted owls (Barrowclough and Gutierrez 1990).

DESCRIPTION: The subspecies *lucida* is a medium sized owl (although the spotted owl ranks among the largest owls in North America (NA) where only 4 species among the 19 in NA are larger), where males average 23-41 cm (9-16 in) in length and females average 30-34 cm (12-13.4 in) (Ganey, *in* Glinski 1998 reports average length as 16-19 in); wingspan 107-114 cm (42-45 in, per Ganey *in* Glinski 1998); males weigh 449-625 g (16-22 oz), females 480-680 g (17-24 oz). The MSO is a brown colored owl with large, irregular and numerous white spots on the head, neck, back, and underparts, giving it a lighter appearance than the other two subspecies. The sexes are nearly identical, but females have darker head and face color, and breeding females have brood patches. The remiges and rectrices of both sexes are dark brown and barred with light brown and white; tail has about ten light bands. MSO has a round face that lacks ear tufts. The large, round, brownish facial disks are concentrically barred with dark brown, with a dark brown border. Their dark brown eyes appear almost black. The bill is a pale yellowish green color, and their legs and feet are fully feathered. Juvenile spotted owls (hatchling to approximately 5 months) have a white downy appearance. Subadults (5 to 26 months) possess adult plumage but have pointed rectrices with white tips. The rectrices of adults (>27 months) have rounded and mottled tips.

AIDS TO IDENTIFICATION: MSO is similar to the Barred Owl (*Strix varia*), but is slightly smaller, and has white spotting on head, back, and underparts rather than streaking.

The Barred Owl is the only other large owl with dark eyes and concentric rings on facial disk. Both owls show strong orange-red eye shine when illuminated by direct light. MSO has a distinctive main call, a series of three or four hesitant, dog like barks and cries. The background coloration of MSO is generally darker brown than other subspecies with plumage spots larger, more numerous and whiter, which gives a lighter appearance.

ILLUSTRATIONS:

Color drawing (Scott 1987: 240)
Color drawing (Peteron 1990: 205)
Color photo (Terres 1980: 658-659)
Color drawing (Sloan, in Glinski 1998: plate 39)
Color photo (Fink, *in* Johnsgard 2002: plate 24)
Color photo (Pat Ward, *in* http://ifw2es.fws.gov/mso/)
Color photo (*In* http://www.gf.state.az.us/w_c/research_mexican_spotted_owl.shtml)
Color photo (NPS, 2002 http://www2.nature.nps.gov/YearinReview/yir2002/04_f.html)
Color photo (Steve Howe, *in* http://biology.usgs.gov/s+t/noframe/r027.htm)
Color photo of species (Jeffrey Rich, *in* ENature at http://www.enature.com/fieldguide/showSpeciesIMG.asp?imageID=17545)
Color photos of species (http://www.owlpages.com/species/strix/occidentalis/Default.htm)

TOTAL RANGE: The MSO currently occupies a broad geographic area, but does not occur uniformly throughout its range. They range from southern Utah and central Colorado south through Arizona, New Mexico, and western Texas (mountains in the Trans Pecos) to the Mexican Plateau (Michoacan and Guanajuato).

RANGE WITHIN ARIZONA: Patchily distributed in forested mountains statewide, along with steep canyons on the Colorado Plateau including the Grand Canyon. They have been found in the following counties: Apache, Cochise, Coconino, Gila, Graham, Greenlee, Maricopa, Mohave, Navajo, Pima, Pinal, Santa Cruz, and Yavapai.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Mexican Spotted owls are mostly solitary outside the breeding season. They roost during the day, and hunt at dusk and at night. They are intolerant of moderately high temperatures, thus, often selecting daytime summer roosts on north facing slopes with dense overhead canopy. Lifetime nest site tenacity has been observed by pairs. "Some owls remain year-round in the same general areas but exhibit seasonal shifts in habitat use pattern (USFWS 1995). Some migrate 20-50 km between summer and winter ranges (USFWS 1995)." (NatureServe 2005). Seasonal migration of some individuals occurs in many or most MSO populations, and in both sexes, but not always year to year. Reasons why only some owls migrate are unknown. When migration occurs too wintering areas, it generally is from higher to lower elevations, and to more open habitats. Recent examples of known wintering areas in Arizona include the Verde Valley, Tonto Creek, and Sabino Canyon (Ganey, in Glinski 1998). Further, owls use these areas at a time when they are unlikely to vocalize (Ganey 1990), making it difficult to locate such areas through calling surveys. It is presently

unknown how and why migrating owls select particular wintering areas. (Ganey and Block, 2005).

Adults are generally long-lived, however, there is a low survival of young to breeding age. Based on banding studies, the species often live for 16-17 years. Exploitive competition (where individuals compete for similar resources such as prey and nest sites) may occur with Great Horned owl (*Bubo virginianus*). They are not a fast flier, but are very agile and maneuverable. Their flight consists of quick wingbeats interspersed with gliding flight. Observed actively defending nest sites and fledged young against Common Raven (*Corvus corax*), Northern Goshawk (*Accipiter gentiles*), Cooper's Hawk (*A. cooperi*), and Golden Eagle (*Aquila chrysaetos*). Starvation is likely another common source of mortality. Juveniles are more vulnerable to starvation because of their poor hunting skills. Both adults and juveniles may be affected by starvation in those years when there is a low abundance or availability of prey.

MSO calls infrequently during the winter (although, Ganey (*in* Glinski 1998) has heard them in all months of the year in Arizona); increases in late Feb-Mar between pair members and adjacent pairs at onset of breeding. There is a general decline in calling activity among MSOs from Jun to Nov (Ganey 1990, *in* Gutiérrez et al. 1995). On a daily basis, calling activity is greatest during the 2-hour period following sunset, with smaller peaks 4-8 hours after sunset and just before sunrise (USFWS 1995). They communicate using a variety of hoots, barks, and whistles. Sexes can be distinguished based on pitch of the call; females are consistently have higher-pitched calls. Besides having lower pitched calls, males generally call more frequently than females. The most common call is the Four-note Location Call, described phonetically as *hoo—hoo-hoo—hoo*. This call is used by males and females to announce territory occupancy and in territorial disputes. It is also used by the male when nearing the nest with food, and after copulation. The Contact Call is a hollow whistle ending in an upward inflection phoneticized as *cooo-weep!* It usually serves to establish and maintain contact between a pair. The Bark Series is used primarily by females during territorial disputes, and sometimes between pairs to maintain contact. It consists of a rapid series of 3-7 loud barking notes phoneticized as *ow!-ow!-ow!-ow!-ow!* Or *yenk!-yenk!-yenk!-yenk!* Both fledged young and adults use bill clicking, which occurs when birds are agitated, excited, or threatened. (Gutiérrez et al. 1995).

Northern spotted owls are known to hybridize with barred owls, however, hybridization has not been reported in the Mexican subspecies. The possibility of hybridization exists in Mexico where barred owls, fulvous owls, and spotted owls overlap in distribution. No evidence exists documenting actual sympatry among these species, however. (USFWS 1995).

REPRODUCTION: MSO's do not build their nests. In Arizona, they use cavity or abandoned platform nests about 80 feet up in coniferous tree, however, they also use ledges on cliffs or pothole sites, and mistletoe clusters. They are monogamous, breeding sporadically, and generally not nesting every year (Ganey 1988, in USFWS 1995). In good years most of the population will nest, whereas in other years only a small proportion of pairs will nest (Fletcher and Hollis 1994, in USFWS 1995). They have one brood, with egg laying peaking sometimes as early as early March in Arizona and New Mexico. They lay 1-3 (usually 2)

faintly buff, unmarked eggs that are 5.0 cm (2.0 in.) long. Incubation by female lasts 28-32 days. Hatching usually occurs in early to mid-May. Young have eyes closed at hatching, are immobile and downy. Male feeds female and young until young are two weeks old. Young leave the nest at about 5 weeks (June), and fly at about 6-7 weeks of age. They stay near the nest for several weeks, and are fed by the adults until late summer, and are independent by early fall (dispersal of young occurs in September-October). Adults breed at 2-3 years of age, but may not breed every year. Reproductive success is generally low (USFWS 1993), with average number of young fledged per pair at about 1.0 (USFWS 1995). (NatureServe 2005).

FOOD HABITS: MSO regularly caches excess food, usually on tree branches. Prey is snatched from the ground in talons after gliding descent from a perch. In Arizona: most common prey includes cottontails, deer mice, woodrats, and voles (Ganey et al. 1988); but also may prey upon various birds, bats, lizards, and snakes (Duncan 1992, Herpetol. Rev. 23:81). (NatureServe 2005). Over most of the MSO range, *Neotoma* species dominate diets in terms of biomass (Kertell 1977, Wagner et al. 1982, Ganey 1992, *in* Gutiérrez et al. 1995). Woodrats were generally more abundant in pellet samples collected in northern latitudes, and peromyscid mice and birds were generally more abundant in southern regions of the owl's range (http://ifw2es.fws.gov/mso/Biology.cfm accessed 2005). Regional differences in the owl's diet likely reflect geographic variation in population densities and habitats of both the prey and the owl.

HABITAT: In the 1993 Federal Register, the USFWS estimated the total suitable MSO habitat in the U.S. at 5,589,734 to 5,714,734 acres. They primarily breed in dense old growth mixed-conifer forests located on steep slopes, especially deep, shady ravines. These sites have high canopy closure, high basal area, many snags, and many downed logs. For foraging, multistoried forest with many potential patches is desirable. In Arizona, they occur primarily in mixed-conifer, pine-oak, and evergreen oak forests; also occurs in ponderosa pine forest and rocky canyonlands (Ganey and Balda 1989). In Arizona, they generally foraged more than or as frequently as expected (based on availability) in virgin mixed-conifer forests (Ganey and Balda 1994). (NatureServe 2005). Range size for single owls in Arizona averages 1,600 acres and combined home ranges occupied by pairs averages 2,000 acres.

MSO nest and roost primarily in closed-canopy forests or rocky canyons. In the northern portion of the range (southern Utah and Colorado), most nests are in caves or on cliff ledges in steep-walled canyons. Elsewhere, nests appear to be in trees (Fletcher and Hollis 1994, USFWS 1995). Nest trees are usually large in size, whereas roosting occurs in both large and small trees. Nest tree species vary somewhat among areas and habitat types, but available evidence suggests that Douglas-fir is the most common species of nest tree (SWCA 1992, Fletcher and Hollis 1994, Seamans and Gutiérrez, in press; *in* USFWS 1995).

Based on the Recovery Plan's established Recovery Units (RU's) for Arizona (USFWS 1995), the major landforms of the Colorado Plateau RU includes interior basins and high plateaus dissected by deep canyons, including the canyons of the Colorado River and its tributaries. Grasslands and shrub-steppes dominate at lower elevations, but woodlands and forests dominate the higher elevations. The Upper Gila Mountains RU consists of steep mountains and deep entrenched river drainages dissecting high plateaus. The Mogollon Rim, a

prominent fault scarp, bisects the unit. The vegetation is a zonal pattern of grasslands at lower elevations upward through pinyon-juniper woodlands, ponderosa pine, mixed-conifer, and spruce-fir forests at higher elevations. Many canyons contain stringers of deciduous riparian forests. The Basin and Range – West exhibits horst and graben faulting with numerous fault-block mountains separated by valleys. Complex faulting and canyon carving define the physical landscape within these mountains. Vegetation ranges from desert scrubland and semi-desert grassland in the valleys upwards to montane forests. The montane vegetation includes interior chaparral, encinal woodlands, and Madrean pine-oak woodlands at lower and middle elevations, with ponderosa pine, mixed-conifer, and spruce-fir forests at higher elevations. Riparian forests may also function as important components of ecosystems supporting spotted owls. They may serve as direct avenues of movement between mountain ranges or as stopover sites where drainages bisect large expanses of landscape that otherwise would be inhospitable to dispersing owls. Many of the riparian ecosystems have deteriorated in the Southwest, and the loss of riparian habitat was another reason for listing the MSO (USFWS 1995).

ELEVATION: 4,500 - 10,000 ft. (1373-3050 m); Ganey (*in* Glinski 1998) reports elevations in Arizona as 3,700 – 9,600 feet (1128-2926 m); while the HDMS reports the elevation range between 2,720 – 9,600 ft. (829-2926 m) based on unpublished records (AGFD, accessed 2005).

PLANT COMMUNITY: Mixed-conifer forests are commonly used throughout most of the range. These forests are generally dominated by Douglas-fir (*Pseudotsuga menziesii*) and/or white fir (*Abies concolor*), with codominant species including southwestern white pine (*Pinus strobiformis*), limber pine (*Pinus flexilis*), and ponderosa pine (*Pinus ponderosa*) (Brown et al. 1980, *in* USFWS 1995). The understory often contains the above coniferous species as well as broadleaved species such as Gambel oak (*Quercus gambelii*), maples (*Acer* sp.), boxelder (*Acer negundo*), and/or New Mexico locust (*Robinia neomexicana*). In southern Arizona and Mexico, Madrean pine-oak forests are also commonly used, and are typically dominated by an overstory of Chihuahuan pine (*Pinus leiophylla*) and Apache pine (=Engelmann pine, *Pinus engelmannii*), in conjunction with Douglas-fir, ponderosa pine, and Arizona cypress (*Cupressus arizonica*). Evergreen oaks are typically prominent in the understory. (Brown et al. 1980, *in* USFWS 1995). (http://ifw2es.fws.gov/mso/Biology.cfm accessed 2005).

POPULATION TRENDS: Unknown. According to USFWS (1995), there is inadequate data to estimate population trends in MSO. There is little confidence in the estimates of population trend that include estimates of juvenile survival because the estimates of juvenile survival are probably biased low. In addition, the population studies from which parameter estimates were derived have not been conducted for a sufficiently long period to capture temporal variation. The greatest concentration of the known MSO population occurs within the Upper Gila Mountains RU, with many spotted owls found within the wilderness areas in this RU (USFWS 1995). Based on crude population estimates, there may be 600-1,200 MSO's in Arizona (Fletcher 1990; McDonald et al. 1991, *In* Ganey *in* Glinski 1998).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS:
Final Recovery Plan, First Revision (USDI, FWS November 2012)
Critical Habitat Listed (USDI, FWS 2001)
LT (USDI, FWS 1993), without Critical Habitat
[PT USDI, FWS 1991]
[C2 USDI, FWS 1985, 1989]

STATE STATUS:
1A (AGFD SWAP 2012)
[WSC, AGFD, WSCA in prep]
[State Threatened (AGFD, TNW 1988)]

OTHER STATUS:
Not Forest Service Sensitive (USDA, FS Region 3 2007)
[Forest Service Sensitive, USDA, FS Region 3 1988, 1999]
Group 3 (NNDFW, NESL 1994, 2005, 2008)
A, Determined Threatened in Mexico (NORMA Oficial Mexicana NOM-059-SEMARNAT-2010).

MANAGEMENT FACTORS: Two primary reasons for listing include: the historical alteration of its habitat in Arizona and New Mexico as the result of timber management practices, specifically the use of even-aged silviculture, plus the threat of these practices continuing, as provided in National Forest Plans. Also cited is the potential threat for additional habitat loss due to catastrophic wildfire. The risk of catastrophic fires is widespread in Southwestern forests and woodlands. Fuel accumulations and forests overstocked with trees place spotted owl habitat at risk with respect to stand-replacing fires. After a large crown fire, habitat components for nesting, roosting, and foraging are reduced or eliminated. Small-scale natural fires and prescribed burns, however, can reduce fuel loadings and create small openings and thinned stands that increase horizontal diversity and reduce the spread of catastrophic fire. (USFWS 1995). Natural disturbances such as the western spruce budworm, or the bark beetle, are also a concern especially during long outbreaks (usually following droughts). Bark beetles are important wood-boring insects in pinyon, ponderosa pine, Douglas-fir, and Engelmann spruce. During long outbreaks, they can kill large groups of mature trees over widespread areas, which can alter MSO habitats. These disturbance agents should be considered in developing management strategies for owl recovery. Several vegetation management tools, including various kinds of silviculture, risk-abatement for fire or insect/disease damage, prescribed burning, and direct population control are appropriate in various combinations. (USFWS 1995).

MSO habitats continue to be lost or degraded by logging and/or forest fragmentation. Also, according to USFWS (1995), "The potential for grazing to influence various components of spotted owl habitat cannot be ignored. However, current predictions of grazing effects on

plant communities as they relate to the owl are inexact. Thus, the integration of spotted owl needs and grazing management will require coordination, and an interactive and adaptive approach between protection, restoration, and management." In addition, there is the "potential for competition with and/or predation by other raptors, including great horned owl and red-tailed hawk (USFWS 1993)." (NatureServe 2005). AGFD (in prep) also reports possible competition problems from great horned owls, in forests that have been thinned.

General recommendations from the Recovery Plan, are proposed for three levels of management: 1) Protected Areas – include a 243 ha (600 ac) "Protected Activity Center" (PAC) placed at known or historical nest and/or roost sites, with slopes >40% in mixed-conifer and pine-oak forests that have not been harvested within the past 20 years. Harvest of trees >22.4 cm dbh (diameter at breast height) is not allowed, but light underburning is permitted on a case-specific basis as needed to reduce fuels. 2) Restricted Areas – include ponderosa pine-Gambel oak and mixed-conifer forests and riparian environments. 3) Other Forest and Woodland Types – include ponderosa pine and spruce-fir forests, pinyon-juniper woodlands, and aspen groves that are not included within PACs. (USFWS 1995).

The MSO inhabits diverse forest types scattered across a physically diverse landscape. In order to approach a status assessment on a rangewide basis, the Recovery Plan divided their range into 11 geographic areas called "Recovery Units" (RU's), six of which occur in the U.S. Three RU's occur in Arizona: Colorado Plateau (includes portions of northern Arizona), Upper Gila Mountains (along the Mogollon Rim/Plateau in Arizona, SE into New Mexico), and Basin and Range – West (southern Arizona where it geographically exhibits horst and graben faulting with numerous fault-block mountains separated by valleys). The RU's were identified based on (in order of importance): 1) Physiographic provinces, 2) biotic regimes, 3) perceived threats to owls or their habitats, 4) administrative boundaries, and 5) known patterns of owl distribution. (USFWS 1995).

PROTECTIVE MEASURES TAKEN: A high profile species to which apply a large number of policies and regulations. Critical Habitat was designated in 2001 (Federal Register 66(22): 8530-8553). "About 90% of the U.S. population occurs on lands administered by the U.S. Forest Service (USFWS 1995). Logging is restricted in a number of areas in national forests, national parks, wilderness areas, and BLM lands." (NatureServe 2005). Owl surveys at Grand Canyon National Park in 2001 and 2002, uncovered 53 MSO in rugged, rocky canyon habitat. Roosts and nests were generally located on rock shelves. These findings resulted in the establishment of 39 Protected Activity Centers surrounding the owl locations, ranging from 700 to 1,000 acres and subject to the management recommendations contained in the Mexican Spotted Owl Recovery Plan. (NPS, 2002).

The Recovery Plan Duration is for ten years, which was determined by the team to 1) allow adequate time to monitor the trends in population and habitat; 2) to fill some of the major gaps in existing knowledge, and accommodate possible changes in future conditions; 3) To try to plan beyond the next decade or so would require an unjustified confidence in our ability to predict the state of our society and the environment; and 4) The Act requires that the status of listed species be reviewed every five years. The Team recommends that once the population

and habitat are shown to be stable or increasing, delisting should be considered at the RU level. (USFWS 1995).

SUGGESTED PROJECTS: More rigorous and directed studies will be needed to address questions on dispersal, genetics, habitat, populations, and effect of management on spotted owls and other ecosystem attributes. Habitat monitoring should address two aspects: persistence of forest types that owls prefer (macrohabitat) and specific habitat attributes within those types (microhabitat). (USFWS 1995). Global inventory needs should be to obtain up-to-date information on occurrences throughout their range. (NatureServe 2005). Since the early 1990s, U.S. surveys have found owls at more locations but this was the last comprehensive attempt to estimate the total number of occurrences (USFWS 2000). Marking individual birds with FWS leg bands and color bands for visual identification provides greater validity in the estimation of the owl population size on the i.e. quadrat, because assumptions of the mark-recapture methods can be tested. Individually marking birds will: 1) eliminate bias, 2) is necessary to estimate annual survival on quadrats that are sampled for two consecutive years, 3) capturing birds allows for careful aging of individuals; hence the resulting age structure data are more useful in assessing the impact of floaters in the population, 4) minimum estimates of dispersal and emigration from the quadrat can be assessed with banded birds that are located off the quadrat. (USFWS 1995).

Suggested research needs include: Determine population attributes and trends in relation to existing management activities. Determine silvicultural techniques that could produce wood products and owls. Determine ways to make younger forests capable of supporting owls. Determine extent of competition with other owls. (NatureServe 2005).

LAND MANAGEMENT/OWNERSHIP: Primarily national forests in Arizona including: Apache-Sitgreaves, Coconino, Coronado, Kaibab, Prescott, and Tonto National Forests. Other ownerships/managements include: BIA – Havasupai and Fort Apache Reservations, Navajo Nation, and Navajo Hopi Joint Use Area; BLM – Kingman and Safford Field Offices; DOD - Fort Huachuca Military Reservation and Navajo Army Depot; NPS – Chiricahua, Coronado and Walnut Canyon National Monuments, and Grand Canyon and Saguaro National Parks; AGFD Lamar Haines Wildlife Area; State Land Department; TNC – Muleshoe Ranch and Ramsey Canyon Preserves; Private.

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ADDITIONAL INFORMATION:

Strix occidentalis translates as "owl of the west"; *lucida* means "light" or "bright."

Habitat connectivity, buffers a population from stochastic variability through time by providing the opportunity for local population failures to be "rescued" by immigration from other populations (USFWS 1995).

Revised: 1992-01-24 (JGH)
1995-07-13 (DBI)
1998-01-28 (SMS)
2001-12-07 (SSS)

2005-04-26 (SMS)

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** ABNKC12060
Data Sensitivity: YES

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Accipiter gentilis* (Linnaeus)
COMMON NAME: Northern Goshawk
SYNONYMS: *Falco gentilis*, *Accipiter gentilis atricapillus* Wilson (subspp. in United States)
FAMILY: Falconiformes: Accipitridae

AUTHOR, PLACE OF PUBLICATION: *Falco gentilis* Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p. 89. *Accipiter gentilis atricapillus* (*Falco atricapillus* Wilson), Amer. Orn., vol. 6, 1812, P. 80, pl. 52, fig. 3.

TYPE LOCALITY: *Falco gentilis*: "in Alpibus = Dalecarlian Alps, Sweden."
U.S. subspecies *A. g. atricapillus*: "within a few miles of Philadelphia [Pennsylvania]."

TYPE SPECIMEN: Type of *A.g. atricapillus*: USNM A08508 (Adult male). G. Suckley, -- -- 18--. Fort Steilacoom, Pierce Co., Washington, in Bair, Brewer, and Ridgway, Hist. of N. Amer. Birds (Land Birds) 3: 238, 240, January 1874.

TAXONOMIC UNIQUENESS: Three North American species in genus. At least 5 subspecies of *A. gentilis* in Eurasia, two found in Arizona: *A.g. atricapillus* and *A.g. apache.* According to NatureServe (2001), the validity of subspecies *apache* is questionable. Snyder and Snyder (*In* Glinski 1998) reports that although the validity of the *apache* race has been questioned, and it is not currently recognized on the American Ornithologists' Union checklist, the balance of opinion appears to be swinging again toward recognition (Whaley and White 1994).

DESCRIPTION: *Accipiter gentilis* is the largest accipiter in Arizona, exhibiting the least size difference between sexes. Females are larger that males, averaging 2.4 pounds in weight, while males average 1.9 pounds. Adult lengths range from 45.7-65.0 cm (18.0-26.0 in.), wingspan 96.5-117.0 cm (38.0-46.0 in.). Short wings and a long tail aid the goshawk in maneuvering through dense woods. The wing chord of adult females averages 35.3 cm (13.9 in) and 32.8 cm (12.9 in) in males; the tail averages 26.7 cm (10.5 in) in females and 23.1 cm (9.1 in) in males. Conspicuous light eyebrow, flaring behind eye, separates black crown from variably gray back. Under parts white with fine gray barring; appear light gray at a distance with conspicuous fluffy under tail coverts. The tail is gray with black transverse bars. Eye color ranges from yellow, orange, and deep mahogany in older birds (gray in nestlings); legs

and feet yellow. Tarsus is feathered halfway to feet, only one third in Cooper's Hawk (*A. cooperii*).

Juvenile: brown above, buffy below, with dense, blurry breast streaking, heaviest on flanks; tail has wavy, dark bands bordered with white and thin white tip; under tail coverts have dark streaks. Light colored eyebrow stripe visible on juvenile but may also appear on immature *A. coóperii*

AIDS TO IDENTIFICATION: **Adult:** larger than *Corvus brachyrhynchos* to *Buteo jamaicensis*; variably gray upper body, light gray breast and light eyebrow stripe. *A. gentilis* twice as big as *A. striatus.*

Juvenile: Can be difficult to distinguish from immature *A. coóperii* which is smaller, has light eyebrow ridge less often. Juvenile goshawk under tail coverts are streaked, seldom so in *A. coóperii*. Juvenile goshawk tail barring is not lined up between feathers, giving a zigzag appearance *A. coóperii* does not have. Dark bars on goshawk's tails are bordered by thin light colored bars, not so on *A. coóperii*. Juvenile *A. coóperii* usually have light colored under parts with relatively fine streaks on breast, *A. gentilis* tends to have dense streaking. This gives juvenile *A. coóperii* a brighter appearance, especially at a distance in flight.

ILLUSTRATIONS:

Color drawings (Scott 1988:190)
Color photos (Terres 1980:506)
B&W photos (Block et al. 1993:34-38)
Color drawing (Sibley 2000)
Color photo (Clark 1987)
Color drawing of egg (Baicich 1997)
Color drawing (National Geographic 1987)
Color photo (*In* Http://www.falconeriaitaliana.com/images/album/finn.htm)
Color photo (*In* http://I-bird.com/Gallery/GALNGoshawk562.htm)
Color photo of juvenile (Http://www.mbr-pwrc.usgs.gov/Infocenter/Photo/Images/h3340pi/jpg)
Color photo of nestlings (*In* http://www.sw-center.org/swcbd/species/goshawk/goshawk.html)
Color photo (Glinski 2002)
Color drawing (Sloan, *in* Glinski 1998: pl. 11)

TOTAL RANGE: Breeding range is Holarctic: northern hemisphere from timberline in Alaska and Canada south to Mexico and northwestern Connecticut and from timberline in Scandinavia and Siberia south to Morocco, Iran, Tibet and Japan. Non-breeding: throughout their breeding range, and irregularly southward.

RANGE WITHIN ARIZONA: Statewide, they breed in high, forested mountains and plateaus, usually above 6,000 ft. Population on Kaibab Plateau exhibits one of the highest breeding densities known (Kennedy 1989).

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: The goshawk's alarm call is a slower and much more intimidating version of the *kek kek kek kek kek* alarm call of Cooper's Hawk, best rendered as *gek gek gek gek gek gek gek*. The alarm and solicitation calls of both species are often imitated by Stellar's Jays, resident in the vicinity of their nests. These realistic imitations are a source of frequent false alarms for those searching for accipiter nests. (Snyder and Snyder, in Glinski 1998). Home ranges during nesting vary from 94 to 3500 hectares depending on sex and habitat characteristics. Home ranges of males are typically larger than those of females, while the home ranges of non-breeders are poorly known, but may be larger than those of breeders. Predators include: Great Horned Owls, martens, fishers and wolverines.

REPRODUCTION: Onset of breeding is generally delayed until two years of age. They may mate and lay eggs earlier but eggs generally are infertile. Lifelong pair bonds are formed when birds sexually mature. Nesting pairs have strong site fidelity, returning to same tract of woods for nesting. The same nest may be used by a pair for up to 5 consecutive years. They may attempt nesting for 1 to 5 years in territories following logging, even with low reproductive success.

Nest building begins in March, with breeding activity beginning approximately mid-April, with eggs laid by late April. They maintain 1 to 8 alternate nests within a nest area. Nest heights vary according to tree species and regional tree-height characteristics. Nests are usually constructed in the lower one-third of nest trees or just below the forest canopy, and range from 9 m in Alaska to 16.9 m in New Mexico. The nest is a large shallow untidy structure of dead twigs, lined with pieces of bark and leafy green twigs or bunches of conifer needles, which are constantly renewed. Usually 2-4 eggs is produced. The pale bluish-white eggs are short sub elliptical, non-glossy and rough-textured, 5- x 45 mm. Incubation, is principally performed by the female and takes 28-38 days. Hatching is asynchronous. Mostly the female performs brooding and feeding of nestlings; the male brings food to the nest. The young begin flying at 35-42 days and become independent at about 70 days. The nestlings are semi-altricial and downy. The first down is short, silky and thick above, sparser below and white. The second down is longer and woollier; gray tinged above and white below. Irides gray. Cere and feet light yellow. Captive breeding is relatively difficult and of questionable value in this species, since it is primarily threatened by habitat loss.

FOOD HABITS: Forages during short flights alternated with brief prey searches from perches. Also hunts by flying rapidly along forest edges, across openings and through dense vegetation. Prey is taken on the ground, in vegetation or in the air. Despite being larger, females do not take heavier prey than males. Dominant mammalian prey includes tree squirrels, rock squirrels, and cottontails. Band-tailed Pigeons, Mourning Doves, Stellar's Jays, and Northern Flickers are the principal avian prey in Arizona, with Montezuma Quail comprising 20 percent of prey remains in southeastern Arizona nests (Snyder and Snyder, in Glinski 1998).

HABITAT:

Breeding: Overall, goshawks nest in a wide variety of forest types including deciduous, coniferous and mixed forests. They typically nest in mature or old growth forests, generally selecting larger tracts of forests over smaller tracts. In Arizona, goshawk's nest most commonly in ponderosa pine forests along the Mogollon Rim and on the Kaibab Plateau, and in Arizona pine and ponderosa pine forests in the southeastern mountains. Occasionally, they breed in relatively low elevation oak forests in the southeastern portion of the state. The lowest-elevation nest found was at 4,900 feet. (Snyder and Snyder, *in* Glinski 1998). In the western U.S. they characteristically nest in coniferous forests including those dominated by ponderosa pine and lodgepole pine, or in mixed forests dominated by various coniferous species including fir, Douglas-fir, cedar, hemlock, spruce. They will also nest in deciduous forests with aspen, paper birch and willow. **Non-breeding:** Habitat requirements during winter, are poorly understood.

ELEVATION: According to unpublished records in the HDMS (AGFD accessed 2003), they have been located at elevations of 4,750-9,120 ft (1,448-2,780m).

PLANT COMMUNITY: Ponderosa pine and mixed conifer forests, including some riparian habitats.

POPULATION TRENDS: Little historical information on goshawk densities exists, but populations appear to have undergone dramatic declines over last 50 years. The most complete data is from the Kaibab National Forest showing a reduction from approximately 130 breeding pairs in 1972 (Crocker-Bedford, 1990) to approximately 30 occupied territories (Zinn and Tibbitts 1990). A total of 107 nesting territories (1991-1996) were located on a 1,754 km2 study area on the Kaibab Plateau (BNA 1997). According to Snyder and Snyder (in Glinski 1998), "the goshawk was probably never abundant in Arizona, although it is widespread in high mountain habitats and can be locally abundant."

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: SC (USDI, FWS 1996)
[C2 USDI, FWS 1991]

STATE STATUS: 1B (AGFD SWAP 2012)
[WSC. AGFD, WSCA in prep]
[State Candidate AGFD, TNW 1988]

OTHER STATUS: Bureau of Land Management Sensitive – subsp. *apache* (USDI, BLM AZ 2010)
[Bureau of Land Management Sensitive USDI, BLM AZ 2008]
Forest Service Sensitive – both subspecies (USDA, FS Region 3 1999, 2007, 2013)

Group 4 – subsp. *atricapillus* (NNDFW, NESL 2001, 2005)
Determined Threatened (Secretaria de Medio Ambiente 2000, 2010)

MANAGEMENT FACTORS: Timber harvest is the principal threat to breeding populations. In addition to the relatively long-term impacts of removing nest trees and degrading habitat by reducing stand density and canopy cover, logging activities conducted near nests during the incubation and nestling periods can have an immediate impact: nest failure due to abandonment. Breeding areas need protection from excessive logging. Crocker-Bedford (1986) proposes 20-200 acre buffers. Kennedy (1990) recommends 1600-acre buffers. Kaibab National Forest 1991 goshawk buffers are 20 acres. Other factors are fire suppression, loss of prey habitat, insect and trees disease outbreaks, and grazing can result in loss of nesting habitat.

PROTECTIVE MEASURES TAKEN: Protection from logging around breeding sites varies from National Forest to National Forest. Kaibab National Forest buffers are 20 acres (1991).

SUGGESTED PROJECTS: Research needs to address several areas:

1. Intensive surveys of National Forests to find unknown breeding territories.
2. Monitoring of known populations to detect declines in breeding success.
3. Color banding studies to gain access to information such as degree of site fidelity and survivorship data.
4. Perform habitat analysis on known goshawk territories to refine management data.
5. Additional studies on population size, trends and life history (life span, fidelity, dispersal, diet composition, habitat use).
6. Inventory and monitoring techniques need to be improved.
7. Need to evaluate the effects of pesticides and extent of movement patterns of all populations.

LAND MANAGEMENT/OWNERSHIP: BIA - Navajo Nation; BLM - Kingman and Arizona Strip Field Offices; DOD - Fort Huachuca Military Reservation, Navajo Army Depot; NPS - Chiricahua National Monument, and Grand Canyon and Saguaro National Parks; USFS - Apache-Sitgreaves, Coconino, Coronado, Kaibab, Prescott, and Tonto National Forests; State Land Department; TNC Ramsey Canyon; Private.

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Timothy Tibbits - National Park Service, Organ Pipe National Monument, Arizona

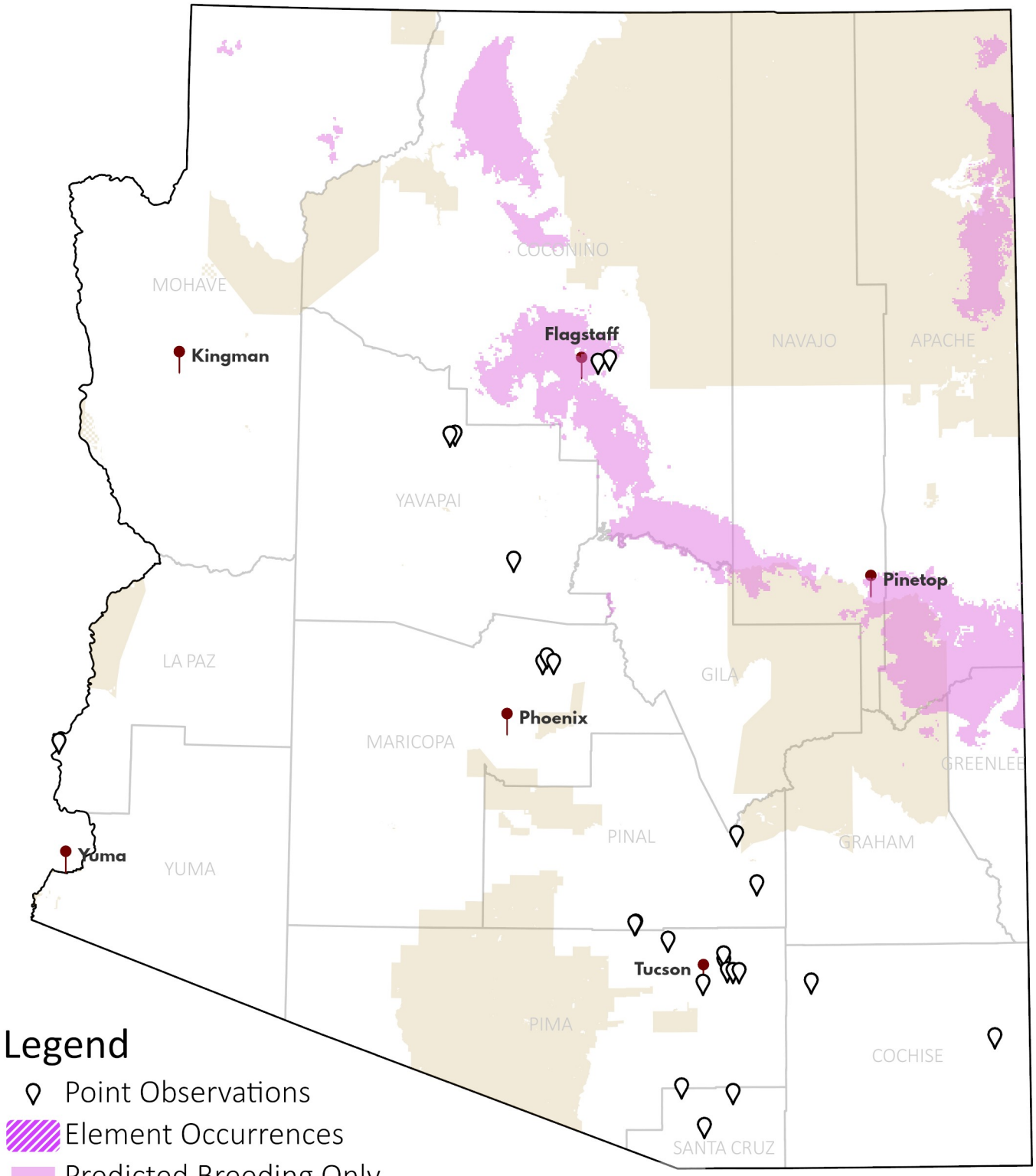
ADDITIONAL INFORMATION:

"Goshawk" was derived from the Anglo-Saxon words *gos* for goose and *havoc* for hawk-hence, a hawk that captures geese ("Goose Hawk"). *Gentilis* is Latin for noble. It was named during the era when only the nobility could fly this bird in falconry.

Revised: 1991-02-22 (DKW)
1993-08-24 (SSS)
1995-08-09 (DBI)
1997-03-05 (SMS)
2003-05-16 (AMS)
2003-06-18 (SMS)
2013-11-14 (BDT)

Contopus cooperi

Olive-sided Flycatcher



Legend

- Point Observations
- Element Occurrences
- Predicted Breeding Only
- Tribal Lands
- Counties

N

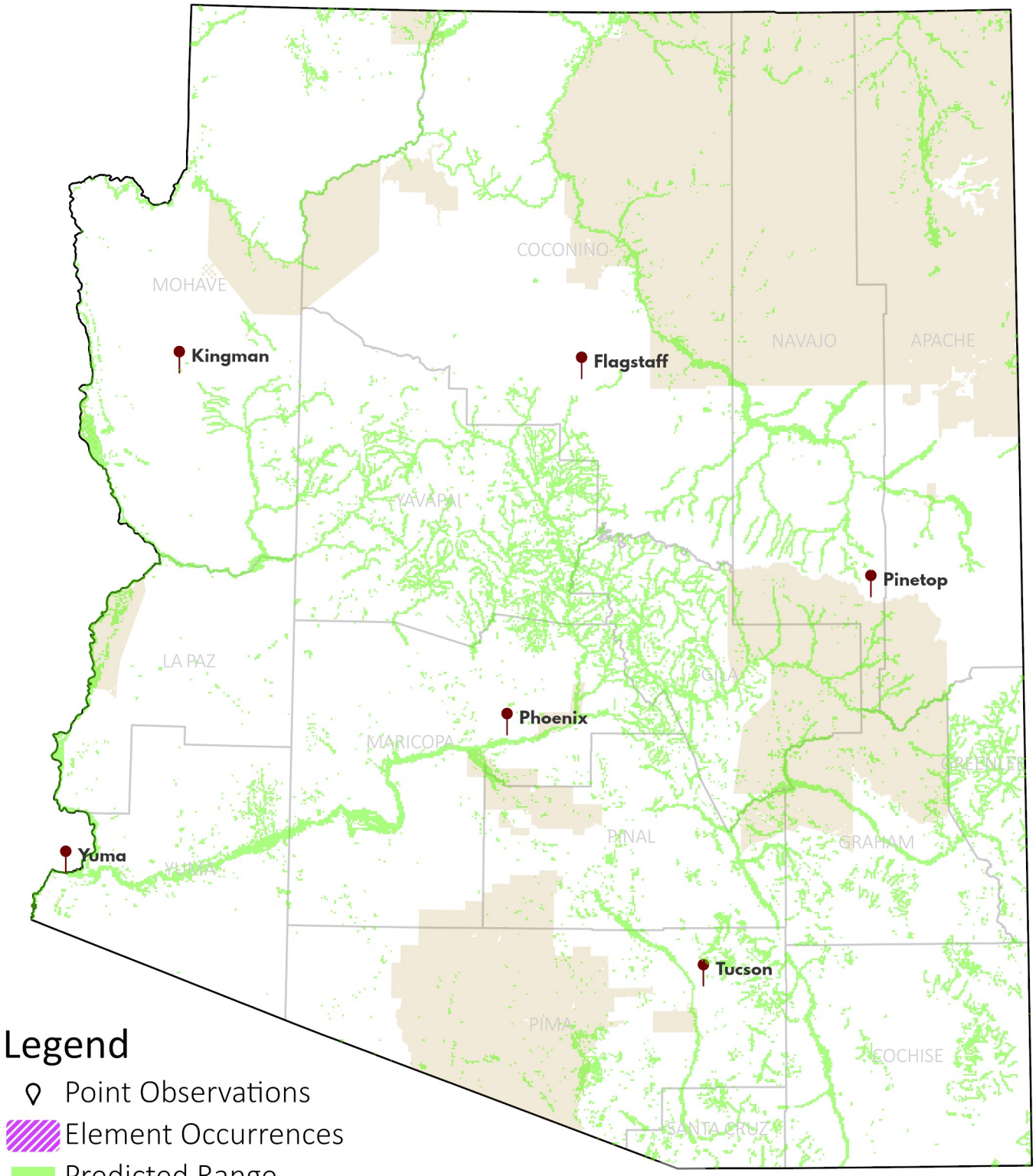
0 50 100 Kilometers

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences. Predicted ranges indicate likely habitat suitability, not presence.

Heritage Data Management System
2019-06-12

Troglodytes pacificus

Pacific Wren



Legend

- Point Observations
- Element Occurrences
- Predicted Range
- Tribal Lands
- Counties

N

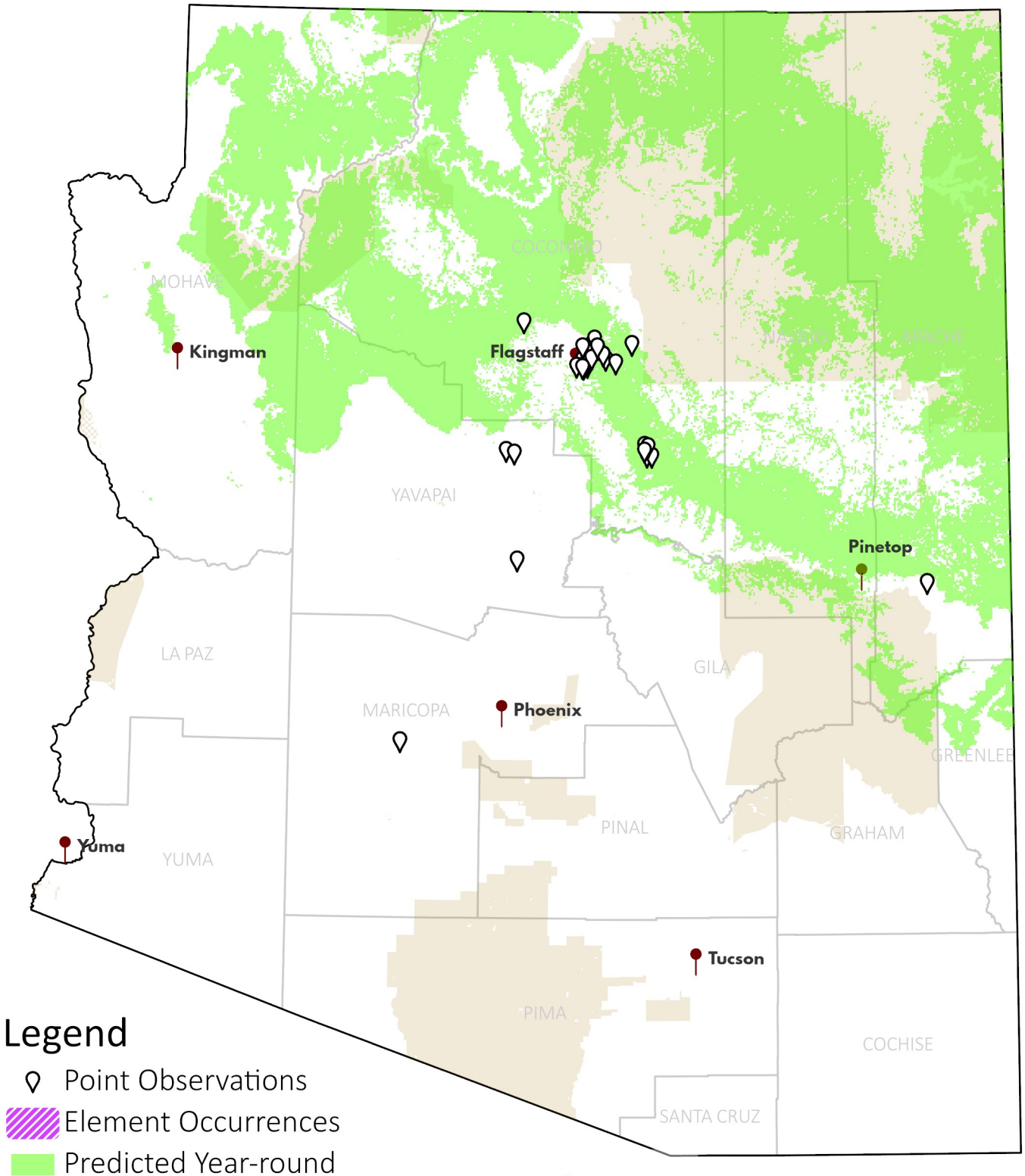
0 50 100 Kilometers

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences. Predicted ranges indicate likely habitat suitability, not presence.

Heritage Data Management System
2019-06-12

Gymnorhinus cyanocephalus

Pinyon Jay



Legend

- Point Observations
- Element Occurrences
- Predicted Year-round
- Tribal Lands
- Counties

N

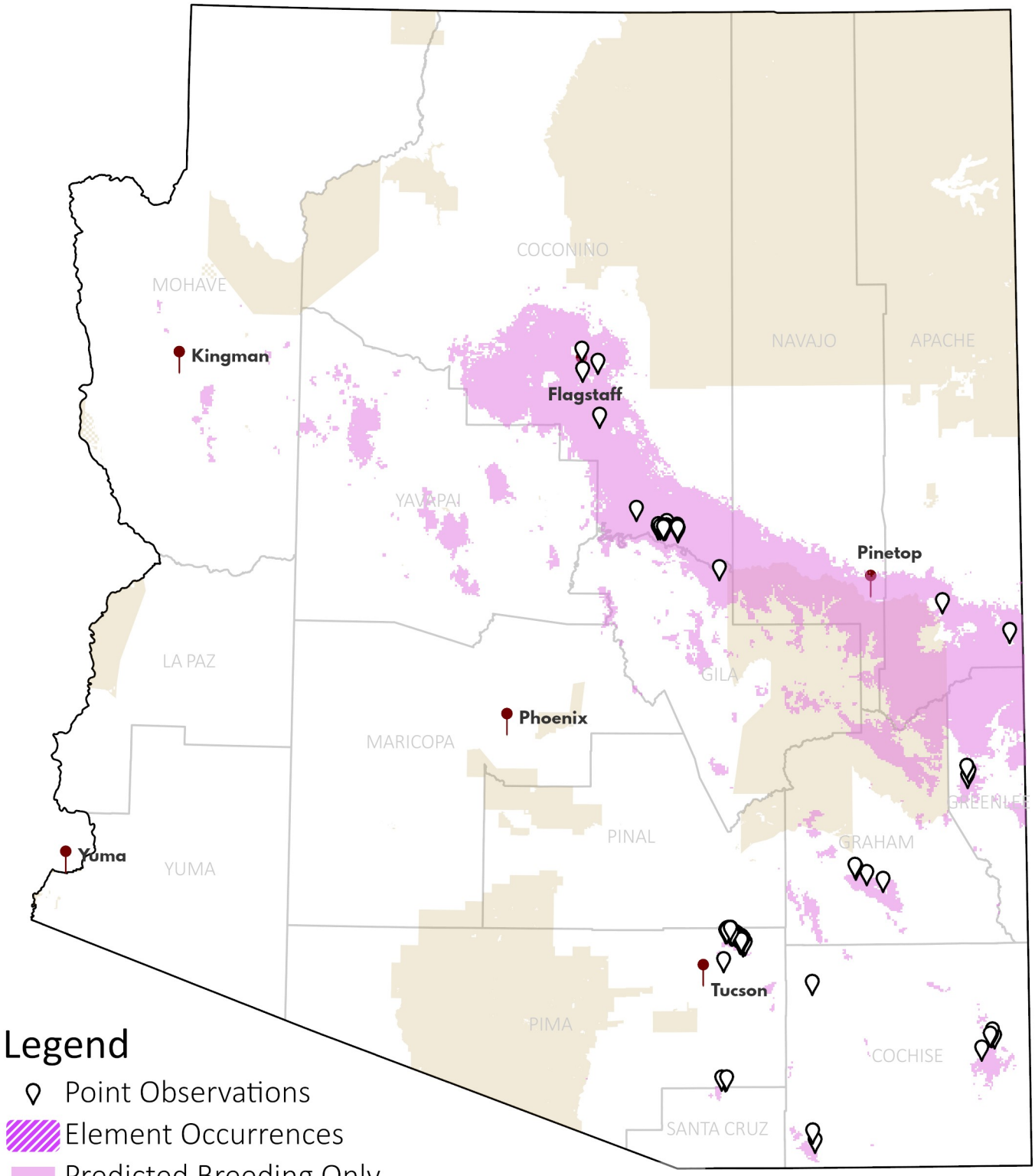
0 50 100 Kilometers

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences. Predicted ranges indicate likely habitat suitability, not presence.

Heritage Data Management System
2019-06-12

Cardellina rubrifrons

Red-faced Warbler



Legend

- Point Observations
- Element Occurrences
- Predicted Breeding Only
- Tribal Lands
- Counties

N

0 50 100 Kilometers

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences. Predicted ranges indicate likely habitat suitability, not presence.

Heritage Data Management System
2019-06-12

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:**
ABPAE33043 **Data**
Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Empidonax traillii extimus*
COMMON NAME: Southwestern willow flycatcher; Traill's flycatcher
SYNONYMS: *Empidonax traillii*
FAMILY: Tyrannidae

AUTHOR, PLACE OF PUBLICATION:

TYPE LOCALITY: Dudleyville (formerly Feldman), on the lower San Pedro River.

TYPE SPECIMEN: May 30, 1940. G. Monson (A.R. Phillips collection #707, Phillips 1948).

TAXONOMIC UNIQUENESS: Eleven species of *Empidonax* in North America, six breed in Arizona. *E. t. extimus* one of four subspecies of *E. traillii* recognized in North America. *E. t. traillii* and *E. alnorum* once considered the same species, the Traill's flycatcher (*E. traillii*). Some sources consider *E. traillii* and *E. alnorum*, and all their subspecies, to constitute a superspecies, the "*traillii* complex." Two species separable by song type, habitat use, structure and placement of nests, ecological separation, and genetic differentiation.

DESCRIPTION: *E. t. extimus* is a medium-sized bird approximately 15.0 cm (5.75 inches) long, including tail. Body brownish-olive to grayish-green on upper parts with pale olive breast, pale yellow belly, whitish throat, and two white wing bars. Eye ring may be faint or absent. Bill relatively large with upper mandible dark and lower mandible usually entirely yellow or pale orange, often with a small dusky tip. Both sexes alike. Species best identified by vocalizations (see "Aids to Identification" below).

AIDS TO IDENTIFICATION: *E. traillii* and *E. alnorum* have almost identical appearances but can be distinguished by voice, range, and habitat. Typical call of *E. traillii* is a repeated "*whit*." Typical call of *E. alnorum* is a sharp note transcribed as either a "*pip*", "*peek*", or "*bic*." Song of *E. traillii* is a sneezy "*fitz-bew*" or "*fitzi-bew*" with accent on first syllable, while that of *E. alnorum* is a falling, buzzing "*fee-beo*" with an emphasis on the second syllable. Another distinguishing feature of *E. traillii* is the tail, which is wide compared to most *Empidonax*, especially at junction with body (Stallcup 1992). *E. t. extimus* tends to be paler in coloration than other subspecies. At higher elevations in eastern Arizona, dark individuals have been observed.

ILLUSTRATIONS:

Color drawing (Scott, 1987: 291).
Color drawing (Peterson, 1990: 239).
Color photo (www.sweetwater.org)
Color photos (http://fresc.fsl.orst.edu)
Color photo (www.usgs.nav.edu)
Photo and map of distribution (http://biology.usgs.gov)
Photo and map of distribution (Sedgwick, 2000)

TOTAL RANGE: Known from southern Nevada, southern Utah, southern California, Arizona, New Mexico, western Texas, and possibly southwestern Colorado. Breeding birds from southwestern Colorado show great individual variation and are intermediate between *E. t. extimus* and *E. t. brewsteri*. *E. traillii* is a neotropical migrant and most likely winters in Mexico, Central America, and perhaps northern South America.

RANGE WITHIN ARIZONA: Breeds locally along the Colorado River in the Grand Canyon near mouth of Little Colorado River, and south of Yuma. Also breeds at the headwaters of the Little Colorado River near Greer and Eagar; very locally along the middle Gila, Salt, and Verde rivers; middle to lower San Pedro River; and upper San Francisco River near Alpine.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: *E. t. extimus* arrives on breeding territory by late April to early May and migrates southward again in August and September. Nest is a compact cup built of shredded bark, cattail tufts, and grasses, lined with fine grasses and feathers. Preferred nesting habitat is mature *Populus fremontii/Salix gooddingii* forests along still or slow moving watercourses at lower elevations; also found in *Tamarix pentandra* thickets (Suckling et al. 1992). At higher elevations, some birds are found in pure willow stands (*Salix* spp.). Brown-headed cowbird parasitizes nest by laying an egg in flycatcher's nest. Cowbird eggs hatch sooner and often out-compete the host young. As a result, flycatcher nest parasitized by cowbirds usually produces only cowbirds. Breeding colonies usually about 1.5 acres. Densities about 9-14 pairs per 100 acres.

REPRODUCTION: Males sing repeatedly from exposed perches while on breeding grounds, occasionally during migration. Breeding birds often heavily affected by brood-parasitism by brown-headed cowbirds. Females lay a clutch of 3-4 eggs from May through July. Incubation lasts 12-13 days, and nestlings fledge after 12-14(15) days. Usually one brood produced per year, but they have been known to raise two. Both parents tend to young.

FOOD HABITS: *E. t. extimus* is insectivorous, collecting flying insects by sailing (flying out short distances from perch) and, to a lesser extent, hovering and gleaning. They consume few berries and seeds.

HABITAT: A riparian obligate that prefers dense canopy cover, large volume of foliage, and surface water during midsummer. They appear to avoid riparian areas found in steep, closed canyons.

ELEVATION: In Arizona, found at elevations ranging from 75 – 9,180 feet (23-2798 m).

PLANT COMMUNITY: Willow-cottonwood thickets, tall dense tamarisk (*Tamarix pentandra*), Russian olive (*Eleagnus angustifolia*) and riparian associates.

POPULATION TRENDS: Extreme population reductions noted rangewide since 1800's because of habitat loss; though quantitative data is lacking. In the 1993 statewide survey, 23-27 paired males detected. In 1991 and 1992, Grand Canyon flycatchers, using patches dominated by tamarisk and varying in size from 0.08 hectare (0.2 acre), to 0.32 ha (0.8 ac), to 0.63 ha (1.5 ac), declined from 11 pairs in 1986 to present number of 4-5 singing males (3-4 pairs) (Tibbitts and Sogge 1993).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS:

Revised Critical Habitat – Final (USDI, FWS 2013)
[Critical Habitat Re-designated (USDI, FWS 2005)]
[Critical Habitat set aside 2001 – Court Order (in USDI, FWS 2002)]
[Critical Habitat Designated (USDI, FWS 2007)]
LE (USDI, FWS 1995)
[PE USDI, FWS 1994]
[C1 USDI, FWS 1991]
[C2 USDI, FWS 1989]

STATE STATUS:

1A (AGFD SWAP 2012)
[WSC, AGFD, WSCA in prep]
[State Endangered AGFD, TNW 1988]

OTHER STATUS:

Not Forest Service Sensitive (USDA, FS Region 3 2007)
[Forest Service Sensitive, Apache-Sitgreaves NF (USDA, FS 2000)]
Group 2 (NNDFW, NESL 2001, 2005, 2008)

E, Probably Extinct in the wild of Mexico, (NORMA Oficial Mexicana NOM-059-SEMARNAT-2010)

MANAGEMENT FACTORS: Threatened throughout their range. Riparian habitat loss, fragmentation and brood-parasitism by brown-headed cowbirds, are two major cause of willow flycatcher decline. Other factors include diversion of water, draining of wetlands, channelization and levying of streambeds, construction of canals, drains and impoundments, livestock grazing, off-road vehicles, and the cutting of woodlands. Possible factors include predation and invasion of riparian habitat by exotic tamarisk.

PROTECTIVE MEASURES TAKEN: Critical Habitat initially designated in 1997, identifying 18 critical habitat units totaling 964 river km in Arizona, California, and New Mexico; Critical Habitat re-designated in 2005 after set aside by Ninth Circuit Court order in 2001.

SUGGESTED PROJECTS: Protection of willow-cottonwood thickets are need, along with restoration where such habitats have been destroyed; including those rivers and streams at middle and lower elevations. Continue statewide monitoring surveys of known and possible breeding sites.

LAND MANAGEMENT/OWNERSHIP: BIA – Colorado River, Havasupai, and Hualapai Reservations, and Navajo Nation; BLM – Arizona Strip, Safford, Tucson, and Yuma Field Offices; BOR – Phoenix Area; NPS – Glen Canyon National Recreational Area and Grand Canyon National Park; USFS – Apache-Sitgreaves and Tonto National Forests; USFWS – Cibola, Havasu, and Imperial National Wildlife Refuges; State Land Department; Alamo Lake State park; Picacho State Recreation Area; AGFD – Alamo Wildlife Area and Mittry Lake; City of Kearny; TNC – Bingham Cienega and Hassayampa River Preserves, and Cascabel Community Management Area; Private.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

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J.P. Hubbard – New Mexico Department of Game and Fish.
Mark S. Sogge – National Park Service.
Tim J. Tibbitts – National Park Service, Organ Pipe Cactus National Monument, Ajo, AZ.

ADDITIONAL INFORMATION:

Field workers should be aware that the subspecies *E. t. brewsteri* is often present in *extimus* range during migration.

Revised: 1992-01-17 (JSP)
1993-03-08 (DBI)
1993-07-12 (JMB)
1994-04-07 (LAJ)
2002-11-11 (RHB)

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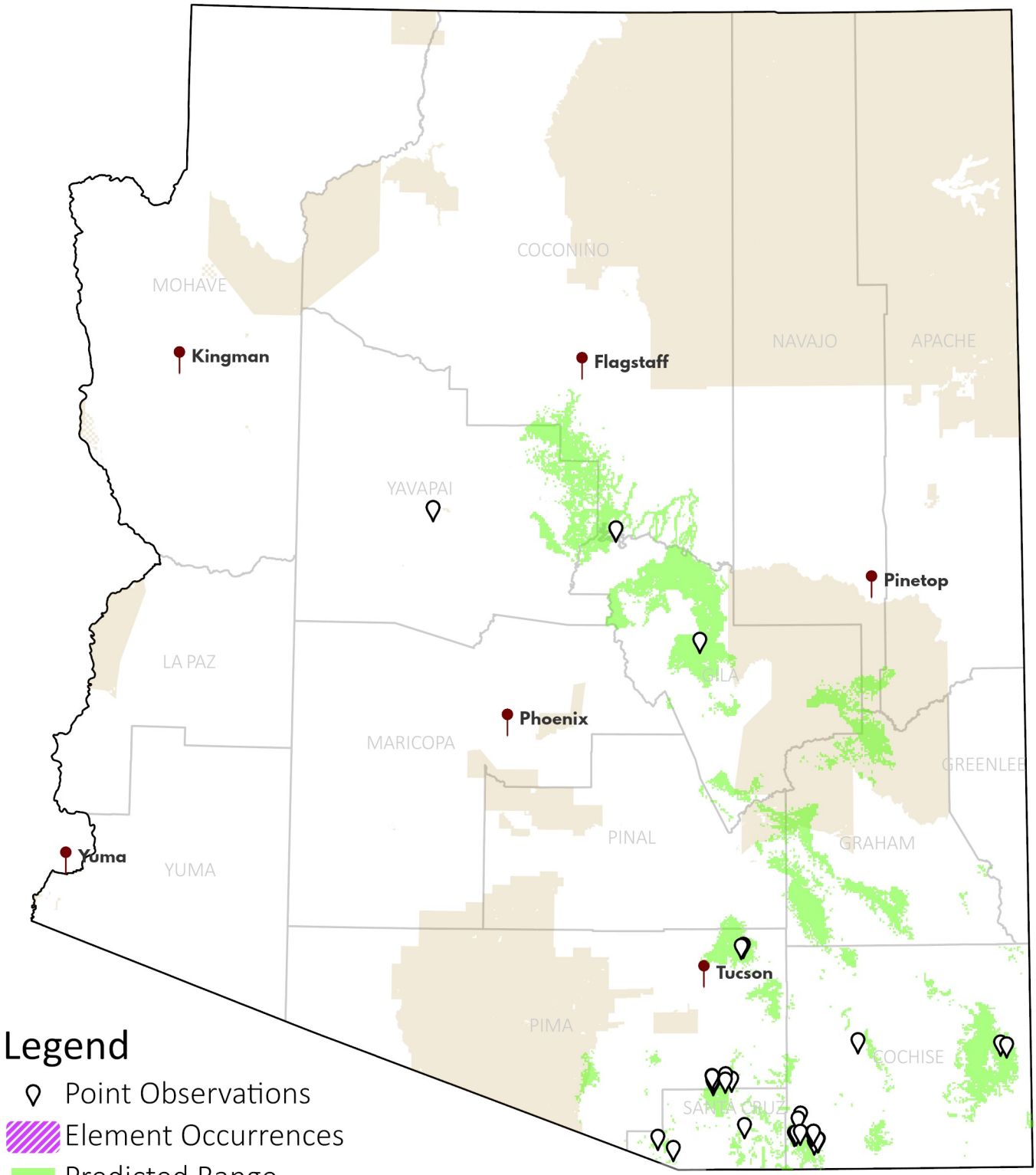
Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

Myiodynastes luteiventris

Sulphur-bellied Flycatcher



Legend

- Point Observations
- Element Occurrences
- Predicted Range
- Tribal Lands
- Counties

N

0 50 100 Kilometers

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences. Predicted ranges indicate likely habitat suitability, not presence.

Heritage Data Management System
2019-06-12

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** ABNKC19070
Data Sensitivity: YES

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Buteo swainsoni*
COMMON NAME: Swainson's Hawk
SYNONYMS:
FAMILY: Accipitridae

AUTHOR, PLACE OF PUBLICATION: C. L. Bonaparte, Geogr. and Comp. List, 1838, p. 3. Based his description on a plate drawn by John James Audubon in The Birds of America (1827), for a bird collected at Fort Vancouver, Washington, date unknown.

TYPE LOCALITY: Columbia River = Fort Vancouver, Washington, Date unknown.

TYPE SPECIMEN: J. Richardson (sn), 1827, Fort Carlton near Saskatoon, Saskatchewan, Canada. Specimen originally incorrectly identified as *Buteo vulgaris*. Dr. Richardson was an English naturalist with the Franklin Arctic expeditions of the 1820s.

TAXONOMIC UNIQUENESS: No subspecies recognized. One of 25 species in the genus Buteo, 1 of 13 in North America.

DESCRIPTION: Medium-sized slender hawk (Crow-sized), with long, pointed wings and a long tail. Measurements include: length 17-22 inches (43-56 cm); wingspan 47-54 inches (120-137 cm); weight 1.3-2.7 lb (595-1240 g). Females slightly larger than males. Plumage extremely variable, but most individuals are recognizable. Adult-sides of the head and entire upper parts dark blackish brown; feathers obscurely edged with paler brown to cinnamon. Tail gray, basally whitish, with a narrow white tip, and several indistinct blackish bars, the last one broader. Primaries blacker than back; becoming paler basally. Throat white; breast brownish chestnut with weak black shaft streaks. Belly and legs dull white; indistinctly mottled and barred with brown to rufous. Under-wings pale with conspicuous dark marks at ends of coverts. Dark phase more or less sooty all over. Wing and tail as in normal phase, except that wing linings are much more marked with blackish. Rufous phase lighter brown below than the dark phase; and somewhat barred and blotched below with rusty brown. Intermediates occur between all the phases. Eye dark brown; cere pale greenish yellow; bill blackish; legs wax yellow (Brown et al 1968).

The immature plumage, which is worn for two years, is similar to that of adults in its two-toned underwing and finely barred tail, but young birds have a spotted and streaked breast that at times shows a hint of a darker pattern, and the head shows a definite buffy streak above the

eye and on the cheek, with a dark eye line and malar stripes. This typical pattern occurs on perhaps half the Swainson's Hawk encountered in Arizona, and if color pattern alone is used for identification, the other half will be mis-identified. (Glinski 1998).

AIDS TO IDENTIFICATION: Distinguished from other buteos by long narrow wings and lankier appearance. The pale phase adult is distinctive, but in all other plumages it may be confused with various other hawks both on its winter and summer range. At all ages most likely to be confused with Broad-winged (*Buteo platypterus*), White-tailed (*B. albicaudatus*) and Short-tailed (*B. brachyurus*) hawks (England et al 1997). In all plumages the basal half of the tail, seen from above, is usually whitish (Brown et al 1968). Close examination of the flight feathers reveals that the three outer primaries are notched, a trait Swainson's shares with the White-tailed Hawk and Broad-winged Hawk; in all other buteos the four outermost primaries are notched (Glinski 1998). Red-tailed Hawk (*B. jamaicensis*) immature may appear similar to immature Swainson's but is told by wing shape and dark patagial mark. Prairie Falcon (*Falco mexicanus*) perched is similar to pale immature Swainson's, but has dark eyes, white area between eye and dark ear patch, and wingtips that do not reach tail tip (Clark and Wheeler 1987).

ILLUSTRATIONS:

Color drawing (Robbins et al 1983:75)
Color drawing (Peterson 1990:175)
Color drawing (National Geographic 1999:117)
Color photos (Farrand, Jr. 1988:8, 216)
B&W photos and Color drawing (Clark and Wheeler, 1987:138-139, pls. 12-13)

TOTAL RANGE: Found only in the New World; it breeds in North America, in the Great Plains and arid regions, north sparingly to interior Alaska, and south to northern Mexico, and winters in South America. The normal winter range is the Pampas of Argentina, and it has been assumed that any found elsewhere at that season are casuals, probably unable to make the long migration (Brown et al 1968).

RANGE WITHIN ARIZONA: Common summer resident of the grassy plains of southeastern Arizona, but also found sparingly to central and south-central Arizona, including the Hualapai Valley. Swainson's Hawks nest less commonly on the Colorado Plateau of northern Arizona than in the Basin and Range biogeographic province to the south. The general shift in occurrence of grasslands in the state has no doubt altered the breeding range. Historically there were likely pockets of suitable Semidesert Grassland from Nogales north to Tucson and following the upper elevation limits of the Sonoran Desert to Phoenix, northwest toward Wickenburg, and then west past Aguila that sustained at least intermittent use by nesting Swainson's hawks. Agricultural areas that reliably afford views of migrating Swainson's include the Sulphur Springs Valley, Cochise County, and the valleys of the Gila and Santa Cruz Rivers, from central Arizona south to Mexico.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Gives a descending shrill, plaintive whistle, *kreeeeeeer*, trailing off at end. In flight, shows profile like that of Turkey Vulture; the wings are held in a dihedral, or V, position, which promotes aerodynamic stability in open landscapes where wind can interfere with flight close to the ground. Highly migratory, often seen in large flocks in spring and fall flights. During the breeding season, a soaring, open country hunter. Sometimes hunts high in the air, but more frequently courses low over prairie. Rarely observed flying low at high speed as Ferruginous Hawk does. Often hunts from perches such as tree limbs, poles or posts, rocks, and elevated ground.

REPRODUCTION: Most pairs arrive on their territories by mid-April (sometimes earlier), perform nest building and courtship through mid-May, incubate through mid-June, and tend nestlings through late July. Many if not most hawks, return to the same nesting area each year, and both members of the pair reconstruct the previous year's nest (Glinski 1998). Breeds in open country, usually nesting in scattered trees. Nest usually high in a tree, but when necessary in a low tree, on a giant cactus, on a ledge of rock outcrop or embankment, and occasionally on the ground. Nests are constructed 6-30 feet up, and are typically re-used (Baicich et al 1997). Typical raptor nest: bulky, unsightly mass of sticks, constructed of various freshly broken sticks, twigs, and debris. Nests lined with inner bark, fresh leaves, flower clusters, down and feathers. Clutch size is two or three eggs. Eggs (2.2 inches or 57 mm) are bluish-greenish-white/white, sparsely marked with brown; about 20% of eggs unmarked (Ehrlich et al 1988). Incubation period is 34-35 days and is completed almost entirely by the female. Male will forage for pair and occasionally cover eggs while female is away from nest. Young fledge at 38-46 days after hatching, but stay near to nest for first few days.

FOOD HABITS: Preys on rabbits, lizards, snakes, frogs, toads, birds (mostly fledglings), and occasionally on large insects such as grasshoppers (Ehrlich et al 1988). Major rodent prey during breeding season includes ground squirrels, pocket gophers (*Thomomys* sp.), voles (*Microtus* sp.), and deer mice (*Peromyscus* sp.) (England et al 1997).

HABITAT: Per Glinski (1998), "Grasslands, Semidesert Grasslands, and Savanna Grassland, either apart or intermixed with open desertscrub habitats of the Sonoran, Mohave, Chihuahuan, and Great Basin Deserts, are home to nesting Swainson's Hawks in Arizona. Many nests in Cochise County are in agricultural and sparsely settled residential settings that border native grassland habitats. It appears that agricultural areas located away from the fringe of a native grassland and surrounded only by desertscrub are not suitable nesting sites." Historically and in existing native habitat, Swainson's forage in open stands of grass dominated vegetation, sparse shrub-lands, and small open woodlands. In many parts of their range today, they have adapted well to foraging in agricultural areas (e.g.,wheat and alfalfa), but cannot forage in most perennial crops or in annual crops that grow much higher than native grasses, making prey more difficult to find (England et al 1997).

ELEVATION: In Arizona, Swainson's Hawks have been recorded breeding at elevations of 1,890ft and 5,650ft (576.45-1723.25 m).

PLANT COMMUNITY: Although Swainson's Hawk will nest in almost any tree of suitable size, in Arizona vegetation used for nesting include: catclaw acacia (*Acacia greggii*), cholla cactus (*Opuntia* sp.), mesquite (*Prosopis glandulosa*), desert willow (*Chilopsis linearis*), Joshua tree (*Yucca brevifolia*), creosotebush (*Larrea tridentata*), paloverde (*Cercidium* sp.), ironwood (*Olneya tesota*), and saguaro (*Carnegiea gigantea*) (Glinski 1998).

POPULATION TRENDS: There are no comprehensive estimate of population size on breeding grounds or in wintering areas in South America. Absent from much of its historical breeding range in central and southern California, where overall population may have declined by >90% during 1900s (Bloom 1980). Swainson's Hawk considered abundant and stable in Idaho, Washington, Montana and Colorado (Harlow and Bloom 1989). There appear to be plenty of nesting pairs in Arizona that produce young annually (Glinski 1998).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None (USDI FWS, 1996)
[C2 USDI, FWS 1985]

STATE STATUS: None

OTHER STATUS: None, USDA FS Region 3, 2013
Not BLM Sensitive (USDI, BLM AZ 2010)
[Bureau of Land Management Sensitive PS, breeding pops (USDI, BLM AZ 2008)]
[Forest Service Sensitive USDA, FS Region 3 2007]

MANAGEMENT FACTORS: Proposed conservation measures, including habitat conservation plans, usually focus on retention of some portion of existing foraging and nesting habitats while allowing other areas to be lost to urban development. As economic conversion of agricultural areas to commercial and residential real estate continues, impacts on Swainson's Hawks populations should be monitored to determine population trends. Alternative, less toxic pesticides and grasshopper baits should be tested in Argentina (England et al 1997). Swainson's Hawks are susceptible to even minor disturbance during the nesting stage, which may lead to desertion of nest.

PROTECTIVE MEASURES TAKEN: Few if any conservation measures have been taken. No effective measures to mitigate the loss or degradation of foraging habitat has been demonstrated. With regard to pesticides, an effort is under way to have monocrotophos removed from the market in the La Pampa area where Swainson's Hawks are numerous, but it is still readily available in other parts of Argentina where the hawks are present (England et al 1997).

SUGGESTED PROJECTS:

LAND MANAGEMENT/OWNERSHIP: BLM, BIA, DOD, State Land Department, Private.

SOURCES OF FURTHER INFORMATION

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Threatened Species, Notice of Review, Proposed Rule. Federal Register 61(40):3596-3613.

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ADDITIONAL INFORMATION:

Revised: 2001-03-06 (JDC)
2001-03-14 (SMS)
2013-11-14 (BDT)

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** ABNSB10012
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Athene cunicularia* (Molina) *hypugaea* (Bonaparte)
COMMON NAME: Western Burrowing owl, North American burrowing owl, Billy owl, ground owl, long-legged owl, prairie dog owl, prairie owl
SYNONYMS: *Speotyto cunicularia hypugaea*, *Strix hypugaea* Bonaparte
FAMILY: Strigidae

AUTHOR, PLACE OF PUBLICATION: *Strix hypugaea* Bonaparte, Amer. Orn., vol. 1, 1825, p. 72.

TYPE LOCALITY: *Strix hypugaea* "Western United States = Plains of the Platte River."

TYPE SPECIMEN: *Athene cunicularia hypugaea* USNM 151022 (adult female). F. Stephens, 29 May 1894. Upper Lake, Lake Co., California, 1400 ft., in Auk 12(4): 372, October 1895.

TAXONOMIC UNIQUENESS: One of four in the genus *Athene*. Up to 18 subspecies currently recognized; 7 in North and Central America, including the Caribbean Basin. *Athene cunicularia hypugaea* is the only sub-species that occurs in Arizona and western North America. *A. c. floridana* occurs in Florida.

DESCRIPTION: This is a small, ground-dwelling owl. Total length for both sexes averages between 19.5-25.0 cm (7.68-9.85 in), the wingspan 58.42 cm (23.0 in), and their mass 150 g. Unlike most owls, males are slightly larger than females. Head is round, lacking eartufts. They have a distinct oval facial ruff, framed by a broad, buffy-white eyebrow-to-malar stripe on the interior part. The iris is usually bright lemon yellow; tends to be paler in females. Wings relatively long and rounded, with 10 brown buffy-white barred primaries (3 outermost with inner webs sinuated); tail is short giving a top-heavy appearance, with 12 brown and buffy-white barred rectrices. Their legs are extremely long, dark gray, extending about 1.5 inches beyond the tail. Bristle-like feathers on legs and feet, white to beige. Their dorsum is brown; back, scapulars, and crown profusely spotted with buffy white. Throat and undertail coverts are white; remainder of underparts of adults buffy-white with broad brown barring on both sides. Females are generally darker than males overall, particularly in worn plumage (see description in Haug et al 1993).

AIDS TO IDENTIFICATION: They have extremely long legs, and bars on the chest, wings, and tail. Most other small owls have a streaked breast, not a spotted one. Unlike most other owls, this owl is often found in large colonies.

ILLUSTRATIONS:

Color photo (Haug et al, 1993:1)
Color photo (Terres, 1980:651)
Color photo (Farrand, Jr., 1988:234)
Color drawing (National Geographic Society, 1999:257)
B&W drawing (Johnsgard, 1988:173-174)

TOTAL RANGE: Throughout much of western North America, from southern British Columbia (last confirmed in 1979), Alberta, Saskatchewan and Manitoba, south to the tip of Baja California. They withdraw from the northernmost portions of their breeding range in winter.

RANGE WITHIN ARIZONA: Occurs locally in open areas, generally year-round, with only a few winter records on the Colorado Plateau in the northeastern part of the state. From the Navajo Nation, broad valleys near Seligman, along the bottomlands of the Colorado River, the lower Colorado River valley, the Yuma area, southern and southeastern Arizona, and agricultural areas of Maricopa and Pinal Counties.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Accomplished vocalists capable of at least 17 different vocalizations, with a frequently heard sound a two-note *coo-coo*, which is similar to the male courtship song except the second note is held a little longer. At night, utters high mournful cry *coo-coo-roo* or *co-hoo*, like call of a dove or roadrunner but higher pitched. A harsh *kak-kak-kak* appears to be a startle call in response to a perceived danger, while young owls disturbed in their burrow make a buzzing sound like a rattlesnake. Most reported vocalizations associated with breeding and nest defense. They are much less vocal when not breeding. Non-vocal sounds include loud bill snaps, used primarily when feeling threatened.

Burrowing owls hunt in flight, from perches, and on the ground. They are adept fliers and often take prey from midair, or sometimes hovering above prey items, dropping rapidly to capture the intended victim. Hunting style varies with type and activity of prey pursued, time of day, and vegetative substrate.

Throughout most of their range in Arizona, they mainly are non-migratory, however, they disperse widely. It is believed that populations in northern Arizona are migratory. In non-migratory populations, they use and maintain burrows year-round. Home range size is approximately 2.0 acres (BISON 2000). Although they are most active during the period from late afternoon until full dark, they can be observed at almost any time of the day. They commonly perch on fence posts or on top of mounds outside their burrows. High ambient temperatures seem to limit their daytime activities (deVos Jr., *in* Glinksi 1998). Burrowing owls show a higher tolerance for carbon dioxide, compared with other birds, apparently a

response to nesting in burrows. Burrows provide protection from weather extremes, as well as from water loss at high temperatures. Neither hibernation nor torpor verified in this species (Haub et al 1993). They sleep and roost in mouth of nest burrow, satellite burrow, or depression in ground.

Lifespan is not well known. Burrowing owls are able to live at least 9 years in the wild and over 10 years in captivity (Kennard, 1975 in Terres 1980). Mortality includes encounters with motor vehicles, while flying across roads, and their many natural enemies. Mammals, particularly badgers (*Taxidea taxus*), are major predators of burrowing owls. Other mammalian predators may include dogs, domestic cats, opossums (*Didelphis virginiana*), weasels (*Mustela* spp.), and skunks (*Mephitis* spp.). Avian predators may include Swainson's Hawks (*Buteo swainsoni*), Ferruginous Hawks (*B. regalis*), Merlins (*Falco columbarius*), Prairie Falcons (*F. mexicanus*), Peregrine Falcons (*F. peregrinus*), Great Horned Owls (*Bubo virginianus*), Red-tailed Hawks (*B. jamaicensis*), Cooper's Hawks (*Accipiter cooperii*), and American Crows (*Corvus brachrhynchos*).

REPRODUCTION: A predominately monogamous bird, they nest in single pairs (pair bonds not permanent) or, more commonly, in small colonies. They usually nest in abandoned burrows of small mammals, including prairies dogs and ground squirrels, often modifying or enlarging the nest burrow by digging with their feet. Due to human encroachment, such as new housing developments, conversion of agricultural and prairie, etc., artificial nest boxes are used for relocating birds. Natural nest cavities generally are a burrow sloping down for 1.5 to 3.0 feet from the surface, and then level and about 5-10 ft. long, about 5 inch diameter, and with a nest chamber of 12-18 inches. Nests lined with whatever material is available nearby, including weed stalks, dung, and feathers or bits of small mammal skins; the use of feces and feed remains as nest lining, is possibly to provide camouflage for the owls' scent from mammalian predators.

Generally are single brooded bird, a second clutch may be produced, if the first one is lost. Clutch size ranges from 4 to 10 eggs, with an average of 6-7 eggs per nest. The eggs are nearly round, smooth and pure white. Nests with eggs are observed from late March through June in southern regions and mid-May to mid-August in more northern regions (i.e. North Dakota). Incubation occurs by both sexes for 27-30 days. Male provides food during incubation and early nestling stages. Hatchlings are altricial (eyes closed, unable to leave nest), ptilopaedic (partially covered with down, usually over back and lower parts), and nidicolous (remain in nest and cared for by parents). Contour feathers are developed by approximately 14 days of age, and fledging occurs at between 40-44 days post hatching. Female does all the brooding, while the male does all the hunting during this period, bringing food to the female then to be given to young. Young begin chasing and feeding on insects, and using satellite burrows at 7-8 weeks of age.

FOOD HABITS: Burrowing owls are opportunistic feeders, taking both invertebrates and vertebrates. In Arizona, they feed primarily on large insects and small mammals, as well as fish, reptiles, amphibians, birds and even prickly pear cactus seeds. Insects usually hunted

during daylight hours, while small mammals hunted more often after dark. Foraging microhabitat typically shortgrass, mowed or overgrazed pastures. Drinking observed in the wild with increases in ambient temperatures (Haub et al 1993).

HABITAT: Variable in open, well-drained grasslands, steppes, deserts, prairies, and agricultural lands, often associated with burrowing mammals. Burrowing owls are at times observed open areas such as vacant lots near human habitation, golf courses and airports.

ELEVATION: Arizona: 650 - 6,140 ft (198-1873 m). New Mexico: lower elevations of 2,800-5,500 ft (854-1676 m), and middle elevations of 5,000-7,000 ft. (1525-2135 m).

PLANT COMMUNITY: Per Biota Information System of New Mexico (BISON 2000), "Great Basin Shrubsteppe with open to dense stands of shrubs and low trees, including big sagebrush (*Artemisia tridentata*), saltbush (*Atriplex confertifolia*), greasewood (*Sarcobatus vermiculatus*), or creosote bush (*Larrea divaricata*). Chihuahuan Desert Scrub of open stands of creosote bush and large succulents (*Ferocactus pringlei* and *Echinocactus platyaconthus*) in southern New Mexico and southwest Texas. Mohave Desert Scrub located between the Great Basin desert scrub and the Sonoran desert scrub, it is intermediate between them, sharing plant species of both but containing the endemic arboreal leaf succulent, Joshua tree (*Yucca brevifolia*). Annual grasslands dominated by wild oat (*Avena* spp.), ripgut brome (*Bromus rigidus*), soft chess (*B. mollis*), bur clover (*Medicago hispida*), and filaree (*Erodium* spp.) with less than 5 percent wood cover."

POPULATION TRENDS: Per Haug et al (1993), "Breeding Bird Survey (BBS) data from 1980 to 1989 show significant declines in west-central Kansas and adjacent parts of Nebraska and Oklahoma, the western Panhandle of Texas, the Trans Pecos region of Texas, and southern New Mexico. Same data set shows significant increases in the Lower Sonoran Deserts and Lower Colorado River Valley in western Arizona and adjacent California, and in the Interior Valley of California. Analysis of Christmas Bird Counts (James and Ethier 1989) suggests a decline in numbers since the mid-1970s. Local populations are believed more prone to extinctions, as seen in California (Johnson 1992). In Canada, a decrease in numbers and range in all western provinces. In Florida, range has expanded northward, nearly to Georgia."

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS:	SC (USDI, FWS 1996) [C2 USDI, FWS 1994]
STATE STATUS:	1B (AGFD SWAP 2012)
OTHER STATUS:	Bureau of Land Management Sensitive (USDI, BLM AZ 2000, 2005, 2008, 2010)

Forest Service Sensitive (USDA, FS Region 3 2007, 2013)
PR, Determined Subject to Special Protection in Mexico. (NORMA Oficial Mexicana NOM-059-SEMARNAT-2010)
A, Determined Threatened in Mexico (MFESL 1994)
Group 4, full species level (NNDFW, NESL 2005, 2008)

MANAGEMENT FACTORS: Conserving burrowing mammal colonies is of primary importance to sustaining viable burrowing owl populations. They respond positively to grazing, but have a negative response (nest site loss) from human efforts to control squirrels and prairie dogs by poisoning (BISON 2000). Habitat alteration, fragmentation, and loss of edge habitat are causing population declines as well.

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: Per Estabrook and Mannan (1998), long-term monitoring is needed to establish trends in burrow occupancy and population fluctuations; more information is needed on the type and abundance of prey species used, and the use of urban habitat for foraging.

LAND MANAGEMENT/OWNERSHIP: DOD, BIA, State Land Department, Private

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

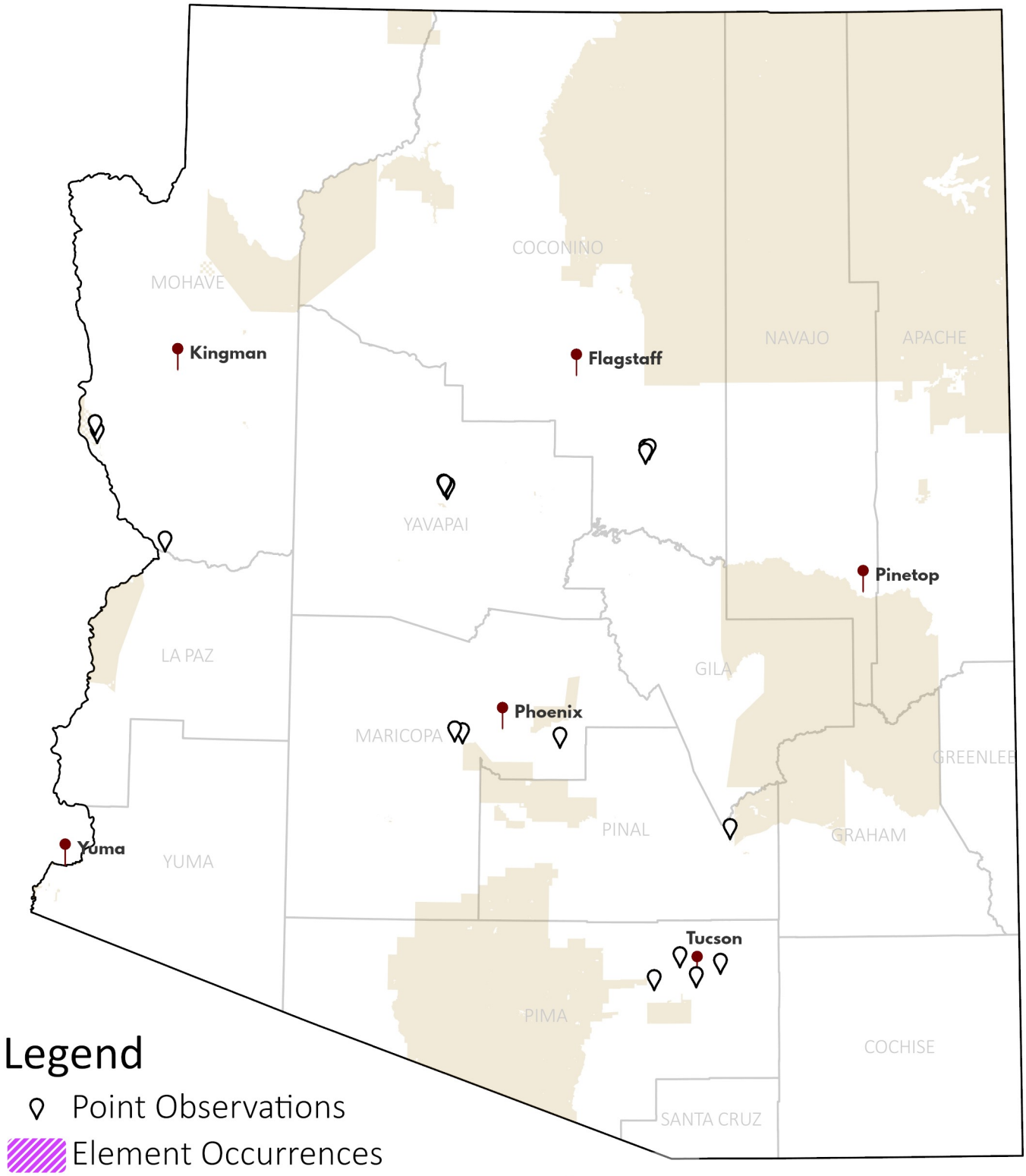
Genus name: from Greek goddess of wisdom, Pallas Athene, to whom the owl was a sacred bird; species name: Latin, minor, burrower (Terres 1980).

Often placed in the monotypic genus *Speotyto*.

Revised: 2001-02-21 (SMS)

Aechmophorus occidentalis

Western Grebe



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

Kilometers

0 50 100

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences.

Heritage Data Management System
2019-06-12

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** ABNRB02020
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Coccyzus americanus* L.
COMMON NAME: Yellow-billed Cuckoo (Western U.S. DPS [Distinct Population Segment]), Yellow-billed Cuckoo, Chow-chow, kow-kow, rain bird, rain crow, rain dove, storm crow
SYNONYMS: *Coccyzus americanus occidentalis* Ridgeway
FAMILY: Cuculidae

AUTHOR, PLACE OF PUBLICATION: *Cuculus americanus* Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p.111. Subspecies *C.* [*occyzus*] *americanus occidentalis* Ridgway, Man. North Amer. Birds, 1887, p. 273. (AOU 1957[1961]).

TYPE LOCALITY: Species: In Carolina = South Carolina.
**Western DPS: "Western United States = Gardner's Ranch on the western side of the Santa Rita Mountains, Arizona."

TYPE SPECIMEN: US 99204, E.W. Nelson, 29 June 1884.

TAXONOMIC UNIQUENESS: Recent genetic research by Dr. Banks indicates that there is no genetic difference between the eastern and western subspecies of *C. americanus* (FR 66(143):38611, 2001); however, this conclusion is not accepted by all ornithologists (see FR 66(143):38611, 2001). The U.S. Fish and Wildlife Service listed as a Candidate species, the Western Distinct Population Segment (DPS). This includes those yellow-billed cuckoos west of the Rocky Mountains; please see 2001 Federal Register for complete delineation of range.

DESCRIPTION: A long and slender medium-sized bird of about 30 cm (12 in)in length, weighing about 60 g (2 oz), with relatively short dark legs. The species has a slender, long-tailed profile, with a stout and slightly down-curved bill. The bill is blue-black with yellow on the basal half of the lower mandible (bill). Adults have a narrow, yellow eye ring. The plumage is grayish-brown above and white below, with rufus primaries flight feathers. Tail feathers are boldly patterned with black and white below. Juveniles resemble adults, except the tail patterning is less distinct, and the lower bill may have little or no yellow; the plumage is held well into fall. Juveniles may be confused with *C. erythropthalmus* (Scott 1987). Adult males and females slightly differ, as males tend to have a slightly larger bill. (Corman 1992, USFWS accessed 10-31-2011).

AIDS TO IDENTIFICATION: "Song sounds hollow and wooden, a rapid staccato *kuk-kuk-kuk* that usually slows and descends to a *kakakowlp-kowlp* ending" (Scott 1987).

ILLUSTRATIONS:
Color drawing (Robbins et al. 1983:172)
Color drawing (Scott 1987:237)
Color drawing (Peterson 1990:213)
Color photo (Terres 1980:130)
Color photo (Birdpix.com, http://www.birdspix.com/)
Color photo of head and bill (http://www.migrationresearch.com)
Color photo (http://www.fws.gov)

TOTAL RANGE: The Western Distinct Population Segment (DPS), nests west of the Rocky Mountains in North America south to southern Baja California. Winters in South America to central Argentina and Uruguay (Terres 1980).

Current/Potential: Arizona probably contains the largest remaining population W of Rocky Mountains; the species is rare in Colorado and Idaho; the breeding population in Nevada is threatened with extinction if not already extirpated. West Texas west of the Pecos River has been identified as within range of the historic western subspecies, but other authors consider birds from this area most similar to eastern Cuckoos. Cuckoos are widespread and uncommon to common in central and eastern Texas. (USFWS accessed 10-31-2011).

Historic: The species was locally common and widespread in California and Arizona; locally common in a few reaches in New Mexico; common very locally in Oregon and Washington; generally local and uncommon in scattered drainages of the arid and semiarid portions of western Colorado, western Wyoming, Idaho, Nevada, and Utah; and generally uncommon and very local in British Columbia. (USFWS accessed 10-31-2011).

RANGE WITHIN ARIZONA: Generally found in southern and central Arizona, and extreme northeast portion of state (Monson and Phillips). Despite losses of riparian habitats from historic levels, the cuckoo is still found in all counties in Arizona. (USFWS accessed 10-31-2011).

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Unlike their European cuckoo counterparts, the Western yellow-billed cuckoo only occasionally parasitizes black-billed cuckoo nests. Breeding often coincides with outbreaks of cicadas and tent caterpillars; they've been known to lay more eggs in good prey-abundant years. Extra eggs may be parasitized in other birds' nests.

REPRODUCTION: Both male and female build the nest, often in willow or mesquite thickets, from 4 to 30 ft above ground. Nest is a stick platform, thinly lined with leaves, mesquite and cottonwood strips, grass and catkins with little depression to hold eggs, but well concealed by surrounding foliage (Corman 1990). Clutch of 3-4 unmarked, pale greenish-blue eggs are laid. Incubation lasts 4-11 days with eggs changing color to greenish-yellow; eggs hatch

synchronously. Young are atricial but leave the nest in 7-8 days. If double clutching occurs, the male feeds the first brood of fledglings, while the female feeds the second brood (Erlich et al. 1988). For a full discussion of nesting methods through care of young, see Potter 1980.

FOOD HABITS: "Hairy caterpillars also bird eggs, frogs, lizards, ants, beetles, wasps, flies, berries and fruit. Young are fed insect regurgitant" (Ehrlich et al. 1988).

HABITAT: Suitable habitats west of the Continental Divide, is limited to narrow, and often widely separated, riparian cottonwood-willow galleries; salt cedar is also used by cuckoos. Dense understory foliage appears to be an important factor in nest site selection, while in California, cottonwood trees are an important foraging habitat. (USFWS accessed 10-31-2011). In addition to cottonwood-willow galleries, cuckoos in Arizona can be found in larger mesquite bosques. They are rarely observed as transients in xeric desert or urban settings (Corman 1992).

ELEVATION: Usually found at elevations less than 6,600 feet (2011 m).

PLANT COMMUNITY: Mainly mature cottonwood-willow stands, to a lesser extent willows or isolated cottonwoods mixed with tall mesquites (Rosenberg et al. 1990).

POPULATION TRENDS: In the western United States, the loss, degradation and fragmentation of riparian habitats, has been identified as the primary factor causing yellow-billed cuckoo declines. Estimates of losses in riparian habitat include 90-95 percent for Arizona, 90 percent for New Mexico, 90-99 percent for California, and more than 70 percent nationwide. (USFWS accessed 10-31-2011). North American Breeding Bird Surveys indicate population declines of 1.6% per year in North America.

Although regional declines have occurred, the yellow-billed cuckoo is relatively common as a breeding bird in much of the eastern United States.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: LT (USDI, FWS, 2014)
[C Western DPS, USDI, FWS 2001]
[C USDI, FWS 2002, 2004-2011]

STATE STATUS: 1A (AGFD SWAP 2012)
[WSC, AGFD, WSCA in prep]
[State Threatened AGFD, TNW 1988]

OTHER STATUS: Group 2, full species level (NNDFW, NESL 2005, 2008)
[Group 3 (NNDFW, NESL 2000)]
Forest Service Sensitive (USDA Region 3 2000, 2007, 2013)

MANAGEMENT FACTORS: Management of riparian habitat known to support cuckoo populations. Riparian habitat has declined up to 90% in Arizona and New Mexico thus negatively affecting this species. Other factors to consider include clearcutting, grazing, and pesticide use in riparian areas.

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: Surveys to determine cuckoo status, use of or dependence on additional areas.

LAND MANAGEMENT/OWNERSHIP: BIA – Cocopah and San Xavier Reservations, and Tohono O'Odham Nation; **BLM –** Havasu, Kingman, Phoenix, Safford, Tucson and Yuma Field Offices; **BOR –** Phoenix Area; **DOD –** Fort Huachuca Military Reservation and Yuma Proving Ground; **NPS –** Montezuma Castle National Monument; **USFS –** Apache-Sitgreaves, Coconino, Coronado, Prescott and Tonto National Forests; **USFWS –** Bill Williams, Buenos Aires, Cibola, Havasu and San Bernardino National Wildlife Refuges; Arizona State Land Department; Red Rock and Patagonia Lake State Parks; **AGFD –** Alamo Wildlife Area, Base Meridian/Amator Wildlife Area, Mittry Lake, Page Springs Fish Hatchery, Upper Verde River Property and Wenima Riparian Corridor; Pinal County; City of Prescott; **TNC –** Canelo Hills Cienega, Dudleyville-Cooks Lake Preserve, Hassayampa River Preserve, Muleshoe Ranch Preserve, Patagonia-Sonoita Creek Preserve and San Pedro Riparian Preserve; Audubon Research Ranch; Private.

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Threatened; Annual Notice of Findings on Resubmitted Petitions; Annual Description of Progress on Listing Actions. Federal Register 73(238):75235.

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USDI, U.S. Fish and Wildlife Arizona Ecological Services Office. Species abstract: Yellow-billed Cuckoo (*Coccyzus americanus*). Accessed 10-31-2011, http://www.fws.gov/southwest/es/arizona/Yellow.htm.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

Troy Corman, Arizona Game and Fish Department, Phoenix.

ADDITIONAL INFORMATION:

Revised: 1995-01-19 (DBI)
1995-03-28 (MJL)
1998-01-28 (SMS)
2001-10-05 (SMS)
2002-08-21 (SMS)
2010-12-14 (SMS)
2011-10-31 (SMS)

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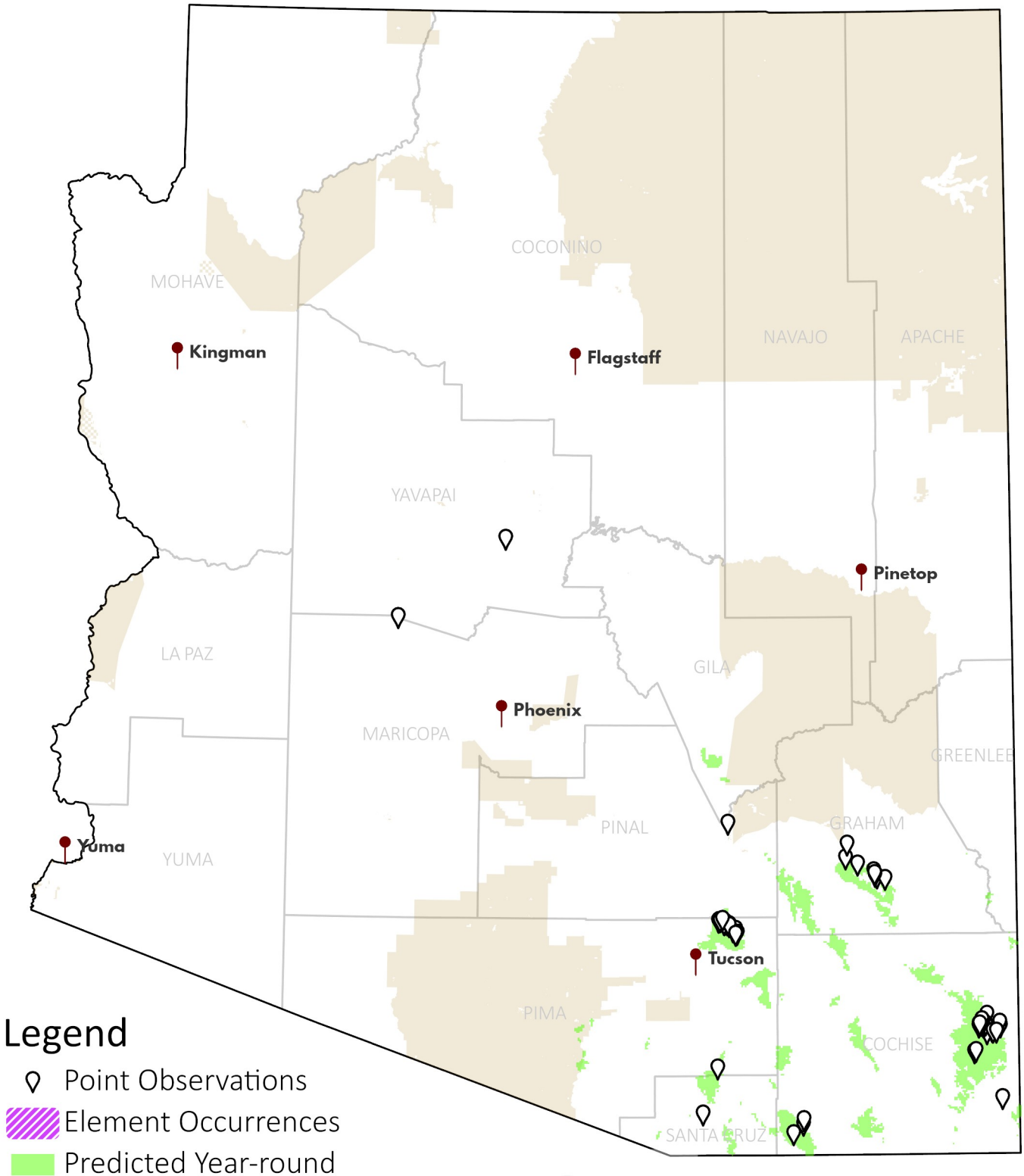
Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X…X **(=taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

Junco phaeonotus

Yellow-eyed Junco



Legend

- Point Observations
- Element Occurrences
- Predicted Year-round
- Tribal Lands
- Counties

N

0 50 100 Kilometers

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences. Predicted ranges indicate likely habitat suitability, not presence.

Heritage Data Management System
2019-06-12

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** ABNME0501A
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Rallus obsoletus yumanensis*
COMMON NAME: Yuma Ridgway's Rail, Yuma Clapper Rail
SYNONYMS: *Rallus yumanensis*, *Rallus longirostris yumanensis*, *Rallus elegans yumanensis*
FAMILY: Rallinae: Rallidae

AUTHOR, PLACE OF PUBLICATION: Dickey. 1923. Auk. 40(1): 90.

TYPE LOCALITY: Laguna Dam near Bard, Imperial County, California.

TYPE SPECIMEN: USNM. D.R. Dickey collection number J-1039, May Canfield and Laurence M. Huey, 15 May 1921.

TAXONOMIC UNIQUENESS: Rallidae includes rails, crakes, coots, moorhens, and gallinules. *Rallus* has 24 species (3 extinct) (Ripley 1977), although Olson (1973) considers only 9 species. *R. obsoletus yumanensis* is 1 of 6 subspecies of Ridgway's rail, though not all subspecies are universally recognized.

DESCRIPTION:

Adult: A smaller subspecies of Ridgway's rail, males are larger than females, standing 20-23 cm (8-9 in) tall. Average weight of adults is 253.0 g (8.9 oz), with males averaging 266.8 g (9.3 oz), and females averaging 226.2 g (7.9 oz) (Todd 1986). Eddleman (1989) differs, stating that average weight of females is 193.0 g (6.8 oz). Adult males have a tawny-orange or burnt-orange breast, orangish beak (usually brighter than breast), while females have a brick-orange breast displayed during the breeding season. The upper mandible of the long, slightly decurved bill is darkish gray, diffusing into orange base. Beak tip is often gray, suffused with orange; forehead and crown dark grayish-brown extending down nape to scapular area on back. Side of head behind and below the eye is subdued gray. Colors of browns and oranges are present toward underside of the head, and in the upperside-neck region. Light eyebrow stripe extends from just above the eye forward to upper mandible; eyelid white; iris dark brownish-orange. Chin and upper throat subdued white, diffusing into color of adjacent body parts. Upper body surfaces, including back, scapulars, rump and upperwing coverts, patterned by light grays and dark browns becoming blotchy and dominant posteriorly on rump, distally on wings. Flanks and underside, including belly just forward of legs, dark gray with narrow vertical white stripes, producing barred effect. Outside of tibia is a light grayish-brown. The long toes, long tarsi and distal tibia are unfeathered, and orange-flesh tone. The tail is dark brown above, white below. Adult rails have a basic pre-body molt

in May-August, resulting in flightless birds found from mid-July to late September. A second, pre-alternate molt occurs from September to December, but does not impact flight or tail feathers (Eddleman 1989).

Juvenile: Hatchlings exhibit black natal down, many have some white downy feathers on the anterior abdominal region. The young retain down for about a month then achieve juvenile plumage. Juvenile plumage varies on fully feathered juveniles with some resembling dull-colored grayish eastern races of clapper rail, while others have extensive black feathering on sides and flanks. The second body molt takes six to seven weeks, with juveniles obtaining buffy adult ventral plumage. After September, juveniles are difficult to distinguish from adults.

AIDS TO IDENTIFICATION: *R. o. yumanensis* differs from other Ridgway's rails by inhabiting primarily freshwater habitats, with the exception of those populations along the west coast of Mexico (which some consider to be of two separate subspecies). Taxonomic uncertainties within *Rallus* reflect the fact that the number of subspecies is poorly represented, both as to scientific specimens and field observation data (Todd 1986). Habitat selection per se, has long been one of the most important criteria for separating species. Vocal calls, is another way to distinguish these birds. While Yuma Ridgway's rails nest in freshwater marshes, King rails generally nest in saltwater marshes. Many, if not most, of the black downy young of Yuma Ridgway's rails have white neossoptiles (downy feathers on most newly hatched birds) on their anterior abdominal regions, but all of King rail downy young examined lacked this white down (Wetherbee and Meanley 1965). According to Scott (editor 1987), Yuma Ridgway's rails are larger than Virginia rails, but duller in color than King rails. Also, Yuma Ridgway's rails are brighter below compared to east coast rails.

ILLUSTRATIONS: Line drawing (Eddleman 1989: cover)
Color drawing (Peterson 1990: 119)
Black and White photo (Rosenberg 1991: 165)
Color drawing (Scott 1987: 97)
Color photo (Terres 1980: 724)
Color & Black and White photos (Todd 1986: cover & pp. 2, 5, 6, 17, 66)

TOTAL RANGE: The historical distribution of the Yuma Ridgway's rail is unclear, due to the cryptic nature of the bird and a lack of survey efforts prior to damming and hydrological alteration. The current distribution includes the Lower Colorado River (LCR) from the Gulf of California in Mexico to the upper end of Lake Mead at the Grand Canyon, the Lower Gila River from its confluence with the LCR to the vicinity of the Phoenix metropolitan area in Arizona, the Virgin River in Arizona and Nevada, and the Imperial Valley/Salton Sea area in California (USFWS 2009). Rail populations on the west coast of Mexico from central Sonora to southern Nayarit, were formerly considered to be of 2 separate subspecies, but are currently attributed to *yumanensis*. Significant breeding areas include Mittry Lake (AZ), Imperial Reservoir, Imperial National Wildlife Refuge (NWR), Bill Williams River NWR, Topock

Gorge and Topock Marsh on Havasu NWR, Cibola NWR, Imperial Wildlife Area, Sonny Bono Salton Sea NWR, and the Cienega de Santa Clara. Smaller populations occur along this range and along the Gila River where moderately extensive emergent vegetation is persistent, including backwaters.

RANGE WITHIN ARIZONA: Colorado River as far north as Lake Mead, the Virgin River, the Bill Williams River, the lower Gila River from near Phoenix to the Colorado River, and the lower Salt and Verde Rivers. Occasional records outside this range include Picacho Reservoir, Tavasci Marsh, Roosevelt Lake, and Quitobaquito Pond (unpublished survey records and reports). See "**Total Range**" for breeding range.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Yuma Ridgway's rails probably do not have a long life-span in wild. Longevity record is 7.6 years (Todd 1986).

They usually walk upright with up-twitching of short tails (distinguishes them from other birds). Often, they take their alarm cues from other birds' actions. When moderately alarmed or cautious, they usually walk off into vegetation. Laterally compressed bodies and the ability to steer right and left enable them to make considerable speed afoot through dense vegetation. They appear to be weak flyers, with slow, fluttering flight, with legs dangling and the head held high. However, other rails are successful fliers over longer distances, and recent research has documented a Yuma Ridgway's rail making a flight of approximately 490 km in 24 hours (Harrity and Conway 2020). Adults are good swimmers (short distances), swimming with a slightly jerky motion as if continuing walking gait in the water. Yuma Ridgway's rails are active in most daylight hours, with little to no activity after dark (Eddleman 1989).

Vocalization: Rails are normally are heard rather than seen. Vocal responses of birds to playback recordings are used regularly to survey populations (used in all rail populations), and to evaluate habitat suitability. Surveys for Yuma Ridgway rails are to be conducted at dusk and dawn from March 1st to May 15th, to coincide with vocalizations peaking during the onset of the breeding season (mid-March to mid-May) (USFWS 2017). "Clatter" (rapid series of "*keks*") seems to be multifunctional, though basically a territorial call; sometimes used as all-is-well call. Common Yuma Ridgway's rail vocalizations include, but are not limited to the "clatter," "duet," "kek," "kek-hurrah," "purr," "agitated kek," and "kek-burr." They are noisiest at dawn, dusk, on moonlit nights, just before a storm, and when startled (Terres 1980; Eddleman and Conway 1999).

Predation: They are not known to be subject to high rates of predation, once adulthood is attained. Coyotes and other carnivorous mammals may be more important predators, especially on nests. Predation of eggs and chicks commonly occur from marsh wrens, great-tailed grackles, northern ravens, coyotes, raccoons, and striped skunks. Red-tail hawks, owls, and northern harriers are common predators during nocturnal calling.

Historically, Harris and Cooper's hawks are common predators (Todd 1986). Eddleman (1989) found that causes of mortality among 37 adult Yuma Ridgway's rails were attributed to predation in 36 cases (50% mammals, 22.2% avian, 27.8% unknown), and disease in 1 case.

Migration: Migration appears incomplete in this taxon. Eddleman (1989) estimated that 70% of birds remained as occupants on the breeding ground over winter. However, Corman and Wise-Gervais (2005) reported individuals of the population near Phoenix on the Gila River were seemingly not present outside of the breeding season, and data from the Salton Sea indicated that most birds migrated for the winter (Bennett an Ohmart 1978, Montgomery 1990). Most recently, Harrity and Conway (2020) documented migratory movements in 40.0% of adults and 21.4% of juveniles, range-wide.

Home Range: Basic requirements of nest site availability, prey diversity and abundance, and protection from avian predators, is all met within a very small area of the wet marsh, often no larger than 0.12 ha (0.29 ac). Home ranges of individuals or pairs, may encompass up to 43.0 ha (106.25 ac), but year-round home ranges averaged 7.50 ha (18.53 ac), (Rosenberg et al. 1991). Eddleman (1989) estimated home ranges for Yuma Ridgway's rails, based on vocalizing birds, as being 0.1-1.6 ha (0.24-4.0 ac) for paired birds and 0.7-3.6 ha (1.8-8.9 ac) for unpaired birds. Observed females had smaller home ranges than males during late breeding, incubation, and early winter. However, post breeding, they had larger home ranges than males, probably due to increased foraging effort because the food base was more sporadically distributed or because the available prey in the breeding home ranges may be depleted. In work done almost entirely in lake and delta cattail marshes at Topock Marsh, Smith (1974) determined an overall density estimate of 1 pair of Ridgway's rails per 13.5 ha (33.4 ac) or 1 rail per 6.8 ha (16.8 ac). Todd (1980) found overall density estimate of 1 pair per 2.1 ha (5.1 ac) or 1 rail per 1.0 ha (2.5 ac), on 77.0 ha (190.3 ac) at Mittry Lake, which is comprised mainly of cattail marshes. In 1981, 42 Yuma Ridgway's rails found on Hall Island (on the Colorado Indian Reservation on CA side of river) for a density of 1 rail per 0.3 ha (0.8 ac). Occasionally, home range of Yuma Ridgway's rails in lacustrine and delta marshes extends 52 m (57 yd) or farther from shore. Movements of Yuma Ridgway's rails beyond established home ranges were of 5 basic types: dispersal of juveniles, dispersal during the breeding season by unpaired males, movements of post breeding adults, movements during late winter, and home range shifts associated with high water (Eddleman 1989).

REPRODUCTION: Reproduction timing varies by habitat. Along the LCR, male rails begin advertisng with "kek" calls in February, pair bonding occurs shortly afterwards. Nesting begins in March with a peak in mid-May on the LCR (Eddleman 1898). In the Salton Sea area nesting begins from May to June, and along the Gila River in Maricopa County, calling does not begin until mid-to late-March (Abbot 1940, Bennett and Ohmart 1978, USFWS 2009). Clutch size ranges from 5 to 10 eggs (Bennett and Ohmart 1978, Eddleman 1989). Incubation ranges from 23-28 days with females generally incubating during the day and males incubating at night (Eddleman 1989). It is not known if Yuma Ridgway's rails will renest after a failed nesting attempt. Initially it was not believed they would renest (Eddleman 1989),

but Ridgway's rails in general are known to re-nest, and may renest up to 5 times after failure of previous nests (Cornell Lab of Ornithology 2019). Adults remain with the chicks for approximately six weeks post-hatch. It is unknown if breeding pair bonds are maintained in subsequent years (USFWS 2009).

Nests are constructed on stable vegetative substrates and may be near shore in shallow water, or over deeper water in the interior or marshes (Abbot 1940, Bennet and Ohmart 1978). They commonly nest along channels where banks are slightly higher than adjacent marsh areas. Such nests are often placed beneath woody shrubs or small trees or in clumped herbaceous growth. Nests elevated over vegetation or soil, have runways leading into them that rails habitually use. Nests consists of dry sedges and grasses, are 18.0-24.0 in (45.7-61.0 cm) tall, 7.0-10.0 in (18.0-25.4 cm) across, are well cupped and 8.0-12.0 in (20.3-30.5 cm) above mud (Terres 1980). Males do most of the nest building, and may build multiple nests which may be used if the original nest is disturbed by predation or high water. Adults are capable of moving eggs between nests in the event of a disturbing event (Conway and Eddleman 2000).

FOOD HABITS: The diet of Yuma Ridgway's rails is dominated by crayfish, with small fish, tadpoles, clams, and other aquatic invertebrates also utilized. They prefer crustaceans including amphipods, but also take fish, frogs, clams, spiders, grasshoppers, crickets, dragonflies, aquatic plant seeds, and bird eggs, etc. Yuma Ridgway's rails are sight-feeders with an excellent sense of smell (Eddleman and Conway 1998). Prey items are taken by shallow probing or surface gleaning in shallow waters, mudflats, and areas of sparse emergent vegetation. During periods of low prey availability, larger home ranges are observed to accommodate daily foraging movements (Conway et al. 1993).

HABITAT: This is the only Ridgway's rail to breed in freshwater marshes; also inhabit brackish water marshes and side waters. They prefer the tallest, densest cattail and bulrush marshes (Rosenberg et al. 1991). Most are found within the Lower Colorado Subdivision of the Sonoran Desertscrub biome. Todd (1986) reported the "average annual rainfall in Yuma Ridgway's rail habitat is usually less than 12.7 cm (5.0 in)." Average daily July temperature exceeds 32º C (89.6º F) along Colorado River and most of the Gila River west of Phoenix. Winters are relatively mild, with January temperatures for Yuma and Gila Bend averaging about 12.8º C (55.0º F). Territories appear to be distributed along a zone where standing water gives way to saturated soil within marsh. Interface between water, soil and vegetation seems far more important than plant species that cover a site. As soon as ground surface of marsh dries out, rails move elsewhere. Plants that typify *yumanensis* habitat include cattail (*Typha domingensis*), which is most dominant and most important plant in water saturated soil interface in U.S. portion of Lower Colorado River Drainage. Often, they are associated with giant bulrush (*Scirpus californicus*) along the Colorado River. Giant bulrush occurs mostly in pure stands, though it also mixes with cattail. It is capable of invading and persisting in somewhat deeper water than cattail, and produces mat of recumbent stems that rails use. Common reed (*Phragmites australis*) marshes are mainly inhabited by Yuma Ridgway's rails where it is bordered or mixed with cattail. Salt cedar (*Tamarix chinensis*), as minor associate of cattail, does form part of the cover used by territorial Yuma Ridgway's rail

in some areas. The appearance of this plant in cattail marshs' indicates a drying trend at soil surface, or local high spot in the marsh.

In winter, most Yuma Ridgway's rails are found in heavily overgrown, relatively narrow, wet sloughs and backwaters, which have more varied vegetation cover of mature and decadent herbaceous and woody vegetation than do lacustrine marshes. Sloughs, especially of smaller size, seem to be important during breeding season, where they have been found in cattail or bulrush choked sloughs. Eddleman (1989) reported that micro-habitats during the breeding season include sites with <30.0 cm (11.8 in) of water, vegetation that is optimally >40.0 cm (15.8 in) tall, and marshes with interface between upland and marsh habitats, or with higher sites within marsh. Stable water levels are important during nesting. Mosaic of variable-aged stands of emergent vegetation interspersed with shallow open-water pools, are necessary for year-round rail habitat (Conway et al. 1993).

Changes that determine habitat suitability include: rapid accretion from flood, bed scour and channel shifting, elevation of riverbed (determines seasonal and annual persistence of backwaters and sloughs), and volume and rate of water flow.

ELEVATION: Below sea level at Salton Sea to 396 m (1,300 ft.) east of Phoenix along the Salt River. Based on Breeding Bird Atlas and annual Clapper Rail survey data (Corman and Wise-Gervais 2005), in Arizona Clapper Rails are found at elevations ranging from about 100 to 1,000 ft (30-305 m) and very locally to 1,500 ft (457 m). Unpublished records in the Heritage Data Management System (HDMS), showed elevation ranges from 75 - 1,700 ft (23 - 519 m), incidental ranges to 2,200 ft (AGFD, accessed 2006).

PLANT COMMUNITY: Lower Colorado Subdivision of the Sonoran Desertscrub biome. On a smaller scale, this includes fresh water marshes consisting mainly of cattails, bulrushes and, to a lesser extent, common reed.

POPULATION TRENDS: Due to a lack of survey standardization from 1969-2008, it is difficult to determine true population trends. Surveys were done in different months (ranging from March to September), and under different protocols, using different recorded calls, varying surveyor experience, and completeness of the survey effort. New or modified routes were included from year to year. Populations are expected to decline without management, due to altered hydrological regimes leading to aging marshes without regeneration (USFWS 2009).

Prior to dam building on the Colorado River, it is believed that river dynamics prevented the existence of significant marsh areas, and Yuma Ridgway's rail distribution was thought to be restricted to primarily the delta in Mexico. Early naturalists did not record Ridgway or clapper rails or extensive marshes above the Gila River confluence until 1921 (Rosenberg et al 1991). The first intensive surveys in the U.S. were conducted in 1973, 1974, and 1981, and yielded counts of 702, 821, and 787 respectively. USFWS (1983) estimated a stable population of more than 700 rails from 1969-1981. Todd (1986) believed the summer

population in the U.S. to average between 900 and 1,000 from the 1960s through mid 1970s. Based on densities estimated during their study and the amount of available habitat, Anderson and Ohmart (1985) estimated 739 rails for the lower Colorado River north of Mexico in the late 1970s. Annual counts conducted by agency biologists have varied from 503 to 1,076 during 1990-2005 (USFWS, unpub. data). The fluctuations may be more related to variations in survey effort than to actual populations. Initial surveys of the population in the Colorado River delta in Mexico resulted in counts of 145 in 1973 and 104 in 1974 (Todd 1986). A survey in 1976 of 20% of an estimated 24,000 ha area yielded a count of 700 (USFWS 1983; unclear whether this was actual birds detected or an estimate). Eddleman (1989) counted 42 rails at the Cienega de Santa Clara in 1987 and estimated a population of 200-400. Overall, he counted 102 rails in the delta and estimated a population of 450-970. Piest and Campoy (1998) counted 240 rails in an estimated 7.5% of cattail habitat at the Cienega de Santa Clara in 1998 and estimated a total population of 5,300. Subsequent estimates at the Cienega have been from 6,300 in 1999 to less than 3,000 in 2002 (Hinojosa Huerta *et al*. 2001; Hinojosa Huerta *et al*. 2003). The Cienega apparently comprises approximately 90% of the Mexican population of Yuma Ridgway's rails and 70% of the total population.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS:
LE (USDI, FWS 1967)
Recovery Plan (USDI, FWS 1983)

STATE STATUS:
1 (AZGFD, AWCS 2022)
[1A (AGFD SWAP 2012)]
[WSC (AGFD, WSCA 1996 in prep)]
[Threatened (AGFD, TNW 1988)]

OTHER STATUS:
Bureau of Land Management Sensitive (USDI, BLM AZ 2007)
No FS Status (USDA, FS Region 3 2013, 1999)
[Forest Service Sensitive USDA, FS Region 3 1988]
A, Determined Threatened in Mexico (NORMA Oficial Mexicana NOM-059-SEMARNAT-2010)
[P, Determined Endangered in Mexico, (Secretaria de Desarrollo Social 1994, 2000)]

MANAGEMENT FACTORS:

Threats: habitat destruction through river channelization, dredging, and drying and flooding of marshes; aging without regeneration of marshes; increasing cost of water and prioritization of water use; floodplain development; habitat fragmentation; diversion of water sources; wildfires; climate change; toxic levels of heavy metals (selenium) (USFWS 2009).

Selenium derived from natural sources in the upper Colorado River basin becomes concentrated by water evaporation in the lower Colorado River. This contaminant is further concentrated in food chains and can cause acute toxicity and reproductive impairment. Eddleman (1989) first documented elevated levels of selenium in Yuma Ridgway's rails and their eggs. Subsequent studies along the lower Colorado River also revealed elevated levels within substrates and rail food items (Rusk 1991, Lusk 1993), and at levels above the threshold for reproductive impairment and embryo toxicity in surrogate bird species (Martinez 1994). Most recently, King *et al*. (2000) found concentrations that were two to three times higher than 10 years prior. Mortality or reproductive impairment has thus far not been detected for Yuma Ridgway's rails. Preliminary information from a joint USFWS-USGS study at Salton Sea and the LCR show concentrations in eggs well above suggested "No Effect Concentrations" at 3.30 to 12.0 µg/g and in blood and feathers 15.0 and 20.0 µg/gram respectively (USFWS 2009). A systematic monitoring program for selenium should be initiated.

Management needs: maintain, enhance, and create marsh habitat; maintain constant flows through lower Colorado River dams sufficient to retain breeding habitat; maintain water flow to the Cienega de Santa Clara; monitor distribution and abundance of breeding birds; monitor heavy metal content in eggs and/or tissue; determine disturbance from human activities such as noise and light pollution.

Management options should be oriented toward preferred habitat perpetuation and creation. Fundamental criteria of standards for all sites should include the presence of: 1) dense vegetation (60.0 cm or more) on wet site with water depths of 30-40 cm (12-16 in), 2) low vegetated hummocks or rises above water adjacent to or within marsh or swamp, 3) adequate food base. Given ephemeral nature of habitat at any one site, and ease with which it is destroyed by floods and man, there should be a minimum of 20 localities established for Yuma Ridgway's rail management. Each site should be suitable for minimum of 8 pairs of rails, with overall average of 15 pairs per locale (Todd 1986). Habitat vigor should be maintained by periodic removal of accumulated vegetation, most likely through controlled burning. The Lower Colorado River Multi-Species Conservation Plan provides for the creation of rail habitat; implementation should be given a high priority.

PROTECTIVE MEASURES TAKEN: Creation of the Lower Colorado River Multi-Species Conservation Program (LCR MSCP), a 50-year, comprehensive Habitat Conservation Plan that addresses the effects of water use and hydropower generation on the LCR on 26 species, including the Yuma Ridgway's rail. The plan provides for 512 acres of rail habitat to be created and managed to maintain habitat quality, in addition to species monitoring and research work, as well as providing funding to maintain existing habitats that are threatened by natural aging processes. This rail habitat will be created in a landscape mosaic on lands along the LCR corridor and in adjacent areas such as the Lower Gila and Virgin Rivers (LCR MSCP 2004). The US Bureau of Reclamation and California partners are working to create and maintain marsh habitat in the Salton Sea (USFWS 2009). Prescribed fire has been used at

Sonny Bono Salton Sea NWR and IWA, and at Mittry Lake Wildlife Area, Havasu NWR, and Imperial NWR, as part of a study of effects of fire on restoration of habitat quality for Ridgway's rails. Survey Protocol for Project Management has been developed and finalized (USFWS 2017). A draft revised recovery plan has been completed, but no recovery plan has yet been finalized (USFWS 2009).

SUGGESTED PROJECTS: Finalization and implementation of a revised species recovery plan. Recovery is primarily focused on managing existing and created habitats throughout the range of the species to ensure sufficient amount of quality habitat to support U.S. and Mexico populations and allows for movement of individuals. It is important to note that the major threats to the Yuma Ridgway's rail (water management, land use changes, and selenium levels in the LCR) cannot be eliminated. However, while a return to historical conditions is impossible, habitats can be manipulated to maintain or restore habitat parameters needed by rails. Continuation of standardized surveys is necessary to gather information on population trends.

LAND MANAGEMENT/OWNERSHIP: In Arizona: BIA - Colorado River, Cocopah, Fort Yuma, Gila River, and Salt River Nations; BLM - Kingman, Phoenix, and Yuma Field Offices; BOR; FWS - Bill Williams, Cibola, Havasu, and Imperial National Wildlife Refuges; NPS – Organ Pipe Cactus National Monument; USFS - Tonto National Forest; State Land Department; AGFD - Arlington, Base and Meridian, Mittry, Picacho, Quigley, and Robbins Butte Wildlife Areas; Private. California: Imperial Wildlife Area; FWS – Salton Sea Sonny Bono NWR. Nevada: BOR – Boulder City.

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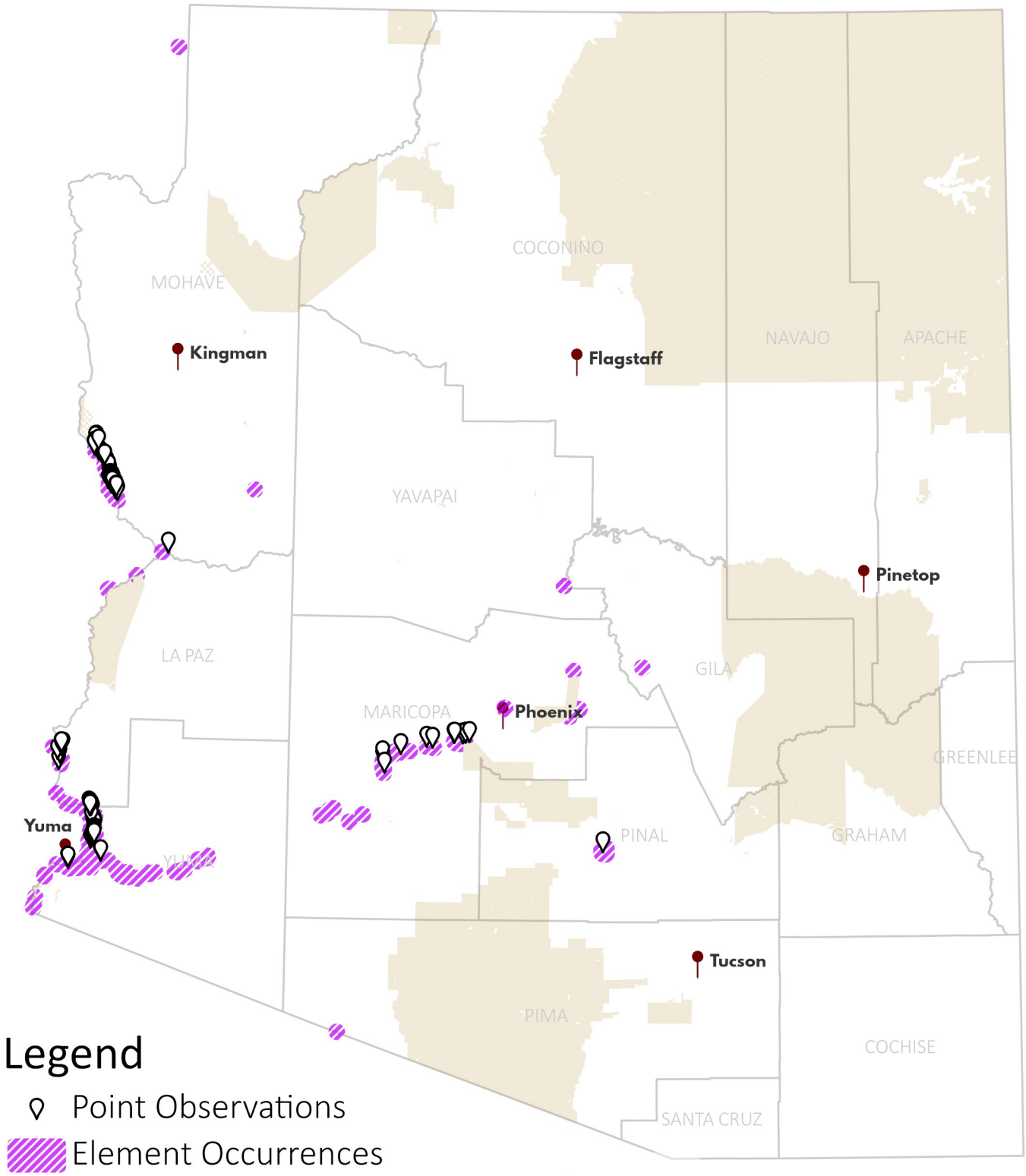
ADDITIONAL INFORMATION:

Revised: 1995-03-22 (SMS)
1995-03-23 (LZW)
1997-02-27 (SMS)
1997-11-14 (SMS)
2001-10-09 (SMS)
2006-01-30 (LP)
2020-10-16 (KSL)
2023-01-04 (MBL)

Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X…X **(=taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

Rallus obsoletus yumanensis

Yuma Ridgway's Rail



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

0 50 100 Kilometers

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences.

Heritage Data Management System
2019-06-13

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AFCJC02070
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Catostomus* (*Pantosteus*) *discobolus*
COMMON NAME: Bluehead Sucker, Zuni Bluehead (=Mountain) Sucker, Bluehead Mountain Sucker
SYNONYMS: *Catostomus delphinus, Catostomus discobolus, Catostomus discobolus discobolus, Catostomus discobolus yarrowi, Minomus jarrovii, Minomus delphinus, Pantosteus delphinus, Pantosteus delphinus delphinus, Pantosteus discobolus, Pantosteus jarrovii, Pantosteus plebeius, Pantosteus yarrowi*
FAMILY: Catostomidae

AUTHOR, PLACE OF PUBLICATION: Cope, E. D. 1872. Recent reptiles and fishes *in* U.S. Geologic Survey of Wyoming and contiguous territory. Special reports Part IV:432-442.

TYPE LOCALITY: Green River, Wyoming.

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: 23 species in genus *Catostomus*, all found in North America. Six species in Arizona. Two subspecies of *C. discobolus* have been discussed, *C.d. discobolus* and *C.d. yarrowi*, the latter being the Zuni population (Smith et al. 1983, Crabtree and Buth 1987).

DESCRIPTION: "...specimens more than 300 mm (11.8 in.) standard length not being uncommon. Coloration varies with habitat conditions, silvery tan to dark green above, silvery to yellowish or dirty white below. Inguinal process sometimes absent or obsolescent. Lips large, with tiny papillae evenly scattered over lower and oral face of upper, but absent from anterior face of upper lip. Caudal peduncle thick to slender, ranging from 4.2 to 10.0 percent of standard length" (Minckley 1973). Lower lip shallowly notched at midline. Lateral line scales usually 90-100 (ranging from 78-122). Predorsal scales usually more than 50 (range 44-75). Dorsal fin rays 9-12 and anal fin rays 7. Breeding adult males have a blue patch on top of the head. The lower fins become yellow or orange, and red or rosy lateral bands form along the sides. Bluehead suckers grow to about 50 cm (20 in.) in the mainstem Colorado River, Grand Canyon, but tributary resident fish tend to be smaller.

AIDS TO IDENTIFICATION: Cartilaginous scraper in lower jaw. Lips deeply notched at corners. Bluish head in breeding males.

ILLUSTRATIONS:
Line drawing (Eddy and Underhill 1978:119)
B&W photos (Minckley 1973:170)
Line drawing (Minckley and Holden 1980:377)
Color drawing (Page and Burr 1991)
Color photo (Rinne and Minckley 1991:30)
Line drawing (Sigler and Sigler 1987:222)
B&W photo (Simpson and Wallace 1978:151
Line drawings and B&W photos (Snyder and Muth 1990:116-123)
Line drawings (Sublette et al. 1990:208, 209)
Color photo (*In* http://www.desertfishes.org/na/catostom/cdiscobo/I_cdisco.shtml)
Color photo (*In* http://www.utahcdc.usu.edu/rsgis2/Search/Display.asp?FINm=catodisc)

TOTAL RANGE: High gradient streams of western North America. Found in Colorado River drainages upstream (including the Grand Canyon) from Lake Mead (AZ, CO, NM, UT and WY), Snake River, above Shoshone Falls (ID and WY), and Bear River (ID and UT) and Weber River drainages (UT and WY) of the Bonneville Basin.

RANGE WITHIN ARIZONA: Colorado River mainstem and Grand Canyon tributaries, including Little Colorado River, Clear Creek, Bright Angel Creek, Shinumo Creek, Kanab Creek and Havasu Creeks; rare below Diamond Head. May be found in a few areas on the Navajo Reservation, and in the San Juan Drainage (Minckley 1995, AGFD Native Fish Diversity Review)

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Can live more than 20 years. Known to hybridize with other species of *Catostomus*.

REPRODUCTION: Spawn in spring and summer, after water temperatures exceed 16.0º C (60.8º F); 2-5 males join a single female to spawn over gravel-sand and gravel-cobble substrates. Spawning in Grand Canyon tributaries occurs during April and May in water depths of a few cm to greater than one meter. Water temperatures at this time are generally 16.0-20.0º C (60.8-68.0º F). Young appear May through June and reach approximately 60 mm (2.36 in.) by the end of the first year in the mainstem. In the upper Colorado River basin they spawn over gravel and rubble, in flatwater reaches but sometimes in currents greater than 1.0 m/s near the upper ends of riffles.

FOOD HABITS: Scrapes algae and invertebrates off rocks with cartilaginous scraper. Mostly immature dipterans and amphipods with diatoms and organic debris also being found in the gut.

HABITAT: Bluehead suckers occupy "a variety of habitats from headwater streams to large rivers" (Sublette et al. 1990). Riverine habitats from cold (12º C), clear streams to warm, very turbid rivers. When water is clear they stay in deep pools and eddies during the day then move into shallow riffles, tributary mouths, shorelines, or other hard-bottomed sites to feed at night. When water is turbid they occupy shallow areas throughout the day. Young inhabit backwaters in the Grand Canyon.

ELEVATION: 610 to 2060 m (2,001 to 6,759 ft.)

PLANT COMMUNITY: Aquatic.

POPULATION TRENDS: Populations are stable except where habitat is destroyed by flooding of riverine habitats by dams.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS:
PS (USDI, FWS 2004, *C.d. yarrowi*)
[None USDI, FWS 1996]
[C2 USDI, FWS 1994 *C.d. yarrowi*]
[C2 USDI, FWS 1991]
[C2 USDI, FWS 1985, 1989]

STATE STATUS:
1A (AGFD SWAP 2012)
[WSC, AGFD, WSCA in prep (*C.d. yarrowi*)]
[State Candidate AGFD, TNW 1988 (*C. d.* ssp. = ssp. *yarrowi*)]

OTHER STATUS:
None, USDA FS Region 3, 2013
[Forest Service Sensitive USDA, FS Region 3 1988, 1999, 2007]
Bureau of Land Management Sensitive (USDI, BLM AZ 2010)
Group 4 (NNFWD, NESL 2001, 2008)

MANAGEMENT FACTORS: Loss of riverine habitat will decimate population, as they are not found in any reservoirs within their range. They do appear to be tolerant of a wide range of temperatures, except for spawning and larval growth requirements. Introduction of non-native fish species are a major threat to this species.

PROTECTIVE MEASURES TAKEN: In 2006 a Statewide Conservation Agreement was completed and signed by nine natural resource management entities in 2007: U.S. Fish and Wildlife Service, Arizona Game and Fish Department, U.S. Bureau of Reclamation, the Hualapai Tribe, Salt River Project, U.S. Bureau of Land Management, Arizona State Land

Department, Arizona Department of Water Resources, The Nature Conservacny, and the U.S. Forest Service (AGFD 2006).

SUGGESTED PROJECTS: Laboratory examination of temperature preference and tolerance; larval and juvenile food habits; age and growth in the Colorado River and tributaries, Grand Canyon.

LAND MANAGEMENT/OWNERSHIP: In Arizona, most of the habitat for bluehead suckers is within Grand Canyon National Park. Other areas lie in the Navajo Nation, Bureau of Land Management, US Forest Service and private lands.

SOURCES OF FURTHER INFORMATION

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ADDITIONAL INFORMATION:

Revised: 1994-08-09 (TLH)
1994-08-15 (MHH)
1997-03-04 (SMS)
2003-05-16 (AMS)
2013-11-14 (BDT)

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AFCJB35020
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Ptychocheilus lucius*
COMMON NAME: Colorado Pikeminnow; Colorado Squawfish; Colorado Salmon; White Salmon
SYNONYMS:
FAMILY: Cyprinidae

AUTHOR, PLACE OF PUBLICATION: Girard, C. 1856, Proc. Acad. Nat. Science, Philadelphia 8:209

TYPE LOCALITY: Colorado River

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: One of three species in the genus; only species in the Colorado; relatively unchanged since the Miocene.

DESCRIPTION: Reports of specimens from Arizona claim the fish reached lengths of 1.8 m (6.0 ft.) and weights of 45.0 kg (100 lbs.) (Minckley 1973, Sublette et al. 1990). Sublette et al. 1990 states that *Ptychocheilus lucius* in excess of 0.9 m (2.95 ft.) and 6.5 kg (14.3 lbs.) are now rare.

"Body somewhat compressed dorso-ventrally. Head flattened and elongated. Mouth large, nearly horizontal. Dorsal and anal fins almost always with nine rays. Dorsal fin far back, originating behind insertion of pelvic fins. Scales small, embedded (especially on breast, belly, and nape). Skin leathery in texture. Lateral line with 80 to 95 scales. Pharyngeal arches delicate, the lower ramus elongated and slender; teeth fragile and elongated, 2, 5-4, 2.

Color olivaceous, darker above. Lower sides yellowish and belly whitened, especially anteriorly. Young with a dark, wedge-shaped basicaudal spot, absent in adults" (Minckley 1973).

"Head: Long, flattened; HL/Sn L=2.7-3.6. SL/HL=3.5-4.3. Mouth large, terminal, the maxillary extending to or beyond the middle of eye. HL/Or L=5.5-11.2. Interior of jaws with acute skin-covered edge. Pharyngeal arch long and thin, dentition 2,5-4,2; teeth fragile. SN L/Or L=1.7-4.8. Mandible with 14-23 pores. Branchiostegal rays 3.

Body: Elongate, subterete, slightly compressed. Average total length 450-600 mm (17.7-23.6 in.); maximum total length 1.8m (6.0 ft.). SL/Pre Dor L=1.6-2.2; SL/BD=4.5-6.0. Body scales small, sometimes missing or deeply embedded on the breast and abdomen. Lateral line strongly decurved, with 84-93 (80-95) scales. Scales above the lateral line 29 (27-30). Caudal peduncle thin; SL/Caud Ped D=12.5-12.9; BD/Caud Ped D=1.7-2.8 Vertebrae 48-49 (47-49).

Fins: Dorsal triangular, distal margin weakly falcate to almost straight; origin posterior to that of pelvics. Pectorals pointed. Pelvics ovate. Anal triangular. Caudal deeply forked, lobes pointed. Rays: Dorsal 9 (9-10); pectorals 16-17 (14-18); pelvics 9 (8-10); anal 9 (8-10); caudal 19" (Sublette et al. 1990).

AIDS TO IDENTIFICATION: Keys in Minckley (1973) and Sublette et al. (1990). Resembles species of genus *Gila* but can be distinguished by elongate body and snout; the maxilla extending to the orbit; and an acute skin-covered edge inside the jaws (Sublette et al. 1990).

ILLUSTRATIONS: B&W photo (Minckley 1973:120)
Color drawing (Page and Burr 1991)
Color photo (Rinne & Minckley 1991:32)
Line drawing (Sublette et al. 1990:172)
B&W photos (Sublette et al. 1990:173)

TOTAL RANGE: Formerly widespread in the Colorado River basin from Wyoming to Arizona and California. Now, native populations are restricted to the upper basin in Wyoming, Colorado, Utah and New Mexico in the Green, Yampa, White, Gunnison and Colorado Rivers (Maddux et al. 1993). Critical habitat was designated for Colorado pikeminnow (called Colorado Squawfish at the time) in the upper basin (Federal Register 59(54), March 21, 1994) effective April 20, 1994. No critical habitat was designated in Arizona.

RANGE WITHIN ARIZONA: Considered extirpated in Arizona (Miller and Lowe 1964; Minckley and Deacon 1968; Minckley 1973), Colorado pikeminnow are restricted to two "experimental, non-essential" reintroduced populations in Arizona (Maddux et al. 1993). Adult and juvenile pikeminnow have been captured in Lake Powell (Minckley 1973; Minckley and Carothers 1980; Miller et al. 1984), but not in the Arizona portion of the lake.

Fish have been experimentally stocked in the Salt River drainage (Cherry Creek, Canyon Creek, Salt River at Horseshoe Bend and Gleason Flat) and the Verde River drainage (Verde River from below Sullivan Lake to Beasley Flat, East Verde River, West Clear Creek, Fossil Creek, and Sycamore Creek [Yavapai County]). A rule was proposed to designate an "experimental, non-essential" population on the Lower Colorado River between Imperial and Parker dams (Federal Register 52(165), August 1987). That rule was never finalized.

Pikeminnow have also been held or reared in Arizona at Page Springs/Bubbling Ponds State Fish Hatcheries, Willow Beach National Fish Hatchery, ASU Research Park, and Palm Lake (Hassayampa River Preserve operated by The Nature Conservancy).

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Early *Ptychocheilus* likely developed riverine adaptations by the mid Pliocene (about 6 million years ago). They were the top predator of the Colorado River basin in the early 1900s. They are largely solitary other than during spawning or when crowed together during low water conditions. The species is potamodromous (migratory in freshwater), with adults capable of long distance migrations for spawning (Tyus 1986, 1991). There is some evidence of homing behavior in pikeminnow (Audet et al. 1985; Tyus 1985). May live 30 years or more. Mature fish are highly mobile while immatures are sedentary.

REPRODUCTION: Fish are sexually mature at 5-7 years of age and at least 40 cm (16in) in length. Tyus (1990) reported that the onset of the reproductive cycle is marked by the beginning of migration to spawning areas. Cues for onset of migration may be high spring flows, increasing water temperature, and possible chemical cues from inundated terrestrial habitats. Movements of 200 miles have been reported, and fidelity to spawning grounds has been observed. Pikeminnow may not spawn annually. Pikeminnow migrations were initiated at water temperatures between 19.4-20.0°C (67-68°F). Baseline flow spikes may also serve as spawning cues (Negler et al. 1988).

Colorado pikeminnow spawn following the peak runoff when water temperatures reach 17.8-25.0°C (64-77°F), the peak between 22.2-25.0°C (72-77°F) (Tyus 1990). Spawning or egg deposition usually takes place during decreasing flows during which time sediment transport is decreasing and temperature is increasing (Tyus and Karp 1989). Spawning may be concentrated in relatively small areas where large, deep pools, eddies, and submerged cobble, gravel, boulder and sand substrates were associated with the main channel (Tyus 1990). Fish gather in the deep pools or eddies where they rest, feed and prepare for spawning bouts. Females, followed by several males leave the pools for riffles or shallow runs where the spawning actually happens. They often return to the pool and the cycle is repeated. Hamman (1981) reported spawning behavior from raceways. Two or three males pursue a single female; as she slowly settles to the bottom with a male on each side, eggs are deposited followed by a release of sperm by the males (Sublette et al. 1990). The process may be repeated. Based on radiotelemetry data, fish may stage (rest) for hours to days in pools and eddies approximately 6.0 ft. (1.83 m) in depth, with water velocities of about 1 ft./sec. (Tyus 1990). Spawning was noted in nearby cobble/boulder bars approximately 3.0 ft. (0.91 m) in depth, with water velocities of about 1.9 ft./sec.. Fish returned to eddies/pools after 30 minutes to 3 hours and were presumably spent.

Eggs, varying in size from 1.5-2.0 mm (0.06-0.079 in.) hatch in 78-108 hours at 20.0°C (68.0°F) and 63 hours at 25.0°C (77.0°F) (Sublette et al 1990). Survival and percent hatch is

highest at 20.0°C (68.0°F); no hatching occurred at 5.0, 10.0 and 30.0°C (41.0, 50.0, and 86.0°F) (Marsh 1985). There is no parental care.

Spawning pikeminnow are known or suspected from the Yampa River canyon; Gray Canyon of the Green River; and two sites on the Colorado River (Black Rocks to Loma, Grand Junction to Clifton). Spawning is suspected from Labyrinth Canyon on the Green River and Cataract Canyon on the Colorado (Maddux et al. 1993). No spawning locations are known from Arizona.

Young may enter the drift as larvae and be transported long distances (perhaps 100 miles) before settling into nursery areas (Tyus and Haines 1991). Young-of-year, juveniles, and subadults have been noted in ephemeral backwater areas, with little or no current velocities, over silt and sand bottoms. Backwaters may be an important nursery area for young pikeminnow (Maddux et al. 1993). Young are highly mobile and may move among habitat types, but appear to seek out sites that provide the greatest warmth.

FOOD HABITS: Young pikeminnow may utilize crustaceans and aquatic diptera larvae. Aquatic and terrestrial insects make up the majority of the diet as fish exceed 50 mm (1.97 in.). Fishes predominate in the diets of squawfish larger than 100 mm (3.9 in.) (Minckley 1973). Condition of young fish entering winter periods may have a role in determining their overwinter survival. Low fat stores and poor condition may result in low overwinter survival of age-0 squawfish (Thompson 1989, Thompson et al. 1991).

HABITAT: Spawning, as described above, takes place over clean cobbles and rubble in relatively swift waters. Preferred temperatures for embryo development, juvenile growth, and adult spawning is from 20.0-26.0°C (68.0-78.8°F) (Berry 1988). Juveniles utilize slackwater, backwater, and side channel areas with low or no current velocity and silt/sand substrates. Larger individuals, greater than 200mm (7.9 in.) occur in turbid, deep, and strongly flowing waters (Sublette et al. 1990). Juveniles prefer total dissolved solid concentrations of 560-1,150 mg/l and avoid concentrations greater than 4,400 mg/l (Sublette et al. 1990). During floods, adults may move to flooded bottom lands where they may feed on terrestrial animals (Sublette et al. 1990).

Artificial habitats may have some utility for rearing young pikeminnow. Osmundson and Kaeding (1989) evaluated the use of gravel pits for grow-out of young pikeminnow. Growth in these gravel pits was related to density of fish and available forage. Survival was overall rather low. Habitat suitability curves have been developed for Colorado pikeminnow (Valdez et al. 1987). Clarkson et al. (1993) reported habitat preference for reintroduced pikeminnow in the Verde River, Arizona. Hendrickson (1993) discussed other aspects of Colorado pikeminnow reintroduction attempts in Arizona.

ELEVATION: Re-introduced on the Tonto National Forest at 1,960 ft. (598 m).

PLANT COMMUNITY: Aquatic

POPULATION TRENDS: Extirpated in Arizona except for reintroduced stock.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: LE,XN (USDI, FWS 1967)

STATE STATUS: 1A (AGFD SWAP 2012)
[WSC, AGFD, WSCA in prep]
[State Endangered AGFD, TNW 1988]

OTHER STATUS: No Forest Service Status (USDA, FS Region 3 1999)
[Forest Service Sensitive, USDA, FS Region 3 1988]
State Endangered, Group I (State of New Mexico 1975)
Endangered, American Fisheries Society
E, IUCN
E, probably Extinct in the wild of Mexico (NORMA Oficial Mexicana NOM-059-SEMARNAT-2010)
[Listed Endangered, Secretaría de Medio Ambiente 2000]
[Listed Endangered Secretaría de Desarrollo Social 1994]
Group 2 (NNDFW, NESL 2001, 2008)
[Group 2 NNDFW, NESL 1994]

MANAGEMENT FACTORS: Interactions with nonnative fishes may be an important factor in the continued survival or success of reintroduced populations of Colorado pikeminnow. Creef et al. (1992), Hendrickson (1993), Brooks (1986), and AGFD (1988) all pointed to predatory interactions as an impediment to successful pikeminnow reintroduction. Channel catfish, smallmouth bass, and flathead catfish were identified as major predators in Arizona. Overlap and interactions with nonnative fishes such as red shiner, fathead minnow and green sunfish may result in reduced growth and survival of age-0 pikeminnow (Karp and Tyus 1990). Dams have blocked migration routes (Tyus 1991). Water temperature changes can be significant, as cold temperatures can inhibit embryonic development (Marsh 1985) and increase early life mortality (Kaeding and Osmundson 1988).

Threats: stream diversion; impoundment; reservoir operations; predation by and competition with nonnative fishes. **Management needs:** re-establish large pikeminnow in historical habitats; ameliorate impacts from nonnative predatory and competitory fish species; evaluate possibility of recreational use; maintain and restore select habitats within historical range.

PROTECTIVE MEASURES TAKEN: In Arizona, no critical habitat is designated. Reintroduction efforts are experimental nonessential. Outside Arizona, six reaches in the upper Colorado basin [totalling 1848 km (1148 miles)], have been designated as critical habitat.

SUGGESTED PROJECTS:

LAND MANAGEMENT/OWNERSHIP: U.S. Forest Service (Tonto, Prescott, and Coconino National Forests), Reclamation withdrawn, Tribal, State, and Private lands. Experimental nonessential populations have been introduced into Forest Service lands.

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ADDITIONAL INFORMATION:

Common name was officially changed (per American Fisheries Society standards) from Colorado Squawfish to Colorado Pikeminnow in 1999.

Revised: 1994-07-29 (LMR)
1994-08-17 (MHH)
1994-09-29 (RWC)
1995-01-29 (KLY)
2001-10-18 (SMS)
2002-12-11 (RHB)

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Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AFCNB02060
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Cyprinodon macularius*
COMMON NAME: Desert Pupfish
SYNONYMS: *Cyprinodon macularius macularius*
FAMILY: Cyprinodontidae

AUTHOR, PLACE OF PUBLICATION: Baird and Girard, 1853, Proceedings of the Academy of Natural Sciences of Philadelphia 6:1-155.

TYPE LOCALITY: San Pedro River, Arizona.

TYPE SPECIMEN: Unknown

TAXONOMIC UNIQUENESS: 12 species of *Cyprinodon* in North America, two existing species in Arizona, *C. macularius* and *C. eremus,* and one extinct species, *C. arcuatus*.

DESCRIPTION: "Body thickened, chubby, or markedly compressed, laterally, in adult males. Mouth superior, highly protractile, armed with tricuspid teeth. Circuli of scales with marked, spine-like projections. Dorsal profile smoothly rounded, not markedly concave posterior to origin of dorsal fin.

Body color of females and juveniles with silvery background, with narrow, vertical, dark bars on sides, generally interrupted laterally to give the impression of a disjunct, lateral band. Fins generally colorless, with the exception of an ocellate spot in dorsal, and rarely a dark spot in anal fin. Mature, breeding male with caudal fin and posterior part of the caudal peduncle yellow or orange, sometimes intense orange-red; other fins generally dark. Body iridescent light- to sky-blue, especially on dorsum of head and predorsal region" (Minckley 1973).

AIDS TO IDENTIFICATION: *C. macularius* differs from the Quitobaquito pupfish, *C. eremus*, by having a narrower head, body, and mouth; longer pelvic fins and depressed anal fins (Miller and Fuiman 1987).

ILLUSTRATIONS: B&W photo (Minckley 1973:189)
Color drawing (Page and Burr 1991)
Color photo (Rinne and Minckley 1991:25)

TOTAL RANGE: Historic range includes lower Gila River basin in Arizona and Sonora, Mexico, including the Gila, Santa Cruz, San Pedro, and Salt rivers as well as the lower Colorado River in Arizona, California, and adjacent Mexican states from the vicinity of Needles downstream to the Gulf of California. Presently, the only remaining natural populations are found in a few sites in the Salton Sea drainage in California, and the Colorado Delta in Baja California and Sonora, Mexico (Minckley 1973, U.S. Fish and Wildlife Service [USDI, FWS] 1993).

RANGE WITHIN ARIZONA: There are no natural populations of this subspecies remaining in Arizona. Populations were introduced at Cold Springs in Graham County, AD

Wash in Yavapai County, and Finley Tank in Santa Cruz County. There are also several (9) refugia populations in private ponds and aquariums.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Capable of withstanding extreme environmental conditions. Known to survive in water with low oxygen content, temperatures over 35□C (95□ F), and salinities almost 3 times that of sea water (Minckley 1973).

REPRODUCTION: When breeding, male pupfish become highly aggressive and territorial. When female ready to spawn, she enters a male's territory. Upon spawning, fertilized eggs are deposited randomly within territory. Territorial behavior of males tends to protect eggs although unintentionally. Hatching occurs within a few days. Growth of young is rapid, sexual maturity may be reached in six weeks under favorable conditions. Pupfish seldom live longer than a year (Minckley 1973).

FOOD HABITS: Small invertebrates, mosquito larvae, detritus, algae, and small bits of aquatic vegetation (Naiman 1979). In softer substrates, dig small pits in search of food and then aggressively defend the pits (Minckley 1973).

HABITAT: Pupfish occupy shallow waters of springs, small streams, and marshes. Often associated with areas of soft substrates and clear water (USFWS 1993).

ELEVATION: Below 1,500 m [4,920 ft.] (Rinne and Minckley 1991). Based on records in the Heritage Data Management System (HDMS), elevation ranges from 1,200 to 3,450 ft (366 - 1,052 m) (AGFD, unpublished data accessed 2001).

PLANT COMMUNITY:

POPULATION TRENDS: Once common fish, now extirpated from most of natural range. Trend since early 1900's has been loss of habitat and declining numbers.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: LE (USDI, FWS 1986), with Critical Habitat

STATE STATUS: 1A (AGFD SWAP 2012)
[WC, AGFD, WSCA in prep]
[State Endangered at subspecies, AGFD, TNW 1988]

OTHER STATUS: No Forest Service Status (USDA, FS Region 3 1999)
[Forest Service Sensitive, USDA, FS Region 3 1988]
P, Determined Endangered in Mexico (NORMA Oficial Mexicana NOM-059-SEMARNAT-2010).
[PR, Determined Subject to Special Protection, Secretaría de Medio Ambiente, 2000]

MANAGEMENT FACTORS: Activities that are known to be detrimental to pupfish populations should be avoided i.e.: dewatering of habitats, stream impoundment, channelization, domestic livestock grazing, timber harvesting, mining, road construction, polluting, and stocking non-natives.

Threats: spring habitat alteration and development; habitat destruction; drought; predation by and competition with nonnative fishes. This species is very susceptible to displacement by non-native species. **Management needs:** protect existing populations; assess genetic composition of remaining naturally occurring populations; identify refugium populations; re-establish populations; monitor and manage reintroductions to maintain minimum of 55 sites in Arizona.

PROTECTIVE MEASURES TAKEN: Recovery plan developed in 1993. Refugia populations established in private ponds and aquariums. Reintroduction efforts made in natural and "quasi-natural" locations.

SUGGESTED PROJECTS: As outlined in recovery plan (USDI, FWS 1993): 1) Protect natural populations of desert pupfish; 2) Re-establish desert pupfish populations; 3) Develop protocols for exchange of genetic material among desert pupfish populations; 4) Monitor and maintain natural, re-established, and refugium populations; 5) Determine factors affecting population persistence; 6) Information and education.

LAND MANAGEMENT/OWNERSHIP: BLM - Kingman, Safford and Tucson Field Offices; USFS - Tonto National Forest; TNC - Hassayampa River Preserve; Roper Lake State Park; Private.

SOURCES OF FURTHER INFORMATION

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ADDITIONAL INFORMATION:

Revised: 1994-09-15 (JNY)
1995-01-29 (KLY)
2001-10-10 (SMS)

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AFCJC02040
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Catostomus* (=*Pantosteus*) *clarki*
COMMON NAME: Desert Sucker, Gila Mountain Sucker
SYNONYMS: *Pantosteus clark*i, *Minomus clarki*
FAMILY: Catostomidae

AUTHOR, PLACE OF PUBLICATION: Baird and Girard, 1854. Descriptions of new species of fishes collected in Texas, New Mexico, and Sonora, by Mr. John H. Clark on the United States and Mexico boundary survey, and in Texas, by Capt. Van Vliet, U.S.A., second part. Proc. Acad. Nat. Sci. Phila. 7:27.

TYPE LOCALITY: "Rio Santa Cruz, Gila" (Basin, Arizona); Jordan (1885).

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: Nine fish varieties from Arizona are included in this genus. Is a member of the subgenus *Pantosteus*. *C*. (=*P*.) *clarki* can be separated from other members of the subgenus by a much lower number of predorsal scales 23(15-30) and lower number of scales, 71(64-81), in the lateral line. Three forms exist in Arizona in the Gila, Bill Williams and the Virgin River drainages.

DESCRIPTION: "Medium-sized catostomid fish, attaining adult size of 100.0 to 280.0 mm (3.9 to 11.0 in.)(or more, to 325.0 mm (12.8 in.)) in standard length; lips large with small papillae evenly dispersed over lower lip" (Minckley 1973). "Jaws with cartilaginous scraping edges" (Sublette et al. 1990). "Scales in the lateral line, 61 to 104, usually 65 to 80 in the Gila drainage, and 80 to 100 in the Virgin River and Bill Williams River drainage. Dorsal rays, 8 to 12, usually 10 or 11; pelvic rays, 8 to 12, usually 9 or 10" (Minckley 1973). Usually a small flap of skin present at the base of each pelvic fin. Coloration silvery tan to dark greenish above, silvery to yellowish below.

AIDS TO IDENTIFICATION: Similar in appearance to other Catostomids inhabiting the same waters except the desert sucker has the cartilaginous edges on the inside of the lips. Hybrids have been reported by Clarkson and Minckley (1988) between *C*. (*Pantosteus*) *clarki* and *C. insignis*.

ILLUSTRATIONS:
B&W photo (Minckley 1973:165)
Color drawing (Page and Burr 1991)
Color photo (Rinne and Minckley 1991:20)
B&W photo (Rinne and Minckley 1991:20)

Line drawing (Sigler 1987: 18)
Line drawings (Sublette et al. 1990:205)
B&W photos (Sublette et al. 1990:205)

TOTAL RANGE: Occurs in the lower Colorado River downstream from the Grand Canyon, generally including the Bill Williams, Salt, Gila, and San Francisco River drainages. "The Gila basin and San Francisco drainage in extreme headwater situations" (Sublette et al. 1990). The tributary streams of the Gila River drainage upstream of the Gila, Arizona, along with the Virgin River basin of Utah, Arizona, and Nevada including the pluvial White River and Meadow Valley Wash.

RANGE WITHIN ARIZONA: Occurs throughout the entire Gila River basin, and in the Bill Williams tributaries (Minckley 1973). Has decreased rapidly in southern part of range (AGFD Native Fish Diversity Review 1995).

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: These suckers feed by scraping stones using their cartilage-sheathed jaws. Some studies have indicated that desert suckers exhibit little seasonal movement and are resistant to downstream displacement despite floods. Preferred temperature is believed to be 17.5º C within modal bounds ranging from 10.0-21.0º C, although they have been found to survive temperatures exceeding 32.0º C. Experimental studies on oxygen deprivation suggest that it has a lower tolerance to reduced oxygen than other native stream fishes. Shows resistance to displacement during flood events.

REPRODUCTION: Spawning is generally in late winter and early spring where adults congregate in large numbers on riffles, in a manner similar to other species of *Catostomus*. Actual act of spawning generally consists of one large female and several smaller males. Adhesive eggs are deposited in a shallow depression made in the gravel. Eggs hatch in a few days. Young tend to congregate along the banks in quiet water in tremendous numbers, then progressively move into the mainstream as they increase in size. Juveniles are mature by their second year of life at a length of about 10.2-12.7 cm (4-5 in).

FOOD HABITS: Chironomid larvae are the primary food of juveniles. As an adult, this species is primarily herbivorous, scraping aufwuchs (diatoms and algae) from stones as well as ingesting plant detritus.

HABITAT: Found in rapids and flowing pools of streams and rivers primarily over bottoms of gravel-rubble with sandy silt in the interstices. Adults live in pools, moving at night to swift riffles and runs to feed. Young inhabit riffles throughout the day, feeding on midge larvae.

ELEVATION: 146 to 2,696 meters (480 to 8,840 feet).

PLANT COMMUNITY:

POPULATION TRENDS:

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: SC (USDI, FWS 1996)
[C2 USDI, FWS 1994]

STATE STATUS: IB (AGFD SWAP 2012)

OTHER STATUS: Bureau of Land Management Sensitive (USDI, BLM AZ 2000, 2005, 2008, 2010)
Forest Service Sensitive, (USDA FS Region 3 2013).

MANAGEMENT FACTORS: Alteration of historic flow regimes and construction of reservoirs have diminished available habitat. In addition, the stocking of non-native fishes has increased competition and or introduced hybridization. A winter snagging season for anglers currently (1994) exists for this sucker and the Sonora sucker, below Stewart Mountain Dam on the Lower Salt River. This management action was taken as a measure to encourage harvest of the species, as many die during the extremely low winter water flows.

PROTECTIVE MEASURES TAKEN: Two studies are underway which will document current population dynamics of the desert sucker in reaches of two central Arizona rivers: "Effects of Fish Snagging on the Lower Salt River" and "Roundtail Chub Study on the Lower Salt/Verde Rivers." Both Enhancement Fund studies will be conducted in FY 94-95.

SUGGESTED PROJECTS: Distribution and population studies within known range.

LAND MANAGEMENT/OWNERSHIP: BIA - Fort Apache, Fort McDowell, Salt River Pima and San Carlos Reservations; BLM - Arizona Strip, Kingman, Phoenix, Safford and Tucson Field Offices; BOR - Phoenix Area; NPS - Montezuma Castle National Monument; USFS - Apache-Sitgreaves, Coconino, Coronado, Prescott and Tonto National Forests; State Land Department; AGFD Black River Lands; Dead Horse Ranch and Red Rock State Parks; Sonoita Creek State Natural Area; TNC - Cascabel Community Management Area, Patagonia-Sonoita Creek, and Aravaipa Canyon and Muleshoe Ranch Preserves; Private.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Rob W. Clarkson – Bureau of Reclamation, Phoenix.

John N. Rinne - USFS Rocky Mountain Forest and Range Experiment Station, Flagstaff, Arizona.

ADDITIONAL INFORMATION:

This species has been actively pursued by archery enthusiasts in tributaries of the Gila River drainage.

Revised: 1994-07-01 (JJW)
1995-01-29 (KLY)
1997-03-04 (SMS)
2001-10-10 (SMS)
2002-12-04 (RHB)

Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AFCJB13160
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Gila intermedia*
COMMON NAME: Gila Chub
SYNONYMS: *Gila gibbosa, Tigoma intermedia, Tigoma gibbosa, Gila nigra, Squalius intermedius, Squalius niger, Squalius lemmoni, Leuciscus intermedius, Leuciscus niger, Richardsonius gibbosus, Gila robusta intermedia*
FAMILY: Cyprinidae

AUTHOR, PLACE OF PUBLICATION: Baird, S.F. and C. Girard. 1854. Descriptions of new species of fishes collected in Texas, New Mexico and Sonora, by Mr. John H. Clark, on the U.S. and Mexican Boundary Survey, and in Texas by Capt. Stewart van Vliet, U.S.A. Procedures of the Society of Natural Sciences, Philadelphia, 7:24-29.

TYPE LOCALITY: Unknown

TYPE SPECIMEN: Unknown

TAXONOMIC UNIQUENESS: The *Gila* genus is a complex association of Cyprinid fishes inhabiting the Western U.S. and Mexico. Eight species known from Arizona (Minckley 1973). *G. intermedia* most closely related to *Gila robusta robusta* and *Gila robusta grahami* (Rinne 1969).

DESCRIPTION: Female Gila chubs may grow to 25.0 cm (9.8 in.) while males seldom reach 15.0 cm (5.9 in.) in total length (Rinne and Minckley 1991).

Minckley in 1973 described the following, *G. intermedia*: "Body chunky. Scales large, thick, and broadly imbricated, basal radii usually present. Lateral-line scales almost always fewer than 80. Dorsal fin-rays usually eight or fewer (rarely nine). Anal fin-rays eight or fewer. Pelvic fin-rays 8 or 9. Length of head divided by depth of caudal peduncle usually 3.0 or less. An abrupt, soft and fatty, nuchal hump rarely developed in large females of some populations. Total vertebrae 38-45, usually fewer than 42. Pharyngeal arch similar to that of G. robusta, teeth 2, 5-4, 2.

Color dark, over-all sometimes lighter on belly. Diffuse lateral bands rarely present. No basicaudal spot. Breeding males with red or orange on lower cheek, posterior parts of lips, paired fin bases, and on ventro-lateral surfaces (including caudal peduncle)."

AIDS TO IDENTIFICATION: May be distinguished from roundtail chub, *Gila robusta*, by chunkier body type. Length of head measured from terminus to posterior edge of operculum divided by the minimum depth of caudal peduncle is usually less than 3.0.

ILLUSTRATIONS: B&W photo (Minckley 1973:104)
Color photo (Rinne and Minckley 1991:24)

TOTAL RANGE: Historically found in headwater streams of Gila River drainage in Arizona, New Mexico and likely in Santa Cruz River system in Sonora, Mexico. It has recently been rediscovered in the San Pedro drainage in Sonora Mexico, where it had been absent in collections since 1857. Currently considered extirpated from New Mexico.

RANGE WITHIN ARIZONA: Currently known from the following drainages; Santa Cruz River (Cienega Creek, Sabino Canyon, Sheehy Spring), Middle Gila River (Eagle, Bonita and Harden Cienega Creeks and San Carlos and Blue Rivers), San Pedro River (Bass, O'Donnell and Redfield Canyons, Babocomari River and Turkey Creek), Agua Fria River (Silver and Sycamore [rare] Creeks), Verde River (Spring and Walker Creeks). Extirpated from Monkey Spring (Santa Cruz River), and Fish and Cave Creeks (Salt River).

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Gila chub were commonly found in association with Gila topminnow, desert and sonora sucker and longfin and speckled dace. Females achieve lengths of 10 in (25 cm), whereas males rarely grow longer than 6 in (15 cm). It is highly secretive, seeking out deeper waters near cover.

REPRODUCTION: Gila chub probably mature in their second to third year. Reproduction occurs primarily from late spring into summer in streams, but can extend into late winter in constant temperature springs. Spawning occurs over beds of submerged aquatic vegetation (Minckley 1973). Actively breeding fish become fire-red along ventro-lateral surfaces and the eyes become yellow to yellow-orange (Minckley 1973).

FOOD HABITS: Gila chub are omnivorous, preferring terrestrial and aquatic insects. At larger sizes they become pisciverous and have been found to consume speckled dace, *Rhinichthys osculus*, and probably other small cyprinids as available. Larger adults feed during evening and early morning hours. Juveniles will feed throughout the day on insects and algae, filamentous and diatomaceous.

HABITAT: Gila chub are normally found in the smaller headwater streams, cienegas and springs or marshes of the Gila River basin. They utilize diverse habitat types based on season and age. Adults have been collected from deep pools with heavily vegetated margins and undercut banks. Juveniles have been collected from riffles, pools and undercut banks of runs. In larger stream systems they utilize heavily vegetated backwaters for cover and feeding. According to Minckley (AGFD Native Fish Diversity Review 1995), they occur in marginal sites (refuges), and likes permanent sites such as seeps etc.

ELEVATION: Arizona records range in elevation from 2,720 - 5,420 ft. (830 - 1,653 m).

PLANT COMMUNITY: Broadleaf riparian vegetation consisting of cottonwood, willow, ash, alder, sycamore, walnut, and *Baccharis* spp. in association with submerged aquatic vegetation typical of cienega/marsh habitats.

POPULATION TRENDS: Populations are expected to expand and contract both seasonally and over time as climactic events affect aquatic habitat. Populations of Gila chub have slowly been disappearing. It was once found in Apache Creek, Duck Creek and San Simon Cienega in New Mexico but is now considered extirpated. They are also extirpated from three waterways in Arizona (Cave Creek, Fish Creek and Monkey Spring). Little is known about distribution of populations in Mexico. Population in Williamson Valley has been extirpated due to 1992 flood event. A population was introduced into Garden Canyon in the Fort Huachuca Mountains in 1992 by Henderson (AGFD Native Fish Diversity Review 1995).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: LE (USDI, FWS 2005) with Critical Habitat [LE USDI, FWS 2006]

STATE STATUS: 1A (AGFD SWAP 2012)
[WSC, AGFD, WSCA in prep]
[State Threatened AGFD, TNW 1988]

OTHER STATUS: State Endangered, Group 1 (NMGFD 1975)
Forest Service Sensitive (USDA, FS Region 3 1999)
[Forest Service Sensitive USDA, FS Region 3 1988]
P, Listed Endangered (Secretaría de Desarrollo Social 1994, and Secretaría de Medio Ambiente 2000, 2010)

MANAGEMENT FACTORS: Controlling the introduction of exotic fish to streams containing Gila chub is vital to their survival. Gila chub are currently co-existing with green sunfish, *Lepomis cyanellus*, in several streams; however, they have been extirpated from one location by largemouth bass, *Micropterus salmoides*. Land management activities that affect watersheds, alter stream flow characteristics or affect the amount of perennial water in streams may affect populations of Gila chub, especially management activities that increase erosion and destroy stream banks.

Threats: aquifer pumping; stream diversion; reduction in stream flows; habitat alteration and competition by nonnative crayfishes; predation by and competition with nonnative fishes.

Management needs: identify and priority-rank management areas; protect watershed and stream flow and restore stream habitats for chub management areas; ameliorate effects of predatory and competitory nonnative fishes and crayfishes in chub waters.

PROTECTIVE MEASURES TAKEN: Portions of O'Donnell Creek, Redfield Canyon and Bass Canyon are included in the Canelo Hills and Muleshoe Preserves, managed by the Nature Conservancy (TNC). A portion of Cienega Creek at the Empire Ranch is managed by the Bureau of Land Management (BLM) as a natural area. BLM Phoenix District is currently proposing translocations from Silver Creek to nearby perennial streams in the Agua Fria headwaters.

SUGGESTED PROJECTS: The Arizona Game and Fish Department is currently conducting a status review of Gila chub under contract to TNC to enable the U.S. Fish and Wildlife Service to determine whether it warrants listing under the Endangered Species Act. Basic life history and ecological research is necessary to better understand this species. Annual or bi-annual monitoring of Gila chub populations should be conducted to identify population trends and factors contributing to population declines.

LAND MANAGEMENT/OWNERSHIP: Streams containing Gila chub are owned and managed by a diverse assemblage of organizations including: BIA - San Carlos Reservation; BLM - Phoenix, Safford and Tucson Field Offices; FWS - San Bernardino National Wildlife Refuge; USFS - Apache-Sitgreaves, Coconino, Coronado, Prescott and Tonto National Forests; State Land Department; TNC - Canelo Hills Cienega and Muleshoe Ranch Preserve; and Private.

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ADDITIONAL INFORMATION:

Revised: 1994-09-12 (DAW)
1994-10-27 (MAL)
1995-01-29 (KLY)
1997-03-05 (SMS)
1997-11-14 (SMS)
2001-10-10 (SMS)
2002-12-04 (RHB)

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Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AFCJB37151
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Agosia chrysogaster chrysogaster* Girard
COMMON NAME: Gila Longfin Dace
SYNONYMS: *Rhynichthys chrysogaster* (Girard), *Agosia metallica* Girard, *Hyborhynchus siderius* Cope, *Zophendum siderium* Jordan
FAMILY: Cyprinidae

AUTHOR, PLACE OF PUBLICATION: *Agosia chrysogaster* Girard. 1856: 187 [23], Proc. Acad. Nat. Sci. Phila. V. 8; ref. 1810.

TYPE LOCALITY: North America, Mexico, state of Sonora, Río Santa Cruz.

TYPE SPECIMEN: Full species: Type - USNM-00000081. J.H. Clark (no date). Syntype MCZ 1957.

TAXONOMIC UNIQUENESS: Only *Agosia* species in Arizona. Two forms occur in Arizona, the Gila form (*A. c. chrysogaster*) and the Rio Yaqui form (*A. chrysogaster* sp. 1).

DESCRIPTION: Full species: Body is "fusiform; with small scales. Adults rarely exceed 65 mm (2.6 in.) standard length. Scales in lateral line 70-90" (Sublette et al. 1990). Head is "thick and blunt. Mouth small, subterminal, oblique; overhung by a bluntly rounded snout; mouth terminates posteriorly at a point under the nares. Back and upper sides silvery gray to olive, sides sometimes with golden flecks; lower sides and abdomen whitish; peritoneum black. Diffuse dusky lateral stripe originates at upper corner of opercle, terminating in a black spot at base of caudal fin." (Sublette et al. 1990).

AIDS TO IDENTIFICATION: The longfin dace can be distinguished from other cyprinids by a small subterminal mouth, small barbells, and the lack of a dark spot on the anterior part of its triangular dorsal fin (Sublette et al. 1990).

ILLUSTRATIONS:
Black & White photos (Minckley 1973:126)
Color photo (Rinne and Minckley 1991:17)
Line drawing (Sublette et al. 1990:89)
Black & White photos (Sublette et al. 1990:89-90)
Color photo (USGS web site)
Color photo (John N. Rinne, *in* http://www.fishbase.org/Photos/PicturesSummary.cfm?ID=2742&what=species)

Color photo, from Aravaipa Creek (John Rinne, *in* http://www.utexas.edu/tmm/sponsored_sites/dfc//na/cyprinid/rhinicht/rchrysog/i_rchrys.shtml)
Color photos of female and male (Dean A. Hendrickson, *in* http://www.utexas.edu/tmm/sponsored_sites/dfc//na/cyprinid/rhinicht/rchrysog/i_rchrys.shtml)

TOTAL RANGE: Native to the Gila, and Bill Williams drainages in Arizona, and the, Magdalena, and Sonoyta drainages in Mexico. They were introduced into the Virgin River basin in Arizona (not established), and the Zuni (not established) and Mimbres rivers, Rio Grande basin (below Elephant Butte Reservoir) and Rio Hondo in New Mexico (considered exotic).

RANGE WITHIN ARIZONA: Primarily in the Gila and Bill Williams drainages and introduced into the Virgin River basin, Arizona. Per W.L. Minckley (AGFD Native Fish Diversity Review 1995), distribution has increased in mountainous areas, probably due to climatic trends. The Rio Yaqui form (*A. chrysogaster* sp. 1) occurs on the San Bernardino National Wildlife Refuge and the Willcox Playa and its tributaries (2005 Fish Diversity Review Team).

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: In response to the onset of a flooding event, longfin dace will move directly into the margins of the current and move back into the channel as discharge declines: they are rarely caught in flood pools or backwaters (Minckley and Barber 1971: Rinne 1975). During drought, they may be found in algal mats or under logs and stones. According to Rinne and Minckley (1991), "It has a remarkable capability to disperse into new habitats, appearing a few hours or days after flow reestablishes in formerly dry stream channels. Longfin dace were once recorded to survive in tiny volumes of water beneath mats of filamentous algae, then reproduce a few days after when summer rains rejuvenated the stream." Maximum life span is three years. This species is highly susceptible to predation, thus removal of non-native species including crayfish from their habitat, is important to the long-term survival of this species in the state (2005 Fish Diversity Review Team).

REPRODUCTION: They may spawn throughout the year but primarily in spring from December to July, and perhaps to September, in low-desert habitats. Most individuals are sexually mature in their first year. The Colorado River longfin dace create saucer-shaped depressions where the eggs are deposited and newly hatched young remain for a brief time, however, these spawning behaviors have not been observed in the Rio Yaqui populations (Rinne and Minckley 1991). Nests are usually excavated in shallow water 2-4 inches (5-20 cm) deep with a slight current and over sandy bottoms; eggs are buried by the spawning act. Nests arrange from 5.9-9.8 inches (15-25cm) in diameter. Hatching occurs in within 4 days. Fry stay in nest until the yolk sac is mostly absorbed before dispersing to shorelines areas. "Fecundity is positively correlated with fish length, weight, ovary weight, and maturity index and therefore is a function of size" (Kepner 1982).

FOOD HABITS: Their diet can be highly variable among populations in different areas. They are omnivorous and opportunistic, feeding primarily on detritus (Minckley 1973, Sublette et al. 1990), but will also feed upon various aquatic invertebrates, zooplankton, and algae depending upon availability. They prefer to feed during the daylight when resources are abundant.

HABITAT: The habitat of longfin dace is wide ranging, from intermittent hot low-desert streams to clear and cool brooks at higher elevations. They tend to occupy relatively small or medium size streams, with sandy or gravely bottoms; eddies, pools near overhanging banks or other cover. Usually in water less than 0.6 ft (0.2 m) deep with moderate velocities of around 1.1f/s (0.3m/s). They are rarely abundant in large streams or above 5,000 ft (1524 m). Generally found in water less than 75□F (24□C), but are tolerant of high temperatures and low dissolved oxygen. During low water, they may take refuge in moist detritus and algal mats (Sublette et al. 1990).

ELEVATION: Generally less than 4,900 feet (1500 meters), but have been recorded ranging to 6,700 ft (2050 m).

PLANT COMMUNITY: Varied, from desert scrub to the lower end of conifer woodlands.

POPULATION TRENDS: Declining trend. According to the 2005 Fish Diversity Review Team, the trend is declining; populations are losing connection due to the loss of the main-stem populations. They are gone from the main-stem of the upper Gila River, are hard to find in the San Pedro River, and are declining in the upper Verde River. It is felt that the Longfin Dace will probably wink out in many sites including the San Pedro River in the next ten years. The Srank has been left at S3S4, but needs to be re-evaluated in 5 years due to the downward trend. According to NatureServe (2005), population trends are unclear, apparently naturally expanding in some areas while stable or declining in other locations; threats are widespread and ongoing. Individual populations may be moved due to changes in water flow. This species can suffer massive mortalities but has the ability to recover numbers rapidly.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: Full species: SC (USDI, FWS 1996)
Full species: [C2 USDI, FWS 1994]

STATE STATUS: 1B (AGFD SWAP 2012)

OTHER STATUS: Full species:
Bureau of Land Management, Sensitive (USDI, BLM 2000, 2005, 2008, 2010)
None, USDA FS Region 3, 2013
[Forest Service Sensitive USDA, FS Region 3 2007]

A, Listed Threatened – Full species (Secretaría de Medio Ambiente 2000, 2010)
[Listed Threatened – full species, Secretaría de Desarrollo Social 1994]

MANAGEMENT FACTORS: For the species: Threats include human activities that alter the quality or flow of water. Flood control, groundwater pumping, and irrigation practices, particularly threatens this species. Non-native species (e.g. Red Shiner, crayfish, etc.) are another major threat to Longfin Dace. Removal of non-native species including crayfish, is important to their health and long-term survival.

The upstream aquifer of Aravaipa Creek Canyon needs to be protected, to insure the existence of a healthy population of this species. Over-appropriation or use of the headward Sulphur Springs Valley aquifer needs to be guarded against. Maintenance of flow in this stream is highly critical because of the habitation of shallow riffle areas by 5 of the 7 remaining native Cypriniform fishes. (BISON, 2000).

According to Rinne (2004), the effects of fire need to be considered when managing for this species. Specifically, the "Study of the effects of wildfire on fishes and their habitats in the Southwest by the USDA Forest Service, Rocky Mountain Research Station escalated in 2002—one of the worst years for wildfire on record…. Because the fish fauna of this region is 1) low in diversity (Rinne and Minckley 1991), 2) dispersed in isolated reaches of streams (Rinne 1995), 3) rapidly declining due to multiple effects (Rinne 2002, 2003c), and 4) largely comprised of threatened and endangered species of fishes, (Rinne 2003b) forest managers and researchers must collaboratively study and manage this rapidly emerging forest issue."

PROTECTIVE MEASURES TAKEN: Some protection is given to the population in Aravaipa Creek (and the Turkey Creek tributary) based on management by the Nature Conservancy. But concern exists for the potential for over-pumping of the Sulphur Springs aquifer that supplies this creek.

SUGGESTED PROJECTS: Taxonomy and basic life history studies, additional investigation of reproductive activities (especially in the Rio Yaqui basin), and work to determine the best removal methods of non-native species, are needed. In addition, need new and continuing inventory of their range to determine the status of this species, especially in smaller streams.

LAND MANAGEMENT/OWNERSHIP: BIA - Fort McDowell and San Carlos Reservations; BLM - Havasu, Kingman, Phoenix, Safford and Tucson Field Offices; NPS - Montezuma Castle National Monument; USFS - Apache-Sitgreaves, Coconino, Coronado, Prescott and Tonto National Forests; State Land Department; Sonoita Creek State Natural Area; Cienega Creek Natural Preserve; TNC - Aravaipa Canyon, Cottonwood Spring, Hassayampa River and

Muleshoe Ranch Preserves, and Patagonia-Sonoita Creek and Cascabel Community Management Area; Private.

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Jeremy Voeltz – Nongame Branch, Arizona Game & Fish Dept. Phoenix.

ADDITIONAL INFORMATION:

Was placed in the genus *Rhinichthys* by Woodman (1992).

"Because the majority of southwestern native fishes are threatened, endangered, or Forest Service sensitive and state-listed species, managers must be vigilant of opportunities to remove fishes from streams whose watersheds are affected by wildfire. There are often very brief (2-3 weeks or less) windows of opportunity to salvage stocks before toxic ash or flood flows result. … Because most populations of rare, southwestern fishes are isolated and unique genetically they are evolutionary significant units. As such, they cannot be replaced once lost." (Rinne, 2004).

Revised: 1994-08-10 (MHH)
1995-01-29 (KLY)
1997-03-04 (SMS)

2002-11-20 (RHB)
2006-03-16 (SMS)
2013-11-14 (BDT)

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Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AFCNC05021
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Poeciliopsis occidentalis occidentalis*
COMMON NAME: Gila Topminnow

SYNONYMS: *Poeciliopsis occidentalis* (accepted)
Heterandria occidentalis
Girardinus occidentalis
Poecilia occidentalis
Mollienisia occidentalis
Arizonichthys psammophilus

OTHER COMMON NAMES: Sonoran Topminnow
FAMILY: Poeciliidae

AUTHOR, PLACE OF PUBLICATION: Baird, S.F. and C. Girard. 1853. Descriptions of new species of fishes collected by Mr. John H. Clark, on the U.S. and Mexican Boundary Survey, under Lt. Col. Jas. D. Graham. Procedures of the Academy of Natural Sciences, Philadelphia, 6:387-390.

TYPE LOCALITY: Santa Cruz River, near Tucson, Arizona.

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: Formerly classified as a subspecies of *P. occidentalis*, with *P.o. sonoriensis.* Hedrick et al. (2001) suggested that each subspecies be recognized as distinct species, based on genetic variation. This taxonomy is broadly accepted, and has been confirmed by Miller (2005), Minckley and Marsh (2009), and Page and Burr (2011). In total, three species in genus, with two occurring in Arizona.

Although recognition of this organism at the species level is widely accepted, the two subspecies are recognized as Species of Greatest Conservation Need in the Arizona Wildlife Conservation Strategy (Arizona Game and Fish Department 2022) with the Gila Topminnow listed under the taxonomy *Poeciliopsis occidentalis occidentalis*. The U.S. Fish and Wildlife Service (2019) also acknowledges *P. occidentalis occidentalis* as a recognized subspecies of the listed entity Gila Topminnow (including Yacqui) (*P. occidentalis*). Therefore, the Heritage Data Management System tracks the taxon as subspecies.

DESCRIPTION: The dorsal profile is slightly curved, and the body is somewhat elongated. Caudal fin rounded to almost square (Minckley 1973). Gonopodium of male elongated, reaching past the snout when in copulatory position. Males are small, rarely more than 2.5 cm (0.98 in.) standard length; females are larger, sometimes 5.0 cm (1.97 in.) or more, usually 3.0 to 4.5 cm (1.18 to 1.77 in.), standard length (Minckley 1973).

Body is tan to olivaceous; darker above and with white often observed on the belly. The scales on the dorsum darkly outlined, extending as black speckles to upper belly and pre-pectoral area; lateral band dark and continuous along sides (Minckley 1973). Fins with rays outlined with melanophores, but lacking dark spots. Breeding males blackened, with some golden in midline of predorsum, and orange at base of gonopodium and sometimes at base of dorsal fin. Females in breeding condition with darkened peritroct (Minckley 1973).

AIDS TO IDENTIFICATION: The two subspecies of topminnows in Arizona, can be distinguished by several morphological characteristics. In *P. o. occidentalis* the snout is short, the mouth subsuperior and the dark lateral band of the female extends from the opercle to the base of the caudal fin (Minckley 1973). In *P. o. sonoriensis* the snout is longer, the mouth superior and the lateral band of the female rarely begins before the base of the pelvic fins (Minckley 1973). In addition, *P. o. sonoriensis* are found at the headwaters of the Yaqui River, whereas *P. o. occidentalis* are found below the headwaters (Arizona Game and Fish Department Native Fish Diversity Review 1995).

Female topminnow may be distinguished from mosquitofish (*Gambusia affinnis*) by the lack of dark spots on the caudal fin and lack of dark sub-orbital teardrop-shaped mark; origin of dorsal and anal fin vertically in line, perpendicular to horizontal axis of fish; in mosquitofish origin of dorsal fin posterior to origin of anal fin (U.S. Fish and Wildlife Service 1999). Male topminnow in breeding condition may or may not become dark black, while male mosquitofish never do; male topminnow gonopodium, when extended forward in copulatory position, extends very near to or past the snout, while male mosquitofish does not (Minckley 1973). Topminnows have weak, spatulate teeth whereas mosquitofish have strong conically shaped teeth, distinguishable only with a microscope (Meffe et al. 1983). Female topminnows are generally larger than males.

ILLUSTRATIONS:
B&W photo (Minckley 1973:199)
Color photos (Rinne and Minckley 1991:26)
Color line drawing (Page and Burr 1991:239)
B&W photo (Wildlife Habitat Management Staff Group 1975:31)

TOTAL RANGE: Once occupied aquatic habitats in the entire Gila River drainage in New Mexico, Arizona and Mexico below 1,524 m (5,000 ft.) in elevation, forming an almost continuous population in wetter periods (Minckley 1999). Gila Topminnow is still found throughout much of its former range in Mexico, in the drainages of the Rios de la Concepcion, Sonora, Matape, and Mayo (Varela-Romero et al. 1990, Minckley et al. 1991, Campoy-Favela 1996). In New Mexico, only one population exists, at Burro Cienega. In Arizona, topminnow are known to occupy several localities in the Santa Cruz River system and Gila River system on the San Carlos Apache Indian Reservation; some of these localities contain re-introduced populations (Arizona Game and Fish Department 2018, U.S. Fish and Wildlife Service 2018).

RANGE WITHIN ARIZONA: Historically found in most perennial springs, streams and vegetated margins of rivers in the Gila River drainage in Yavapai, Gila, Pinal, Maricopa,

Graham, Greenlee, Cochise, Pima, Santa Cruz and Yuma Counties (Arizona Game and Fish Department 2018, U.S. Fish and Wildlife Service 2019). As of 2017, disjunct populations exist in 11–15 natural locations and 66 re-introduced locations within the Gila River drainage, particularly in the Santa Cruz River system, but spread across the historic range in a variety of ecological settings in Pima, Santa Cruz, Cochise, Graham, Greenlee, Pinal, Maricopa, and Yavapai Counties (Arizona Game and Fish Department 2018, U.S. Fish and Wildlife Service 2019).

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: At one time, this was the most common fish found in the Gila River Basin. Competitive and predatory interactions with introduced fish species, especially mosquitofish, have greatly reduced the range and abundance of the Gila Topminnow (Minckley 1999). The rapid replacement of topminnow by introduced mosquitofish, has been impressively documented at many localities (Minckley 1973); however, in some diverse habitats the two fishes have been able to co-exist for many years (Minckley et al. 1977, Minckley 1999). In most instances, replacement occurs through direct predation by mosquitofish on young and small Gila Topminnow, including shredding of the fins of larger topminnow, which leads to increased risk of infection (Minckley 1973). Long-term drought apparently has a synergistic and negative effect on this relationship, speeding the decline and disappearance of Gila Topminnow (Duncan 2013). Populations of Gila Topminnow historically expanded into intermittent waters during wet years and then retreated to headwater springs and perennial reaches of streams during drier years (Minckley 1999, Arizona Game and Fish Department 2018). Their high fecundity and long reproductive season, allows them to rapidly expand into new habitat (Minckley 1999). The life span of this species is approximately 1 year, but it appears to be linked to sexual maturation, which is dependent upon time of year in which they were born.

REPRODUCTION: Gila Topminnows are fertilized internally, where the young develop. Females may carry two broods simultaneously, one far more advanced than the other (U.S. Fish and Wildlife Service 1998). Females also have the ability to store sperm packets for later fertilization of eggs (Minckley 1991). The reproductive season normally lasts from March through August, but young may be produced year-round in some thermally stable springs (U.S. Fish and Wildlife Service 1998, Minckley 1999). During breeding, some males become dark black and exhibit aggressive breeding behavior, while others will not become black but still attempt to mate inconspicuously with females. The typical brood size ranges from 10–15 young, with larger broods produced during the summer. Brood time is 24–28 days, and young may reach sexual maturity in a few weeks to several months (U.S. Fish and Wildlife Service 1998).

FOOD HABITS: Gila Topminnows are omnivorous and opportunistic feeders. They utilize a broad spectrum of foods such as detritus and amphipods; but feed voraciously on aquatic insect larvae, especially mosquitos, when abundant (Minckley 1973, 1991).

HABITAT: Gila Topminnow use shallow shorelines and slackwater areas of small streams, springs, and marshes. They concentrate in protected inlets, shoreward of sandbars or debris, or associated with aquatic or streamside vegetation (Minckley 1999). This species prefers shallow

warm water in a moderate current with dense aquatic vegetation and algae mats. Topminnows can withstand water temperatures from near freezing to 90–100 degrees F (Heath 1962). They also can live in a fairly wide range of water chemistries, with a pH ranging from 6.6 to 8.9; dissolved oxygen readings from 2.2 to 11 mg/l (Meffe et al. 1983); and salinities from tap water to sea water (Schoenherr 1974, in U.S. Fish and Wildlife Service 1998).

ELEVATION: Attempted re-introductions indicate the species prefers elevations below 5000 ft. (1525 m). Based on records in the Heritage Data Management System (HDMS), elevation ranges from 1,320–7,510 ft. (403–2,291 m), with most below 5,000 ft. (AGFD, unpublished data accessed 2020).

PLANT COMMUNITY: Cottonwood/willow or burro brush/seep willow terrestrial riparian communities, in association with aquatic plants such as green algae, *Nasturtium, Chara*, and *Potamogeton* spp.

POPULATION TRENDS: Gila Topminnow was once the most common fish in southern Arizona, but has declined to natural populations at 11 (possibly 15) sites in Arizona (3 populations not observed since 2004 and 2005; rediscovered population in Santa Cruz River awaiting genetic analysis, unclear if this is a natural population) (Arizona Game and Fish Department 2018). Since the 1930's, more than 200 attempted reestablishments of Gila Topminnow have occurred in the historic range, of which, the vast majority failed, mainly due to change in environmental conditions and negative interactions with nonnative fishes (Voeltz and Bettaso, 2003).

Recent reintroductions have been more successful. In 2001 there were only 15 established populations located in the wild. In 2017, 40 wild populations had been established, with an additional 26 populations established in sites that require human intervention to provide and maintain water (Arizona Game and Fish Department 2018). Of the wild populations, 32 populations are considered viable, having greater than 500 individuals and having persisted for more than 5 years (Arizona Game and Fish Department 2018). This meets the criteria for delisting. The Arizona Game and Fish Department petitioned to reclassify the Gila Topminnow to threatened status in 2018 (Arizona Game and Fish Department 2018). The U.S. Fish and Wildlife Service (2019) issued a 90-day finding that this action may be warranted and initiated a review of the status to determine whether this petitioned action is warranted.

SPECIES PROTECTION AND CONSERVATION

Status definitions: https://bit.ly/hdms-status-definitions
Heritage Network Conservation Status Rank definitions: https://bit.ly/hdms-rank-definitions

ENDANGERED SPECIES ACT STATUS: LE,UR as *Poeciliopsis occidentalis* (USFWS 1967, 2019, 2023)

STATE STATUS: 1 (AZGFD, AWCS 2022)

HERITAGE NETWORK STATUS: G3
S1S2

OTHER STATUS: Bureau of Land Management Sensitive, (USDI, BLM Arizona, 2017)
Not Forest Service Sensitive (USDA, FS Region 3 1999, 2007, 2013)
Full Species - A, Determined Threatened in Mexico (Secretaría de Medio Ambiente y Recursos Naturales 2010)

PREVIOUS STATUS
ENDANGERED SPECIES ACT STATUS: LE (USDI, FWS 1967, 1970)
STATE STATUS: 1A (AGFD SWAP 2012)
Threatened (AZGFD, WSCA 1996 in prep)
Threatened (AZGFD, TNW 1988)

OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 1988)
Full Species Listed Threatened (Secretaría de Medio Ambiente 2000)
Full Species Listed Threatened (Secretaría de Desarollo Social 1994)

MANAGEMENT FACTORS: Five genetic management units are defined for this species; Monkey and Cottonwood Springs, Sharp Spring, the lower Santa Cruz River, Cienega Creek, and Bylas Spring (Hedrick et al. 2001, 2006). For redundancy, multiple refugia populations should be established from each management unit. Populations of each genetic management unit are maintained at the Arizona State University Animal Care Facility (Arizona Game and Fish Department 2018). Re-introduction into available historic habitat without introduced fishes should be continued. Land Management activities such as mining, grazing, fuel-wood cutting, logging etc., should be evaluated in relation to site-specific characteristics, as these activities can have either a positive or negative effect on Gila Topminnow populations due to timing, intensity or other activity related factors (U.S. Fish and Wildlife Service 1998).

Threats: Spring habitat development; aquifer pumping; habitat destruction; drought; predation by and competition with nonnative fishes (U.S. Fish and Wildlife Service 1998).

Management needs: Protect existing natural populations; identify sites for reintroduction; re-establish populations; monitor and manage reintroductions to maintain minimum of 55 sites in Arizona (U.S. Fish and Wildlife Service 1998).

PROTECTIVE MEASURES TAKEN: Listed as endangered under the Endangered Species Act (U.S. Fish and Wildlife Service 1967), although a petition to reclassify to threatened status has been received and found warranted by the US Fish and Wildlife Service (Arizona Game and Fish Department 2018, U.S. Fish and Wildlife Service 2019). Statewide Safe Harbor Agreement between Arizona Game and Fish Department and the U.S. Fish and Wildlife Service signed in

2007 (Arizona Game and Fish Department 2007). Of 78 populations in existence, 94 percent are on protected lands (federal, tribal, state, county, and city governments, private conservation organizations or private groups enrolled in conservation agreements) (Arizona Game and Fish Department 2018). Ninety-one percent of existing populations have bariers that isolate them from nonnative fishes. Of the remaining seven, fish barriers have been proposed or scheduled, and mechanical removal is occurring at two locations (Arizona Game and Fish Department 2018). Propagation of a native fish stock to be used as baitfish could reduce or eliminate use of nonnative baitfish in the Gila River basin (Arizona Game and Fish Department 2018). AZGFD is developing agreements with counties in the Gila River basin to use Gila Topminnow instead of western mosquitofish for vector control programs. This program was successfully piloted in 2017, and will help reduce the spread of western mosquitofish (Arizona Game and Fish Department 2018).

At Cottonwood Spring, a Conservation Agreement signed between U.S. Fish and Wildlife Service, The Nature Conservancy, and the private land owner established a cattle exclosure at the spring (U.S. Fish and Wildlife Service 1998). Portions of Cienega Creek are within the Bureau of Land Management's Las Cienegas National Conservation Area. Portions of lower Sonoita Creek, Fresno Canyon, and Coal Mine Canyon have been acquired by Arizona State Parks and are now part of the Sonoita Creek State Natural Area (U.S. Fish and Wildlife Service 1998). A Memorandum of Understanding was signed in 1981 between the U.S. Fish and Wildlife Service, AGFD and U.S. Forest Service allowing coordination for the re-introduction of Gila Topminnow on Forest Service administered lands. The Coronado National Forest has tried to improve conditions for the Gila topminnow in Redrock Canyon by closing roads, constructing exclosures, modifying Allotment Management Plans, and monitoring riparian conditions (U.S. Fish and Wildlife Service 1998).

Populations of each genetic management unit are maintained at the Arizona State University Animal Care Facility. Each genetic management unit is also represented by at least 7 populations which have persisted for at least 3 years (Arizona Game and Fish Department 2018).

SUGGESTED PROJECTS: Control nonnative fish in non-isolated locations, actions to minimize spread of western mosquitofish, monitoring effect of climate change on water availability, consider delisting species, as criteria are met.

LAND MANAGEMENT/OWNERSHIP: BIA - Salt River Pima and San Carlos Reservations; BLM - Kingman, Phoenix, Safford and Tucson Field Offices; NPS - Saguaro National Park; USFS - Coconino, Coronado, Prescott and Tonto National Forests; State Land Department; Roper Lake State Park; Sonoita Creek State Natural Area; TNC - Cottonwood Spring and Hassayampa River Preserves, and Patagonia - Sonoita Creek, Boyce Thompson Southwestern Arboretum; Private.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

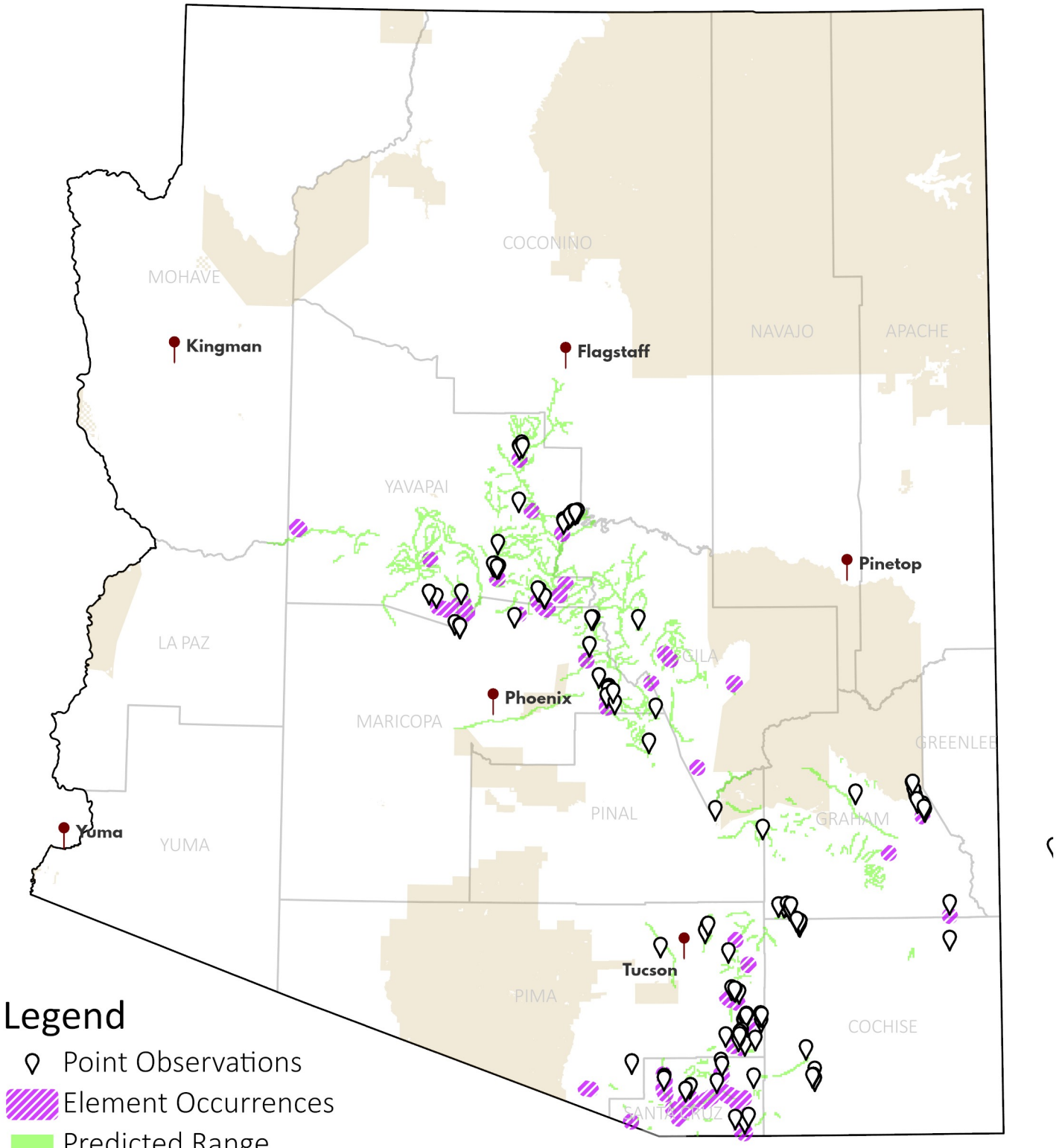
Jeff Simms - Bureau of Land Management, Safford District, Safford, Arizona
Jerry Stefferud - Tonto National Forest, Phoenix, Arizona
Sally Stefferud - USDI, Fish and Wildlife Service, Ecological Services, Phoenix, Arizona
David A. Weedman - Arizona Game and Fish Department, Habitat Branch, Phoenix

ADDITIONAL INFORMATION: Criteria for downlisting met in 2018. The Arizona Game and Fish Department petitioned to reclassify the Gila Topminnow to threatened status in 2018 (Arizona Game and Fish Department 2018). The petition was found warranted by the U.S. Fish and Wildlife Service in a 90-day finding (USDI, FWS 2019).

Revised: 1994-07-11 (DAW)
1995-01-31 (KLY)
2001-10-18 (SMS)
2020-08-11 (KSL)
2023-01-09 (MBL)
2024-10-11 (CPS)

Poeciliopsis occidentalis occidentalis

Gila Topminnow



Legend

- Point Observations
- Element Occurrences
- Predicted Range
- Tribal Lands
- Counties

N

0 50 100 Kilometers

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences. Predicted ranges indicate likely habitat suitability, not presence.

Heritage Data Management System
2019-06-12

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AFCJB20040
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Lepidomeda vittata*
COMMON NAME: Little Colorado Spinedace
SYNONYMS: *Lepidomeda jarrovii, Lepidomeda jarrovi*
FAMILY: Cyprinidae

AUTHOR, PLACE OF PUBLICATION: Cope, 1874, Proc. Amer. Philosoph. Soc. 14:129-139.

TYPE LOCALITY: Little Colorado River, somewhere between the mouth of the Zuni River and Sierra Blanca, Apache County, Arizona.

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: One of six species in genus, three of which are found in Arizona. All species in genus occur in western North America.

DESCRIPTION: Small, generally less than 100.0 mm (3.9 in.) in length. Scales in lateral line usually more than 90. Second spine of dorsal fin strong. Dorsal fin moderately high, acute, its depressed length is 5.2 to 5.8 cm (2.05 to 2.3 in.) predorsal length. Eight anal fin rays, rarely nine. Pharyngeal teeth in two rows, 1 or 2, 4-4, 1 or 2 (Minckley 1973). Sides usually silvery, darker above and sometimes white below, rarely with lateral blotches. Upper side and back is olivaceous, bluish, or lead grey. Breeding males with bases of paired fins watery yellow to orange or red-orange, otherwise fins are clear, parts of belly watery-yellow.

AIDS TO IDENTIFICATION: Second spine of the dorsal fin strong compared to others in the genus. Identified with the combination of the 4-4 teeth in the main row, 8 anal rays, usually more than 90 lateral-line scales, and typically 41 or 42 total vertebrae distinguish it from the other species in the genus.

ILLUSTRATIONS: Photo (American Fisheries Society 1979:35).
B&W photo (Minckley 1973:109)
Color photo (Rinne and Minckley 1991:15)
B&W photo (Wildlife Habitat Management Staff Group 1975:14)

TOTAL RANGE: Endemic to the Little Colorado River and its north flowing tributaries, including the Arizona counties of Coconino, Navajo, and Apache. Historical distribution is similar to the current distribution but may have possibly occurred in the Zuni River watershed south of Gallup, New Mexico (Hill et al. 1989). Considered extirpated from Silver Creek and its tributaries (USFWS 2019).

RANGE WITHIN ARIZONA: Range comprised of disjunct populations in the Little Colorado River and several north-flowing tributaries in Eastern Arizona. Known to occur in various streams in the East Clear Creek watershed, Chevlon Creek watershed, and Little Colorado River headwaters (USFWS 2018). Occurs in Apache, Coconino, and Navajo counties.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY *L. vittata* appear to be quite capable of tolerating relatively harsh environments that undergo dramatic diel fluctuations in pH, dissolved gases, and water temperature. Predation occurs mainly from introduced *Oncorhynchus mykiss* (rainbow trout) and *Lepomis cyanellus* (green sunfish).

REPRODUCTION: Spawns prolifically in early summer and then sporadically throughout summer into early autumn. In males, bases of paired fins and parts of belly become watery-yellow during spawning season. Females lay 650 to 5000 eggs, and may spawn more than once a year. Engage in broadcast spawning over the bottom or on aquatic vegetation, and debris (Minckley 1973).

FOOD HABITS: Spinedace are omnivorous. Food items include chironomid larvae, other dipterans, filamentous green algae, and crustaceans (Runck and Blinn 1993). Laboratory studies and field collections revealed this species is opportunistic, and is able to switch diets with food availability (Blinn and Runck 1990).

HABITAT: Found in water ranging from 0.16-1.3 meters (0.5-4.3 feet) in depth, but most abundant in depths of around 0.6 meters (1.9 feet). Most common in slow to moderate water currents, over fine gravel bottoms. Avoids deep, heavily-shaded pools and shallow, open areas. Prefers unshaded pools with rocks or undercut banks for cover (Hill et al. 1989; Minckley 1984). Temperatures where populations exist generally range from 58-79F (14-26C). Young of the year are most abundant on uniformly turbulent riffles 10 to 25 cm (3.9 to 9.8) in depth (Minckley and Carufel 1967).

ELEVATION: 1,000 to 3,000 m (3,300 to 9,800 ft.).

PLANT COMMUNITY: Riparian vegetation includes *Alnus* (alder), *Salix* (willow), *Quercus* (oak), and mixed conifer species.

POPULATION TRENDS: Population trends are likely to decline in the long-term, due to extended drought and climate change. However, populations are likely to remain stable in the relatively near future (10-year timestep) (USFWS 2018).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: LT, with Critical Habitat (USDI, FWS 1987)
[PT (USDI, FWS 1985)]
[UR (USDI, FWS 1983)]
[C1 (USDI, FWS 1982)]
[PT (USDI, FWS 1967)]

STATE STATUS: 1 (AZGFD, AWCS 2022)
[1A (AGFD SWAP 2012)]
[WSC (AGFD, WSCA 1996 in prep)]
[Threatened (AGFD, TNW 1988)]

OTHER STATUS: Bureau of Land Management Sensitive (USDI, BLM AZ 2017)
Not Forest Service Sensitive (USDA, FS Region 3 2013)
[Forest Service Sensitive (USDA, A-S National Forest 2000)]
[Forest Service Sensitive (USDA, FS Region 3 1988)]

MANAGEMENT FACTORS: The limited, highly fragmented distribution and relatively low population numbers of this species make it highly vulnerable to stressors. Stressors effecting the Little Colorado Spinedace include drought, ground and surface water withdrawals, high-severity wildfires, and predation and competition with non-native warm water fishes, particularly Green Sunfish (*Lepomis cyanellus*) (USFWS 2018).

Threats: Natural events (habitat modification by ungulates in headwater meadows, high severity fires), environmental conditions (drought, climate change), and species characteristics (vulnerability of individuals and sites to non-native predators, competition with non-native crayfish).

Management needs: Delineate spinedace management areas; conserve existing populations and their watersheds; establish refugium sites within historical habitats; ameliorate effects of nonnative fishes in spinedace habitats.

PROTECTIVE MEASURES TAKEN: The Coconino and Apache-Sitgreaves National Forests have developed and implemented forest management projects intended to reduce the risk of high severity fires in drainages with either occupied or suitable habitat for *L. vittata* (USFWS 2018). The Coconino NF also has closed roads in sensitive portions of the East Clear Creek watershed (USFWS 2018). The lower reach of Chevelon Creek, the White Mountain Hereford Ranch (through which Rudd Creek flows), the Wenima property (through which the Little Colorado River flows), and the EC Bar Ranch (through with Nutrioso creek flows) are currently owned and managed by the Arizona Game and Fish Department (USFWS 2008, 2018). Little Colorado Spinedace were stocked into Willow Creek, Yeager Canyon, Kehl Canyon, and Barbershop canyon by AZGFD from 2013 to 2018. Additional sites have been identified for translocations by the Department and additional translocations are planned

(USFWS 2019). The Bureau of Reclamation, Forest Service, and USFWS are working to provide increased protection of headwater meadows in the East Clear Creek watershed (USFWS 2018).

SUGGESTED PROJECTS: Delisting recovery criteria includes the establishment and/or maintenance of a minimum of 5 viable populations for each of the 3 lineages (East Clear Creek, Chevelon Canyon, and Little Colorado lineages; 15 viable populations in total). There are currently 6-7 viable populations throughout the species range. Additional populations will be established through reintroduction. Populations must persist for five years to be considered viable (USFWS 2019).

Additional recovery criteria include maintenance of five core habitat and core recovery areas within each of the watersheds that support Little Colorado River spinedace, and establishment of at least one refugia for each of the Little Colorado River spinedace lineages (USFWS 2019). Non-recovery criteria suggested projects include protection of environmental flows in future water development plans, stream and riparian area restoration, development of watershed management plans, and control or non-native fish and aquatic organisms (USFWS 2018).

LAND MANAGEMENT/OWNERSHIP: BIA - Hopi Reservation; BLM; USFS - Apache-Sitgreaves and Coconino National Forests; AGFD - Sipe White Mountain Wildlife Area and Wenima Riparian Corridor; Private.

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Dean Blinn, Northern Arizona University (retired), Flagstaff, Arizona

ADDITIONAL INFORMATION:

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Revised: 1994-07-19 (LOC)
1994-07-22 (SMS)
1994-09-07 (DBD)
2001-10-15 (SMS)
2020-07-07 (KSL)
2022-05-12 (KSL)
2023-01-09 (MBL)

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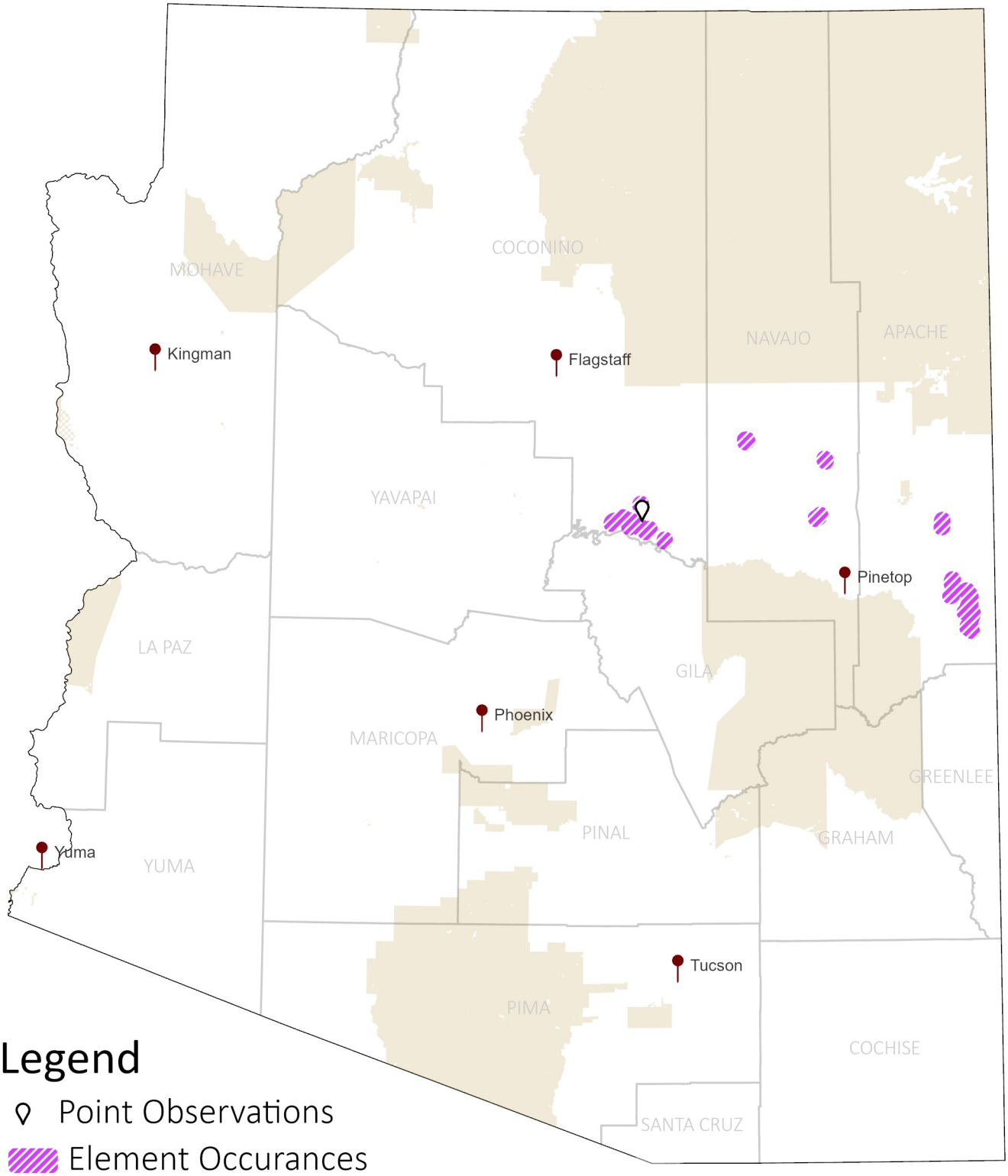
Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

Lepidomeda vittata

Little Colorado Spinedace



Legend

- Point Observations
- Element Occurances
- Tribal Lands
- Counties

N

0 50 100 Kilometers

ARIZONA GAME & FISH

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences.

Heritage Data Management System
2022-07-25

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AFCJC02250
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Catostomus* sp. 3
COMMON NAME: Little Colorado Sucker, Little Colorado River Sucker
SYNONYMS: *Catostomus latipinnis*
FAMILY: Catostomidae

AUTHOR, PLACE OF PUBLICATION: Minckley, 1971, Keys to native and introduced fishes of Arizona. J. Arizona Acad. Sci., 6:183-188.

TYPE LOCALITY:

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS:

DESCRIPTION: Up to 50.0 cm (19.7 in.) total length and more than 1.0 kg (2.2 lbs.). Body fusiform, chubby and sharply bicolored, with dark gray to blue-black above and white to yellow below in both adults and young (Minckley 1973). Scales large with dorsal scales sharply outlined. Head relatively large, with a long snout and moderately enlarged lower lip. Fleshy lobes on lower lips not produced. Interradial membranes of fins typically dark. Lateral line scales 73 to 97, although usually fewer than 90. Dorsal fin-rays 11 or 12 (Minckley 1973).

AIDS TO IDENTIFICATION: Similar to flannelmouth sucker, *C. latipinnis*, though caudal peduncle is thicker and deeper, lower lip is smaller, and distal margin of dorsal fin is slightly falcate to square (Page and Burr 1991).

ILLUSTRATIONS:
B&W photo (Minckley 1973:158)
Color photo (Rinne and Minckley 1991:21)

TOTAL RANGE: Endemic to the upper portion of the Little Colorado River and many of its north flowing tributaries (Coconino, Navajo and Apache Counties). Also introduced into the Salt River.

RANGE WITHIN ARIZONA: See "**TOTAL RANGE**."

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Isolated in range from the remainder of the Colorado River system by a series of falls (Minckley 1973).

REPRODUCTION: Spawning occurs in early- to mid-spring. Young occupy slow moving riffles (Minckley 1973).

FOOD HABITS: "Foods consist of detrital material, algae and some higher vegetation, and a substantial proportion of aquatic invertebrates. Feeding occurs late in the evening and early in mornings with large adults moving to riffle areas and stirring large areas of gravel and sand with their activities" (Minckley 1973).

HABITAT: In creeks, small to medium rivers, and impoundments. Predominantly found in pools with abundant cover. Also found in riffles.

ELEVATION: 670 to 2160 m (2,200 to 7,100 ft.). Based on records in the Heritage Data Management System (HDMS), elevation ranges from 4,900 to 7,350 ft (1495 - 2242 m) (AGFD, unpublished data accessed 2001).

PLANT COMMUNITY: Riparian vegetation includes: *Alnus* (alder), *Salix* (willow), *Quercus* (oak), *Juniperus* (juniper), *Tamarix* (salt cedar) and mixed conifer species.

POPULATION TRENDS: Reductions in historic numbers and distribution are thought to have occurred as a result of habitat loss. Loss of habitat has occurred due to reduction in stream flows (leading in some instances to complete dewatering of the channel), water diversions, dam construction, channel and watershed erosion, and interactions with non-native fish species. A continuing downward trend is expected as these factors continue to impact this species.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: CCA (USDI, FWS 2006)
[None USDI, FWS 1996]
[C2 USDI, FWS July 1994 *]

STATE STATUS: 1A (AGFD SWAP 2012)
[WSC, AGFD, WSCA in prep]
[Candidate AGFD, TNW 1988]

OTHER STATUS: Bureau of Land Management Sensitive (USDI, BLM AZ 2010)
[None - USDI, BLM AZ 2005]
[Bureau of Land Management Sensitive USDI, BLM AZ 2000, 2008]

Forest Service Sensitive (USDA, FS Region 3 1999, 2007, 2013)

MANAGEMENT FACTORS: Maintenance of instream water flows. Consideration of deleterious impacts from non-native fish species interaction.

PROTECTIVE MEASURES TAKEN: In 2006 a Statewide Conservation Agreement was completed and signed by nine natural resource management entities in 2007: U.S. Fish and Wildlife Service, Arizona Game and Fish Department, U.S. Bureau of Reclamation, the Hualapai Tribe, Salt River Project, U.S. Bureau of Land Management, Arizona State Land Department, Arizona Department of Water Resources, The Nature Conservancy, and the U.S. Forest Service (AGFD 2006).

SUGGESTED PROJECTS: An effort is needed to fully describe and name the species. Studies are needed to further determine its life history.

LAND MANAGEMENT/OWNERSHIP: BIA - Hopi Reservation; BLM - Safford Field Office; USFS - Apache-Sitgreaves and Coconino National Forests; State Land Department; AGFD Chevelon Creek Wildlife Area and Wenima Riparian Corridor; Private.

SOURCES OF FURTHER INFORMATION

REFERENCES:

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USDI, Fish and Wildlife Service. 2006.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

Revised: 1994-09-06 (DBD)
1994-09-12 (MHH)
1997-03-05 (SMS)
2001-10-10 (SMS)

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Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

***Listed C2 in July 1994 per Sam Spiller, FWS State Supervisor (September 1994 memo), but not listed in the November 1994 Notice of Review.**

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AFCJB37140
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Tiaroga cobitis*
COMMON NAME: Loach Minnow
SYNONYMS: *Cliola cobitis, Rhinichthys cobitis*
FAMILY: Cyprinidae

AUTHOR, PLACE OF PUBLICATION: Girard, C. 1857. Researchers upon the cyprinoid fishes inhabiting the freshwaters of the United States of America, west of the Mississippi valley, from specimens in the Museum of the Smithsonian Institution. Proceedings of the Academy of Natural Sciences of Philadelphia 8(1856):165-213.

TYPE LOCALITY: San Pedro River, Arizona.

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: Monotypic genus

DESCRIPTION: Small stream dwelling minnow, rarely exceeding 65.0 mm (2.6 in.) in length. Elongated body is a little compressed, and flattened vertically. Mouth is small, terminal, and highly oblique with no barbels present. Upper lip is non-protractile and attached to the snout by a broad fold of tissue. Gill openings are restricted. Two rows of pharyngeal teeth, dental pattern is 1,4-4,1 (Minckley 1973).

Loach minnow have an olivaceous background coloration highly blotched with darker pigment. Whitish spots are present at the origin and insertion of the dorsal fin as well as the dorsal and ventral portions of the caudal fin base. A black basicaudal spot is usually present. There are 65 scales in the lateral line. The dorsal fin contains 8 rays, and the anal contains 7. Breeding males develop bright red-orange coloration at the bases of paired fins, on adjacent fins, on the base of caudal opening, and often on abdomen. Breeding females become yellowish in color on their fins and lower body (Minckley 1973).

AIDS TO IDENTIFICATION: Distinguished from the similar speckled dace by whitish spots that are present on the origin and insertion of the dorsal fin as well as on the dorsal and ventral portions of the caudal fin base.

ILLUSTRATIONS: B&W drawing (Marsh 1991:i.)
B&W photos (Minckley 1973:133)
Color line drawing (Page and Burr 1991)
Color photos (Rinne and Minckley 1991:16)
B&W photo (Wildlife Habitat Management Staff Group 1975:23)

TOTAL RANGE: Historically was endemic to Gila River Basin near and upstream of Phoenix, and included the Agua Fria, Gila, Salt, San Pedro, and Verde River systems in Arizona. They were also found in New Mexico, and Sonora, Mexico. Today in Arizona, they are found in Aravaipa Creek, the Blue River, and irregularly at the confluence of the north and east forks of the White River and the San Francisco River, between Clifton and the New Mexico border (Propst et al. 1985). In New Mexico, the loach minnow now occupies just over half of its range and is extirpated from Sonora, Mexico.

RANGE WITHIN ARIZONA: Historically in Arizona, the loach minnow occupied as much as 2,000 stream km (1,243 miles), but now are found in less than 200 stream km (124 miles) (Propst et al. 1987). Loach minnow are limited in Arizona to reaches in the Black River (Apache County), White River (Gila County), North and East forks of the White River (Navajo County), Aravaipa Creek (Graham and Pinal counties), San Francisco and Blue Rivers, and Campbell Blue and Eagle creeks (Greenlee County). Known populations once present in other rivers and streams of the state, have been extirpated.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Loach minnow are short lived. Few, if any, live through the fourth year. Populations of loach minnow vary both spatially and temporally because of natural changes in their environment and differing dynamic characteristics of individual populations.

REPRODUCTION: Spawning was observed to take place in late winter to early spring in Aravaipa Creek and from late March to early June in New Mexico. First spawn occurs in their second year. Spawning occurred in the same riffles that were occupied by adults during the non-reproductive season. Adhesive eggs are deposited on the underside of flattened rocks. The nest cavities are usually open on the downstream side while the upstream portion of the rock is embedded in the substrate. The male, and possibly the female, guards the nest cavity. The number of eggs per rock ranges from 5 to more than 250, with means of 52 to 63 (Marsh 1991). Individual females contain from 150 to 1200 mature ova. Eggs incubated at 18 to 20 ^{o}C hatched in five to six days.

FOOD HABITS: Loach minnow are opportunistic benthic insectivores, feeding mainly upon riffle-dwelling larval emphemeropterans, simuliid, and chironomid dipterans. They actively seek their food among bottom substrates, rather than pursuing items in the drift.

HABITAT: The cryptic, solitary, and sedentary loach minnow occupies turbulent, rocky riffles of mainstream rivers and tributaries. They prefer moderate to swift current velocity and gravel or cobble substrates. Sometimes associated with dense, filamentous green algae. It is restricted almost exclusively to a bottom dwelling habitat because of a reduced gas bladder.

ELEVATION: Up to about 8,240 ft (2513 m). Based off records in the Heritage Data Management System (HDMS), elevation ranges from 2,325 - 8,240 ft. (709 - 2513 m) (AGFD, unpublished data accessed 2001).

PLANT COMMUNITY: Prefers an open, low growing riparian type community composed mostly grass and shrubs.

POPULATION TRENDS: Loach minnow was once locally common throughout much of the Verde, Salt, San Pedro, San Francisco, and Gila (upstream from Phoenix) river systems, occupying both the mainstream and perennial tributaries up to about 2,200 m (7,218 ft.) elevation. This range has been dramatically reduced and fragmented, due to habitat destruction, and competition and predation by introduced fish species. It is now considered rare to uncommon in Arizona, except Aravaipa Creek and Blue River. The loach minnow is believed to be extirpated from Mexico, although the Gila River drainage in that country still lacks adequate surveys. Its distribution in New Mexico is fragmented. According to Marsh (1991), unknown populations of the loach minnow may still occur in places not surveyed or incompletely inventoried, especially in Mexico, and within the expansive San Carlos Apache and Fort Apache Indian reservations, or on National Forest lands.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS:
LE with CH (USDI, FWS 2012)
[PE with Proposed CH, USDI, FWS 2010]
[LT-USDI, FWS 1986]
[Critical Habitat Removed (Court Order No. CIV 02-0199 JB/LCS, 08-31-2004)]
[Critical Habitat Listed (USDI, FWS 2000)]
[Critical Habitat Listed (USDI, FWS 1994)]

STATE STATUS:
1A (AGFD SWAP 2012)
[WSC, AGFD, WSCA in prep]
[State Threatened AGFD, TNW 1988]

OTHER STATUS:
Forest Service Sensitive (USDA, A-S National Forest 2000)
[Forest Service Sensitive, USDA, FS Region 3 1988]
E, probably Extinct in the wilds of Mexico (NORMA Oficial Mexicana NOM-059-SEMARNAT-2010).
Listed Endangered (Secretaría de Medio Ambiente 2000)
[Listed Endangered Secretaría de Desarrollo Social 1994]

MANAGEMENT FACTORS: Dewatering of stream reaches, impoundment, livestock grazing, habitat alteration, and introduced non-native fish have been the greatest threats to loach minnow populations. Non-native predatory fish species in particular include piscivorous catfishes (*Ictalurus punctatus, I. melas, I. natalis*, and *Pylodictus olivaris*), and the red shiner (*Notropis lutrensis*). **Management needs:** conserve, protect, and monitor existing populations; delineate priority waters; ameliorate impacts from nonnative predatory and competitory species from loach minnow waters; develop captive propagation techniques;

enhance or restore select habitats within historical range; reintroduce into select historical habitats.

PROTECTIVE MEASURES TAKEN: Listed Proposed Threatened (Endangered Species Act), with Proposed Critical Habitat under consideration as of October 28, 2010. A Loach Minnow Recovery Plan was prepared by the USFWS (1990). An artificial propagation project with loach minnow was completed in 2004.

SUGGESTED PROJECTS: Protect existing populations of loach minnow. Monitor status of existing populations. Identify nature and significance of interaction with non-native fishes. Quantify, through research, loach minnow habitat needs and the effects of physical habitat modification on life cycle completion. Enhance or restore habitats occupied by depleted populations. Reintroduce populations to selected streams within historic range. Determine quantitative criteria for describing a self-sustaining population. Consider contingency planning and preliminary investigations for captive holding, propagation and rearing. Information and education (USDI, FWS 1990).

LAND MANAGEMENT/OWNERSHIP: BIA; BLM - Safford Field Office; USFS - Apache-Sitgreaves National Forest; TNC - Aravaipa Canyon and Muleshoe Ranch Preserves; Private.

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Marsh, P.C. 1991. Loach Minnow, *Tiaroga cobitis* Recovery Plan; for Region 2, U.S. Fish and Wildlife Service, Albuquerque, New Mexico. Arizona State University, Tempe, Arizona. pp. i-38.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Paul Marsh - Arizona State University, Tempe.

D.L. Propst - New Mexico Department of Game and Fish, Albuquerque.

Kirk Young - Arizona Game and Fish Department, Phoenix.

ADDITIONAL INFORMATION:

Revised: 1994-07-21 (MAL)
1995-01-29 (KLY)
2001-10-22 (SMS)
2002-12-06 (RHB)
2010-10-29 (SMS)

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AFCJC11010
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Xyrauchen texanus*
COMMON NAME: Razorback Sucker
SYNONYMS: *Catostomus texanus, Catostomus cypho, Xyrauchen cypho*
FAMILY: Catostomidae

AUTHOR, PLACE OF PUBLICATION: Abbott 1861. Proceedings of the Academy of Natural Sciences of Philadelphia

TYPE LOCALITY: Colorado and New rivers, Arizona

TYPE SPECIMEN: Unknown

TAXONOMIC UNIQUENESS: *Xyrauchen* is one of several monotypic genera of the family Catostomidae (USFWS 2018).

DESCRIPTION: From Bestgen (1990); "The body shape is elongate, robust, and somewhat laterally compressed. The caudal peduncle tends to be short and deep. An enlargement of the interneural bones forms the distinctive razor-like keel, providing basis for the common name, razorback sucker. The moderate-sized mouth has a clefted lower lip, and lateral margins of the lips are continuous and rounded. Razorback sucker have elongated heads with a flattened dorsal surface and well-developed fontanelle. There are usually 14–15 primary dorsal fin rays, seven primary anal fin rays, 45–47 vertebrae, 68–87 scales in the lateral series, with 44–50 gill rakers on the first arch. Body coloration is dark brown to olivacious on the upper dorso-lateral surfaces and ranges from yellow to white on the lower ventro-lateral surfaces. Adults can reach up to 1,000 mm (3.3 ft) total length (TL) and weigh 6 kg (13.2 lbs), but they are more typically found within the 400–700 mm (1.3-2.3 ft) TL range, weighing less than 3 kg (6.6 lbs). During spawning, razorback sucker are sexually dimorphic, with breeding males showing bright yellow and orange laterally and ventrally, dark dorsal surfaces, and tuberculation, especially on the anal and caudal fins, and females exhibiting a distended genital papillus."

Skeletal measurements indicate a heavily ossified and thickened morphology, potentially from adaptation to strong river currents historically occupied by the species (Eastman 1980).

AIDS TO IDENTIFICATION: Adults razorbacks are easily distinguished from other suckers by the prominent predorsal keel. Young lack a keel and may be difficult to distinguish from other *Catostomus* species.

ILLUSTRATIONS:
B&W photo (Minckley 1973:153)
B&W drawing (Page and Burr 1991)
Color photo (Rinne and Minckley 1991:33)
B&W drawing (Sublette et al. 1991:227)
B&W photo (Sublette et al. 1991:228)

TOTAL RANGE: Endemic to large rivers of the Colorado River Basin from Wyoming to Mexico, including the states of Colorado, Utah, New Mexico, Nevada, California, Sonora, and Baja. Razorback sucker are thought to have been uncommon in turbulent, canyon-bound reaches, with robust populations typically being found in calm, flatwater river reaches (Tyus 1987; Lanigan and Tyus 1989; Bestgen 1990). Currently, *X. texanus* occurs and spawns throughout much of its historic range due to stocking of hatchery-produced fish, though some areas have patchy distributions. The only known wild population of razorback sucker in the Colorado River basin to consistently demonstrate natural recruitment occurs in Lake Mead (Shattuck et al 2011). Razorback suckers have been extirpated from the Gila River basin and reestablishment efforts have not been successful (USFWS 2018).

RANGE WITHIN ARIZONA: Historically razorback suckers inhabited the Colorado, Gila, Salt, Verde, and San Pedro rivers. Razorback suckers have been extirpated from the Gila River basin. Stocking has been conducted at multiple sites throughout the drainage, but no evidence of reproduction or recruitment has been found (USFWS 2018). Presently populations occur in Lake Mead and upstream to the lower Grand Canyon, Lake Mojave, Lake Havasu, and the Colorado River below Parker dam. All except for the Lake Mead population are maintained by stocking. (Albrecht et al. 2014; Kegerries, Albrecht, Gilbert et al. 2017; Kegerries, Albrecht, Rogers et al. 2017).

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Razorback suckers are long lived. Older individuals in Lake Mohave have been estimated at 40 + years. They tend to grow quickly in the first five to seven years, with growth being slow or nonexistent in old individuals. Maturity is reached in 2-6 years, depending on rearing habitat. Usually sedentary, but they can travel significant distances on occasion. The "keel" along the back and inset eyes are likely adaptive features to the high flood events of historical habitat.

REPRODUCTION: Spawning occurs from late winter through spring along flat to gently sloping gravelly shorelines or bays, generally in less than 2 m (6.6 ft) of water. Spawning season varies latitudinally, with spawning in the Upper Colorado River Basin occurring from mid-April to mid-June, while the majority of spawning occurs between January and April in the Lower Colorado River Basin (USFWS 2018). Evidence suggests that suckers migrated from larger rivers to smaller tributaries prior to spawning, presumably allowing additional thermal units to be obtained. Razorback sucker display strong spawning site fidelity in both lentic and lotic habitats (Modde and Haines 2005). A single female is attended by 2 to 12 males, and the group moves in tight circles over the bottom. Spawning takes place when the group settles to

the bottom and with a vibrating action release gametes. The eggs are adhesive and attach to the interstitial spaces within the gravel substrate. The young hatch in a few days and live along the shoreline for a time. Females will spawn repeatedly with several males. Sublette et al. (1991) describe changes in breeding males: "Males become dark brown to black on the back and develop a russet- to orange-colored lateral band and yellow belly. Coarse, sharp tubercles, which are hornlike outgrowths of skin, are developed on the anal, caudal, and pelvic fins, and on the caudal peduncle." Hatching success is highly dependant on water temperature above 8° C (46° F), and is most successful from 9.5°C to 20°C (49°F to 68°F) (Bozek et al. 1990).

Razorback suckers are known to hybridize with flannelmouth suckers, Sonora suckers, and nonnative white suckers. Hatchery propagation has been successful and is being utilized for reintroduction programs.

FOOD HABITS: Razorback sucker diet differs with habitat type. Lotic adult razorback sucker consume a mixture of benthic invertebrates, algae, detritus, and inorganic materials. Lentic-inhabiting sucker diets are dominated by cladoceran zooplankton though some algal and detrital materials are present in gut contents (Marsh 1987).

HABITAT: Use a variety of habitat types from mainstem channels to slow backwaters of medium and large streams and rivers, sometimes around cover. Historically, razorback sucker inhabited virtually all components of low velocity riverine habitat; backwaters, floodplains, sloughs, oxbow lakes, and other slackwater habitats within the main channel were particularly important (Holden 1973, Holden and Stalnaker 1975, Behnke and Benson 1983, Minckley 1983). In impoundments they prefer depths of a meter or more over sand, mud or gravel substrates. Adult razorbacks tolerate a wide range of temperatures from near freezing temperatures to 32.0º C (89.6º F), with optimum temperatures around 22-25º C (71.6-77.0º F). Razorback suckers are tolerant of a wide range of water quality conditions including pH ranges between 6.0 and 9.0, dissolved oxygen levels as low as 2.0mg/L, and salinities up to 23,000–27,750 µS/cm (Slaughter et al. 2002, Stolberg 2012). Few adult sucker utilize swift whitewater habitats, though movement through these locations has been documented (Albrecht et al. 2014, Kegerries et al. 2015).

Three specific habitat types are considered necessary to complete the life cycle: 1. Spawning habitat of rocky substrates of boulder, cobble, and clean gravel along river margins, mid-channel bars, and island complexes, or reservoir, backwater, and floodplain shorelines. 2. Larvae and juveniles need access to persistent, shallow, and warm, sheltered shorelines of backwaters, floodplains, etc. with cover (turbidity and/or vegetation) to avoid predation. 3. Adults need pockets of deeper water, either in reservoirs or large eddies and pools with slow velocities (USFWS 2018).

ELEVATION: Intermediate to low elevation rivers. Arizona records indicate elevations of 181 - 5,000 ft. (55 – 1,525 m), which includes some introduced sites.

PLANT COMMUNITY:

POPULATION TRENDS: The razorback sucker was once common in many of the rivers of the Colorado River Basin. In recent times with the impoundment of large rivers and other habitat alterations, there exist a few isolated adult populations in several large impoundments. Due to lack of recruitment these populations remain small. Lack of recruitment is due primarily to adverse changes in the temperature of water released from impoundments and to predation on eggs and larvae by non-native introduced species of fish. There has been limited success from reintroductions of young individuals. According to Minckley (AGFD Native Fish Diversity Review 1995), they are reproducing in the upper basin, but not recruiting. He also states that there is an unconfirmed report of razorback recruitment occurring at Dinosaur National Monument, but he thinks this is doubtful.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS:
LE, PT (USDI, FWS 1991, 2021)
Critical Habitat (CH) Designated (USDI, FWS 1994)
[CH Proposed (USDI, FWS 1993)]
[LE (USDI, FWS 1991)]
[PE (USDI, FWS 1990)]
[UR (USDI, FWS 1989b)]
[C1 USDI, FWS 1989a]
[C2 USDI, FWS 1982, 1985]
[PT withdrawn (USDI, FWS 1980)]
[PT (USDI, FWS 1978)]

STATE STATUS:
1 (AZGFD, AWCS 2022)
[1A (AGFD SWAP 2012)]
[WSC (AGFD, WSCA 1996 in prep)]
[Endangered (AGFD, TNW 1988)]

OTHER STATUS:
Bureau of Land Management Sensitive (USDI, BLM AZ 2017)
Not Forest Service Sensitive (USDA, FS Region 3, 2013, 2007, 1999)
[Forest Service Sensitive, USDA, FS Region 3 1988, A-S National Forest 2000]
P, Determined Endangered in Mexico (NORMA Oficial Mexicana NOM-059-SEMARNAT-2010)
[Listed Endangered, Secretaría de Medio Ambiente 2000, 1994]
Group 2 (NNDFW, NESL 1994, 2001, 2008)

MANAGEMENT FACTORS:

Threats: climate change and drought; altered flow hydrology and cold tailwater releases from reservoirs; dams and diversions; hybridization; inbreeding and lack of genetic diversity; predation by and competition with nonnative fishes; pollution; possibly parasites.

Management needs: ameliorate effects of reservoirs and nonnative fish species in razorback waters; monitor status of populations; complex lotic and lentic habitat; suitable water temperature and quality; variable flow regimes; habitat connectivity; multiple interconnected, naturally recruiting, and resilient populations; genetic and ecological diversity.

PROTECTIVE MEASURES TAKEN: The razorback sucker was listed (USFWS October 23, 1991) as an endangered species in 19991 with critical habitat designated in 1994. The species was proposed to be reclassified to Threatened in 2021 due to substantial improvements in species status since listing (USDI, FWS 2021). Critical habitat in Arizona includes: the Colorado River and its 100 year flood plain from the confluence with the Paria River to Davis Dam including Lakes Mead and Mohave to full pool elevation, from Parker Dam to Imperial Dam including Imperial Reservoir to the full pool elevation or 100 year flood plain whichever is greater, the Gila River and its 100 year flood plain from the AZ-NM border to Coolidge Dam including San Carlos Reservoir to the full pool elevation, the Salt River and its 100 year flood plain from State Route 77 bridge to Roosevelt Diversion Dam, the Verde River and its 100 year flood plain from Forest Service boundary (Prescott National Forest in the vicinity of Perkinsville) to Horseshoe Dam, including Horseshoe Lake to full pool elevation. A Razorback Sucker Recovery Plan was completed in 1998, and recovery goals that amended and supplemented the 1998 plan were approved in 2002 (USFWS 1998, USFWS 2002). Downlisting criteria require genetically and demographically viable, self-sustaining razorback sucker populations in the Green River subbasin and either the Colorado River subbasin or the San Juan River subbasin, a genetic refuge in Lake Mohave, and two genetically and demographically viable, self-sustaining populations in the lower basin. Delisting requires population improvements for three consecutive years post-downlisting (USFWS 2018). The 2012 5-year review indicated that recovery goals should be updated with new information (USFWS 2012). Routine monitoring of existing populations, as well as artificial propagation and reintroduction programs are in progress.

In Arizona, the Glen Canyon Dam Adaptive Management Program coordinates research and monitoring activities aimed at protection of natural resources of the Colorado River through the Grand Canyon. The Lower Colorado River Multi-Species Conservation Program is a partnership of federal and non-federal stakeholders to balance use of lower Colorado River water resources and conservation of native species and habitats in compliance with the Endangered Species Act through a Habitat Conservation Plan. Other conservation entities include the Gila River Basin Conservation Program, the Salt River Project's Horseshoe-Bartlett Habitat Conservation Plan, the Lake Mohave Native Fish Workgroup, and the Lake Mead Razorback Sucker Workgroup.

SUGGESTED PROJECTS: As identified and implemented by management programs: 1. Reestablish populations with hatchery-produced fish. 2. Identify and maintain genetic variability of razorback sucker in Lake Mohave. 3. Provide and legally protect habitat

(including flow regimes necessary to restore and maintain required environmental conditions) necessary to provide adequate habitat and sufficient range for all life stages to support recovered populations. 4. Provide passage over barriers within occupied habitat to allow unimpeded movement and, potentially, range expansion. 5. Investigate options for providing appropriate water temperatures in the Gunnison River. 6. Minimize entrainment of subadults and adults at diversion/out-take structures. 7. Ensure adequate protection from overutilization. 8. Ensure adequate protection from diseases and parasites. 9. Regulate nonnative fish releases and escapement into the main river, floodplain, and tributaries. 10. Control problematic nonnative fishes as needed. 11. Minimize the risk of hazardous-materials spills in critical habitat. 12. Remediate water-quality problems. 13. Minimize the threat of hybridization with white sucker. 14. Provide for the long-term management and protection of populations and their habitats beyond delisting (i.e., conservation plans) (USFWS 2018).

LAND MANAGEMENT/OWNERSHIP: BIA - San Carlos Reservation; BLM - Yuma Field Office; FWS - Bill Williams, Cibola, and Havasu National Wildlife Refuges; NPS - Glen Canyon and Lake Mead National Recreation Areas; USFS - Apache-Sitgreaves, Coconino, Prescott, and Tonto National Forests; Lake Havasu State Park; La Paz County Park; TNC - Hassayampa River Preserve; Private.

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Paul Marsh - Arizona State University, Tempe.
Kirk Young - Arizona Game and Fish Department, Phoenix.

ADDITIONAL INFORMATION:

Razorback suckers were an important food fish for modern populations along the Colorado River. Commercial fisheries existed as recently as 1949 (Minckley, 1973). Early maturity and longevity is characteristic of fish species that do not successfully recruit every year. Historically razorbacks may have only had successful spawning when conditions were just right.

The species name *texanus* is based on a misunderstanding that the earliest specimens erroneously originated from the Colorado River in Texas (Marsh et al. 2015).

Revised: 1994-09-12 (AWM)
1994-09-20 (MHH)
1995-01-29 (KLY)
2001-10-22 (SMS)
2002-12-09 (RHB)
2020-09-16 (KSL)
2023-01-09 (MBL)

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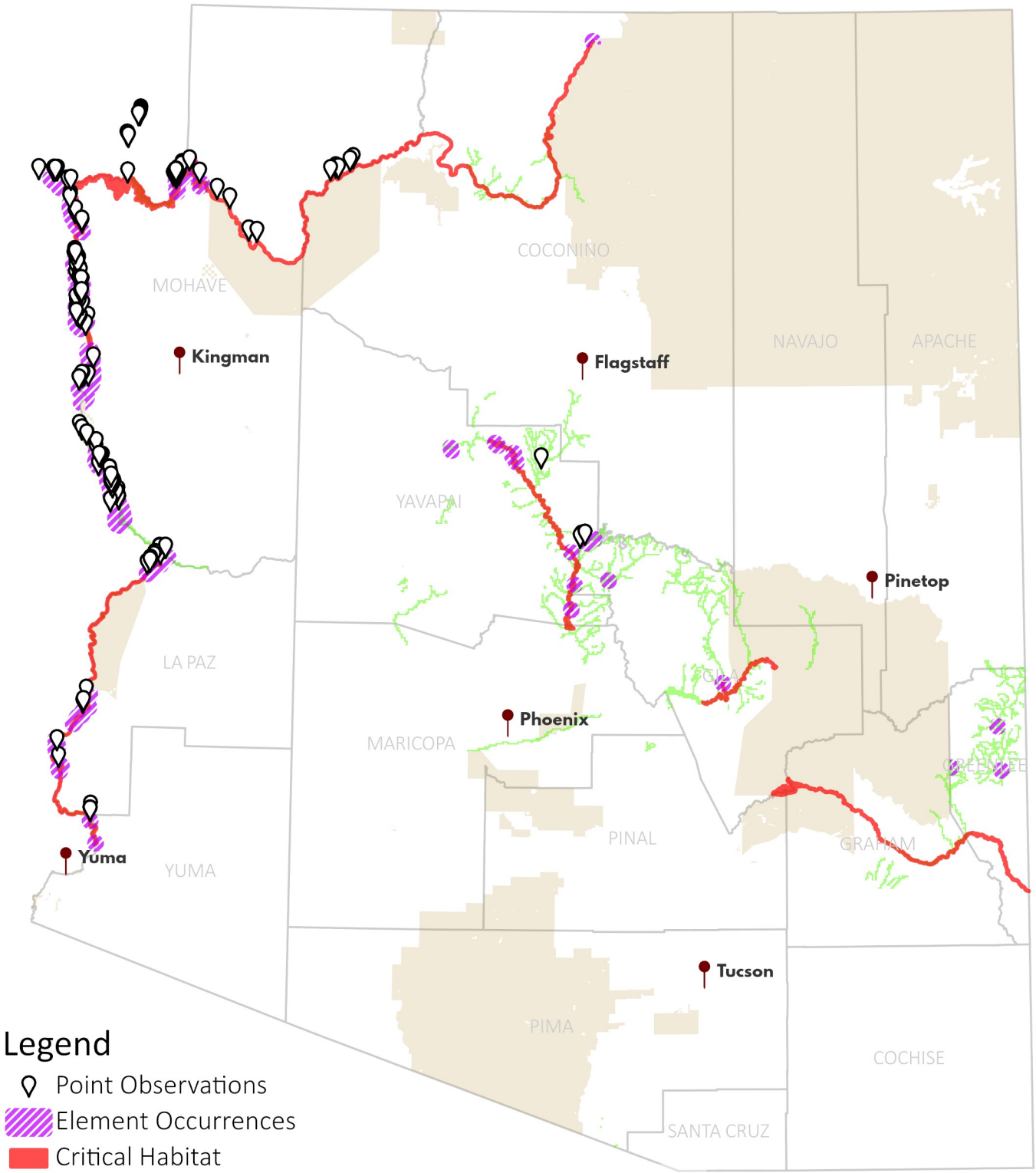
Xyrauchen texanus

Razorback Sucker



Legend

- Point Observations
- Element Occurrences
- Critical Habitat
- Predicted Range
- Tribal Lands
- Counties

N

0 50 100 Kilometers

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences. Predicted ranges indicate likely habitat suitability, not presence.

Heritage Data Management System
2019-06-13

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AFCJB13150
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Gila robusta* Baird & Girard
COMMON NAME: Roundtail Chub
SYNONYMS: *Gila robusta robusta, Gila robusta grahami, Gila robusta seminuda, Gila robusta jordani, Gila gracilis, Ptychocheilus vorax, Gila nacrea, Gila nigra*
FAMILY: Cyprinidae

AUTHOR, PLACE OF PUBLICATION: Baird and Girard 1853. Proceedings of the Academy of Natural Sciences of Philadelphia, 6:368-369.

TYPE LOCALITY: The specimens originally described by Baird and Girard 1853 were collected by a person with the last name Woodhouse prior to 1853 from the Zuni River in either Arizona or New Mexico, no further data is on record at the Smithsonian National Museum of Natural History in Washington D.C. [but likely Little Colorado R., below Grand Falls, Coconino Co., Arizona].

TYPE SPECIMEN: There were originally three type specimens collected and described of which two have been lost and only a bone from the third remains (Smithsonian National Museum of Natural History Washington D. C., Catalog #USNM-246). Numerous other specimens exist within the Smithsonian collections however, these were not the specimens originally described by Baird and Girard 1853a.

TAXONOMIC UNIQUENESS: There are currently 14 species under the genus *Gila*. This species is represented by four nominal subspecies in the Colorado River System (including Pluvial White River, Nevada; Hubbs and Miller 1948), three of which occur in Arizona waters.

Gila robusta robusta, G.r. grahami, and *G.r. seminuda* have been discussed as the three subspecies making up the "robusta complex." DeMarais et al. (undated) recognize the Virgin River chub as a full species, *Gila seminuda.* Research looking into the subspecies *G.r. robusta* vs. *G.r. graham*i is ongoing.

Minckley and DeMarais (2000) proposed that *Gila nigra*, an assemblage that possibly arose through more than one hybridization event between *Gila robusta* and *Gila intermedia*, be recognized as a distinct species (Headwater Chub). However, Gerber et al. (2001) cited several studies of allozymic and mtDNA characters that failed to identify any diagnostic characters among *Gila intermedia, Gila nigra*, and *Gila robusta robusta*; they referred to these taxa as *G. robusta*. AFS checklists (Nelson et al. 2004, Page et al. 2013) listed *Gila*

robusta and *Gila nigra* as distinct species, but more recent analyses have synonymized *G. nigra* with *G. robusta* (Page et al. 2017, Carter et al. 2018).

DESCRIPTION: Deep compressed body; flat head; slender caudal peduncle; large forked caudal fin; angle along anal fin base continues into middle of caudal fin. Terminal mouth extends to front of eye. Dark olive-gray above; silver side. Breeding male may develop red orange on lower half of cheek and paired fin bases. 80-99 lateral scales, usually 9 dorsal rays, 9 anal rays; pharyngeal teeth 2,5-4,2. Individuals may reach 49 cm (19 in.) and frequently attain 25-30cm (10-12 in.). *G.r. grahami* of Arizona and New Mexico generally have 80- 85 lateral scales while *G.r. robusta* in the rest of the U.S. tend to have greater than 85 (Page and Burr 1991).

AIDS TO IDENTIFICATION: Similar species include the Humpback Chub and Bonytail Chub, however, these fish have extremely slender caudal peduncles, smaller eyes, angle along anal fin base continuing above caudal fin; large individuals have hump on nape, and a depressed head which is absent on roundtail chub. Other characteristics include a large mouth, with lower lip outlined in black. They are somewhat trout-like in appearance, except they lack an adipose fin.

ILLUSTRATIONS:
B&W photo (Minckley 1973:100)
Color drawing (Page and Burr 1991)
Color photo (Rinne and Minckley 1991:23)
Line drawing (Sublette et al. 1990:126)
B&W photos (Sublette et al. 1990:127)

TOTAL RANGE: Roundtail Chubs are known from larger tributaries of the Colorado Basin from Wyoming south to Arizona and New Mexico, as well as, the Rio Yaqui south to Rio Piaxtla, northwestern Mexico (Sublette et al. 1990). In New Mexico, it occurs in the upper Gila River. The Zuni and San Francisco Rivers, New Mexico, represent waterways where *G. robusta* has been extirpated (Sublette et al. 1990).

RANGE WITHIN ARIZONA: Currently occurs in two tributaries of the Little Colorado River (Chevelon and East Clear Creeks); several tributaries of the Bill Williams River basin (Boulder, Burro, Conger, Francis, Kirkland, Sycamore, Trout, and Wilder Creeks); the Salt River and four of its tributaries (Ash Creek, Black River, Cherry Creek and Salome Creek); the Verde River and five of its tributaries (Fossil, Oak, Roundtree Canyon, West Clear, and Wet Beaver Creeks); Aravaipa Creek (a tributary of the San Pedro River); Eagle Creek (a tributary of the Gila River). (USDI, FR 74(128):32356, 7 Jul 2009).

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY:

REPRODUCTION: Roundtail Chub breed in spring and early summer (Minckley 1973, Sublette et al. 1990) as spring runoff is subsiding, often in association with submerged cover such as fallen trees and brush. Fertilized eggs are randomly scattered over gravel substrate with no parental care.

FOOD HABITS: Primarily carnivorous. Adults feed on aquatic and terrestrial insects, filamentous algae, and other fishes. Young feed on small insects, crustaceans, and algae in quiet backwaters until they reach 25 to 50 mm (1 to 2 in.) in length.

HABITAT: Roundtail Chub occupy cool to warm water, mid-elevation streams and rivers where typical adult microhabitat consists of pools up to 2.0 meters (6.6 feet) deep adjacent to swifter riffles and runs. Cover is usually present and consists of large boulders, tree rootwads, submerged large trees and branches, undercut cliff walls, or deep water. Smaller chubs generally occupy shallower, low velocity water adjacent to overhead bank cover. Sublette et al. (1990), state that roundtails also inhabit large reservoirs.

ELEVATION: Current range includes areas varying in elevation from approximately 1,210 to 7,220 ft. (369 – 2,202 m), although more commonly found between 2,000 and 5,000 ft. (610 – 1,525 m).

PLANT COMMUNITY: Riparian vegetation which often provides cover for Roundtail chubs generally consists of *Populus fremontii* (Fremont cottonwood), *Baccharis* sp. (seep willow), *Fraxinus velutina* (velvet ash), and *Tamarix* sp. (tamarisk). Aquatic vegetation is generally sparse in their current range, however, roundtail frequently forage on available algae, *Cladophora* sp. and pondweed, *Potamogeton* sp.

POPULATION TRENDS: As with many native fish, reductions in range and numbers are likely the result of habitat loss, as well as competition with, and predation by, non-native fish species. Minckley (1973) adds hope by describing the roundtail as "one fish that appears capable of maintaining its populations fairly well despite the numbers of introduced fishes that now infest Arizona waters", although he states that populations that were doing well in the Salt and Verde Rivers ten years ago, have decreased since. He also feels that the middle breeding populations are being knocked out due to predation by Flathead Catfish (AGFD Native Fish Diversity Review 1995).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: Not Listed, SC USDI, FWS 2022
[SC USDI, FWS 2017]
[PT, Lower Colorado River Basin DPS, USDI, FWS 2015]
[C* - LCR Basin DPS – USDI, FWS 2009, 2010, 2011, 2012, 2013, 2014]

[NW – LCR Basin DPS – USDI, FWS 2006]
[UR – LCR Basin DPS – USDI, FWS 2005]
[SC USDI, FWS 1996]
[C2 USDI, FWS 1991, 1994]
[C1 – *G.r.seminuda* – USDI, FWS 1982,1985]
[C2 – *G.r. grahami, G.r.* ssp. (Moapa) – USDI, FWS 1982, 1985, 1989]

STATE STATUS:
1 (AZGFD, AWCS 2022)
[1A (AGFD SWAP 2012)]
[WSC (AGFD, WSCA 1996 in prep)]
[Threatened (AGFD, TNW 1988)]

OTHER STATUS:
Bureau of Land Management Sensitive (USDI, BLM AZ 2017)
[Not Bureau of Land Management Sensitive (USDI, BLM AZ 2010)]
[Bureau of Land Management Sensitive (USDI, BLM AZ 2008)]
Forest Service Sensitive (USDA, FS Region 3 2013)
[Forest Service Sensitive (USDA, FS Region 3 1988, 1999, 2007)]
Group 2 (NNDFW, NESL 2000, 2001, 2008)
A, Determined Threatened in Mexico, (NORMA Oficial Mexicana NOM-059-SEMARNAT-2010).
Determined Subject to Special Protection in Mexico (Secretaría De Medio Ambiente, 2000)
[Listed Rare, Secretaría de Desarrollo Social 1994]

MANAGEMENT FACTORS:

Threats: aquifer pumping; stream diversion; reduction in stream flows; predation by and competition with nonnative fishes.

Management needs: watershed and stream flow protection; research to determine mechanisms of disappearance; ameliorate effects of deleterious nonnative fishes.

PROTECTIVE MEASURES TAKEN: Arizona Game and Fish and US Forest Service are planning on statewide population surveys for this species and has one survey in progress (as of 8/94) in central Arizona, Roundtail Chub study, Lower Salt/Verde Rivers (FY 1994-1995).

In 2006 a Statewide Conservation Agreement was completed and signed by nine natural resource management entities in 2007: U.S. Fish and Wildlife Service, Arizona Game and Fish Department, U.S. Bureau of Reclamation, the Hualapai Tribe, Salt River Project, U.S. Bureau of Land Management, Arizona State Land Department, Arizona Department of Water Resources, The Nature Conservancy, and the U.S. Forest Service (AGFD 2006).

SUGGESTED PROJECTS: Monitor populations. Maintain, improve, and augment habitat. Reintroductions to historic range. Further investigation of the "robusta complex."

LAND MANAGEMENT/OWNERSHIP: BIA - Fort Apache, Salt River Pima, and San Carlos Reservations; BLM - Kingman and Safford Field Offices; BOR - Phoenix Area; NPS - Montezuma Castle National Monument; USFS - Apache-Sitgreaves, Coconino, Prescott, and Tonto National Forests; State Land Department; Dead Horse Ranch State Park; AGFD Page Springs Fish Hatchery; TNC - Aravaipa Canyon Preserve; Private.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Chris Cantrell - Arizona Game and Fish Department, Phoenix

ADDITIONAL INFORMATION:

Revised: 1994-07-24 (MFK)
1994-08-01 (MHH)
1994-08-26 (JJW)
1995-01-31 (KLY)
1997-03-05 (SMS)
2001-10-12 (SMS)
2002-12-04 (RHB)
2015-10-07 (BDT)
2023-01-09 (MBL)

Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AFCJC02100
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Catostomus insignis*
COMMON NAME: Sonora Sucker, Gila Sucker
SYNONYMS: *Minomus insignis, Catostomus insigne, Catostomus gila*
FAMILY: Catostomidae

AUTHOR, PLACE OF PUBLICATION: Baird and Girard, 1854. Descriptions of new species of fishes collected in Texas, New Mexico, and Sonora, by Mr. John H. Clark on the U.S. and Mexican Boundary Survey, and in Texas by Capt. Stewart Van Vliet, U.S.A., Proc. Soc. Nat. Sci. Philadelphia. 7:28.

TYPE LOCALITY: Baird and Girard (1854): "Rio San Pedro of the Rio Gila" (San Pedro River, probably near mouth of Babacomari River, Cochise County, Arizona).

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: There are 16 other species of the genus in North America.

DESCRIPTION: A medium-sized catostomid fish, although adults can attain a size of 80.0 cm (31.5 in). Minckley (1973) states that adults can weigh greater than 2.0 kg (4.4 lbs). "Body fusiform, chubby. Head large. Lower lips enlarged, but only moderately, fleshy lobes not produced. Dorsal fin generally square on distal margin, usually with 11 (rarely 12) fin-rays. Scales relatively large, typically fewer than 60 in lateral line, crowded anteriorly, but not markedly so.

Body sharply bi-colored, brownish dorsally, yellow beneath. Dorso-lateral scales sharply outlined with melanophores over-all, each scale with a discrete broadening of the outline, to form a variably distinct spot; spots aligned to provide a visual effect of longitudinal, punctuate lines on upper sides of darkly-colored individuals. Interradials of fins variably darkened; lower fins typically yellow to white" (Minckley 1973).

"Tiny young of this species, and of most other suckers, have dorsal mouths that migrate to the ventral position as the fish develops through their larval stages" (Stewart 1926 in Minckley 1973).

AIDS TO IDENTIFICATION: Very similar in appearance to the Yaqui Sucker, *C. bernardini*. Hybrids have been reported by Clarkson and Minckley (1988) between *C. insignis*

and *C. (Pantosteus) clarki*. Melanophoric spots formed on upper body scales form apparent dash lines. Sometimes this sucker is sharply bicolored.

ILLUSTRATIONS:
B&W photo (Minckley 1973:160)
Line drawing (Page and Burr 1991:170)
Color drawing (Page and Burr 1991:171)
Color photos (Rinne and Minckley 1991:20)
Line drawings (Sublette et al. 1990:200)
B&W photos (Sublette et al. 1990:200)

TOTAL RANGE: Gila and Bill Williams systems (Colorado River drainage) New Mexico and Arizona, also in northern Sonora, Mexico. Sublette, et al. (1990) describe the Sonora Sucker as "native to the Gila and San Francisco drainages (except in extreme headwaters)" in New Mexico.

RANGE WITHIN ARIZONA: "...widespread in the Gila and Bill Williams river basins in Arizona" (Sublette et al. 1990). Per 1995 AGFD Native Fish Diversity Review, this fish is thought to be rare to absent in the Salt River Canyon, mainly due to predation by flathead catfish (*Pylodictis olivaris*).

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: "*C. insignis* seems intolerant of lake conditions" (Minckley 1973), although a few specimens have been collected at Roosevelt Lake, Arizona, during netting and electrofishing surveys of the late 1980s by AGFD. Sublette et al. 1990 describe the Sonora Suckers of Arizona and New Mexico's San Francisco and Gila Rivers as "very sedentary" despite seasonal changes and major flood events.

REPRODUCTION: "Spawning begins in late winter and continues through midsummer. The female is usually attended by two males. Eggs are deposited in riffles, fall into the interstices between gravels, and incubate" (Reughard 1920 in Sublette et al. 1990). "They tend to move to smaller streams or onto riffles in larger streams, but a few populations are known to spawn in lakes" (Minckley 1973). Spawning does not appear to be correlated with any specific pattern of stream flow or temperature.

FOOD HABITS: "The young feed along the margins of streams, sometimes by the millions, upon tiny crustaceans, protozoans, and other animal and plant groups" (Minckley 1973). Adults are likewise omnivorous, "feeding in early morning and late evening on the aufwuchs assemblage (diatoms and algae) of shallow pools. A significant component of the diet is macroinvertebrates, particularly Ephemeroptera (Clarkson and Minckley 1988), with some coarse sand occasionally ingested" (Sublette et al. 1990).

HABITAT: The Sonora sucker is found in a variety of habitats from warm water rivers to trout streams. "It has an affinity for gravelly or rocky pools, or at least for relatively deep, quiet waters" (Minckley 1973). Adults tend to remain near cover in daylight, but move to runs and deeper riffles at night. Young live and utilize runs and quit eddies.

ELEVATION: 369 to 2663 m (1,210 to 8,730 ft.) (AGFD, unpublished data accessed 2001).

PLANT COMMUNITY:

POPULATION TRENDS: "The status of the species is stable in the San Francisco and Gila River drainages, New Mexico" (Sublette et al. 1990). Thought to be lost from the entire Santa Cruz watershed (D. Foster 2005).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: SC (USDI, FWS 1996)
[C2 USDI, FWS 1994]

STATE STATUS: 1B (AGFD SWAP 21012)

OTHER STATUS: Forest Service Sensitive, USDA, FS Region 3, 2013
Bureau of Land Management Sensitive (USDI, BLM AZ 2000, 2005, 2008, 2010)
P, Listed Endangered (Secretaría de Medio Ambiente 2000, 2010)
[Listed Endangered, Secretaría de Desarrollo Social 1994]

MANAGEMENT FACTORS: Alteration of historic flow regimes and construction of reservoirs have diminished available habitat for Sonoran Sucker. General watershed erosion causing excessive sand deposition in streams has eliminated much pool habitat required by the species. .A winter snagging season for anglers currently (1994) exists for this sucker and the desert sucker below Stewart Mountain Dam on the Lower Salt River. This management action was taken as a measure to encourage harvest of the species, as many die during the extremely slow winter water flows.

PROTECTIVE MEASURES TAKEN: Two Arizona Game and Fish Department studies are underway which will document current population dynamics of the Sonora sucker in reaches of two central Arizona rivers: "Effects of Fish Snagging on the Lower Salt River" and "Roundtail Chub Study on the Lower Salt/Verde Rivers". Both of these Enhancement Fund studies will be conducted in FY 94-95.

SUGGESTED PROJECTS: Distribution and population trend studies within known range. Variability in reproductive success. Suggest that AZGFD actively search for species in Mexico via cooperators (D. Foster 2005).

LAND MANAGEMENT/OWNERSHIP: BIA - Fort Apache, Fort McDowell, Salt River Pima, and San Carlos Reservations; BLM - Kingman, Safford, and Tucson Field Offices; BOR - Phoenix Area; NPS - Montezuma Castle National Monument; USFS - Apache-Sitgreaves, Coconino, Coronado, Prescott, and Tonto National Forests; State Land Department; AGFD Black River Lands; Dead Horse Ranch and Red Rock State Parks; TNC - Canelo Hills Cienega, Patagonia-Sonoita Creek, Aravaipa Canyon and Muleshoe Ranch Preserves; Private.

SOURCES OF FURTHER INFORMATION

REFERENCES:

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USDI, Fish and Wildlife Service. 1996. Endangered and Threatened Wildlife and Plants: Review of Plant and Animal Taxa that are Candidates for Listing as Endangered or Threatened Species. Federal Register 61(40):7596-7613.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

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John N. Rinne - USFS Rocky Mountain Forest and Range Experiment Station, Flagstaff, Arizona.

ADDITIONAL INFORMATION:

Revised: 1994-07-01 (JJW)
1995-01-29 (KLY)
1997-03-04 (SMS)
2001-10-10 (SMS)
2002-12-04 (RHB)

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AFCJB37050
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Rhinichthys osculus*
COMMON NAME: Speckled Dace
SYNONYMS: *Rhinichthys nubilus, Apocope oscula oscula, Agosia couesii, Argyreus osculus*
FAMILY: Cyprinidae

AUTHOR, PLACE OF PUBLICATION: Girard, 1856, Proc. Acad. Nat. Sci. Philadelphia, 8:165-213.

TYPE LOCALITY: Species was described from Babocomari Creek, flood tributary of San Pedro River, just north of Fort Huachuca, Cochise County, Arizona (Lowe 1964).

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: Eight species of this genus in United States. *R. osculu*s only species of *Rhinichthys* found in Arizona. Two subspecies of *R. osculu*s found in Arizona; *R.o. osculu*s inhabits the southern part of the Gila River System, and *R.o. yarrowi* in larger rivers and creeks to the north.

DESCRIPTION: Small minnow, rarely exceeding 7.6 cm (3.0 in.) in length. Body chunky, rounded, somewhat flattened ventrally; body depth usually about equal to length of head. Upper jaw protractile, or if a frenum is present, it is very small. Barbels usually present at sides of upper lips. Fins generally rounded, dorsal fin origin above or just behind pelvic-fin insertion. Moderately small scales, 60 to 90 along lateral line. Dorsal fin with 6 to 9 rays, usually 8. Anal fin with 7 rays (rarely 6). Pharyngeal teeth in two rows, 1, 4-4, or 2, 4-4, 2, or a combination there of.

Coloration highly variable, drab olivaceous with patterns ranging from large black blotches on body, through a single or double lateral band, to almost unicolored. Breeding males vivid red on bases of paired fins and on body near those fins, on and near anal fin base, the lower caudal lobe, the mouth, and near the upper part of gill cleft (Minckley 1973).

AIDS TO IDENTIFICATION: Small eye; a broad, blackish mid dorsal stripe; a conspicuous black spot at base of the caudal fin. *Rhinichthys osculus* differs from *Agosia chrysogaster*, longfin dace, in that *A. chrysogaster* has nearly terminal mouth, white spots at front and rear of dorsal fin, white bar on caudal peduncle, no scales on breast, belly and part of back; lacks barbel, groove on snout. Differs from *R. cataractae*, longnose dace, in that *R. cataractae* has a long fleshy snout in front of mouth, no groove separating snout from upper lip (Page and Burr 1991).

ILLUSTRATIONS:
B&W photo (Minckley 1973:129)
Color line drawing (Page and Burr 1991:100).
Photo (USDA, Forest Service Rocky Mtn Forest and Range Experiment Station 1991:17)
B&W photo (Wildlife Habitat Management Staff Group 1975:147).

TOTAL RANGE: Native to all major western drainages from the Columbia and Colorado rivers south to Sonora, Mexico (Lee et at. 1980).

RANGE WITHIN ARIZONA: In Arizona, found in Colorado, Bill Williams, and Gila River drainages, except slower and warmer portions of Colorado River mainstream. Minckley (AGFD Native Fish Diversity Review. 1995. Tempe, Arizona) states that there are 4 populations in the southern part of its range.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Where this species has been more thoroughly studied, as in the Great Basin, high levels of morphological and genetic variability have been found. In many cases, individual springs and isolated basins have been found to have unique species or subspecies (Simons 1987). In Arizona there are at least two major body forms, a small, highly speckled or blotched, chubby-bodied form found in the southern part of the Gila River system, and a larger, banded or unicolored, more streamlined form found north of the Mogollon Rim. Can persist for long periods in intermittent pool even though they are crowed, diseased and starving. Relatively low tolerance for water with high temperature or low oxygen content.

REPRODUCTION: Two breeding periods, one in spring and the other in late summer. Spawn over coarse substrate using broadcast spawning method. Congregate in large groups and release many eggs.

FOOD HABITS: Omnivorous feeder, subsists on algae and other plant material, small crustaceans, insect larvae, and small snails (McClane 1974).

HABITAT: A bottom dweller, found in rocky riffles, runs, and pools of headwaters, creeks, and small to medium rivers: rarely in lakes (Page and Burr 1991). Reside in water less than 0.5 m (1.6 ft.) deep, with current averaging about 0.4m/sec (1.3ft/sec). Often congregate below riffles and eddies. Breeding adults prefer swift water.

ELEVATION: Peak abundance found 2,000 to 3,000 m (6562 - 9843 ft.), rarely below 1,500 m (4921 ft.). Based on records in the Heritage Data Management System (HDMS), which does not include the entire range in Arizona, elevation ranges from 1,550 - 8,920 ft. (473 - 2721 m) (AGFD, unpublished data accessed 2001).

PLANT COMMUNITY:

POPULATION TRENDS: Stable

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: SC (USDI, FWS 1996)
[C2 USDI, FWS 1994]

STATE STATUS: 1B (AGFD SWAP 2012)

OTHER STATUS: No Forest Service Status (USDA, FS Region 3 1999)
[Forest Service Sensitive, USDA, FS Region 3 1988]
Bureau of Land Management Sensitive (USDI, BLM AZ 2000, 2005, 2008, 2010)
No NNDFW Status (NNDFW, NESL 2000)
[Group 4, NNDFW, NESL 1994]
E, probably Extinct in the wilds of Mexico (NORMA Oficial Mexicana NOM-059-SEMARNAT-2010).
Listed Endangered (Secretaría de Medio Ambiente 2000)
[Listed Endangered Secretaría de Desarrollo Social 1994]

MANAGEMENT FACTORS: Speckled dace are widespread, abundant, and not in danger of extinction. Little management needed except to promote land use practices which maintain natural aquatic habitats. This species does not fare well in the presence of non-native predatory fish; introductions of these fishes should be prevented (Simons 1987).

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS:

LAND MANAGEMENT/OWNERSHIP: BIA - Hualapai and San Carlos Reservations, and Navajo Nation; BLM - Arizona Strip, Kingman, Phoenix and Safford Field Offices; NPS - Grand Canyon National Park and Montezuma Castle National Monument; USFS - Apache-Sitgreaves, Coconino, Coronado, Prescott and Tonto National Forests; State Land Department; AGFD Black River Lands; Sonoita Creek State Natural Area; TNC - Aravaipa Canyon and Muleshoe Ranch Preserves, and Patagonia-Sonoita Creek; Private.

SOURCES OF FURTHER INFORMATION

REFERENCES:

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Rinne, J.N. and W.L. Minckley. 1991. Native fishes of arid lands: a dwindling resource of the desert southwest. U.S. Department of Agriculture, Forest Service, General Technical Report RM-206. Fort Collins, Colorado. pp.16-17.

Secretaría de Desarrollo Social. 1994. Diario Oficial de la Federacion. p. 53.

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Secretaría de Medio Ambiente y Recursos Naturales. 2010. NORMA Oficial Mexicana NOM-059-SEMARNAT-2010, Protección ambiental-Especies nativas de México de flora y fauna silvestres-Categorías de riesgo y especificaciones para su inclusión, exclusión o cambio-Lista de especies en riesgo.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

Revised: 1994-07-19 (LOC)
1994-07-25 (SMS)
1995-01-29 (KLY)
1997-03-05 (SMS)
2001-10-18 (SMS)
2002-12-04 (RHB)

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Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AFCJB22010
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Meda fulgida*
COMMON NAME: Spikedace
SYNONYMS:
FAMILY: Cyprinidae

AUTHOR, PLACE OF PUBLICATION: Girard, C. 1856, Proc. Acad. Nat. Sci. Philadelphia 8: 165-213.

TYPE LOCALITY: The specimens originally described were collected from the San Pedro River near Charleston Pass, Arizona.

TYPE SPECIMEN: There were 21 type specimens originally described by Girard 1856. They were collected by John H. Clark prior to 1856 and are currently being held in the Smithsonian National Museum of Natural History in Washington D.C., Catalog #USNM-154.

TAXONOMIC UNIQUENESS: Monotypic genus, one of six species endemic to the Colorado River basin, *Meda fulgida* being endemic more specifically to the Gila River basin in Arizona and New Mexico (and most likely in Sonora, Mexico as well).

DESCRIPTION: Maximum length rarely exceeds 75.0 mm (2.95 in.) (Rinne and Minckley 1991). Slender body, somewhat compressed at front, strongly compressed at caudal peduncle; fairly pointed snout with no barbels; slightly subterminal mouth; large eye. Dorsal fin origin behind pelvic fin origin. Scales are present only as small deeply embedded plates. The first spinous ray of the dorsal fin is the strongest and most sharp-pointed. There are seven dorsal fin-rays and typically nine anal fin-rays. Pharyngeal teeth are typically 1, 4-4, 1. Olive-gray to light brown above; brilliant silver side, often with blue reflections; black specks and blotches on back and upper side. Breeding male has spectacular, bright, brassy yellow head and fins. (Minckley 1973, Page and Burr 1991).

AIDS TO IDENTIFICATION: Spikedace are distinguishable from other similar species by comparing morphology and coloration. Spikedace bodies are slender, more strongly compressed at the caudal peduncle, and when compared to similar species other than the woundfin, appear to have more brilliant silver coloration on the sides. The Spikedace most closely resembles the woundfin in morphology, however it is easily distinguishable from the Woundfin by noting the lack of barbels on the Spikedace which are small but present on the Woundfin.

ILLUSTRATIONS:
B&W photo (Minckley 1973:113)
Color drawing (Page and Burr 1991)
Color photo (Rinne and Minckley 1991:15)
Line drawing (Sublette et al. 1990:136)
B&W photos (Sublette et al. 1990:78, 79)

TOTAL RANGE: Historically, Spikedace were common and locally abundant throughout the upper Gila River basin of Arizona and New Mexico. In Arizona this included the Agua Fria, San Pedro, and San Francisco River systems, and the Gila, Salt and Verde Rivers and major tributaries upstream of present-day Phoenix. In New Mexico it included San Francisco River, Gila River, and the East, Middle and West Fork of the Gila.

The critical habitat designated by the USFWS (2012) is comprised of 8 units: (1) the upper Verde River and such eastern tributaries as Oak Creek and West Clear Creek down to Fossil Creek (which has a restocked population); (2) portions of the Salt River sub-basin feeding into Lake Roosevelt including Tonto Creek and its tributaries Greenback, Rye and Spring Creeks; (3) Aravaipa Creek, Redfield and Hot Springs Canyons (all with populations); (4) Bonita Creek (with a restocked population since 2007); (5) Eagle Creek; (6) San Francisco River; (7) the Blue River (restocked in 2012); and (8) the upper Gila River in New Mexico.

RANGE WITHIN ARIZONA: Presently, the only extant natural population known in Arizona is a 24 km (15 mile) reach of Aravaipa Creek in Graham and Pinal counties. Fish have been stocked in 5 other locations: Fossil Creek, Redfield Canyon, Hot Springs Canyon, Bonita Creek and the Blue River, but these are not yet considered to be established populations.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Spikedace average 1.6 in (4 cm) in length at the end of their first year, and 2.5 in (6.4 cm) by the end of the second. Fish generally live one to two years although some may reach three to even four years.

REPRODUCTION: Spawning occurs in spring and summer. Males come into breeding condition as early as April; spawning may continue through June. Breeding males have bright brassy yellow heads and fin bases, yellow bellies and fins. During courtship, males patrol over shallow, sand-bottomed areas, where speed of flow is moderate. "No territoriality between males is evident, but they seem to remain evenly spaced throughout a patrolled area. Females generally enter the area from downstream, where they are immediately accosted by two or more males. A "chase" occurs, with the males a little behind and in close contact with the female. The chase terminates when the female either strikes the bottom, or halts, in a flurry of males. All participants then float slowly with the current, then resume their previous activities, or, the female moves downstream, into a pool most of the time, and the males return to patrol" (Minckley 1973). Females lay approximately 100-300 eggs or more

depending on size. Yearling females generally lay one brood per season, whereas two-year old and older females may produce two (Minckley 1973).

FOOD HABITS: Generally aquatic and terrestrial insects, will feed on fry of other fish during certain seasons. Diet composition is largely determined by, type of habitat and time of year (Minckley 1973).

HABITAT: "The Spikedace occupies mid-water habitats of runs, pools, and swirling eddies..." (Rinne and Minckley 1991). Prefers moving in water less than 1.0 m (3.3 ft.) deep and 0.3-0.6m/sec (1-2ft/sec). They concentrate in the downstream ends of riffles and eddies although many have been collected in the upstream portions of shear zones less than 0.33 m (1.1 ft.) deep. "In larger streams, found only at the mouth of creeks" (Minckley 1973). Young in-habitat backwaters over silt and sand.

ELEVATION: Current listings for elevations at points of capture range from 494 to 1,373 m (1,620 to 4,500 ft.). However, their previous range was believed to have been much more extensive.

PLANT COMMUNITY:

POPULATION TRENDS: "The Spikedace was formerly widespread in the (Gila) basin, but has suffered marked reductions in range in the last few decades,...in areas where the Spikedace still persists, it seems far less abundant now than formerly" (Minckley 1973). According to Minckley, this species declines and explodes in numbers often (AGFD Native Fish Diversity Review 1995). According to the 2012 uplisting package, Spikedace in Arizona are restricted to Aravaipa Creek, Eagle Creek, and the Verde River, but have not been collected in the latter two locations for over a decade. As of this abstract revision in 2013, the only extant natural population known in Arizona is a 24 km (15 mile) reach of Aravaipa Creek in Graham and Pinal counties. Fish have been restocked in 5 other historic locations: Fossil Creek, Redfield Canyon, Hot Springs Canyon, Bonita Creek and the Blue River, but these are not yet considered to be established populations.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS:

LE with CH (USDI, FWS, 2012)
[PE with Proposed CH (USDI, FWS 2010)]
[Critical Habitat Designated (USDI, FWS 2007)]
[CH proposed (USDI, FWS 2005)]
[CH revoked (Court Order No. CIV 02-0199 JB/LCS, 08-31-2004)]
[CH designated (USDI, FWS 2000)
[CH proposed (USDI, FWS 1999)
[CH revoked (USDI, FWS 1998)]

[CH designated (USDI, FWS 1994)]
[LT (USDI, FWS 1986)]
[PT (USDI, FWS 1985)]
[C1 (USDI, FWS 1982)]

STATE STATUS: 1 (AZGFD, AWCS 2022)
[1A (AGFD SWAP 2012)]
[WSC (AGFD, WSCA 1996 in prep)]
[Threatened (AGFD, TNW 1988)]

OTHER STATUS: Not Forest Service Sensitive (USDA, FS Region 3 2007, 2013)
[Forest Service Sensitive (USDA, A-S National Forests 2000)]
[Forest Service Sensitive (USDA, FS Region 3 1988)]
Bureau of Land Management Sensitive (USDI, BLM AZ 2017)

MANAGEMENT FACTORS:

Threats: stream flow depletion; diversion; habitat alteration and competition with nonnative crayfishes; predation by and competition with nonnative fishes, especially red shiner.

Management needs: conserve, protect, and monitor existing populations; delineate spikedace priority waters; ameliorate impacts from nonnative predatory and competitory species from spikedace waters; develop captive propagation techniques; enhance or restore select habitats within historical range; reintroduce into select historical habitats.

PROTECTIVE MEASURES TAKEN: Listed as Endangered (Endangered Species Act), with Critical Habitat Designated as of February 23, 2012.

SUGGESTED PROJECTS: Protect and monitor the status of existing populations of Spikedace. Identify nature and significance of interaction with non-native fishes. Quantify, through research, spikedace habitat needs and the effects of physical habitat modification on life cycle completion. Enhance or restore habitats occupied by depleted populations. Reintroduce populations to selected streams within historic range. Determine quantitative criteria for describing a self-sustaining population. Consider contingency planning and preliminary investigations for captive holding, propagation and rearing.

LAND MANAGEMENT/OWNERSHIP: BIA - San Carlos Reservation; BLM - Safford Field Office; NPS - Montezuma Castle National Monument; USFS - Apache-Sitgreaves, Coconino and Prescott National Forests; TNC - Aravaipa Canyon Preserve; Private.

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Tony Robinson – Arizona Game and Fish Department, Nongame Branch, Phoenix.

ADDITIONAL INFORMATION:

Revised: 1994-07-22 (MFK)
1994-08-22 (MHH)
1995-01-29 (KLY)
2001-10-15 (SMS)

2002-12-04 (RHB)
2013-02-06 (BDT)

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** IITRI78190
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Wormaldia planae*
COMMON NAME: A caddisfly
SYNONYMS: *Wormaldia arcopa* (Denning)
FAMILY: Philopotamidae

AUTHOR, PLACE OF PUBLICATION: Ross, H.H. (1956) Evolution and classification of the mountain caddisflies. University of Illinois Press, Urbana, Illinois, 213 pp.

TYPE LOCALITY: Mexico: Chiapas: Finca Vergel

TYPE SPECIMEN: Illinois Natural History Survey (INHS): Insect Collection #38042. A. Dampf (s/n), 19 May 1935. Holotype. INHS 38036, 38038, 38046 and 38044 are paratypes.

TAXONOMIC UNIQUENESS: The caddisfly family Philopotamidae contains five genera in the Nearctic Region, with *Wormaldia,* first described in 1865 by McLachlan, being the second largest (Munoz-Quesada and Holzenthal 2008). NatureServe (2018) list 19 species of *Wormaldia* in the continental U.S. and Canada. Munoz-Quesada and Holzenthal (2008) report 28 species in the New World, the 17 recognized species in the Nearctic Region and 14 in the Neotropical Region. Two species occur in Arizona: *W. arizonensis* is found in AZ, TX and UT, and in Durango and Nuevo Leon, Mexico, while *W. planae* is only found in Arizona (and numerous South and Central American countries, and the Caribbean). Both *W. arizonensis* and *W. planae* are also the only species found in both the Nearctic and Neotropical Regions. *Wormaldia planae* is the most common and widespread *Wormaldia* species in the New World.

DESCRIPTION: Adult: Length of male forewing 4.5–5.0 mm. Head brown, with yellowish setae. Antenna long, slender, yellowish, with small, brown and yellowish rings of small setae. Maxillary palps yellowish, with brown setae. Labial palps yellowish, with brown setae. Dorsum of thorax yellowish. Legs yellowish, with small, brown setae. Forewing yellowish, covered with fine, small, brown setae, with apical forks I, II, III, IV, and V present; hind wing translucent, with few fine, small, brown setae, with apical forks I, II, III, and V present (Munoz-Quesada and Holzenthal 2015).

In the revision of the Nearctic species of *Wormaldia* (Munoz-Quesada and Holzenthal 2008) there are detailed diagrams and description of the diagnostic features used to distinguish this species. Identifications in caddisflies are determined based of characteristics of the male genitalia. In

summary, *W. planae* can be distinguished from the other Nearctic species of this genus by the shapes of tergum VIII and segment X. Tergum VIII in *W. planae* has two conspicuous lateromesal processes posteriorly that enclose a broad U-shaped mesal emargination. Tergum X is complex and subtriangularly elongate with various lobate processes anteromesally and lateromedially, with the apex having a triangular appearance. Some specimens examined showed a slight morphological variation in the shape of the posterior margin of tergum VIII from that of the holotype. In those specimens examined, the two lateromesal processes are slightly shorter, and the U-shaped mesal emargination is shallow.

AIDS TO IDENTIFICATION: Munoz-Quesada and Holzenthal 2008 also provide a dichotomous key to the Nearctic species of *Wormaldia*:

1. Sternum VII with posteromesal process 8
- Sternum VII with posterior margin straight, without mesal process 2

2 (1'). Sternum VIII with slight, convex, posteromesal process 7
- Sternum VIII with posterior margin straight, without mesal process ……..…..…… 3

3 (2'). Tergum X complex, subtriangular, with conspicuous, lobate processes anteriorly or lateromedially 6
- Tergum X simple, triangular, without conspicuous, lobate processes 4

4 (3'). Segment IX, when viewed laterally, posteriorly straight; inferior appendages, when viewed ventrally, paired basal segments united for about their anterior 2/3, separated posteromesally by shallow, U-shaped emargination ..... *W. anilla* (Ross)
- Segment IX, when viewed laterally, posteriorly concave; inferior appendages, when viewed ventrally, paired basal segments united for about their anterior 2/5, separated posteromesally by deep emargination 5

5 (4'). Segment IX, when viewed laterally, narrow, C-shaped in appearance, anterior margin convex, when viewed ventrally, posteriorly projected sinuously with mesal process; inferior appendages, when viewed ventrally, with paired basal segments separated posteromesally by wider emargination ..... *W. pachita* Denning
- Segment IX, when viewed laterally, broad in appearance, enlarged ventrally, anterior margin straight, when viewed ventrally, posteriorly convexly projected with mesal concavity; inferior appendages, when viewed ventrally, with paired basal segments separated posteromesally by narrower emargination ..... *W. strota* (Ross)

6 (3). Segment X, when viewed laterally, its apex prominently balloon-shaped, without lobate projection; superior appendage, when viewed laterally, with dorsomedial margin extended convexly ..... *W. arizonensis* (Ling)
- Segment X, when viewed laterally, its apex semiovate, with lobate projections; superior appendage, when viewed laterally, dorsomedial margin straight ……..…… ***W. planae*** Ross and King

ILLUSTRATIONS:

Photos of generic caddisflies: http://eol.org/pages/1101/media?page=105.

TOTAL RANGE: United States: Arizona, and Mexico, Guatemala, Nicaragua, Costa Rica, Panama, Colombia, Ecuador, Venezuela, Guyana, Brazil, Trinidad, Tobago, Grenada and St. Vincent (Flint 1995).

RANGE WITHIN ARIZONA: Central Arizona, in the vicinity of Camp Verde and waterways to the northeast and southeast. The species has been reported from Beaver Creek, Sycamore Creek and Fossil Creek, and from below the outlet of Montezuma Well. Most locations are in eastern Yavapai County and extreme northwest Gila County (Fossil Creek serves as a boundary between the two counties).

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Caddisflies are aquatic insects of streams, rivers and lakes. There are over 1200 species in North America. The larvae build a silken tubular case for protection. These slender, finger-shaped, silken tubes are attached in crevices underneath sticks or stones in rapidly flowing water (Flint 1991). They feed by cleaning fine organic particles from the tube's inner surfaces. *Wormaldia* adults are crepuscular and nocturnal (Munoz-Quesada and Holzenthal 2015).

REPRODUCTION: Like many other insects, caddisflies undergo complete metamorphosis (from egg, to larva, to pupae, to adult). Eggs are laid in a suitable aquatic setting, and usually hatch with a few weeks. The larvae build their protective cases and can take 1-2 years before they spin their pupae and become dormant. They remain as pupae for 2-3 weeks, then emerge as adults. When they leave their pupae, splitting their case, they must swim to the surface of the water. The new adults dry their wings and begin their short adult lives as active, sexually mature air-breathing insects. Most adult caddisflies live less than a month (J-Rank Articles and Chamisa, 2018).

FOOD HABITS: Adult caddisflies feed on plant nectar, other plant liquids, or nothing at all. Most caddisfly larva are herbivorous and feed on decaying plant tissue and algae, and diatoms are a preferred algae (Chamisa 2018).

HABITAT: *W. planae* prefer the cooler, spring fed streams in mountainous regions (Flint 1988 referenced in USDA Forest Service 2013, and Flint 1991). During a study in Mexico, larvae were found in the upper part of a slow speed stream, where the substratum was more rocky (Bueno-Soria et al 1981). Oak Creek has one of the highest diversities of aquatic insects in Arizona (Blinn and Ruiter 2009, cited in USDI Bur Rec 2014). Although *W. planae* has yet to be collected there, Spring (Oak) Creek is considered to be suitable habitat (USDI Bur Rec 2014).

ELEVATION: Not specified in the collection records or literature, but general elevations from Fossil Creek and Beaver Creek (in the vicinity of Montezuma Well) range from 2500 – 3700 feet (760 – 1130 m).

PLANT COMMUNITY: Not specified.

POPULATION TRENDS: No information available. The known collections for Arizona were made between 1981 and 1987. When the species was identified in 1999, it was a significant range extension northward from the type locality in southern Mexico. Since there is no further information, known collection sites should be re-visited to determine whether or not the species is still extant in Arizona (see Suggested Projects, below).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None.
STATE STATUS: None.
OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3, 2013)
[Forest Service Sensitive (USDA, FS Region 3, 2007)]

MANAGEMENT FACTORS: Not specified, but actions that maintain the clean, flowing streams such as Fossil Creek are presumed to be beneficial.

PROTECTIVE MEASURES TAKEN: *W. planae* is listed as a Forest Service Sensitive species. Populations extant at the outlet of Montezuma Well are afforded the additional protection of being within a USNPS National Monument. It is likely that some of the Fossil Creek locations lie within the reach designated as a Wild and Scenic River by Congress in 2009. The occurrence of *W. planae* is a part of the unique faunal assemblage resulted an "outstandingly remarkable" finding in the Fossil Creek Wild and Scenic River Resource Assessment (USDA Forest Service and National Wild and Scenic Rivers System, 2017). The management and conservation of this Fossil Creek reach also serves as a protective measure.

SUGGESTED PROJECTS: The collections in Arizona were made in the 1980s, and then identified in 1999 (Illinois Natural History Survey, 2018). Some of the documented locations (e.g., below Montezuma Well outlet and Fossil Creek) should be resurveyed to ascertain whether or not *W. planae* is still extant. If found again at one or more of the previous collection sites, efforts should be extended to determine if there may be an even wider distribution within Central Arizona. According to the Bureau of Reclamation (2014), Spring (Oak) Creek has suitable habitat for this species.

LAND MANAGEMENT/OWNERSHIP: The vast majority of the collection sites would be on USDA Forest Service land (Coconino and Tonto NF), USDI National Park Service (Montezuma Well NM), and possibly some private land holdings.

SOURCES OF FURTHER INFORMATION

LITERATURE CITATIONS:

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USDA Forest Service Region 3. 2013. Regional Forester's List of Sensitive Animals.

USDA Forest Service and National Wild and Scenic Rivers System. February 27, 2017 version. Fossil Creek Wild and Scenic River Resource Assessment.

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ADDITIONAL INFORMATION:

Revised: 2018-09-07 (BDT)

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Invertebrate Abstract **Element Code:** ICMAL05360
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Stygobromus arizonensis*
COMMON NAME: Arizona Cave Amphipod
SYNONYMS:
FAMILY: Crangonyctidae

AUTHOR, PLACE OF PUBLICATION: J.R. Holsinger. 1974. Systematics of the subterranean amphipod genus *Stygobromus* (Gammaridae), Part I: Species of the Western United States, Smithsonian Institution Press, City of Washington.

TYPE LOCALITY: Near Fort Huachuca, Cochise County, Arizona.

TYPE SPECIMEN: Holotype, USNM 142778. J.L. Colehour, September 1963.

TAXONOMIC UNIQUENESS:

DESCRIPTION: Relatively small species, ranging from 2.5-10.0 mm long, with a shrimp-like appearance; without eyes or pigment. Largest female, 3.7 mm long; largest males, 5.0 mm long. Antenna 1 is 45-50 percent as long as the body and 40 percent longer than antenna 2; primary flagellum with 12-13 segments. Antenna 2, flagellum with 5 segments. Mandibles sub equal; spine row with 6 spines; palpal segment 2 with 5 setae on inner margin distally.

AIDS TO IDENTIFICATION:

ILLUSTRATIONS: Line drawings (Holsinger 1974)

TOTAL RANGE: Flying "H" Ranch and a small spring in a mine at Paradise, Cochise County, Arizona.

RANGE WITHIN ARIZONA: See "**Total Range.**"

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: In general, amphipods are much more active at night than during daylight hours. As an amphipod swims it often rolls over on its side or back (hence the name

"sideswimmer"). Fishes are the chief predators but birds, predaceous aquatic insects and amphibians also take a toll.

REPRODUCTION: Most common species breed some time between February and October, depending largely on water temperatures.

FOOD HABITS: In general, amphipods are voracious feeders, all kinds of animal and plant material is consumed. Only rarely do they attack living animals, but freshly killed animals are consumed readily.

HABITAT: Prefers aquatic habitats in subterranean caves and mine tunnels. Type specimen taken in deep pool at depth of about 3 feet.

ELEVATION: 5,245 ft. (1,600 m).

PLANT COMMUNITY: Unknown

POPULATION TRENDS: Unknown

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None (USDI, FWS 1996)
[C2 USDI, FWS 1991, 1994]
[C2 USDI, FWS 1989]

STATE STATUS: None

OTHER STATUS: Bureau of Land Management Sensitive (USDI, BLM AZ 2010)
Not Forest Service Sensitive (USDA, FS Region 3 2007)
[Forest Service Sensitive USDA, FS Region 3 1988, 1999]

MANAGEMENT FACTORS: Threats include groundwater pollution and groundwater depletion. Management should include surveys of wet cave habitats to better determine distribution and number of populations, and monitoring of groundwater quality and levels, in known areas of distribution.

PROTECTIVE MEASURES TAKEN: Unknown

SUGGESTED PROJECTS: As specific threats include groundwater pollution by groundwater drawdown, the water table level at the cave should be evaluated. Additional pollutant threats are toxins, siltation and sedimentation. Perhaps searches for *Stygobromus arizonensis*, as well as other amphipods and caverniculous invertebrates, could be coordinated

with bat projects as this would involve less disturbance for both bats and the invertebrates as well as any other species which may use cave habitat.

LAND MANAGEMENT/OWNERSHIP: USFS - Coronado National Forest and private.

SOURCES OF FURTHER INFORMATION

REFERENCES:

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USDI, Fish and Wildlife Service. 1994. Endangered and Threatened Wildlife and Plants; Animal Candidate Review for Listing as Endangered or Threatened Species, Proposed Rule. Federal Register 59(219): 59026.

USDI, Fish and Wildlife Service. 1996. Endangered and Threatened Wildlife and Plants: Review of Plant and Animal Taxa that are Candidates for Listing as Endangered or Threatened Species. Federal Register 61(40): 7596-7613.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

John Holsinger - Department of Biology, Old Dominion University, Norfolk, Virginia

ADDITIONAL INFORMATION:

According to an unattributed status review dated November 7, 1984, “Apparently this cave-caverns and underground lakes are only partially explored and are difficult to negotiate. It seems quite likely that other water habitats in the system may also have *Stygobromus*.”

According to an unattributed undated USDI, FWS report, *S. arizonensis* known only from three specimens; two collected at a cave on the Flying "H" Ranch and one from a mine near Paradise, Arizona. *S. arizonensis* has not been collected since 1963. Undescribed specimens of *Stygobromus* have also been taken from Sycamore Creek, about 32 miles NE of Phoenix. Morphologically, these individuals are very similar to *S. arizonenis* and may be an additional locale for the species but their exact status remains to be thoroughly assessed.

Revised: 1992-03-24 (DBI)
1993-06-17 (DBI)
1995-06-19 (DBI)
1997-03-03 (SMS)
2003-11-07 (AMS)

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Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Invertebrate Abstract **Element Code:** IMGASJ0770
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Pyrgulopsis arizonae*
COMMON NAME: Bylas Springsnail
SYNONYMS: *Pyrgulopsis sancarlosensis*, *Apachecoccus arizonae*
FAMILY: Hydrobiidae

AUTHOR, PLACE OF PUBLICATION: D.W. Taylor. 1987. Fresh-water molluscs from New Mexico and vicinity. Bulletin 116: 32-34.

TYPE LOCALITY: Unnamed spring on north side of Gila River, north of Bylas, Graham County, Arizona.

TYPE SPECIMEN: Holotype: LACM 2203. D.W. Taylor, 20 April 1971.

TAXONOMIC UNIQUENESS: The *Pyrgulopsis* genus comprises of 137 species (Hershler et al. 2014), 12 of which can be found in Arizona.

DESCRIPTION: Shell elongately ovate with blunt apex, spire with convex outline. The shell height (from top of shell to bottom of shell) is 1.1 to 2.4 mm; whorls 3.25 to 4.25 in number, moderately rounded. The operculum is plane, ovate, pale amber, with an amber internal callus. Attachment scar bordered by a narrow but discrete thickening that leaves no conspicuous trace. Male and female are approximately the same size. Snout darkly pigmented, tentacles and sides of head/foot with lighter pigment, central section of latter sometimes unpigmented. The penis has a large accessory lobe bearing an oval glandular patch on dorsal and ventral surfaces, and a free portion at right angle to long axis on penis. All hydrobioids have a foot with a rounded posterior end.

AIDS TO IDENTIFICATION: Due to the small size of this animal, it cannot be identified to species in the field but must be identified in a laboratory by a qualified authority. The rule of thumb that springsnail species are specific to a particular location (i.e. a single spring or group of springs connected or close to each other), may be used as a means of preliminary identification. With this springsnail being found at Porter Wash and Cold Springs along with the Gila Tryonia, it can be difficult to distinguish if one or both species is present in the field.

ILLUSTRATIONS: Line drawings (Taylor, 1987)
Micrographs of operculum (Hershler and Landye, 1988)
Line drawings (Hershler and Landye, 1988)
Photographs of shells (Hershler and Landye, 1988)

SEM micrographs of radula (Hershler and Landye, 1988)
Line drawings (Hershler and Ponder, 1998)
Photograph (Sorensen, 2013)

TOTAL RANGE: Three springs on the north bank of the Gila River between Bylas and Pima, Graham County, southeastern Arizona: Tom Niece Spring Complex, Cold Springs, and Bylas Spring. Populations at Porter Wash and Cold Spring need to be verified genetically, but they are obviously hydrobioid snails. Porter Wash has six spring runs and pools that are occupied, while Cold Spring has three spring runs that are occupied by springsnails.

RANGE WITHIN ARIZONA: See "**Total Range.**"

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: The hydrobioid digestive system is typical of style-bearing neotaenioglossans. The mouth opens to a short oral area containing a pair of dorsolateral chitinous jaws composed of small, simple rodlets, immediately behind which is a well- developed buccal mass (situated within the snout). A pair of simple, unbranched, tubular salivary glands opens anterodorsally to the buccal cavity and (almost always) pass posteriorly over the nerve ring, rarely stopping short of the ring, but never passing through it in hydrobioids. Hydrobioids have a taenioglossate radula (i.e., seven teeth per row) comprising numerous rows of cuspate teeth, each of which includes a typically squarish or trapezoidal central tooth flanked on each side by lateral, inner marginal, and outer marginal teeth. Teeth near the anterior end of the radula are often worn or broken, whereas the proximal portion of the ribbon has several to many rows of poorly differentiated or incompletely formed teeth. (Hershler and Ponder, 1998).

REPRODUCTION: Most hydrobioids are oviparous, with females depositing small egg capsules, either singly or (rarely) in strings, on the substrate. A small number of hydrobioids are ovoviviparous, in which female's brood shelled young in the pallial gonoduct. Hydrobioid egg capsules are typically hemispherical to spherical. Copulation in hydrobioids is usually via an anterior opening to the glandular oviduct. The ventral channel may be traversed at least in part by the penis, but it is more likely that the penis only enters the anterior most section. (Hershler and Ponder, 1998).

FOOD HABITS: While the specific food habits of *Pyrgulopsis arizonae* have yet to be identified, "hydrobioid snails primarily feed on periphyton, which is a complex mixture of algae, bacteria, microbes, and detritus that live upon submerged surfaces in aquatic environments" (Mladenka, 1992).

HABITAT: Spring sources are all mildly thermal, ranging from 26 to 32^{o}C. The most abundant submergent vegetation is *Chara*, with marginal sedges and *Distichlis*. *Pyrgulopsis arizonae* is most common on firm substratum in the springbrooks, on dead wood, gravel, and pebbles.

ELEVATION: 2,580 - 2,800 ft. (787 - 854 m).

PLANT COMMUNITY: *Chara*, Watercress (*Rorippa nasturtium- aquaticum*), Yerba Mansa *(Anemopsis californica),* Rushes (*Juncus* spp.), and Mesquite (*Prosopis* spp.).

POPULATION TRENDS: Unknown, but recent timed presence/absence counts from July 2013 and August 2015 indicate that the populations at Porter Wash and Cold Spring appear fairly robust overall. All of the sites surveyed in both years had springsnails present, although counts at some of the spring runs at Porter Wash and Cold Spring were lower in 2015 than 2013 (Sorensen, 2013; Sorensen and Fadlovich, 2015).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: SC (USDI, FWS 1996)
[C2 USDI, FWS 1994]
[C2 USDI, FWS 1991]

STATE STATUS: SGCN Tier 1A (AGFD 2012)

OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 1999, 2013)
Bureau of Land Management Sensitive (USDI, BLM AZ 2000, 2005, 2010)

MANAGEMENT FACTORS: Threats: restricted geographic distribution with associated potential for extinction due to chance events; water developments, including pond construction; habitat degradation due to livestock grazing. Management needs: fencing to protect springs from effects of livestock and periodic monitoring of populations and habitats.

PROTECTIVE MEASURES TAKEN: Bureau of Land Management has installed fencing to exclude livestock around Porter Wash and Cold Spring sites, to protect the spring runs, pools, wetland vegetation, and native wildlife that reside in those springs. BLM also maintains the spring habitat at those sites with periodic removal of invasive weeds and tamarisk. Since 2012, Arizona Game and Fish Department and U.S. Fish and Wildlife Service have held training workshops for agency partners and contractors about Arizona springsnails.

SUGGESTED PROJECTS: Further study of springsnail ecology, life history, and population dynamics. Maintenance and improvement of spring run habitat for springsnails is needed; some spring run habitat is overgrown with rushes and Yerba Mansa with little open water habitat other than in the spring-fed pools. Surveys to see if species is present in any other suitable habitats that may not have previously been studied.

LAND MANAGEMENT/OWNERSHIP: BIA - San Carlos Reservation; BLM - Safford Field Office; Private.

SOURCES OF FURTHER INFORMATION

REFERENCES:

Arizona Game and Fish Department. 2012. Arizona's State Wildlife Action Plan 2012-2022. Phoenix, AZ.

Hershler, R. and J.J. Landye. 1988. Arizona Hydrobioidae (Prosobranchia: Rissoacea).

Smithsonian Contributions to Zoology. Number 459: 35, 39-41.

Hershler, R. and W.F. Ponder. 1998. A Review of Morphological Characters of Hydrobioid Snails. Smithsonian Institution Press, Washington D.C.

Hershler, R., H_P. Liu, and J. Howard. 2014. Springsnails: A New Conservation Focus in Western North America. Bioscience Advance Access. Pub. July 16, 2014

Mladenka, G.C. 1992. The ecological life history of the Bruneau hot springs snail (*Pyrgulopsis bruneauensis*). Unpublished M.Sc. Thesis, Idaho State University, Pocatello, Idaho.

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USDI, Fish and Wildlife Service. 1994. Endangered and Threatened Wildlife and Plants; Animal Candidate Review for Listing as Endangered or Threatened Species, Proposed Rule. Federal Register 59(219): 59000

USDI, Fish and Wildlife Service. 1996. Endangered and Threatened Wildlife and Plants: Review of Plant and Animal Taxa that are Candidates for Listing as Endangered or Threatened Species. Federal Register 61(40): 7596-7613.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

Bob Hershler - Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C.

Jerry Landye – Retired USDI, Fish and Wildlife Service, Pinetop, Arizona

ADDITIONAL INFORMATION:

Independently described by Hershler and Landye, 1988. Taylor (1987) takes precedence as his data was published one month earlier (Sally Stefferud, US Fish and Wildlife Service pers comm. 1992). Hershler (pers comm. to S. Stefferud, 1991) indicated that Hershler believes the species he described, *Pyrgulopsis sancarlosensis*, holotype USNM 859051, J.J. Landye. 29 June 1973, to be separate and distinct from *A. arizonae* described by Taylor (1987).

Revised: 1992-03-27 (DBI)
1993-06-25 (DBI)
1997-03-03 (SMS)

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Invertebrate Abstract

Element Code: IMGASJ0210
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Pyrgulopsis simplex*
COMMON NAME: Fossil Springsnail
SYNONYMS:
FAMILY: Hydrobiidae

AUTHOR, PLACE OF PUBLICATION: R. Hershler, and J.J. Landye. 1988. Arizona Hydrobiidae (Prosobranchia: Rissoacea). Smithsonian Contributions to Zoology. Number 459: 32.

TYPE LOCALITY: Spring near Strawberry, Gila County, Arizona

TYPE SPECIMEN: Holotype: USNM 859049. J.J. Landye, 16 October 1971.

TAXONOMIC UNIQUENESS: This genus comprises 35 described species and an additional 20-25 undescribed species in the Southwest.

DESCRIPTION: Moderate size species with shell height (height from top of shell to bottom of shell) of 2.0 to 2.5 mm with ovate-conic shell. The shell has 3.5-4.25 unshouldered and moderately convex whorls. Sexual dimorphism was significant in one of the two populations studied. Snout unpigmented, sides of head/foot with light dusting of melanin. All hydrobioids have a foot with a rounded posterior end. Penial filament darkly pigmented along virtual entirety of length.

AIDS TO IDENTIFICATION: Due to the small size of this animal, it cannot be identified to species in the field but must be identified in a laboratory by a qualified authority. Therefore, to obtain specimens, sift sand believed to contain the snail through an ordinary kitchen strainer. Rule of thumb that spring snail species are specific to a particular location (i.e. a single spring or group of springs connected or close to each other), may be used as a means of preliminary identification. The penial filament of *P. simplex* is shorter than that of *P. sancarlosensis*, but longer than those of *P. conicus* and *P. morrisoni*.

ILLUSTRATIONS:
Photographs of shells (Hershler and Landye, 1988)
Line drawings (Hershler and Landye, 1988)
SEM micrographs of radula (Hershler and Landye, 1988)
Line drawings (Hershler and Ponder, 1998)

TOTAL RANGE: Spring near Strawberry, Gila County, along with Fossil Springs, Yavapai County, Arizona.

RANGE WITHIN ARIZONA: See "**Total Range**".

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: The hydrobioid digestive system is typical of style-bearing neotaenioglossans. The mouth opens to a short oral area containing a pair of dorsolateral chitinous jaws composed of small, simple rodlets, immediately behind which is a well-developed buccal mass (situated within the snout). A pair of simple, unbranched, tubular salivary glands opens anterodorsally to the buccal cavity and (almost always) pass posteriorly over the nerve ring, rarely stopping short of the ring, but never passing through it in hydrobioids. Hydrobioids have a taenioglossate radula (i.e., seven teeth per row) comprising numerous rows of cuspate teeth, each of which includes a typically squarish or trapezoidal central tooth flanked on each side by lateral, inner marginal, and outer marginal teeth. Teeth near the anterior end of the radula are often worn or broken, whereas the proximal portion of the ribbon has several to many rows of poorly differentiated or incompletely formed teeth. (Hershler and Ponder, 1998).

REPRODUCTION: Most hydrobioids are oviparous, with females depositing small egg capsules, either singly or (rarely) in strings, on the substrate. A small number of hydrobioids are ovoviviparous, in which female's brood shelled young in the pallial gonoduct. Hydrobioid egg capsules are typically hemispherical to spherical. Copulation in hydrobioids is usually via an anterior opening to the glandular oviduct. The ventral channel may be traversed at least in part by the penis, but it is more likely that the penis only enters the anterior most section. (Hershler and Ponder, 1998).

FOOD HABITS:

HABITAT: They are typically found only in the headspring and upper sections of the outflow. The genus *Pyrgulopsis* is generally found on rock or aquatic macrophytes in moderate current. Because springsnails have only a partial operculum, they cannot withstand any desiccation, and occur only in water that is perennially flowing.

ELEVATION: 4,140 - 4,310 ft. (1262 - 1315 m).

PLANT COMMUNITY: Unknown.

POPULATION TRENDS: Fossil springsnail had experienced no apparent reduction in range or abundance as a result of activities in the Fossil Creek watershed during the past two decades.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: SC (USDI, FWS 1996)
[C2 USDI, FWS 1991, 1994]

STATE STATUS: 1 (AZGFD, AWCS 2022)
[1A (AGFD SWAP 2012)]

OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 1999, 2007, 2013)
Bureau of Land Management Sensitive (USDI, BLM AZ 2000, 2005, 2008, 2010)

MANAGEMENT FACTORS: **Threats:** water development activities; deterioration or disappearance of natural habitats. **Management needs:** protection of spring source; periodic monitoring of snail populations and their habitats.

PROTECTIVE MEASURES TAKEN: Fossil springs was recently designated a Botanical Area by the Coconino National Forest, an action designed to provide increased protection and restoration of the area. Public access to Fossil Springs is limited to foot travel, however, other springs in the watershed containing the Fossil springsnail are provided no special protection.

SUGGESTED PROJECTS: More studies on life history, morphology, and habitat requirements are needed.

LAND MANAGEMENT/OWNERSHIP: USFS - Coconino and Tonto National Forests.

SOURCES OF FURTHER INFORMATION

REFERENCES:

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USDI, Fish and Wildlife Service. 1994. Endangered and Threatened Wildlife and Plants; Animal Candidate Review for Listing as Endangered or Threatened Species, Proposed Rule. Federal Register 59(219): 59006.

USDI, Fish and Wildlife Species. 1996. Endangered and Threatened Wildlife and Plants: Review of Plant and Animal Taxa that are Candidates for Listing as Endangered or Threatened Species. Federal Register 61(40): 7596-7613.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

Bob Hershler - Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C.

Jerry Landye - USDI, Fish and Wildlife Service, Pinetop, Arizona

ADDITIONAL INFORMATION:

Revised: 1992-03-24 (DBI)
1993-06-24 (DBI)
1997-03-03 (SMS)
2003-12-02 (AMS)
2023-01-12 (MBL)

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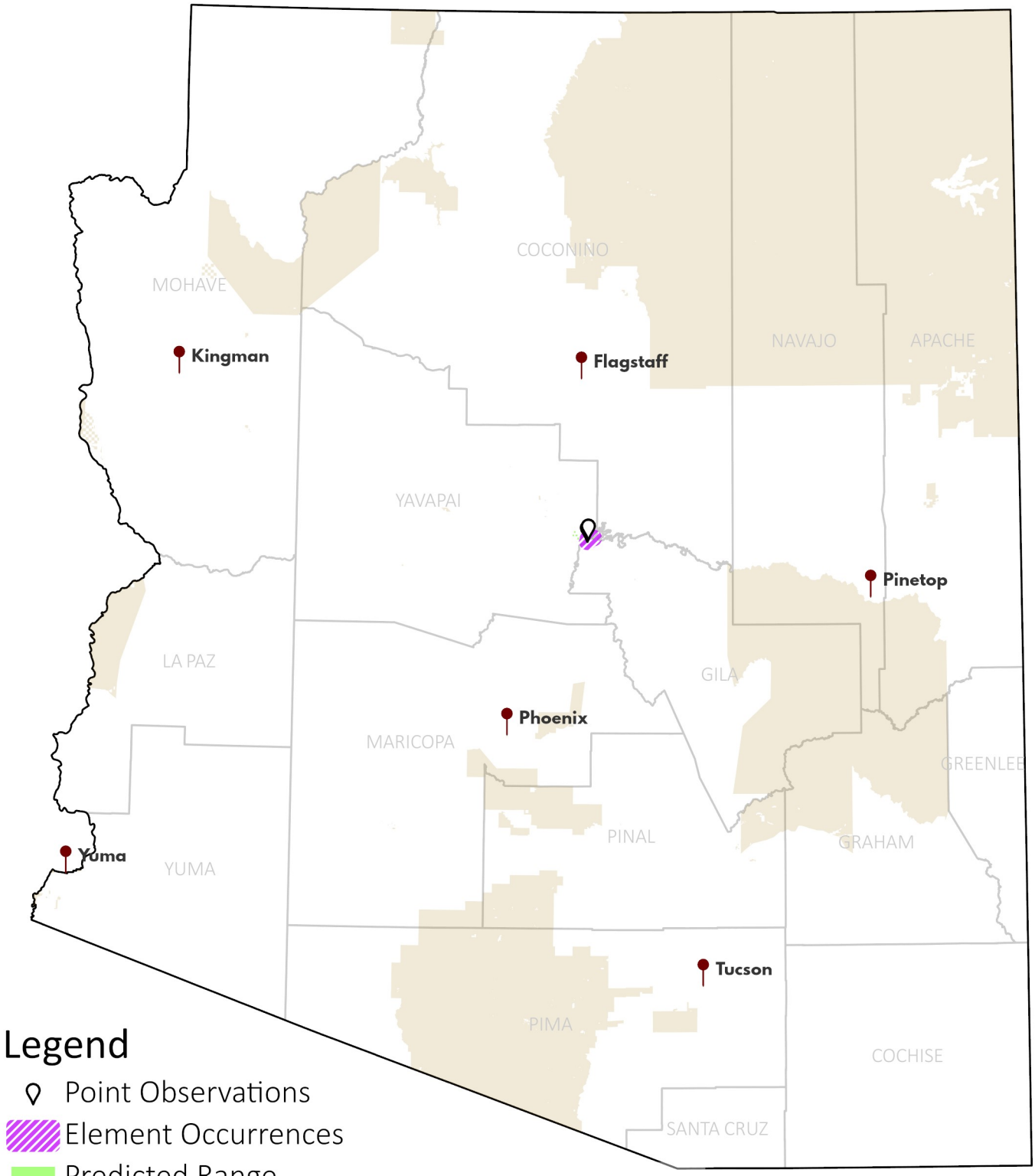
edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

Pyrgulopsis simplex

Fossil Springsnail



Legend

- Point Observations
- Element Occurrences
- Predicted Range
- Tribal Lands
- Counties

N

0 50 100 Kilometers

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences. Predicted ranges indicate likely habitat suitability, not presence.

Heritage Data Management System
2019-06-12

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Invertebrate Abstract **Element Code:** IMGASJ7160
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Tryonia gilae*
COMMON NAME: Gila Tryonia
SYNONYMS:
FAMILY: Littoridinidae (According to Taylor, 1987)
Hydrobiidae (According to Hershler, 1988)

AUTHOR, PLACE OF PUBLICATION: D.W. Taylor. 1987. Fresh-water molluscs from New Mexico and vicinity. New Mexico Bureau of Mines and Mineral Resources. Bulletin 116: 36-37.

TYPE LOCALITY: Unnamed spring on north side of river about 2 miles north of Bylas, Graham County, Arizona.

TYPE SPECIMEN: Holotype: LACM 2187. D.W. Taylor, 20 April 1971. Paratype: UTEP 10,063.

TAXONOMIC UNIQUENESS: The *Pyrgulopsis* genus comprises of 137 species (Hershler et al., 2014), 12 of which can be found in Arizona.

DESCRIPTION: An elongate species attaining a shell length (length from mantle collar to posterior tip of digestive gland) of 3.4 mm. Whorls number 4-5 in larger males and 5-6 in larger females, regularly convex and separated by an incised suture (area where whorls touch). Shell is narrowly conical and broadly rounded anterior end. Adult shell height 1.9-3.3 mm. The shell is clear, transparent, and without periostracum. Protoconch smooth and flat (sometimes slightly depressed), with 1.0-1.25 whorls. Inner lip is fairly straight, slightly thickened and reflected; outer lip is rounded and thin. The operculum is amber, paucispiral, over one and a half times longer than wide, and with three whorls. Snout is longer than wide, terminating with fleshy lips. Cephalic tentacles are narrow, slightly expanded at the tips, and moderately elongate. The head/foot is lightly dusted with epithelial melanin throughout, except for tentacles. All hydrobioids have a foot with a rounded posterior end. Penis is flattened, elongate, and large relative to snout, extending forward from attachment without coiling. Penis also has two lobes on inner curvature near distal tip and single, enlarged lobe on outer curvature at base.

AIDS TO IDENTIFICATION: Due to the small size of this animal, it cannot be identified to species in the field but must be identified in a laboratory by a qualified authority. The rule of thumb that springsnail species are specific to a particular location (i.e. a single spring or group of springs connected or close to each other), may be used as a means of preliminary identification. Perhaps not always, but at Porter Wash and Cold Spring we have observed that they co-exist with the Bylas springsnail due to the similar appearance of both snails,

further identification must be done in the lab.

ILLUSTRATIONS: Line drawings (Taylor, 1987)
Scanning electron microscope (SEM) micrograph of protoconch (Hershler and Landye, 1988)
SEM micrograph of operculum (Hershler and Landye, 1988)
Photographs of shell (Hershler and Landye, 1988)
Line drawings (Hershler and Landye, 1988)
SEM micrographs of cephalic tentacles (Hershler and Landye, 1988)
SEM micrographs of radula (Hershler and Landye, 1988)
SEM micrographs of penis (Hershler and Landye, 1988)
Line drawings (Hershler and Ponder, 1998)
Photograph (Sorensen, 2013)

TOTAL RANGE: Unnamed spring north of Bylas, Graham County, Arizona (same as type locality). Populations at Cold Springs and Porter Wash need to be verified genetically, but are obviously hydrobiid snails. Porter Wash has six spring runs and pools that are occupied, while Cold Spring has three spring runs that are occupied by springsnails.

RANGE WITHIN ARIZONA: See "**Total Range**."

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: The hydrobioid digestive system is typical of style-bearing neotaenioglossans. The mouth opens to a short oral area containing a pair of dorsolateral chitinous jaws composed of small, simple rodlets, immediately behind which is a well-developed buccal mass (situated within the snout). A pair of simple, unbranched, tubular salivary glands opens anterodorsally to the buccal cavity and (almost always) pass posteriorly over the nerve ring, rarely stopping short of the ring, but never passing through it in hydrobioids. Hydrobioids have a taenioglossate radula (i.e., seven teeth per row) comprising numerous rows of cuspate teeth, each of which includes a typically squarish or trapezoidal central tooth flanked on each side by lateral, inner marginal, and outer marginal teeth. Teeth near the anterior end of the radula are often worn or broken, whereas the proximal portion of the ribbon has several to many rows of poorly differentiated or incompletely formed teeth. (Hershler and Ponder, 1998).

REPRODUCTION: Most hydrobioids are oviparous, with females depositing small egg capsules, either singly or (rarely) in strings, on the substrate. A small number of hydrobioids are ovoviviparous, in which female's brood shelled young in the pallial gonoduct. Hydrobioid egg capsules are typically hemispherical to spherical. Copulation in hydrobioids is usually via an anterior opening to the glandular oviduct. The ventral channel may be traversed at least in part by the penis, but it is more likely that the penis only enters the anterior most section. (Hershler and Ponder, 1998).

FOOD HABITS: While the specific food habits of *Tryonia gilae* have yet to be identified, "hydrobioid snails primarily feed on periphyton, which is a complex mixture of algae, bacteria, microbes, and detritus that live upon submerged surfaces in aquatic environments" (Mladenka, 1992).

HABITAT: Spring sources are all mildly thermal, ranging from 26 to 32^{o}C. The most abundant submergent vegetation is *Chara*, with marginal sedges and *Distichlis*. Found on dead wood, leaves, or stones in spring or brooks.

ELEVATION: 2,600 - 2,800 ft. (793 - 854 m).

PLANT COMMUNITY: *Chara*, Watercress (*Rorippa nasturtium- aquaticum*), Yerba Mansa (*Anemopsis californica*), Rushes (*Juncus* spp.), and Mesquite (*Prosopis* spp.).

POPULATION TRENDS: Unknown, but recent timed presence/absence counts from July 2013 and August 2015 indicate that the populations at Porter Wash and Cold Spring appear fairly robust overall. All of the sites surveyed in both years had springsnails present, although counts at some of the spring runs at Porter Wash and Cold Spring were lower in 2015 than 2013 (Sorensen, 2013; Sorensen and Fadlovich, 2015).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: SC (USDI, FWS 1996)
[C2 USDI, FWS 1994]
[C2 USDI, FWS 1991]

STATE STATUS: SGCN Tier 1A (AGFD 2012)

OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 1999, 2013)

MANAGEMENT FACTORS:

Threats: restricted distribution with associated potential for extinction due to chance events; groundwater depletion, reduction of spring flow.

Management needs: protection of spring sources; periodic monitoring of snail populations and their habitats; research on ecology and systematics.

PROTECTIVE MEASURES TAKEN: Bureau of Land Management has installed livestock exclusion fencing around Porter Wash and Cold Spring sites, to protect the spring runs, pools, wetland vegetation, and native wildlife that reside that those springs. BLM also maintains the spring habitat at those sites with periodic removal of invasive weeds and tamarisk. Since 2012, Arizona Game and Fish Department and U.S. Fish and Wildlife Service have held workshops for agency partners and contractors about Arizona springsnails.

SUGGESTED PROJECTS: Further study of springsnail ecology, life history, and population dynamics. Maintenance and improvement of spring run habitat for springsnails is needed; some spring run habitat is overgrown with rushes and Yerba Mansa with little open water habitat other than in the spring-fed pools. Surveys to see if species is present in any other suitable habitats that may not have previously been studied.

LAND MANAGEMENT/OWNERSHIP: BIA - San Carlos Reservation; BLM – Safford Field Office; Private.

SOURCES OF FURTHER INFORMATION

REFERENCES:

Arizona Game and Fish Department. 2012. Arizona's State Wildlife Action Plan 2012-2022. Phoenix, AZ.

Hershler, R. and J.J. Landye. 1988. Arizona Hydrobiidae (Prosobranchia: Rissoacea). Smithsonian Contributions to Zoology. Number 459: 43, 48-49.

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Mladenka, G.C. 1992. The ecological life history of the Bruneau hot springs snail (*Pyrgulopsis bruneauensis*). Unpublished M.Sc. Thesis, Idaho State University, Pocatello, Idaho.

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Sorensen, J.A. 2013. Bylas Springsnail and Gila Tryonia Survey by AZGFD and BLM – July 2013. Unpublished field report. Arizona Game and Fish Department, Phoenix, Arizona. 3 pp.

Sorensen, J.A. and R.M. Fadlovich. 2015. Bylas Springsnail and Gila Tryonia Survey by AZGFD, BLM, and USFWS – August 2015. Unpublished field report. Arizona Game and Fish Department, Phoenix, Arizona. 3 pp.

Taylor, D.W. 1987. Fresh-water molluscs from New Mexico and vicinity. New Mexico Bureau of Mines & Mineral Resources. Bulletin 116: 36-37.

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USDI, Fish and Wildlife Service. 1996. Endangered and Threatened Wildlife and Plants: Review of Plant and Animal Taxa that are Candidates for Listing as Endangered or Threatened Species. Federal Register 61(40): 7596-7613.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

Bob Hershler - Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C.

Jerry Landye – Retired USDI, Fish and Wildlife Service, Pinetop, Arizona.

AGFD Invertebrate Abstract - *Tryonia gilae*

ADDITIONAL INFORMATION:

Hershler and Landye list holotype (USNM 859059. J.J. Landye. 30 January 1971) and four paratypes (unnumbered) that are different from those listed by Taylor (1987).

Revised: 1992-03-23 (DBI)
1993-06-15 (DBI)
1997-03-03 (SMS)
2003-12-04 (AMS)
2015-08-07 (RMF)

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Invertebrate Abstract **Element Code:** IMGASC9410
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Sonorella micromphala* Pilsbry, 1939
COMMON NAME: Milk Ranch Talussnail
SYNONYMS:
FAMILY: Helminthoglyptidae

AUTHOR, PLACE OF PUBLICATION: Pilsbry, 1939, Mono Acad. Nat. Sci. Phi. 3: 1; fig. 320.

TYPE LOCALITY: According to Bequaert & Miller (1973), "Rim of Mogollon Plateau, "on the furthest peak visible from Pine, at 6,000 to 7,000 ft," Gila Co.; more precisely on W slope of Milk Ranch Point, above Pine, where it was collected recently by junior author at 6,600 ft."

TYPE SPECIMEN: Unknown.

TAXONOMIC UNIQUENESS: Based on an unpublished revision by W.B. Miller (1968a, in Bequaert and Miller 1973), he recognized 68 valid species of *Sonorella* (with 19 subspecies), 57 of them in Arizona (three common with Sonora), 3 in New Mexico, 1 in trans-Pecos Texas (in common with New Mexico), 8 in Sonora (3 in common with Arizona), and 3 in Chihuahua. *Sonorella micromphala* is 1 of 15 species in the *S. binneyi* Complex.

DESCRIPTION: Snails in the genus *Sonorella* have a "depressed globose, helicoids shell, 12 to 30 mm in diameter, umbilicate or perforate, with a wide, unobstructed mouth and a thin, barely expanded peristome, smoothish or slightly sculptured with growth-lines, occasionally with fine oblique or spiral granulation and short hairs (mainly on the early whorls), lightly colored, and normally with a dark peripheral band. Its most characteristic features are, however, in the genitalia, which lack a dart sac and mucus glands." (Bequaert and Miller, 1973). For species in the *S. binneyi* Complex: the usually short penis is more or less thick, with a bluntly rounded verge. The shell is relatively small and globose, occasionally depressed, with a smooth, silky-lustrous periostracum; usually with apical spirally descending threads. (Bequaert and Miller, 1973).

AIDS TO IDENTIFICATION: The most characteristic features of the genus *Sonorella* are, in the genitalia, which lack a dart sac and mucus glands (Bequaert and Miller 1972).

ILLUSTRATIONS:

TOTAL RANGE: Mogollon Rim in vicinity of Pine, Gila County, Arizona, USA.

RANGE WITHIN ARIZONA: See "**Total Range**."

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Terrestrial gastropods do not move much, usually only to find food or reproduce. Olfaction is the primary sensory behavior utilized to find and move toward a food item (on the scale of centimeters to meters). A moving terrestrial gastropod lays down water-laden mucus on which it moves, exposing its integument to a potentially drying atmosphere, and increasing its water losses through the pallial cavity because of the necessity for gas exchange. A roosting terrestrial gastropod deploys a variety of passive mechanisms for water conservation, including the direct protection of its wet surfaces from drying conditions, avoidance of temperature extremes, the creation of more favorable microclimates and decreases in gas exchange. (A. Cook, *in* Barker 2001).

REPRODUCTION:

FOOD HABITS: Probably omnivorous, feeding on plant material (including algae, mosses, lichens, and possibly roots, shoots, leaves, flowers, flowers, anthers, pollen, fruit, seeds and rotting wood), and microorganisms associated with live and decaying vegetation; followed to a lesser extent by fungi and soil. (Speiser, *in* Barker, 2001).

HABITAT: The talussnail is a rock snail usually found in taluses or "slides" of coarse broken rock, generally found in crevices one to several feet below the surface, sealed to stones by their mucus. (SDCP).

ELEVATION: Based on Type Locality (Bequaert & Miller, 1973), elevation ranges from 6,000 – 7,000 feet (1830-2135 m).

PLANT COMMUNITY:

POPULATION TRENDS: Unknown.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: 2 (AZGFD, AWCS 2022)
[1C (AGFD SWAP 2012)]
OTHER STATUS: None

MANAGEMENT FACTORS: Threats include destruction or disturbance of talus slopes.

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: Validity of the informal *Sonorella* "species-groups" (or "complexes") has been brought into question by Naranjo-García (1988) and Roth (1996). Further research, including the use of molecular techniques, is needed to help clarify the relationships of these informal taxa. (Gilbertson and Radke 2005).

LAND MANAGEMENT/OWNERSHIP: USFS – Tonto National Forest; Private.

SOURCES OF FURTHER INFORMATION

REFERENCES:

Arizona Game and Fish Department. 2012. Arizona's State Wildlife Action Plan 2012-2022. Phoenix, AZ.

Arizona Game and Fish Department. 2022. Arizona Wildlife Conservation Strategy: 2022-2032. Arizona Game and Fish Department, Phoenix, Arizona. 378 pages.

Bequaert, J.C., and W.B. Miller. 1973. The Mollusks of the Arid Southwest. The University of Arizona Press. Tucson, Arizona. Pp. 111, 120.

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NatureServe. 2008. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.0. NatureServe, Arlington, Virginia. Available https://explorer.natureserve.org/ (Accessed: April 2, 2008).

Santa Barbara Museum of Natural History. 2008. SBMNH: Invertebrate Zoology Online Database Collection. http://www.sbcollections.org/iz/recordview.php. Accessed: 4/2/2008.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

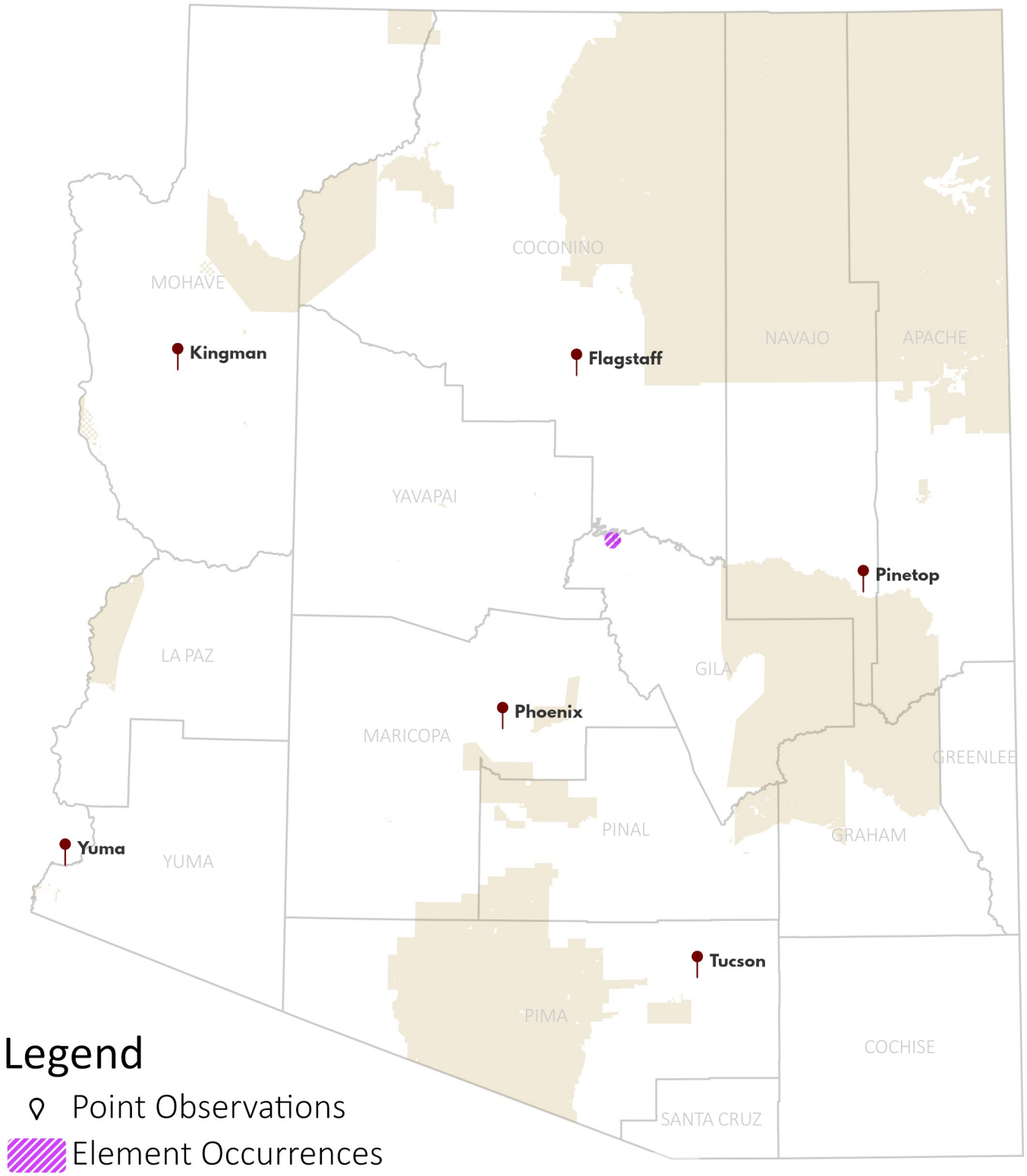
The genus *Sonorella* occurs over most of Arizona (except a strip north of the Grand Canyon, an extensive northeast corner, an the small southwest *Eremarionta* area), the southwest corner of New Mexico, trans-Pecos Texas, northeast Sonora, and the northwest corner of Chihuahua, Mexico. (Bequaert and Miller, 1973).

Revised: 2008-04-10 (SMS)
2023-02-13 (MBL)

Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

Sonorella micromphala

Milk Ranch Talussnail



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

Kilometers

0 50 100

ARIZONA GAME & FISH

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences.

Heritage Data Management System
2019-06-13

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Invertebrate Abstract **Element Code: IIDIP46010**
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Agathon arizonicus*
COMMON NAME: Net-winged midge
SYNONYMS: *Dioptopsis arizonica*, *Dioptopsis alpina*
FAMILY: Blephariceridae

AUTHOR, PLACE OF PUBLICATION: C.P. Alexander. 1958. Geographical distribution of the net-winged midges (Blephariceridae, Diptera). X International Congress of Entomologists (Montreal, 1956) 1:813-828. (Dr. Hogue has reviewed this abstract and has corrected **AUTHOR, PLACE OF PUBLICATION:** to: **AUTHOR, ORIGINAL PLACE OF PUBLICATION:** C.P. Alexander.1958. Undescribed species of nematocerous Diptera. Part V. Bull. Brooklyn Entomological Society 53:48.52 [described on pp.50-51]).

TYPE LOCALITY: *A. arizonica*: Workman Creek, Sierra Ancha Mountains, Gila County, Arizona. *A. alpina*: Lake Alpine, Alpine County, California.

TYPE SPECIMEN: Holotype: Male of *arizonica* in USNM C.P. Alexander collection. No number. Holotype: Male of *alpina* in USNM. No number.

TAXONOMIC UNIQUENESS:

DESCRIPTION: Slender delicate flies, 3.0-13.0 mm long. The eye in both sexes is usually divided transversely into an upper region with larger ommatidia and a lower region with smaller ommatidia. The legs are long with hind leg being stouter than the rest. "A medium-sized, sturdily built, well sclerotized blephericerid. Male distinctly smaller than female. Male coloration: generally dull gray-brown, pruinose. Mesoscutum evenly brownish-gray. Wing membrane hyaline" Hogue (1987). The mouthparts are usually sexually dimorphic with the mandible being present in the female but not the male.

AIDS TO IDENTIFICATION: Mosquito-like in size with long legs. Resemble crane flies but without a V-shaped suture on mesonotum. Anal angle of wing prominent. Wings sometimes with a network of fine lines between the veins. Ocelli present. These flies occur along swift-moving streams in which the larvae live. They are relatively rare. For detailed genera key, see Hogue (Blephariceridae, 1987). *A. arizonicus* adult females superficially resemble those of *A. doanei* and *A. markii*. The well-pigmented body coloration distinguishes it from both. From *A. doanei* it is normally separated by the lack of wing vein R_{2+3} (rarely absent in that species) and by the 14- rather than 15-segmented antennae.

ILLUSTRATIONS: Line drawings of various body parts (Hogue 1987:33)
Line drawings of larval segments and pupa (Hogue 1987:36.)

TOTAL RANGE: According to Hogue (1987), "*A. arizonicus* exhibits a somewhat unusual distributional pattern, ranging through the Cascades from central Oregon, south in the Sierra Nevada and Transverse Ranges of southern California, then reoccurring disjunctly in the highlands of southeastern Arizona."

RANGE WITHIN ARIZONA: Occurs disjunctly in the highlands of southeastern Arizona including Gila and Graham counties.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: The following information is for the Blephariceridae as a whole, but is believed to be accurate for the genus *Agathon* as well. "Members of this family are confined to areas in the immediate vicinity of rapidly flowing streams. Larvae and pupae occur on smooth-faced rocks and boulders in swiftly moving or torrential waters, often in waterfalls. The female glues eggs in small groups to rock surfaces. Oviposition evidently occurs when the water level of the stream drops after the onset of the dry season. Eclosion is initiated when the eggs become submerged with the coming of the wet season" (Hogue 1987).

Four larval instars which are able to adhere to rock surfaces because of their flattened bodies and ventral sucking organs. Locomotion accomplished by sideways progression, occurring only when the larvae are alarmed and forward motion accomplished by undulation. Prepupal larvae migrate to cracks and hollows or bare faces of rocks. Only 5-10 minutes required for transformation to pupal stage. Pupa is white with dark gills at first but quickly turns black. Adheres to rock surfaces.

Time required for the emergence of adult from pupal case is unusually short, only 3-5 minutes. Emergence occurs when pupa is submerged or in shallow water, but is probably most common when pupa is at edge of receding water. Wings expand to full size during growth within pupal case, unfolding during emergence and adult is able to fly immediately.

REPRODUCTION: The female glues eggs in small groups to rock surfaces. Oviposition evidently occurs when the water level of the stream drops after the onset of the dry season. Eclosion is initiated when the eggs become submerged with the coming of the wet season. (Hogue 1987).

FOOD HABITS: Larva feeds on diatoms and perhaps algae browsed from the substratum surface. Females in Blephariceridae having mandibles, suck the blood of other similar-sized or smaller, weak, slow-flying Diptera. Food of males and nonmandibulate females is unknown; may feed on flower nectar or on nothing at all.

HABITAT: Members of the family are confined to areas in the immediate vicinity of rapidly flowing streams. Larvae and pupae occur on smoothed-faced rocks and boulders in swiftly moving torrential waters, often in waterfalls. (Hogue 1987).

ELEVATION: Above 6,000 ft. (1830 m), up to 9,300 ft (2835 m) in the Pinaleno Mountains in Arizona.

PLANT COMMUNITY: Pinyon-juniper woodland.

POPULATION TRENDS:

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: None
OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 1999)

MANAGEMENT FACTORS:

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS:

LAND MANAGEMENT/OWNERSHIP: USFS - Tonto National Forest, Pleasant Valley Ranger District.

SOURCES OF FURTHER INFORMATION

REFERENCES:

Borror, D.J. and R.E. White. 1970. A field guide to insects. Houghton Mifflin Co. Boston. P.264.

Hogue, C.L. 1987. Blephariceridae. In G.C.D. Griffiths. Flies of the nearctic region. II (4) 32-38 and 191-197.

Mohlenbrock, R.H. 1989. Workman Creek Falls, Arizona. Natural History Magazine. Pp 87-90.

NatureServe Explorer: An online encyclopedia of life [web application]. 2002. Version 1.6. Arlington, Virginia, USA: NatureServe. Available: http://www.natureserve.org/explorer. (Accessed: June 12, 2003).

USDA, Forest Service Region 3. 1999. Regional Forester's Sensitive Species List.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

Hogue, C.L. Curator of Entomology, Natural History Museum of Los Angeles County.

ADDITIONAL INFORMATION:

According to Hogue in Blephariceridae, "The classification of the North American Blephariceridae is unsatisfactory. The genera are provisional, some doubtlessly polyphyletic (*Agathon*) or worthy of new status distinct from Old World genera (*Dioptopsis*). Only recently have the immature stages of many of the known Nearctic species been correlated with their adults (Hogue 1973), but many remain in doubt. The only subfamily found in North America is the Blepharicerinae with two tribes, the Blepharicerini and the Paltostomini. The blepharicerini includes the gen[us] *Agathon*..."

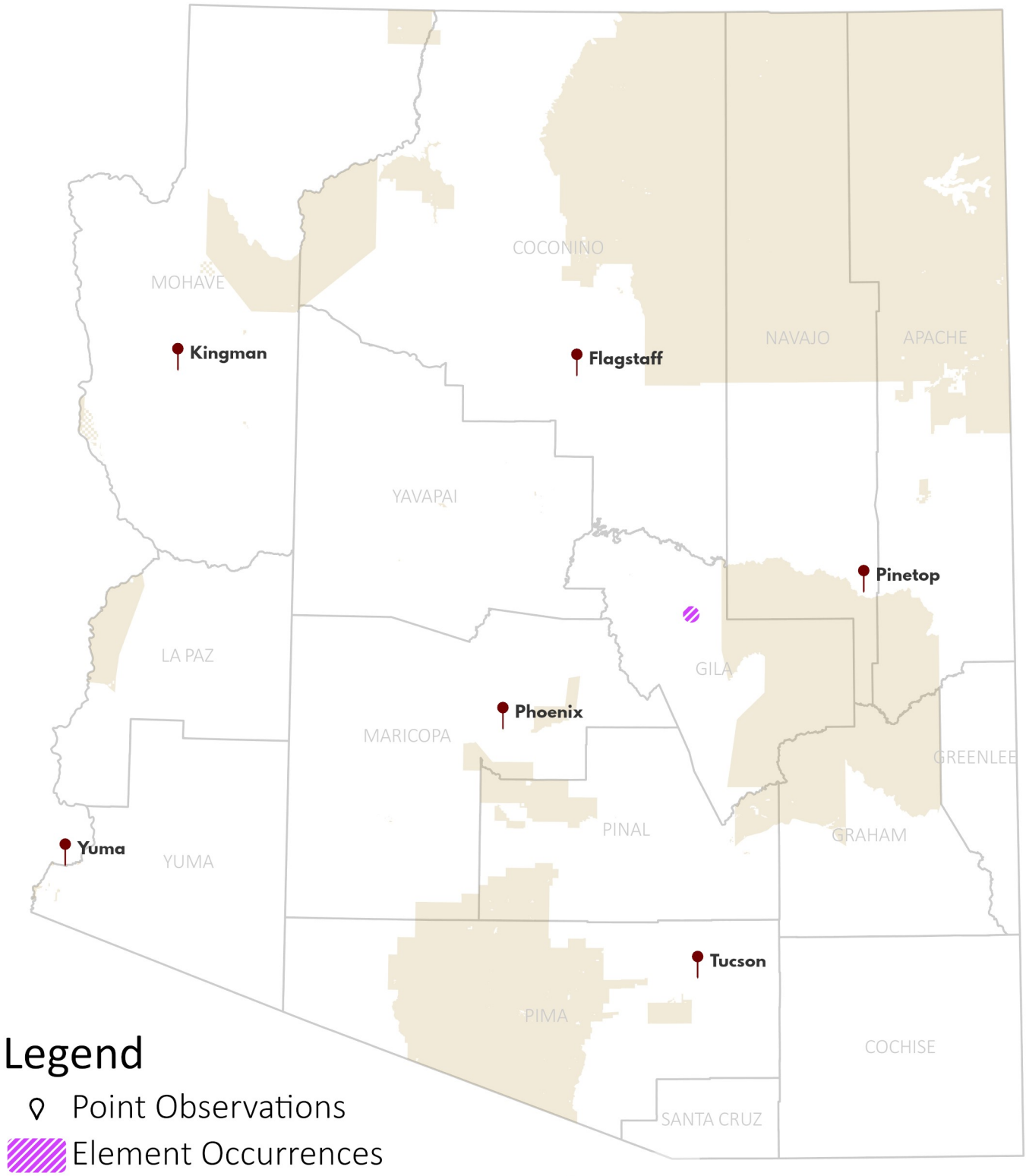
Dr. Hogue stated in a letter on file that *A. arizonicus* is very abundant where it is found, however, more collecting is needed to see if it is found more widely in Arizona. He stated that on his collection trip to Workman Creek within the Tonto, which was done in the spring of 1991, that samples were collected in every stage of life from larval to adult. He said that when a group is found there are "millions of individuals, they are very abundant."

He also stated, however, that observing these individuals could be problematic because if searches are made during the wrong part of the life cycle, they could easily be missed. The eggs are laid during low water season and as the water rises, the rocks wet out and the larvae emerge, and then pupate. If the search is made when the water is high, or after the flies emerge and leave, no evidence of the population will be found.

Revised: 1992-04-24 (DBI)
1995-03-30 (DBI)
1996-06-29 (CH)
2003-08-01 (AMS)

Agathon arizonicus

Netwing midge



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

Kilometers

0 50 100

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences.

Heritage Data Management System
2019-06-13

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Invertebrate Abstract **Element Code:** IICOL59010
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Cylloepus parkeri* (Sanderson)
COMMON NAME: Parker's Cylloepus Riffle Beetle
SYNONYMS:
FAMILY: Elmidae

AUTHOR, PLACE OF PUBLICATION: M.W. Sanderson. 1953. New species and a new genus of New World Elmidae with supplemental keys. The Coleopterists' Bulletin 7:33-40.

TYPE LOCALITY: Bloody Basin, Yavapai County, Arizona. 8 June 1947.

TYPE SPECIMEN: Carnegie Museum of Natural History (CMNH), F.H. Parker, 8 June 1947. No collection numbers given. Brown (1983) reports "Type" as and adult male deposited at INHS.

TAXONOMIC UNIQUENESS: Location. Found only in Bloody Basin area.

DESCRIPTION: *C. parkeri* in adult stage is a very small, black (sometimes with large reddish spots on elytra), non-swimming beetle living on rocks, sand and gravel in riffles. Body is cylindrical, legs long with large claws, and moderately long antennae. Adults range in size from 2.15-2.75 mm long and 0.85-1.1 mm wide. Larvae are very small, brown, hard, elongate, and roughly triangular in cross section; about 6.0 mm long and live in riffles. The body is NOT covered in dense, short hair.

For riffle beetles in general, the body is usually dark brown or red-brown, with color patterns or various metallic tints. There are numerous longitudinal rows of very small indentations, such as would be made by the point of a needle, on the hardened front of the wings. The antennae ranges from 1-8 mm. In general for the larvae, the body length is usually 3-8 mm and may range up to 16 mm. The body is elongate, cylindrical and hard. They are usually dark brown or red-brown. The legs have four segments (not counting the claws). There is one claw on the end of each leg. The abdomen has nine segments. Abdomen segment nine has a cavity that is covered by a hinged lid, and there is a tuft of filamentous gills that can be withdrawn into this cavity (Voshell 2002).

AIDS TO IDENTIFICATION: Black with two large reddish spots on each elytron or wing covers.

ILLUSTRATIONS: Color photos (Palmer 1992)
Black & White drawing (Borror 1970)
Black & White drawing (Warrick 1986)
Color drawing of adult and larvae (Voshell 2002)

TOTAL RANGE: According to McKown, only known habitat for *C. parkeri* occurs Yavapai County, Arizona, in spring fed Roundtree Canyon in Bloody Basin within the Tonto National Forest. R. Johnson (1992) states that it also occurs in Tangle Creek, also located in Bloody Basin.

RANGE WITHIN ARIZONA: See "**Total Range.**"

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Little is known of life history or ecology of *C. parkeri* Sanderson, but it is believed to be similar to other species of riffle beetles. Apparently distribution is highly localized suggesting to Johnson (1992) that newly emerged adults do not fly. Mature larvae pupate outside water in moist soil along stream's edge. Although aquatic, *C. parkeri* does not swim, but crawls about slowly on underwater plants or debris. Riffle beetles are efficient clingers by virtue of their long, sharp claws at the end of the legs and their small, compact, hard bodies.

Riffle beetle larvae breathe dissolved oxygen with gills that are on the end of their abdomen in a pocket with a door. They protrude the gills out in the water and wave them to obtain dissolved oxygen. They withdraw the gills into the pocket in their abdomen and close the door to protect them from abrasion by sediment carried in the moving water. Adult riffle beetles breathe by means of a highly developed plastron, with microscopic length hairs as dense as several million per square millimeter of body surface. This plastron is so efficient that most riffle beetle adults never have to come to the surface for air again after they enter the water. Most riffle beetles require a lot of oxygen and are only found in waters with dissolved oxygen at or near the saturation point.

Larvae are different from most other kinds of water beetles because riffle beetle larvae shed their skin six to eight times, instead of the usual three times. Most riffle beetles spend 1 or 2 years as larvae, but some species take up to three years to complete the larval stage. Newly emerged adult riffle beetles undergo a short flight period, but after they enter the water they lose the ability to fly. The unneeded hind wings progressively waste away by some unknown process. Adult life spans are not known, but riffle beetle adults are thought to be long lived. It is speculated that some species do not reach sexual maturity until their second year of adult life, and some may live on into a third year (Voshell 2002).

REPRODUCTION: Riffle beetles typically deposit eggs on the underside of submerged rocks and debris.

FOOD HABITS: Both adults and larvae feed on periphyton, algae, moss and vegetable material.

HABITAT: Permanent, clean, slow moving small streams, with loose gravelly substrate and very little sand.

ELEVATION: 2,850 - 4,000 ft. (869 - 1,220 m).

PLANT COMMUNITY: Juniper, catclaw, Mimosa, and prickly pear occur on canyon slopes. Riparian vegetation includes sycamore, ash, willow, and cockleburrs. Aquatic flora consists of watercress growing in a bed of various sizes of rock and gravel with very little sand.

POPULATION TRENDS: Unknown

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None (USDI, FWS 1996)
[C2 USDI, FWS 1994]
[C2 USDI, FWS 1991]
[C2 USDI, FWS 1989]

STATE STATUS:

OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 1999)
[Forest Service Sensitive, USDA, FS Region 3 1988]

MANAGEMENT FACTORS: *C. parkeri* requires water very high in oxygen content. This factor greatly restricts distribution. High sensitivity to pollutants is good measure of water quality. Activities such as mining, stream channelization, and heavy grazing would almost certainly be detrimental to this beetle.

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: Because little is known about this riffle beetle, little can be done except protection of known sites of occurrence and determination of the exact range on a national level. Taxonomic investigations should be done.

LAND MANAGEMENT/OWNERSHIP: USFS - Tonto National Forest and possibly Prescott National Forest.

SOURCES OF FURTHER INFORMATION

REFERENCES:

Borrer, D.J. and R.E. White. 1970. Insects: Peterson Field Guides. Houghton Mifflin Company, Boston MA. Pp.172-173.

Brown, H.P. 1983. A Catalog of the Coleoptera of America North of Mexico. Agriculture Handbook Number 529-50.

Johnson, R. 1992. Unpublished status survey for the United States Fish and Wildlife Service, Arizona Ecological Services, Phoenix, Arizona.

Merritt, R.W. & K.W. Cummins. Date Unknown. An Introduction to the Aquatic Insects of North America.

NatureServe Explorer: An online encyclopedia of life [web application]. 2002. Version 1.6. Arlington, Virginia, USA: NatureServe. Available: http://www.natureserve.org/explorer. (Accessed: June 26, 2003).

Palmer, B. 1992. Color Photos. Arizona Game and Fish Department.

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USDA, Forest Service Region 3. 1999. Regional Forester's Sensitive Species List.

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USDI, Fish and Wildlife Service. 1991. Endangered and Threatened Wildlife and Plants; Animal Candidate Review for Listing as Endangered or Threatened Species, Proposed Rule. Federal Register 56(225): 58826.

USDI, Fish and Wildlife Service. 1994. Endangered and Threatened Wildlife and Plants; Animal Candidate Review for Listing as Endangered or Threatened Species, Proposed Rule. Federal Register 59(219): 59014.

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White, R.E. 1983. A field guide to the beetles. Houghton Mifflin Co. Boston.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

Robert Johnson - Arizona State University, Tempe

Milton Sanderson - Retired, New Mexico

Greg Warrick - Prescott National Forest, Prescott, Arizona.

ADDITIONAL INFORMATION:

Revised: 1992-01-21 (JSP)
1993-06-17 (DBI)
1995-06-19 (DBI)
1997-03-02 (SMS)
2003-08-09 (AMS)

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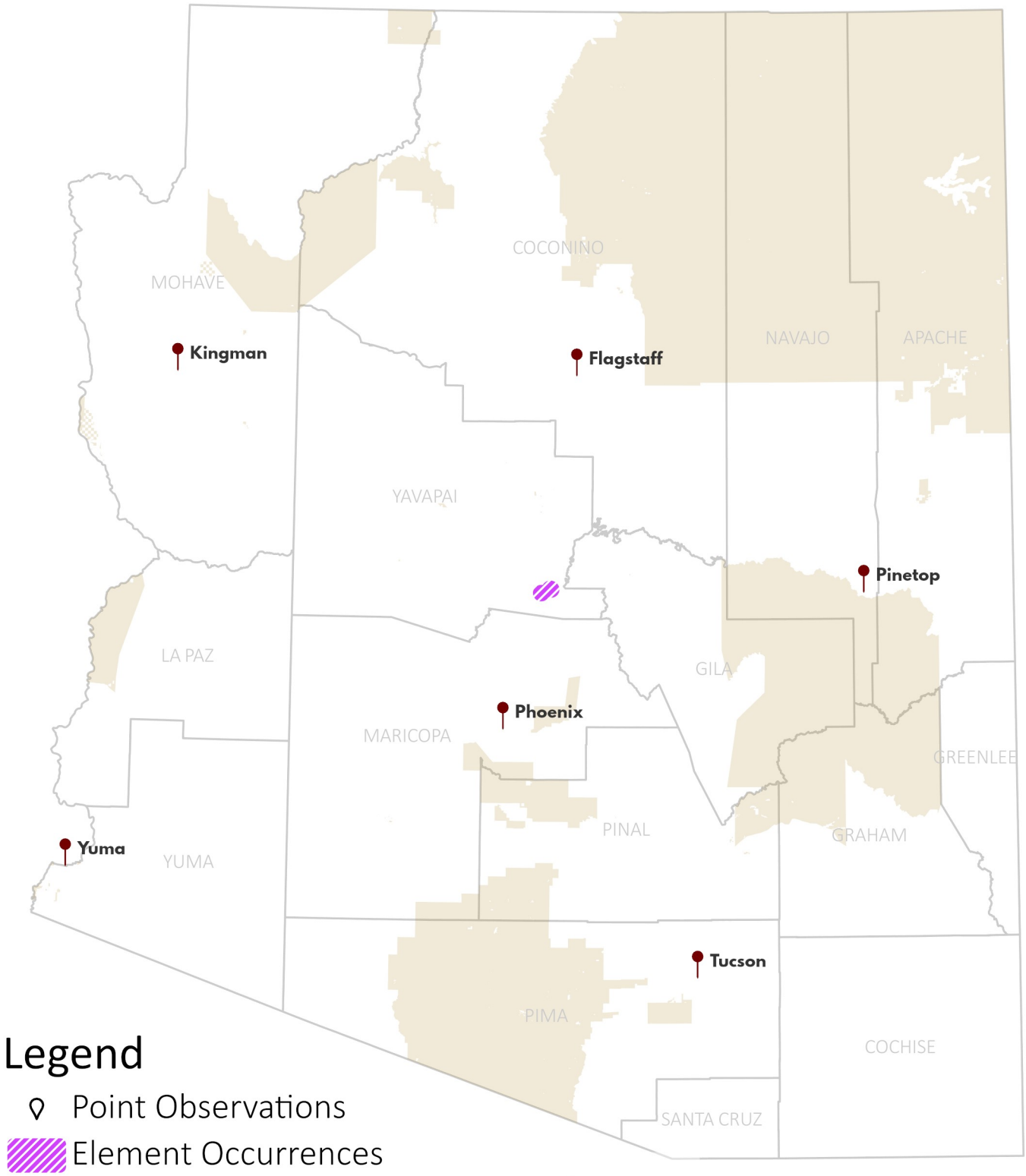
Cylloepus parkeri

Parker's Cylloepus Riffle Beetle



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

0 50 100 Kilometers

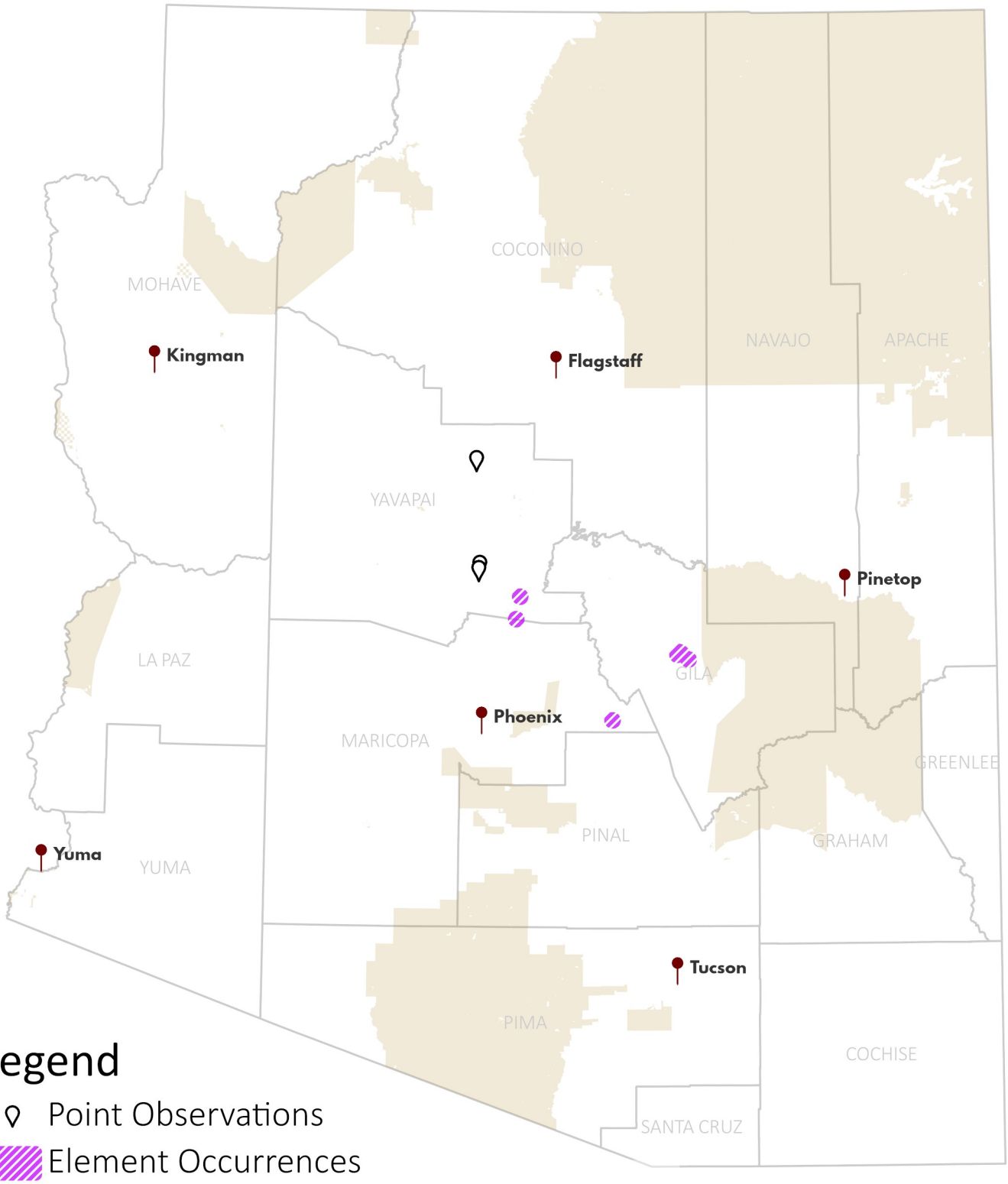
ARIZONA GAME & FISH

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences.

Heritage Data Management System
2019-06-13

Sonorella ashmuni

Richinbar Talussnail



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

0 50 100 Kilometers

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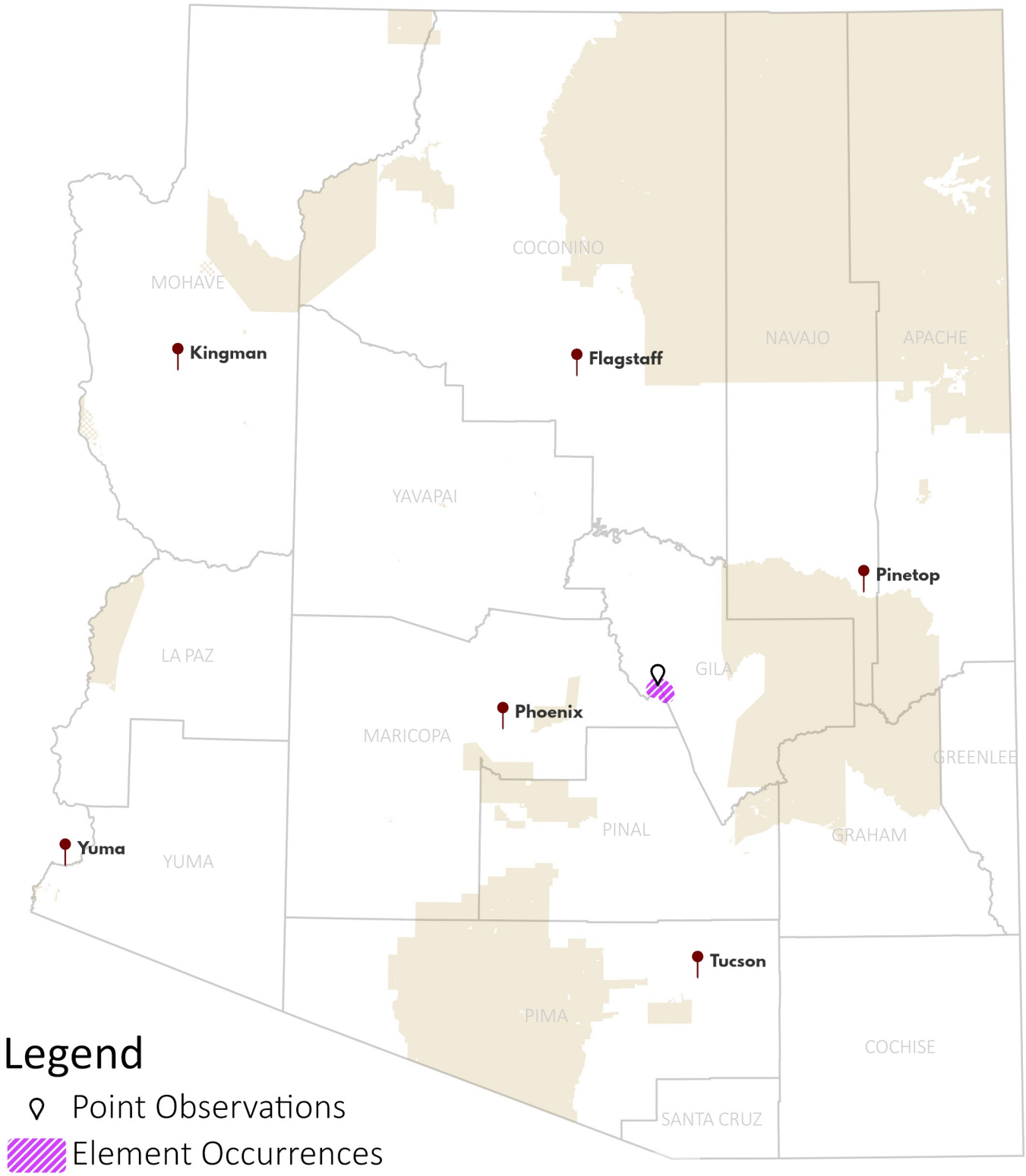
Heritage Data Management System
2019-06-13

Myotophallus rooseveltianus

Roosevelt Talussnail



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

Kilometers

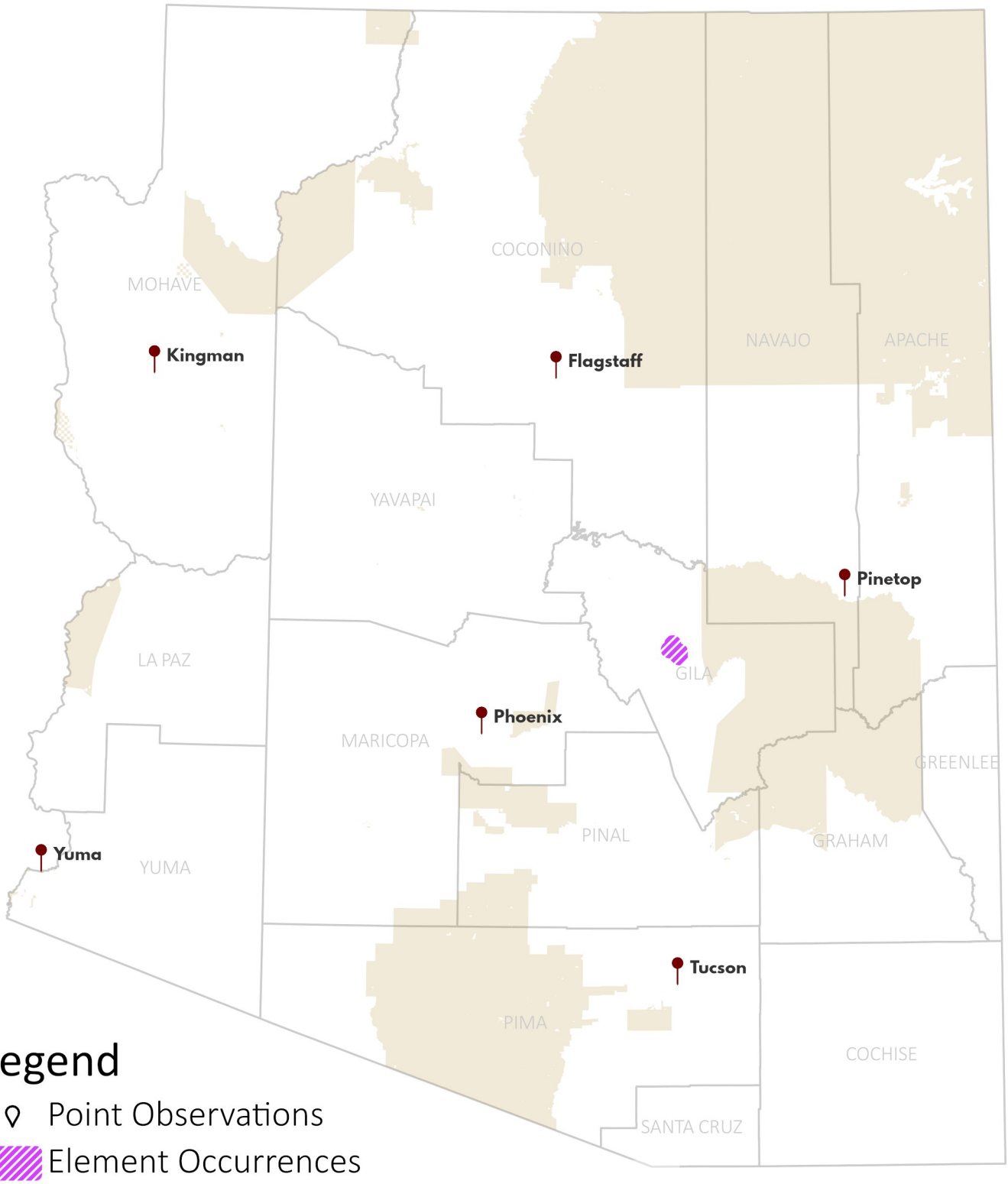
0 50 100

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences.

Heritage Data Management System
2019-06-13

Sonorella anchana

Sierra Ancha Talussnail



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

0 50 100 Kilometers

ARIZONA GAME & FISH

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences.

Heritage Data Management System
2019-06-13

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Invertebrate Abstract **Element Code:** IMGASC9370
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Sonorella magdalenensis* (Stearns, 1890)
COMMON NAME: Sonoran talussnail
SYNONYMS: *Helix magdalenensis* Stearns, 1890; *Sonorella tumamocensis* Pilsbry & Ferriss 1915; *S. sitiens arida* Pilsbry & Ferriss 1915; *S. hinkleyi* Pilsbry & Ferriss 1919; *S. hinkleyi fraterna* Pilsbry & Ferriss 1919; *S. tumacacori* Pilsbry & Ferriss 1919; *S. cayetanensis* Pilsbry & Ferriss 1919; *S. linearis* Pilsbry & Ferriss 1923
FAMILY: Helminthoglyptidae

AUTHOR, PLACE OF PUBLICATION: (R.E.C. Stearns, 1890, as *Helix*, U.S. Nat. Mus 13(813):205-225; Pls. 15-17).

TYPE LOCALITY: Sonora, Mexico, on top of a mountain, 1,000 ft above Magdalena; elevation not given. Found in 1965 at the probable T.L. in Sierra Magdalena, ca 1 mi N of Magdalena, at 3,650 ft (which is ca 1,000 ft above the town). (Bequaert & Miller, 1973).

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: Based on an unpublished revision by W.B. Miller (1968a, in Bequaert and Miller 1973), he recognized 68 valid species of *Sonorella* (with 19 subspecies), 57 of them in Arizona (three common with Sonora), 3 in New Mexico, 1 in trans-Pecos Texas (in common with New Mexico), 8 in Sonora (3 in common with Arizona), and 3 in Chihuahua. *Sonorella magdalenensis* is 1 of 23 species in the *S. granulatissima* Complex.

DESCRIPTION: Snails in the genus *Sonorella* have a "depressed globose, helicoids shell, 12 to 30 mm in diameter, umbilicate or perforate, with a wide, unobstructed mouth and a thin, barely expanded peristome, smoothish or slightly sculptured with growth-lines, occasionally with fine oblique or spiral granulation and short hairs (mainly on the early whorls), lightly colored, and normally with a dark peripheral band. Its most characteristic features are, however, in the genitalia, which lack a dart sac and mucus glands." (Bequaert and Miller, 1973). For species in the *S. granulatissima* Complex: The verge of the penis is usually stout and truncate, reaching extremes of diminution in some species or gigantism in others. Snails in the complex have minutely granulose or wrinkly-granulose shells, with a readily peeling periostracum; mostly without apical spirally descending threads. (Bequaert and Miller, 1973).

AIDS TO IDENTIFICATION: The most characteristic features of the genus *Sonorella* are, in the genitalia, which lack a dart sac and mucus glands (Bequaert and Miller 1972).

ILLUSTRATIONS:

TOTAL RANGE: In Arizona from Pima County and Santa Cruz counties. Sonora, Mexico, from Sierra Magdalena (Type Locality) to as far south as Sierra Pajaritos.

RANGE WITHIN ARIZONA: In Pima County, known from Cerro Colorado; Roskruge Mts.; S part of Tucson Mts.; N foothills of Santa Rita Mts.; and Tumamoc Hill near Tucson. In Santa Cruz County, known from San Cayetano and Tumacacori mountains.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Terrestrial gastropods do not move much, usually only to find food or reproduce. Olfaction is the primary sensory behavior utilized to find and move toward a food item (on the scale of centimeters to meters). A moving terrestrial gastropod lays down water-laden mucus on which it moves, exposing its integument to a potentially drying atmosphere, and increasing its water losses through the pallial cavity because of the necessity for gas exchange. A roosting terrestrial gastropod deploys a variety of passive mechanisms for water conservation, including the direct protection of its wet surfaces from drying conditions, avoidance of temperature extremes, the creation of more favorable microclimates and decreases in gas exchange. (A. Cook, *in* Barker 2001).

REPRODUCTION:

FOOD HABITS: Probably omnivorous, feeding on plant material (including algae, mosses, lichens, and possibly roots, shoots, leaves, flowers, flowers, anthers, pollen, fruit, seeds and rotting wood), and microorganisms associated with live and decaying vegetation; followed to a lesser extent by fungi and soil. (Speiser, *in* Barker, 2001).

HABITAT: The talussnail is a rock snail usually found in taluses or "slides" of coarse broken rock, generally found in crevices one to several feet below the surface, sealed to stones by their mucus (SDCP).

ELEVATION: In Arizona, from as low as 2,750 feet up to 6,000 feet (839-1830 m) elevation (Bequaert & Miller, 1973).

PLANT COMMUNITY:

POPULATION TRENDS: Unknown.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: 1C (AGFD SWAP 2012)
OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 2013)

MANAGEMENT FACTORS: Threats include destruction or disturbance of talus slopes.

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: Validity of the informal *Sonorella* "species-groups" (or "complexes") has been brought into question by Naranjo-Garcia (1988) and Roth (1996). Further research, including the use of molecular techniques, is needed to help clarify the relationships of these informal taxa. (Gilbertson and Radke 2005).

LAND MANAGEMENT/OWNERSHIP: USFS – Coronado National Forest; State Land Department; Private.

SOURCES OF FURTHER INFORMATION

REFERENCES:

Arizona Game and Fish Department. 2012. Arizona's State Wildlife Action Plan 2012-2022. Phoenix, AZ.

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USDA, Forest Service Region 3. 2013. Regional Forester's List of Sensitive Animals.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

The genus *Sonorella* occurs over most of Arizona (except a strip north of the Grand Canyon, an extensive northeast corner, an the small southwest *Eremarionta* area), the southwest corner of New Mexico, trans-Pecos Texas, northeast Sonora, and the northwest corner of Chihuahua, Mexico. (Bequaert and Miller, 1973).

Revised: 2008-04-03 (SMS)

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Invertebrate Abstract **Element Code:** IMGASJ0180
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Pyrgulopsis glandulosa*
COMMON NAME: Verde Rim Springsnail
SYNONYMS: *P. glandulosus*
FAMILY: Hydrobiidae

AUTHOR, PLACE OF PUBLICATION: R. Hershler, and J.J. Landye. 1988. Arizona Hydrobiidae (Prosobranchia: Rissoacea). Smithsonian Contributions to Zoology. Number 459.

TYPE LOCALITY: Nelson Place Spring, Yavapai County, Arizona.

TYPE SPECIMEN: Holotype: USNM 859047. Landye and Edwards, 28 September 1973.

TAXONOMIC UNIQUENESS: This genus comprises 35 described species and an additional 20-25 undescribed species in the Southwest.

DESCRIPTION: Shell white to transparent; periostracum (layer of chitin covering the outer portion of shell) is light brown and thin, covering much of shell surface or absent. Shell about a third taller than wide. Whorls are 3.5 to 4.0 in number, convex and slightly shouldered, sutures (line where spirals have contact) slightly impressed. The shell height is 2.0-2.8 mm. The snout is longer than wide, fairly thickened, and terminating distally with fleshy lips. Cephalic tentacles narrow, slightly less than twice as long as snout, somewhat expanded at tips. Dorsal penial surface with at least two elongate ridges, ventral surface with two accessory crests. All hydrobioids have a foot with a rounded posterior end. Females larger than males.

AIDS TO IDENTIFICATION: Due to animal's small size, it cannot be identified to species in the field but must be identified in a laboratory by a qualified authority. To obtain specimens, sift sand believed to contain the snail through ordinary kitchen strainer. Rule of thumb that spring snail species are specific to a particular location (i.e. a single spring or group of springs connected or close to each other), may be used as a means of preliminary identification. Based on penial morphology, this species is most similar to *P. montezumensis*, which also occurs in Verde River drainage, but differs in having a larger penis.

ILLUSTRATIONS:
Photographs of shells (Hershler and Landye, 1988)
Line drawings (Hershler and Landye, 1988)

Scanning electron microscope (SEM) micrographs of penis and cephalic tentacles (Hershler and Landye, 1988)
SEM micrographs of radula (Hershler and Landye, 1988)
Line drawings (Hershler and Ponder, 1998)

TOTAL RANGE: Nelson Place Spring complex, consisting of two springs, separated by 150 meters, that form the headwaters of Sycamore Creek, Yavapai County, central Arizona.

RANGE WITHIN ARIZONA: See "**Total Range.**"

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: The hydrobioid digestive system is typical of style-bearing neotaenioglossans. The mouth opens to a short oral area containing a pair of dorsolateral chitinous jaws composed of small, simple rodlets, immediately behind which is a well-developed buccal mass (situated within the snout). A pair of simple, unbranched, tubular salivary glands opens anterodorsally to the buccal cavity and (almost always) pass posteriorly over the nerve ring, rarely stopping short of the ring, but never passing through it in hydrobioids. Hydrobioids have a taenioglossate radula (i.e., seven teeth per row) comprising numerous rows of cuspate teeth, each of which includes a typically squarish or trapezoidal central tooth flanked on each side by lateral, inner marginal, and outer marginal teeth. Teeth near the anterior end of the radula are often worn or broken, whereas the proximal portion of the ribbon has several to many rows of poorly differentiated or incompletely formed teeth. (Hershler and Ponder, 1998).

REPRODUCTION: Most hydrobioids are oviparous, with females depositing small egg capsules, either singly or (rarely) in strings, on the substrate. A small number of hydrobioids are ovoviviparous, in which female's brood shelled young in the pallial gonoduct. Hydrobioid egg capsules are typically hemispherical to spherical. Copulation in hydrobioids is usually via an anterior opening to the glandular oviduct. The ventral channel may be traversed at least in part by the penis, but it is more likely that the penis only enters the anterior most section. (Hershler and Ponder, 1998).

FOOD HABITS:

HABITAT: Freshwater, bethnic, spring-spingbrook.

ELEVATION: 5,280 ft. (1,610 m).

PLANT COMMUNITY: Unknown.

POPULATION TRENDS: Unknown.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: SC (USDI, FWS 1996)
[C2 USDI, FWS 1991, 1994]

STATE STATUS: 1 (AZGFD, AWCS 2022)
[1A (AGFD SWAP 2012)]

OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 1999, 2007, 2013)
Bureau of Land Management Sensitive (USDI, BLM AZ 2000, 2005, 2008, 2010)

MANAGEMENT FACTORS: **Threats:** highly restricted geographic distribution with associated potential for extinction due to chance events; water development and groundwater depletion. **Management needs:** protection of spring source; periodic monitoring of snail population and its habitat; research on ecology and systematics.

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS:

LAND MANAGEMENT/OWNERSHIP: USFS - Prescott National Forest; Private.

SOURCES OF FURTHER INFORMATION

REFERENCES:

Arizona Game and Fish Department. 2012. Arizona's State Wildlife Action Plan 2012-2022. Phoenix, AZ.

Arizona Game and Fish Department. 2022. Arizona Wildlife Conservation Strategy: 2022-2032. Arizona Game and Fish Department, Phoenix, Arizona. 378 pages.

Hershler, R. and J.J. Landye. 1988. Arizona hydrobiidae (prosobranchia: rissoacea) Smithsonian Contributions to Zoology. Number 459: 8-17.

Hershler, R. and W.F. Ponder. 1998. A Review of Morphological Characters of Hydrobioid Snails. Smithsonian Institution Press, Washington D.C.

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USDA, Forest Service Region 3. 2007. Regional Forester's List of Sensitive Animals.

USDA, Forest Service Region 3. 2013. Regional Forester's List of Sensitive Animals.

USDI, Bureau of Land Management. 2000. Arizona BLM Sensitive Species List. Instruction Memorandum No. AZ-2000-018.

USDI, Bureau of Land Management. 2005. Arizona BLM Sensitive Species List.

USDI, Bureau of Land Management Region 2. 2008. Arizona BLM Sensitive Species List.

USDI, Bureau of Land Management Region 2. 2010. Arizona BLM Sensitive Species List.
USDI, Fish and Wildlife Service. 1991. Endangered and Threatened Wildlife and Plants; Animal Candidate Review for Listing as Endangered or Threatened Species, Proposed Rule. Federal Register 56(225): 58821.
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USDI, Fish and Wildlife Service. 1996. Endangered and Threatened Wildlife and Plants: Review of Plant and Animal Taxa that are Candidates for Listing as Endangered or Threatened Species. Federal Register 61(40): 7596-7613.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

Bob Hershler - Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C.
Jerry Landye - USDI, Fish and Wildlife Service, Pinetop, Arizona.

ADDITIONAL INFORMATION:

Revised: 1992-03-24 (DBI)
1995-03-29 (DBI)
1997-03-03 (SMS)
2003-12-01 (AMS)
2023-01-12 (MBL)

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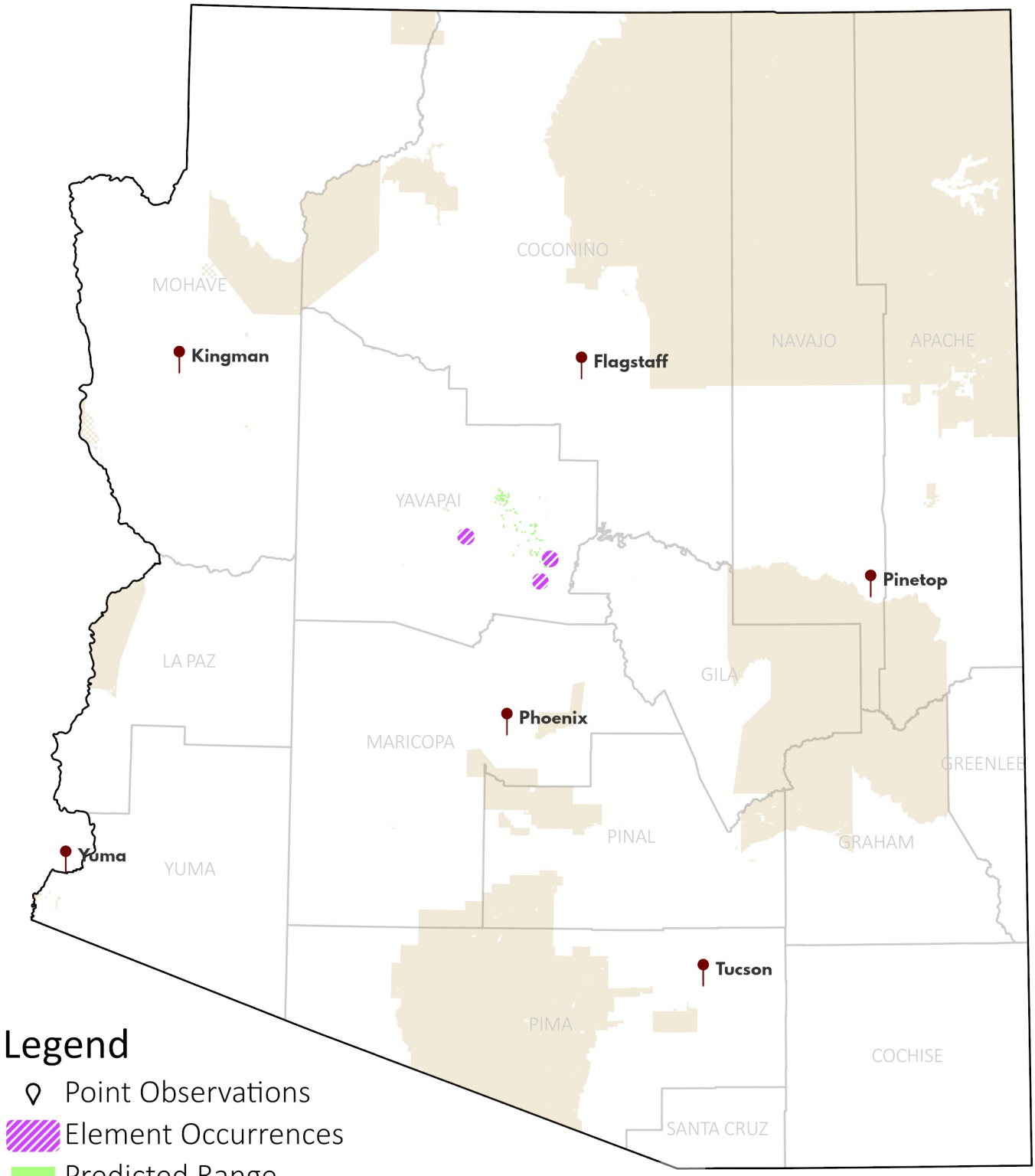
Pyrgulopsis glandulosa

Verde Rim Springsnail



Legend

- Point Observations
- Element Occurrences
- Predicted Range
- Tribal Lands
- Counties

N

0 50 100 Kilometers

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences. Predicted ranges indicate likely habitat suitability, not presence.

Heritage Data Management System
2019-06-12

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AMACC09010
Data Sensitivity: YES

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Idionycteris phyllotis* Allen
COMMON NAME: Allen's lappet-browed bat; Allen's big-eared bat; Mexican big-eared bat
SYNONYMS: *Corynorhinus phyllotis; Idionycteris mexicanus; Plecotus phyllotis*
FAMILY: Vespertilionidae

AUTHOR, PLACE OF PUBLICATION: Allen, G.M. 1916. Bull. Mus. Comp. Zool., 60:352.

TYPE LOCALITY: San Luis Potosi, probably from near city of San Luis Potosi or near Rio Verde.

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: Monotypic species.

DESCRIPTION: Tawny above with hairs dark brown at base; underparts slightly lighter. No fur on wings or membranes. The ears are large, 4.0 cm () long with two flaps (lappets) projecting forward from the base of the ears; tragus 1.6 cm (). Ears often protected by folding and coiling them into "rams' horns" which lay along the sides of their necks. No glandular enlargements on muzzle; keeled calcar.

AIDS TO IDENTIFICATION: The presence of the forward-projecting lappets at the base of the ears distinguish *Idionycteris phyllotis* from the other 4 big-eared bats with which it may be confused: *Euderma maculatum* (Spotted bat), *Antrozous pallidus* (Pallid bat), *Macrotus californicus* (California leaf-nosed bat) and *Corynorhinus townsendii* (Townsend's big-eared bat) (Hoffmeister, 1986). Call is a loud, distinctive "peep" at about 1 second intervals, similar to *E. maculatum* but lower in pitch. Also emits a "rapid clicking" or "low, barely audible cheeping" much like *C. townsendii*.

ILLUSTRATIONS:
Black and white photo (Barbour and Davis 1969: 184)
Color photo (Barbour and Davis 1969: plate XIX)
Black and white photo (Hoffmeister 1986: 106)
Color photo (Whitaker 1980: plate 142)

TOTAL RANGE: In the central highlands of Mexico from the Distrito Federal, San Luis Potosi, Tamaulipas and Durango, northward into west-central New Mexico to the Colorado River Valley, Arizona (Barbour and Davis, 1969). Typically found in mountainous regions at higher elevations. Seasonal movements, and cold season distribution unknown.

RANGE WITHIN ARIZONA: Specimens taken across most of Arizona, but not known from the southwestern deserts of Arizona. Most Arizona specimens have been collected from the southern Colorado Plateau, the Mogollon Rim and adjacent mountain ranges.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Flights characterized by "swift, direct flights from one place to another, interspersed with slower flights and by occasional near hoverings, as if the bat were carefully seeking an exit" (Barbour and Davis, 1969). Capable of highly maneuverable flights, can hover and even fly vertically. Their roosts are often loosely associated with roosts of *Corynorhinus townsendii*, *Myotis californicus* (California Myotis), and *Myotis thysanodes* (Fringed Myotis). Trees are commonly used as roosts on the Coconino and Apache-Sitgreaves National Forests, in Arizona (AGFD 1996). Per Barry Spicer (1992 pers. comm.), there is no information on male or winter roosts, with the single exception of one individual observed in February 1992, in a through and through adit, in the Union Pass area near Kingman.

REPRODUCTION: Reproduction in this species is poorly known. Females form maternity colonies in the early summer. Males are possibly solitary roosters during this time. Young born mid to late June in Arizona, begin to fly by late July. Arizona maternity roosts are known from the Kingman area, and the Aravaipa Canyon area in the Galiuro Mountains. Lactating females have been captured in the vicinity of Flagstaff.

FOOD HABITS: Fragile skull and jaw suggest that *I. phyllotis* feeds primarily on soft-bodied insects. This is supported by diet studies, which have found the main food to be small moths (Microlepidoptera, 6-12 mm in size). There are also records of *I. phyllotis* feeding upon soldier beetles (Cantharidae), dung beetles (Scarabeidae), leaf beetles (Chrysomelidae), roaches (Blattidae) and flying ants (Formicidae). Food is gleaned from the surface, or pursued and taken in flight.

HABITAT: In Arizona, bats are netted most often in ponderosa pine, pinyon-juniper, Mexican woodland and riparian areas of sycamores, cottonwoods and willows. They have also been collected in white fir and in Mohave desertscrub. Boulder piles, cliffs, rocky outcrops or lava flows is the common terrain at or near most collection locations. Typically netted along streams or over ponds where the bats may be seeking insects, water or both. They roost in caves and abandoned mineshafts.

ELEVATION: 1,320 - 9,800 ft (403-3,225 m), but most observations are at altitudes between 3,500 - 7,500 ft (1,100-2,500 m).

PLANT COMMUNITY: Ponderosa pine, pinyon-juniper, Mexican woodland and riparian areas of sycamores, cottonwoods and willows.

POPULATION TRENDS: Very poorly known. Barbour and Davis (1969) and Hoffmeister (1986) point to the paucity of pre-1955 records for Arizona and discuss the possibility that this species has only recently expanded its range into Arizona, Nevada, Utah and New Mexico.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: SC (USDI, FWS 1996)
[C2 USDI, FWS 1994]

STATE STATUS: None

OTHER STATUS: Bureau of Land Management Sensitive (USDI, BLM AZ 2010)
Not BLM Sensitive (USDI, BLM AZ 2008)
[Bureau of Land Management Sensitive (USDI, BLM AZ 2000, 2005)]
Forest Service Sensitive (USDA, FS Region 3 2007, 2013)

MANAGEMENT FACTORS: Maternity colonies are easily disturbed, often resulting in abandonment.

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: Survey for maternity and hibernaculum roost sites.

LAND MANAGEMENT/OWNERSHIP: BLM - Arizona Strip and Kingman Field Offices; NPS - Grand Canyon National Park; USFS - Apache-Sitgreaves, Coconino, Coronado, Kaibab and Tonto National Forests; BIA - Hualapai Reservation; State Land Department; AGFD Viet Ranch; TNC - Aravaipa Canyon Preserve; Private.

SOURCES OF FURTHER INFORMATION

REFERENCES:

Allen, G.M. 1916. Bats of the genus *Corynorhinus*. Bull. Mus. Comp. Zool., 60:352.

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Barbour, R.W. and W.H. Davis. 1969. Bats of America. The University Press of Kentucky. pp. 183-186.

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Hayward, B.J. and R.R. Johnson. 1961. Notes on *Plecotus phyllotis* from Arizona. Journal of Mammalogy 42(3):402.

Hoffmeister, D.F. 1986. Mammals of Arizona. University of Arizona Press. pp. 104-107.
USDA, Forest Service Region 3. 2007. Regional Forester's List of Sensitive Animals.
USDA, Forest Service Region 3. 2013. Regional Forester's List of Sensitive Animals.
USDI, Bureau of Land Management. 2000. Arizona BLM Sensitive Species List. Instruction Memorandum No. AZ-2000-018.
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MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

I. phyllotis is readily trapped in mist nets; they do not seem as adept at avoiding them as some of the other big-eared bats, such as *Corynorhinus townsendii*. *I. phyllotis* is most often netted 1½ - 2 hours after dusk. These bats are fairly docile and seldom attempt to bite when captured.

Revised: 1991-08-16 (DKW)
1992-05-03 (BKP)
1992-10-02 (RBS)
1994-03-25 (DCN)
1995-06-08 (DBI)
1996-06-19 (SMS)
1997-03-04 (SMS)
2001-10-03 (GLR)

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AMACC01160
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Myotis occultus*
COMMON NAME: Arizona Myotis, Occult Little Brown Bat, Hollister's Bat
SYNONYMS: *Myotis lucifugus occultus, Myotis baileyi*
FAMILY: Vespertilionidae

AUTHOR, PLACE OF PUBLICATION: Hollister, 1909. Proc. Biol. Soc. Wash., 22:43.

TYPE LOCALITY: West side of Colorado River, 10 miles above Needles, San Bernardino Co., California.

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: One of 88 North American species in the genus (Wilson and Reeder 2005). During and since the 1960s the question of whether or not this bat is a species or subspecies has been the subject of investigation. It was originally described in 1909 as a distinct species. Various dental characteristics were later found to overlap with those of *M. lucifugus* leading some authorities (e.g. Findley and Jones, 1967 and Hall, 1981) to consider it only subspecifically distinct from *M. lucifugus*. Barbour and Davis (1969) disagreed, believing that the available evidence was insufficient to warrant such a change. Hoffmeister (1986) assessed 25 cranial measurements and concluded that it was not conspecific with *M. lucifugus* and referred it tentatively to *Myotis occultus*. Based on recent mitochondrial DNA and morphological evidence by Piaggio et al. (2002), *M. occultus* is a specifically distinct, monophyletic lineage. Wilson and Reeder in 1993, originally considered *occultus* a subspecies under *M. lucifugus*, however in their 2005 update, they consider this species distinct (*M. occultus*). They gave the following comments; "Included in *lucifigus* by Findley and Jones (1967) and most subsequent authors, but apparently distinct, se Paiggio et al., (2002)."

DESCRIPTION: Medium sized *Myotis* (total length = 80.0-97.0 mm [3.2-3.88 in.] and forearm length = 36.0-41.0 mm [1.44-1.64 in.]) with sleek glossy fur. Small ears (11.0-16.0 mm [0.44-0.64 in.]) and large feet (8.0-11.0 mm [0.32-0.44 in.]) are characteristic. Long hairs occur on the toes and extend beyond the tips of the claws. Color often bright, generally tawny, ochraceous, pale tan, or reddish-brown to dark brown.

It is the only long-footed (i.e. hind foot length >8.0 mm [0.32 in.]) *Myotis* in Arizona with a gradually sloping forehead and the only *Myotis* in Arizona with only 1 small upper premolar behind the canine. In the rare individual with 2, it is on one side only or one is crowded out of alignment.

AIDS TO IDENTIFICATION: The genus *Myotis* is distinguished from other bat species in Arizona by lack of a nose-leaf, enlarged facial glands, a tail extending beyond the tail membrane, or fur on the tail membrane. *Myotis* are initially identified by their uniform shades of brown and by their straight and relatively narrow tragus with a pointed tip.

When compared to other *Myotis*, the lack of a keeled calcar distinguishes *M. occultus* from *M. californicus* (Californian Myotis), *M. ciliolabrum* (Western Small-footed Myotis), and *M. volans* (Long-legged Myotis). Shorter ears (11-16 mm) distinguish *M. occultus* from *M. evotis* (20-24 mm), *M. auriculus* (19-21 mm) and usually from *M. thysanodes* (12-19 mm). *M. occultus* is distinguished from *M. thysanodes* (Fringed Myotis) by the lack of a macroscopic fringe of hairs on trailing edge of the tail membrane. Lack of bare spot between scapulae and lack of grayish back distinguish *M. occultus* from *M. velifer* (Cave Myotis). Darker ears and longer forearm (36.0-41.0 mm [1.44-1.64 in.]), and a glossier coat distinguish *M. occultus* from *M. yumanensis* (Yuma Myotis) which usually has light-colored ears, a shorter forearm (31.0-36.0 mm [1.24-1.44]), and a dull coat.

ILLUSTRATIONS:

B&W photo (Barbour and Davis 1969:73)
Color photo (Barbour and Davis 1969: plate VI)
Color photo (Bat Conservation International, http://www.batcon.org/index.php/all-about-bats/species-profiles.html)

TOTAL RANGE: *Myotis occultus* ranges from southern California to Arizona, New Mexico, and Colorado (USA), south to Distrito Federal (Mexico); possibly W Texas (USA). (Wilson and Reeder (2005). The winter habitats remain a mystery. These bats may hibernate in hollow tree cavities (Bat Conservation International, 2011). Gary Bell (pers. comm., in Howell 1989), reported a winter record of a few hibernating individuals in December from a mine just northwest of Parker in California. Bob Dickerman (field notes, in Howell 1989) reported a few individuals in late December from a mine in northern Sonora.

RANGE WITHIN ARIZONA: Generally observed at higher elevations in Apache, Coconino, Cochise, Gila, Greenlee, Mohave, Navajo, and Yavapai counties. Most observations from the Mogollon Plateau, generally from Alpine in the White Mountains northwest to near Flagstaff. *Myotis occultus* has also been observed in the Chiricahua Mountains, Sierra Ancha Mountains, Pinal Mountains, Mingus Mountain, the Verde Valley, Oak Creek Canyon, San Francisco Mountains, Coconino Plateau, and the Hualapai Mountains. (unpublished data, HDMS, AZ Game and Fish Department 2011). Likely occurs along the lower Colorado River Valley since it is known from at least 4 localities in the California portion of that area, from the southernmost tip of Nevada south to near Yuma and 1 unmappable locality in the "Mojave Desert" of Arizona.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: In Arizona, nursery colonies chose larger than average snags, located on slopes with more exposure to solar heating. At lower elevations, roost snags were closer than

randomly sampled snags to water. Tree cavities and crevices normal preference as day roosts. *Myotis occultus* select roosts that provide safe havens from predators that are close to foraging grounds. (Bat Conservation International, 2011).

REPRODUCTION: Throughout its range, reproduction poorly known. Adult males and females appear to roost separately during the summer season when maternity colonies are established. In northern Arizona, numerous maternity colonies of 50-100 bats each have been documented beneath exfoliating bark of ponderosa pine snags. Colony size varied with elevation. At elevations of 2,262-2,621 m (7421-8599 ft) average colony size was 50 bats, while at 2,015-2,262 m (6611-7421 ft) average colony size was 220 bats. Two colonies both at lower elevations contained 984 and 444 bats each. (Bat Conservation International, 2011). *Myotis occultus* apparently has 1 young per year in late June.

FOOD HABITS: Generally hunts low over water for flying aquatic insects, mainly midges, mosquitoes, mayflies, and caddisflies. In the Southwest *M. occultus* has been observed foraging under large cottonwoods and in an orchard at low elevations. At higher elevations, they usually forage at low levels over and around water. A single Arizona myotis can consume 600 mosquitoes in an hour (Davis, 2003).

HABITAT: During the summer in Arizona, *M. occultus* is usually found in ponderosa pine and oak-pine woodland near water. However, it is found along permanent water or in riparian forests in some desert areas such as along the lower Colorado and Verde rivers. In New Mexico, it is considered to be a resident around large permanent bodies of water and transient elsewhere. Vegetation zone is not thought to be an important influence there.

No hibernacula are known from Arizona or New Mexico; however, Findley, et al. (1975) suggests that in New Mexico they hibernate within the area of their summer range. Mines are rarely used in summer although both winter records are from mines. It has been found roosting with *M. yumanensis*, *M. velifer*, and *Tadarida brasiliensis* (Mexican Free-tail Bat).

ELEVATION: In Arizona, this bat is most common at higher elevations. Their elevation ranges from 3,200 ft (975.4 m) in the Verde Valley to 8,620 ft (2,627.4 m) in the San Francisco Mountains. There are also records from much lower elevations between 150 and 1,000 feet (45.7-304.8 m) along the lower Colorado River.

PLANT COMMUNITY: They primarily forage over or near water. In Arizona this is usually in association with mixed conifer forests, including ponderosa pine/grassland, ponderosa pine/gambel oak, and aspen/ponderosa pine forests.

POPULATION TRENDS: Not well understood. One maternity colony near Blythe, California and possibly a second near Castle Hot Springs, Arizona have been eliminated. A third colony near Bosque Del Apache, New Mexico, is reported to be at least partially excluded from previously used buildings. According to the California Department of Fish and Game, populations have drastically declined in many parts of its range.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: SC (USDI, FWS 1996)
[C2 USDI, FWS 1985, 1989, 1991, 1994]

STATE STATUS: 1B (AGFD SWAP 2012)

OTHER STATUS: None (USDA, FS Region 3, 1999)
[Forest Service Sensitive USDA, FS Region 3, 1988]
Bureau of Land Management Sensitive (USDI, BLM AZ 2010)
[Not BLM Sensitive (USDI, BLM AZ 2008)]
[Bureau of Land Management Sensitive (USDI, BLM AZ 2000, 2005)]

MANAGEMENT FACTORS: *Myotis occultus* may use manmade structures for roosting, but based on radio tracking studies performed in northern Arizona, maternity colonies were frequently observed in large ponderosa pine snags. They may use tree cavities, mines or possibly caves for winter hibernation. Available water seems to be a consistent feature near all occurrences. Forest harvesting practices could impact this species, especially if too many large ponderosa pine snags are removed from a forest. This species is susceptible to disturbance, thus disturbance of maternity and hibernating colonies are a threat to this species.

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: A status survey, along with searches for maternity and hibernation roosts need to be conducted through their entire range within the state. General life cycle information is needed, such as reproduction, diet, roosting, hibernation parameters, etc.

LAND MANAGEMENT/OWNERSHIP: BIA - Yavapai-Apache Nation (Camp Verde Indian Reservation); BLM – Kingman Field Office; NPS - Montezuma Castle National Monument; USFS - Apache-Sitgreaves, Coconino, Coronado, Kaibab, Prescott and Tonto National Forests; State Land Department; AGFD Viet Ranch; AMNH Southwest Research Station; Private.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

B.J. Hayward - Western New Mexico University. Silver City, New Mexico.
Donna J. Howell - Tucson, Arizona.
Ernest W. Valdez – United States Geological Survey, Fort Collins Science Center, University of New Mexico, Albuquerque. E-mail: ernie@usgs.gov.

ADDITIONAL INFORMATION:

Revised: 1991-08-13 (RBS)
1992-10-06 (RBS)
1994-04-07 (DCN)
1997-03-04 (SMS)
2003-06-16 (SMS)
2003-06-20 (AMS)
2011-01-20 (SMS)

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edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AMAFD03111
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Dipodomys spectabilis baileyi*
COMMON NAME: New Mexico Banner-tailed Kangaroo Rat
SYNONYMS: *D. s. clarencei*
FAMILY: Heteromyidae

AUTHOR, PLACE OF PUBLICATION: Goldman, 1923, Proc. Bio. Soc. Wash., 36:140.

TYPE LOCALITY: 40 miles west of Roswell, Chaves County, New Mexico. Goldman (1923) may have incorrectly reported the type locality. The type was collected by Vernon Bailey, which he reported as collected "40 miles northwest of Roswell, New Mexico." (Bailey 1931:259). Bailey's distribution map (Bailey 1931:249, Fig. 44) also placed the type northwest of Roswell. (BISON 2000).

TYPE SPECIMEN: USNM 97185 (Holotype), V. Bailey, 1899. Original number 6961.

TAXONOMIC UNIQUENESS: In North America, the species *spectabilis* is 1 of 16 in the genus *Dipodomys*, and 1 of 5 that occur in Arizona. *D. s. baileyi* is 1 of 3 subspecies of *spectabilis* that occurs in the State, the others include *D. s. spectabilis*, and *D. s. perblandus*.

DESCRIPTION: Banner-tails are large kangaroo rats, with head and body length of 5-6 inches (12.7-15.2 cm); tail 7-9 in (17.8-22.9 cm); hind foot long 1.88-2.0 in (4.7-5.1 cm) with 4 toes, front feet small; weight 3.37-6.2 oz (98-176 g). They are dark buff above and white below, with a long tail that has a prominent white tip preceded by a black band; narrow white side stripes extend only two-thirds the length of the tail. The upper and lower stripes are grayish black to dusky. They have 20 teeth, and the skull is more massive with more expanded zygomatic arches than other subspecies of *D. spectabilis*. Cheek pouches and 6 mammae (2 pairs inguinal, 1pair pectoral) present. Ears are wide with large auditory openings and hooded tips to keep out the dirt.

AIDS TO IDENTIFICATION: The Banner-tailed is likely only confused with Desert kangaroo rat (*D. deserti*), in which the bottom tail stripe is absent or pale. Ord's (*D. ordii*) and Merriam's (*D. merriami*) kangaroo rats are much smaller, with no white tip on tail.

ILLUSTRATIONS:
Color photo (Whitaker, Jr., 1996: plate 109).
Color drawing (Burt and Grossenheider, 1980: plate 14).

B&W photo (Hoffmeister, 1986:307).
Color photo (Texas Parks and Wildlife, 1994).

TOTAL RANGE: Northeast Arizona, New Mexico, west Texas.

RANGE WITHIN ARIZONA: Apache County, in northeast Arizona.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Banner-tail sign includes large, conspicuous mounds of earth and vegetation up to 4 feet (1.2 m) high and 15 feet (4.5 m) wide (although sometimes only 6 in/15.0 cm high and 5 ft/1.5 m wide), with several entrances opening to burrow systems and trails leading from them. Mound entrances are 4-6 inches in diameter, with occupied tunnel entrances closed during the day. Usually 3 or 4 levels of rooms, all more or less connected by tunnels and passageways. Only one animal occupies a mound except when young are present, or when a male defends the mound of a female from another male. There are about 10 storage areas per mound. Most tunnels are within 20 inches of the surface, except the nest burrow, which goes deeper. Old mounds may be used for years, thus dispersing young rarely construct their own mound; newly constructed mounds can take up to 2 years to build. Home-range not more than 600 ft (183 m) across; may move nearly a mile (1.6 km). Density of active mounds are 1.7 per ha in central New Mexico. Both males and females defend their territories, although they are tolerant of neighbors (friendly rivals or enemies), which is beneficial to maintaining territorial claims (Randall 1989).

A nocturnal animal that does not hibernate or estivate (like other kangaroo rats), but remains in its burrow during inclement weather. They may forage during daylight hours in times of drought. Lifespan is 1-3 years in wild. They hop about (sometimes run) much like a robin, with ease and grace as if walking on four legs, using their long legs and hind feet. Their tail is used for balancing and turning, much like a rudder. Banner-tails make a *peeee* sound lasting about a second, but also growl, squeak, squeal, and chuckle. They foot-drum in or near their mounds at night, in response to neighbors or in case of a challenge to the mound. Foot-drumming and sand-kicking, along with alert posture and avoidance, help them avoid snake predators. Other enemies include Badgers, foxes, Bobcats, and great horned and barn owls. (Whitaker, Jr. 1996).

REPRODUCTION: For the species, reproduction may occur throughout the year except October and November. Most births occur January – August. Time of breeding is irregular and apparently regulated by weather and food conditions. One to 3 litters are born each year; 1-4 young per litter. Gestation period last 22-27 days, with young born hairless, pink, and with eyes and ears closed. They are full-grown by 4 months of age. Occasionally, females from the first litter will breed later that same year; otherwise, they do not breed until the following year. Nest consists of chaff, stems, and leaves of grasses.

FOOD HABITS: Consumes seeds of grass and various other plants, and at times, green and succulent plants. They store many types of seeds to carry them over periods of scarcity. Stores from a fraction of a gram to well over 5 kg have been found.

HABITAT: Preferred habitat is Great Basin desertscrub, and desert grasslands with scattered shrubs, mesquite, or junipers. They occupy scrub or brush-covered slopes, often with creosote bush or acacia on hard or gravelly soil; hard soils support their complex and deep burrow systems.

ELEVATION: The species *D. spectabilis*, is known to occur at elevations from 3,500 - 4,000 ft (1067.5-1220 m). BISON (2000), report elevations for the subspecies *D. s. baileyi* from 4,000-5,000 ft (1220-1525 m) northwest of Albuquerque, New Mexico.

PLANT COMMUNITY: For the species: often found in areas with catclaw, mesquite, and *Opuntia*. Seeds cached include *Bouteloua rothrockii* (crowfoot grama), *B. aristidoides* (six-weeks grama), *Boerhaavia wrightii* (spiderling), *Aristida* sp. (needlegrass), *Prosopis velutina* (mesquite), and *Mollugo verticillata*. (Hoffmeister 1986). In central New Mexico, the subspecies *D. s. baileyi* was found in vegetation including *Sporobolus*, *Aristida*, *Muhlenburgia*, *Tridens*, *Bouteloua*, *Andropogon*, *Mentzilia pumila*, and *Gutierrezia sarothrae*, with *Salsola kali* and *Yucca glauca* sparsely intermixed (Schroder and Geluso 1975, *in* BISON 2000).

POPULATION TRENDS: Unknown. Was observed on the Navajo Nation as recently as 1989-1991. How many and distribution of observations is unknown.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS:	None
STATE STATUS:	1B (AGFD SWAP 2012) [WSC, WSCA, AGFD in prep] [Endangered, TNW, AGFD 1988]
OTHER STATUS:	None. USDA, FS Region 3, 2013 Bureau of Land Management Sensitive – full sp. (USDI, BLM AZ 2010) [Bureau of Land Management Sensitive (USDI, BLM AZ 2008)] [Forest Service Sensitive (USDA, FS Region 3 2007)] Group 4, full species level (NNDFW, NESL 2005, 2008) PR, Determined subject to Special Protection in Mexico (NORMA Oficial Mexicana NOM-059-SEMARNAT-2010)

MANAGEMENT FACTORS: Habitat loss and degradation.

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS:

LAND MANAGEMENT/OWNERSHIP: BIA - Navajo Nation.

SOURCES OF FURTHER INFORMATION

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Charles LaRue, Private consultant.

ADDITIONAL INFORMATION:

Specimens taken on the Navajo Nation by Chuck LaRue in 1989-1991.

Revised: 2001-02-28 (SMS)
2014-01-29 (BDT)

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AMAFB06010
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Cynomys ludovicianus*
COMMON NAME: Black-tailed prairie dog
SYNONYMS:
FAMILY: Sciuridae

AUTHOR, PLACE OF PUBLICATION: Mearns, Bull. Amer. Mus. Nat. Hist. 2:303. 1890.

TYPE LOCALITY: Subspecies *arizonensis*: Point of Mountain, near Willcox, Cochise County, Arizona.

TYPE SPECIMEN: Subspecies *arizonensis* was collected by Mearns in 1885 at Point of Mountain near Willcox, Cochise County, Arizona, and was originally described in 1890 as a new species, the Arizona prairie dog (*Cynomys arizonensis*).

TAXONOMIC UNIQUENESS: According to Holly Hicks and William E. Van Pelt with the Arizona Game and Fish Department (in Interagency Management Plan for Black-tailed Prairie Dogs, Draft - 2009 Revision [In cooperation with the Arizona Black-tailed Prairie Dog Working Group]), "Taxonomy: Taxonomists recognize two subspecies of BTPDs*: Cynomys ludovicianus ludovicianus* (Plains subsp.) and *C. l. arizonensis* (Arizona subsp., Hall 1981). The Arizona subspecies' range is northeastern Mexico, west Texas, southern New Mexico, and was formerly found in southeastern Arizona. The Plains subspecies' range is New Mexico, north Texas, Oklahoma, Kansas, Nebraska, Colorado, Wyoming, Montana, North Dakota, South Dakota, and Canada. These two subspecies have been the subject of several investigations regarding their taxonomic status, including those of Hollister (1916), Pizzimenti (1975), Hansen (1977), and Chesser (1981). Regardless of the differing conclusions, it is generally believed that *C. l. arizonensis* is only slightly differentiated from *C. l. ludovicianus*, so for convenience **it is acceptable to regard this species as monotypic.** However, from a conservation and evolutionary standpoint, the difference of these two subspecies may have significant management implications."

According to Hoffmeister (1986), the *C. l. arizonensis* specimen from Willcox, demonstrated a difference at the P <.05 level for hind foot with no significant difference in the other 17 measurements. Hoffmeister considered the species monotypic.

NatureServe (2004), "Four species of *Cynomys* occur in the United States, and one (*C. mexicanus*) is endemic to Mexico. The prairie dogs found in the U.S. are grouped into two subgenera, the white-tailed prairie dogs (subgenus *Leucocrossuromys*), and the black-tailed prairie dog (subgenus *Cynomys*). The three species in the white-tailed subgenus are 1) the Utah prairie dog (*C. parvidens*), found only in southern Utah (Pizzimenti and Collier 1975); 2) the white-tailed prairie dog (*C. leucurus*), found in Colorado, Utah, Wyoming, and

Montana (Clark et al. 1971); and 3) the relatively abundant Gunnison's prairie dog (*C. gunnisoni*), found in Colorado, Utah, Arizona, and New Mexico (Pizzimenti and Hoffman 1973). The single species of black-tailed prairie dog, *C. ludovicianus*, is found on the Great Plains from west Texas to southern Canada (Burt and Grossenheider 1976). The Mexican prairie dog (*C. mexicanus*) occurs in east-central Mexico in the states of Coahuila, Nuevo Leon, Zacatecas, and San Luis Potosi (Ceballos-G. and Wilson 1985).

Hall (1981) listed two subspecies of black-tailed prairie dog, the nominate form and the Arizona prairie dog (*C. ludovicianus arizonensis*). Genetic studies suggests that the Arizona form does not qualify for subspecies status (Chesser 1979). Some question still exists about the possible subspecific status of certain populations, especially that in the Tularosa Basin of southern New Mexico (Hubbard 1992). New genetic techniques (e.g., PCR) may help clarify the situation (Cully 1992)."

DESCRIPTION: The black-tailed prairie dog (BTPD) is a large, burrowing, ground squirrel belonging to a group of four other prairie dog species found only in North America. It is the largest of all *Cynomys* species weighing 700-1500 g (24.69-52.91 oz), and measuring 28-33 cm (11-13 in) from nose tip to rear end. They have short, black-tipped tail (usually greater than 7.0 cm (2.75 in); 15%-30% of the body length) and small ears. There are no distinguishing markings on their yellowish brown fur; belly is lighter. The 22 teeth include sharp incisors for clipping plant leaves and stems. Females have four pair of functional mammae.

AIDS TO IDENTIFICATION: *Cynomys gunnisoni* also occurs in Arizona, though not within the historic range of *C. ludovicianus*. The tail of *C. gunnisoni* is tipped with white, and there are five pairs of functional mammae.

ILLUSTRATIONS:
Color photo (Lasley *in* http://www.greglasley.net/btprairie.html)
Color photo (*In* http://animaldiversity.ummz.umich.edu/site/accounts/)
Color photo (C.D. Grondahl, *in* http://www.npwrc.usgs.gov/resource/distr/mammals/mammals/prairie.htm)

TOTAL RANGE: The species is distributed through northern Chihuahua and Sonora Mexico, west Texas, eastern and southern New Mexico, and southeast Arizona northward through eastern Colorado and the western plains states to southern Saskatchewan Canada. The subspecies *arizonensis* ranges from southern and eastern New Mexico and southeast Arizona, and into northern Sonora, Mexico,

RANGE WITHIN ARIZONA: Formerly southeast Arizona, from the west side of the Huachuca Mountains eastward, and from Bonita southward through the Sulphur Springs Valley, but extirpated by 1961. The Arizona Game and Fish Department started to re-establish BTPD in 2008 within the Las Cienegas National Conservation Area in SE Arizona. Four small colonies have been established by 2012, The goal of this Department program is to have BTPD occupying 7,100 acres in 3 of the 4 counties of the historic distribution (Cochise, Graham, Pima and Santa Cruz).

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Prairie dogs are diurnal, active only during daylight hours, and spend a lot of time feeding and socializing. They live in towns, which can cover 1 to 1000 acres. Within the towns, each family or coterie of prairie dogs occupies a territory of about one acre. The basic prairie dog coterie comprises one adult male (at least 2 years old), three or four adult females, and several yearlings or juveniles (Hoogland and Foltz 1982). Large coteries with two or more males occasionally occur. Females remain in their coterie for life, whereas males usually leave within 12-14 months after weaning. The coterie system deteriorates in spring during gestation and lactation (King 1959). An organizational level higher than the coterie, is the ward (King 1959), a town subdivision described according to topographic features. Black-tails do not hibernate during winter. They may remain underground for several days during bad weather (a month or more has been documented in severe winter conditions), but on clear days they will be visible again. According to Hoffmeister (1986), black-tailed prairie dogs have been studied in detail in Colorado, Wyoming and South Dakota. The main predators of these prairie dogs are black-footed ferrets and badgers. The life span for animals in the wild averages 3-4 years, but females can live to eight years. BTPD have an extensive system of vocalizations and visual cues for communication; they have different alarm calls for different predators (e.g., hawk vs. coyote).

REPRODUCTION: The breeding system is harem-polygynous, with most females copulating with one male and males with several females. Females are in estrous for several hours of only one day per year, though if conception fails they can undergo a second estrous. According to Hoffmeister (1986), for the species as a whole, breeding occurs in late February and young are born in late March to early April. Gestation averages 35 days. Adult females give birth to 1-8 "pups," which remain underground until early May, when they come above ground to forage on green vegetation. Usually, only about 3 pups survive to this stage. They reach almost adult size by the end of the summer. Though most adult females become pregnant, juvenile mortality is high with only one half of copulating females weaning a litter. Minimum breeding age is two years for both sexes.

FOOD HABITS: They consume a wide variety of grasses, weeds and shrubs, feeding on the stems, leaves and seeds, however, forbs are preferred over grasses. They have also been known to eat insects. This vegetative diet also provides moisture from the plants themselves; they do not need a source of water. When above ground vegetation is in short supply, roots are dug as a required food supply. Food items are apparently not stored below ground.

HABITAT: Dry, flat, open plains and desert grasslands. Since prairie dogs do not like tall grass (<30cm preferred), they will choose a site with little vegetation, often in areas heavily grazed by cattle. Slope should be <10%. Burrows are usually quite visible because of the large mound of dirt around the entrance. The mounds provide both a vantage point (often to detect predators) and protection from flooding. Fine to medium textured soils are preferred presumably because burrows and other structures tend to retain their shape and strength better than in coarse, loose soils. Colonies are commonly found on silty clay loams, sandy clay loams, and loams, with very little gravel and good drainage. More specifically, <30% clay, ~50% sand and >70% silt (Roe and Roe, 2003). Tunnels extend downward 3-10 feet, then horizontally for another 10-15 feet, and average 4-5 inches in diameter. These systems are arranged so that wind blows through and provides ventilation. Several tunnels are excavated from the main tunnel to provide nesting and resting areas, and to avoid the hotter part of summer days. A chamber is dug from one of these tunnels and used as the bathroom. When it becomes full, another is dug.

ELEVATION: Elevation range is from 2,300 - 7,200 ft. (700 - 2200 m).

PLANT COMMUNITY: Short to mid-height, Plains and Desert grasslands.

POPULATION TRENDS: *Cynomys ludovicianus* once occurred in considerable numbers in Arizona but were extirpated by 1961. In 2008, the Arizona Game and Fish Department initiated a re-introduction program within the historic range in SE Arizona. As of 2013, four small colonies have been stocked.

According to NatureServe (2013), the Global Status is "apparently secure." Throughout its range, there are many occurrences and large populations (millions), but the extent of both occupied habitat and abundance have been reduced from historic levels by about 98%. Overall threats (see Management, below) are rated as moderate and not as serious as previously believed.

The Global Short Term Trend is declining in some areas, increasing in others; overall trend at present probably stable or slightly decreasing, with a long-term outlook of slow decline (USFWS 2002). The largest increases are in South Dakota, where the populations are recovering from past persecution in an area that is still plague-free (S. Linner, USFWS, pers. comm.). Some of the past abundance and trend information is in question, and USFWS (2002) emphasized the danger of determining trends based on abundance estimates derived in different ways at different times.

A small stable population exists in Canada (Laing, 1988 COSEWIC report; USFWS 2000). Range and abundance continue to decline in Mexico, where the largest remaining black-tailed prairie dog complex exists .From 1988 to 1996, range decreased by 80 percent and occupied habitat declined by 34 percent (see USFWS 2000).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS:
SC (USDI, FWS Aug 2004)
[C (USDI, FWS 2001, 2002, May 2004)]
[None (USDI, FWS 1996)]
[C2 (USDI, FWS 1991)]

STATE STATUS:
1A (AGFD SWAP 2012)
[WSC, AGFD, WSCA in prep]
[State Endangered AGFD, TNW 1988]

OTHER STATUS:
None. USDA, FS Region 3, 2013
Bureau of Land Management Sensitive (USDI, BLM 2008, 2010)
[Forest Service Sensitive (USDA, FS Region 3 2007)]
Determined Threatened (Secretaria de Medio Ambiente 2000, 2010)

[Determined Threatened, Secretaria de Desarrollo Social 1994]

MANAGEMENT FACTORS:

According to NatureServe (2004, 2013), threats fall into four main categories. 1) Exotic disease, particularly sylvatic plague (*Yersinia pestis*) to which prairie dogs are highly susceptible. Outbreaks have been documented to kill more than 99% of BTPDs in a colony, so plague is still of concern to local populations and long term persistence. However, given that about 10% of the historical range is both plague-free and available, limited immune response has been observed in some individuals, and some sites have demonstrated the ability to recover to pre-plague levels, the USFWS (2004) has concluded that plague no longer appears to be as significant a threat as previously thought and is not likely to cause the BTPD to become an endangered species in the foreseeable future. 2) Loss of habitat to agriculture and urbanization. This was undoubtedly a major factor in the previous decline of the BTPD, but has become more stabilized in more recent years and is no longer a significant threat. 3) Habitat fragmentation and its many effects (Miller et al. 1994). Fragmentation of habitat can be a serious threat at the local level because it can lead to inbreeding or the remaining colony can be heavily impacted by catastrophic events such as a plague. 4) Control activities by government, private organizations, and individuals via poisoning and shooting. The range-wide extermination programs that targeted prairie dogs from 1900 till now certainly contributed to the massive reduction in population and range. BTPDs were considered agricultural pests or as competitors to cattle for rangeland resources. Poisoning, using various products, was the eradication method of choice. Hoogland (2005) states that poisoning on federal, state and private lands have increased since the species was removed from the candidate list by the USFWS in 2004, but the USFWS does not believe this activity can drive the species towards endangered status in the foreseeable future, even though they acknowledged the possibility of potentially significant local population reductions. Today, such poisoning efforts generally target local, problem populations by land managers and are directed towards control, not extermination. The USFWS (2004) also acknowledged that recreational shooting can significantly reduce populations at specific sites and that even extirpation may have occurred in isolated circumstances, but that recovery from very low numbers have also been documented so that recreational shooting does not constitute a significant threat.

BTPD Re-Introduction in Arizona: In 2008, 74 BTPDs were trapped at the Ladder Ranch in New Mexico and released at Las Cienegas National Conservation Area in Pima County, SE Arizona. At least four offspring were observed the following spring. In 2009, another 107 prairie dogs were released, some at the original site and the remainder at a new, second site, also within Las Cienegas NCA.

This reintroduction program, implemented by the Arizona Game and Fish Department, is consistent with the objectives of the Black-Tailed Prairie Dog Conservation Assessment and Strategy (Van Pelt, 1999), the Draft Interagency Management Plan for Black-Tailed Prairie Dogs in Arizona (Van Pelt et al, 2001), and the BLM Resource Management Plans for the Las Cienegas NCA. In addition to the AZGFD and BLM, other participants in the Arizona BTPD Working Group include the Arizona State Land Department, Malpai Borderland Group, the Phoenix Zoo, U.S. Forest Service, U.S. Army Fort Huachuca and other interested parties, including private citizens. This reintroduction program followed a 12-step process that included compliance with all applicable regulations and public input, and took nearly eight years before the first actual release.

AZGFD personal assessed over 77,000 acres (31,000 ha) in the Safford BLM district, and concluded that either due to soil types or vegetative cover, these areas were unsuitable. A University of Arizona study (Koprowski and Coates, 2004), funded through the AZGFD Heritage Program, assessed potential lands in the San Pedro Riparian NCA, Fort Huachuca, and the Las Cienegas NCA. Vegetation at the first two sites, either too shrub-invaded or too high a density of non-native tall grasses, respectively, rendered these sites unsuitable. However, on the Las Cienegas NCA, over 15,000 acres (6,000 ha) were identified where the soils, slope and vegetation most closely resembled the habitat found at the nearest currently extant BTPD colony at the Ejido Morales, near Cananea Municipality in Sonora, Mexico.

Many other details were also identified and executed. Source populations were identified in New Mexico, southwestern Texas, Chihuahua and Sonora, Mexico. Approximately 60-100 animals would be released at the initial site, and it was thought that translocation of intact family groups (coteries) could augment the success of the reintroduction. Site preparation included reducing vegetation to a height conducive to BTPD, and installing man-made burrows and acclimation cages. Due to plague concern, all animals were dusted to kill fleas at the capture site, and any animals that died within 2-weeks of release were necropsied to determine cause of death. Monitoring protocols were planned for different phases of the program.

By 2011, three sites had been stocked within the Las Cienegas NCA. The fourth site was prepared, but draught conditions limited the availability of BTPDs for translocation, so no animals were released. Due to the extreme draught conditions, each of the first three colonies experienced population declines from high predation and low forage availability. Each required augmentations to maintain stability and genetic integrity. Eighty animals from two sources (New Mexico and Mexico) were released to augment populations at the first three sites, and the fourth site received its first animals in September 2012. In 2011, the University of Arizona began a survivorship study at the new colonies. Trapping animals to implant pit tags and painting their fur with unique symbols allowed both the University and the Department to monitor individual animals. It was quickly realized that the with the drought conditions and limited forage availability, the prairie dogs were travelling well outside their colonies and into the tall grass in search of food. This made them more vulnerable to predation by coyotes and raptors, and populations declined rapidly. The number of offspring produced each year was also low. From 2009-2011 a total of 34 pups emerged, with only 10 in 2011. To combat these issues, the program decided to provide supplemental food (an Herbivore Chow donated by the Phoenix Zoo). Initially, the supplemental feeding succeeded in reducing predation mortalities. In 2012, the feeding was begun earlier in March with the hope of increasing the production of offspring. The result was a virtual population explosion when 132 pups emerged, and this technique is now standard operating procedure for new colony establishment, especially during drought periods. This also allowed the program to source animals for the fourth colony from the first three colonies. Ultimately, once the Las Cienegas colonies are stabilized, they will be used for source animals to establish new colonies in two additional counties in SE Arizona.

PROTECTIVE MEASURES TAKEN: USFWS (Federal Register, 25 March 1999) found that a petition to list this species as threatened under the U.S. Endangered Species Act presented substantial information indicating that listing may be warranted; a status review was

initiated. USFWS (2000,2001,2002) determined that listing as Threatened is warranted but precluded by actions of higher priority. USFWS (May 2004) determined that listing as Threatened is not "warranted-but-precluded," since they received important new information that they are currently analyzing. USFWS (Aug 2004) determined that the proposed rule to list this species as Threatened is not warranted, and it is no longer considered to be a candidate species for listing. This is based on recent distribution, abundance, and trend data that indicates that the threats to this species are not as serious as earlier believed (see Management Factors, above). After the first petition was filed to list the species, there was an effort among 11 western states to begin a conservation program, and the Prairie Dog Conservation Team was formed. The PDCT developed a multi-state plan which provided guidelines under which individual states could develop their own state management plan. The state commitments in these agreements, and the resulting state management plans for BTPD, contributed to the Service's decision to remove this species from the candidate list. In Arizona, this effort evolved into the Arizona Black-Tailed Prairie Dog Working Group, which decided to focus re-establishment efforts on State Trust and federal lands.

Most existing regulations involving BTPDs are inadequate for long-term conservations goals (Hicks et al, ????. Across its range, the BTPD has various classifications, ranging from agricultural pest to nongame mammal. In four states (CO, KS, ND and SD) it is classified as a pest and there are various levels of either state or local mandatory controls in effect. In AZ, CO and TX, there are various hunting regulations and bag limits under some conditions. However, currently in AZ, while the re-establishment program in underway, there is no open hunting season (which also precludes recreational shooting) for BTPD.

SUGGESTED PROJECTS: Inventories and monitoring are needed rangewide, to determine locations and sizes of colonies, ownership, and presence of plague. Also needed are comparative ecological studies of proposed source and introduction sites to determine suitability, and on-site studies of introduction and management of existing colonies in other areas. Other areas where work is needed are prairie dog/predator interactions, long-term effects of prairie dogs on communities (flora, fauna, soils), and prairie dog subspecies status. Research is especially needed on floral/faunal interactions in the less studied portions of the prairie dog's range, such as southern and northern range limits.

LAND MANAGEMENT/OWNERSHIP:

SOURCES OF FURTHER INFORMATION

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Bill Van Pelt, Arizona Game and Fish Department, Phoenix.

ADDITIONAL INFORMATION:

In 1972 a reintroduction was attempted at the Audubon Research Ranch, Elgin, Arizona, but failed.

D.A. McCullough and R.K. Chesser of Texas Tech University in Lubbock, Texas, stated in an abstract from the 1985 SWAN meetings in Glendale, Arizona, that they used immunoelectrophoresis to investigate the relationships within *Cynomys*. Their results indicate "this technique can be utilized to depict specific differences but that the conservative nature of the immunological reactions may not be adequate for separation of lower levels of classification."

The Great Plains ecosystem evolved with bison, prairie dogs, and fire as major forces/processes; bison and fire are effectively gone, and the prairie dog is vastly reduced. The black-tailed prairie dog is a keystone species upon which many other prairie species depend, but now "may be as functionally extinct as the bison" (M. Gilpin, pers. comm. in

Miller and Cully 2001). Black-footed ferret (*Mustela nigripes*, G1) is almost completely dependent on prairie dogs for food. Mountain plover (*Charadrius montanus*, G2), burrowing owl (*Speotyto cunicularia*, G4), ferruginous hawk (*Buteo regalis*, G4), and swift fox (*Vulpes velox*, G3) are among those animals that are found in greatest numbers on prairie dog towns. The highly fragmented nature of the Great Plains makes dispersal and gene flow between populations problematic. NatureServe (2004).

Two BTPD colonies are still extant in Sonora, Mexico, just south of Las Cienegas NCA. In 2011, AGFD and CEDES personnel completed density mapping at these colonies using the Biggens et al method. The La Mesa colonies had 177.2 acres, and the population estimate was 1,351 individuals with a 95% confidence interval of 931 to 1,771 animals. The Las Palmitas colony had 146 acres, with a population estimate of 1,905 individuals and 1,440 to 2,371 animals at the 95% C.I. 60 animals from these colonies were trapped and relocated to Las Cienegas to expand the genetic base (AGFD, 2011).

Revised: 1992-01-02 (DBI)
1992-05-08 (BKP)
1997-03-03 (SMS)
2004-07-30 (AMS)
2004-08-19 (SMS)
2013-05-20 (BDT)

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AMACD01010
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Tadarida brasiliensis*
COMMON NAME: Brazilian Free-tailed Bat, Mexican Free-tailed Bat, Pan-American Free-tailed Bat, American Free-tailed Bat, Guano Bat, House Bat
SYNONYMS: *Tadarida mexicana*, *Molossus mexicanus*, *Nyctinomus mohavensis*, *Nyctinomus brasiliensis*
FAMILY: Molossidae

AUTHOR, PLACE OF PUBLICATION: Geoffroy Saint-Hilaire, I. 1824. Memoire sur une Chauve-Souris americaine, formant une nouvelle espece dans le genre Nyctinome. Annales des Sciences Naturelles, Paris, 1: 337-347.

TYPE LOCALITY: "Curityba, Paraná, Brazil" (Shamel, H.H. 1931. Notes on the American bats of the genus *Tadarida*. Proc. U.S. Natl Mus., 78:1-27.)

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: *Tadarida* is 1 of 13-18 genera in Molossidae worldwide and 1 of 2-3 genera in the U.S. Depending on the authority, *T. brasiliensis* is either 1 of 3 species or the only species in the genus in the U.S. (and Arizona). Only 1 subspecies in Arizona (*T. b. mexicana*) of the 9 subspecies recognized for the genus. Cockrum (1969) theorizes "four or more behaviorally (and possibly genetically) separate populations of *T. b. mexicana* occur in the western United States during the summer months."

According to NatureServe 2003, "The specific relationships of Antillean populations of *Tadarida* remain obscure; it has been suggested that Caribbean populations represent a distinct species or that they are related to *T. b. Cynocephala* but not to other populations of the *Brasiliensis* complex (Jones 1989). Two of the 9 subspecies (*T. b. mexicana* and *T. b. cynocephala*) occur in the U.S. Though morphological data suggest intergradation (Schmidly 1977), these two subspecies differ widely in behavior (migratory vs. nonmigratory) and roost preference, and gene flow between them has been reported to be minimal and unidirectional at most (Owen et al. 1990). However, McCracken and Gassel (1997) found high genetic similarity and evidence of gene flow between these nominal subspecies, such as typically seen between geographic populations of the same subspecies."

"The generic name *Rhizomops* was proposed in 1984 for *Tadarida brasiliensis* (and presumably all subspecies), but this was rejected by Owen et al. (1990) because the genus was based entirely on plesiomorphic characters."

"McCracken et al. (1994) examined allozyme data from several maternity and winter colonies within the range of subspecies *mexicana* and determined that populations are not structured genetically into distinct geographic units."

DESCRIPTION: Small to medium-sized bat with body length 4.6-6.5 cm (1.8-2.6 in), forearm 3.6-4.6 cm (1.4-1.8 in), and wingspread 29.0-32.5 cm (11.6-13.0 in). The species has short velvety fur with nearly black muzzle and membranes, and hair of uniform color ranging from dark gray to smoky brown. Leathery wings are long, slender, and pointed. The tail extends noticeably beyond trailing edge of interfemoral membrane. Large, round ears bear a series of small papillae on leading edge, and lie forward along head, above the eyes. It is snub-nosed with wrinkled upper lips. Their toe hairs are very long and stiff.

AIDS TO IDENTIFICATION: *Tadarida brasiliensis* has deep vertical grooves on the upper lip. When their ears are laid forward, they do not extend appreciably beyond the muzzle. It is the smallest *Tadarida* in the United States, and is the only one in which the ears are not joined at the midline, and the hair is uniform in color.

ILLUSTRATIONS: Black and white photo (Barbour and Davis 1969: 197-198, Figs. 102-104)
Line drawings (Hall 1981: 240-241, Figs. 194-195)
Black and white photo (Hoffmeister 1986: 115)
Color photo (http://www.biology.eku.edu/bats/brazilianfreetailedbat.html)
Color photo (http://www.batcon.org/discover/species/tbrasil.html)
Color photo (Wilson 1999)
Color photo (Harvey et al. 1999)

TOTAL RANGE: Northern range extends to southern Oregon, Nevada, northern Utah, northern Nebraska into Arkansas, northern Alabama, Mississippi, and Georgia, and southern North Carolina. Also southward through most of Central America and into at least seven South American provinces and into the Caribbean islands.

RANGE WITHIN ARIZONA: Throughout the state in the summer, and only in the southern half of the state in the winter, and in lesser numbers.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: This bat has been found roosting in caves, mine tunnels, and crevices in bridges, parking garages and buildings; and in attics. Some of these roosts are used only in the spring and fall by bats as transition or resting roosts, on their annual migrations north and south. They are known to roost in tightly packed groups. Roosts are generally high (at least 3 m) above the ground, to allow free fall required to attain flight. Avian predators include American kestrels, Mississippi kites, red-tailed hawks, roadrunners, and Great horned owls. These bats draw attention because of their renowned ability to carry rabies (it is second to the eastern red bat).

REPRODUCTION: Brazilian free-tailed bats probably breed in the lower latitudes in late February and early March. Ovulation occurs in late March. In Texas, gestation period appears to be about 90 days; in California, 100 days. One or two young per female born mid-June to early July. Births may occur over a long period of time, however, the majority takes place within 10 days of each other. During the day, young hang in dense groups away from females. Mother locates and nurses own young in the large colonies. Young are nursed in the afternoon, and again when females return from foraging in the night. Young develop rapidly and are flying in about 5 weeks. Apparently the high temperatures in the roosts are essential for rapid growth of young bats; the larger the colony the less the energy expenditure per bat to maintain a given temperature. Females may become pregnant as yearlings and the males become sexually mature at 18-22 months.

FOOD HABITS: They emerge about sundown to feed. According to Barbour and Davis (1969), "The stream of bats is shaped like an undulating tube with a diameter of about 30 feet. The column slopes gradually upward to a height of about 500 feet where it divides into small flocks of bats." They feed primarily on moths (90%) and numerous other insects in small amounts. They are precise hunters that can bite off the soft abdomen of a moth in flight and let the wings, legs, and thorax fall to the ground. They probably hunt in groups. It has been estimated that where there are nurseries with populations into the multimillions, the annual consumption of insects would be about 18,144,000 Kg (40,000,000 lbs.).

HABITAT: In the spring, these migratory bats move northward from southern Arizona and Mexico, to the Lower Sonoran and Upper Sonoran life zones. Considered primarily a lowland species, they do sometimes range into the highlands.

ELEVATION: Less than 9,200 feet (2,806 m). Based on unpublished records from the Heritage Data Management System (AGFD, accessed 2004), elevation ranges from 450 to 8,475 ft. (137 - 2,583 m).

PLANT COMMUNITY: Desert scrub, coniferous forests, and coniferous woodlands

POPULATION TRENDS: Appears stable. According to NatureServe 2003, the population is estimated at 120-150 million.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: None
OTHER STATUS: None (USDA, FS Region 3, 1999)
[Forest Service Sensitive USDA, FS Region 3, 1988]

MANAGEMENT FACTORS: Suitable sites for large colonies are extremely limited; threats include pesticides and disturbance to major roosts.

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: Mapping of migration routes, identification and protection of nurseries, restricting the use of fat-soluble pesticides in their grazing area. Studies to clarify subspecies are needed.

LAND MANAGEMENT/OWNERSHIP: BIA - San Carlos Reservation; BLM - Havasu, Kingman, Phoenix, Safford, and Tucson Field Offices; FWS - Bill Williams and Havasu National Wildlife Refuges; NPS - Lake Mead National Recreation Area, and Montezuma Castle National Monument; USFS – Coconino, Coronado, Kaibab, Prescott and Tonto National Forests; State Land Department; Picacho Peak State Park; City of Tucson; AMNH Southwestern Research Station; Johnson Historical Museum; Private.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Pat Brown - Brown/Berry Biological Consulting

ADDITIONAL INFORMATION:

Very little research is being conducted outside of the Northern Hemisphere. According to Bailey, odor of musk which they emit is so strong that from outside a building, a colony can be detected.

Ronnie Sidner states that although they show up frequently in man-made structures, they are susceptible to disturbance.

Revised: 1992-02-13 (JSP)
1994-04-01 (DBI)
1994-04-07 (DCN)
2004-02-20 (AMS)

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AMACB01010
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Macrotus californicus* Baird
COMMON NAME: California Leaf-nosed Bat; Leaf-nosed Bat
SYNONYMS: *M. waterhousii californicus*
FAMILY: Phyllostomidae

AUTHOR, PLACE OF PUBLICATION: Baird, 1858. Proc. Acad. Nat. Sci. Phila., 10:116.

TYPE LOCALITY: USA, California, Imperial Co., Old Fort Yuma.

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: Species *californicus* is one of two in the genus *Macrotus*, and the only species of the genus to occur in Arizona.

This species was formerly considered a subspecies of *M. waterhousii*. Chromosomal studies and multivariate analysis of cranial characters demonstrated the existence of two different groups with a narrow zone of overlap in southern Sonora, but no evidence of hybridization (Davis and Baker 1974). The chromosomal variation is of the Robertsonian type in which the fundamental number (FN) is constant but the diploid number (2N) varies. In this case, both groups had an FN of 60 but the northern population, now *M. californicus*, was found to have a 2N of 40 and the southern population, *M. waterhousii*, had a 2N of 46. No variation was found within either group. The primary cranial character that separates the two species, as identified by multivariate analysis, is interorbital breadth measured across the narrowest part. If breadth is 3.8 mm (1.52 in.) and is a male or it measures less than 3.8 mm (1.52 in.) it is *M. californicus*. If it measures 3.8 mm (1.52 in.) and is a female or it measures more than 3.8 mm (1.52 in.) it is a *M. waterhousii*.

Genic heterozygosity (=$\overline{H}$ which is the mean number of heterozygous loci per individual) for *M. californicus* has been estimated at 0.030. This estimate, based on electrophoretic analysis of allozymic variation at 17 loci, is low for mammals which average 0.056 (Straney et al. 1976). Estimates for mammals are mostly within the range of 0.008 to 0.110. Heterozygosity for this bat is also near the low end (0.026 -0.144) for the few bats analyzed.

DESCRIPTION: A medium sized gray bat with a total length of 8.5-9.9 cm (3.35-3.90 in). The forearm is 4.6-5.2 cm (1.81-2.05 in), tail 28-41 mm, and weight is 12-22 g (0.42-0.78 oz). They have long ears (longer than 25 mm) that joins together at the base. At the tip of the nose is a distinct erect leaf-like projection, hence were their name comes from. Their tail extends

slightly beyond the tip of the interfemoral membrane, approximately 5-10 mm. Dentition: 2/2, 1/1, 2/3, 3/3.

AIDS TO IDENTIFICATION: *M. californicus* is identified by the combination of large ears and nose-leaf. No other large-eared bat has a nose-leaf and no other bat with a nose-leaf has such large ears. It is easily distinguished from *Choeronycteris mexicana* and *Leptonycteris curasoae* by its much larger ears (>29.0 mm [>1.16 in.)] in *M. californicus*, < 19.0 mm (0.76 in.) in *C. mexicana* and *L. curasoae*) which are joined together near their base. *M. californicus* also has a shorter rostrum, shorter tongue, no bristle-like papillae on the tongue and its first upper premolars contact its canines and usually also its second premolar. Guano of this bat is reported to have a distinctive odor that maybe used to help identify a roost.

Roosting *Macrotus* give clues to their identity by where they hang and how they cluster. They generally prefer to hang from the ceiling of caves and mines in groups of up to several hundred. Although they roost close to each other they are not usually touching or tightly packed as are the individuals of many other colonial bat species. If they do come into contact they become restless and move.

ILLUSTRATIONS:

Color photo (Barbour and Davis 1969: plate I)
Black and white photo (Hoffmeister 1986:59)
Color photo (Whitaker 1980: plate 147)
Color photos:
http://www.bing.com/images/search?q=california+leaf+nosed+bat+pictures&qs=SC&sk=IM1NH1AS1SC3&FORM=QBIR&pq=california%20leaf-nosed%20bat&sc=8-25&sp=7&qs=SC&sk=IM1NH1AS1SC3

TOTAL RANGE: They range from N Sinaloa and SW Chihuahua (Mexico) north to S Nevada and S California (USA); also range into Baja California and Tamaulipas (Mexico). (Wilson and Reeder, 2005).

RANGE WITHIN ARIZONA: Primarily south of Mogollon Plateau; additional reports in extreme southeastern and in summer extreme northwestern Mohave County. Year-round occupant of some roosts. Winter range essentially the same as summer range. Not known from northwestern Mohave County in winter.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: This bat is not known to hibernate, and although it may not occupy the same roost year-round it is not known to migrate. Remains active year-round. When temperatures drop to between 9º and 12º C, they do not become torpid, but regulate their body temperature to between 18º and 20º C. They can only survive these temperatures for a few hours. Sustained exposure to ambient temperatures less than 26º C results in death. These bats rarely encounter

such low temperatures for long periods within the underground caverns and desert conditions in which they live.

Most individuals leave day roosts within 1 to 3 hours after sunset although some may leave immediately after sunset. Their vision is better than other insectivorous bats that have been tested and is at least as good as that of frugivorous and nectarivorous bats that have been tested. *M. californicus* in the lab can locate motionless (dead) mealworms which suggests it may be able to exploit prey items unavailable to other bat species.

Kidney anatomy indicates that *M. californicus* is better able to concentrate urine and thus conserve water than its closest relative *M. waterhousii*, which occupies a wetter habitat. Some individuals in captivity have been reported to go for at least 6 weeks without drinking water (Lu and Bleier 1981). However, Bell et al. (1986) suggest that these bats are able to exist in temperate desert areas because they minimize energy expenditure by using geothermally-heated winter roost sites with stable year-round temperature of about 29º C and an "energetically frugal pattern of foraging that relies on visual prey location" and detection of prey-produced sounds.

REPRODUCTION: One young per year. Females can breed during their first autumn. Males, however, do not breed until their second year. Females congregate in maternity colonies to give birth during May and June. The young are nursed during the following month after which they are able to fly and begin foraging for themselves. Nursery colonies are in roost sites with temperatures of about 90º-95º C and located near the entrance to the roost.

During spring and summer males roost separately. They may be in small groups in roosts at different localities from maternity roosts or in a different place but at the same site as a maternity roost. Males join females in late summer and early fall and they are found together during winter. Fertilization takes place in early fall with embryological development greatly slowed through the winter until March when it proceeds normally. Some nursery colony sites are occupied year round. Maximum life expectancy is greater than 15 years.

FOOD HABITS: Primarily takes prey while hovering close to the ground or by gleaning from vegetation often within 3 feet of the ground. It does not crawl well, so it does not forage on the ground as does *Antrozous pallidus* but rather lands on its prey from above and then takes it to a night roost to feed. Feeds on large, flying insects such as grasshoppers, moths and flying beetles. Also capable of taking prey in flight. Insect larvae, especially lepidopterans, and other flightless, or daytime active prey are taken from bushes and off the ground. Daytime insects are especially important during winter months.

Hoffmeister (1986) reports that *M. californicus* may also feed on fruits, including those of cacti. Commonly uses night roosts, where it may take large insects (sphinx moths, butterflies, dragonflies) to eat and where insect wings and other discarded body parts may be found below the roost site. Foraging typically occurs during two periods: 1 to 3 hours after sunset and a 2 hour period ending about half an hour before sunrise. Total time spent foraging by a single bat has been estimated at about 1 3/4 hours including time spent at a night roost eating larger prey items. These bats do not hibernate and therefore must feed year-round.

HABITAT: Mostly found in the Sonoran desertscrub; primary summer and winter range essentially the same; primarily roost in mines, caves, and rock shelters. Day roosts in mines are usually within about 80 feet of the entrance. Prefer roost sites with large areas of ceiling and flying space. In colder parts of their range, during winter, they are found in mines where temperatures are well above external ambient temperatures. During this time they are found in roosts with temperatures 80°F and are usually found 100 ft or more back from the entrance.

Nocturnal roosts are found in places that provide overhead protection and an adequate flight approach. Such places including a variety of manmade structures, rock shelters and mines.

ELEVATION: All Arizona records below 4,000 feet (1,220 m) with most below about 2,500 feet (7,625 m). Based on records in the Heritage Data Management System, elevation ranges from 160 - 3,980 ft. (49 - 1,214 m) (AGFD unpublished data, accessed 2001).

PLANT COMMUNITY: Predominantly Sonoran and Mohavean, but also occasionally in Chihuahuan and Great Basin desertscrub.

POPULATION TRENDS: Concerns expressed by biologists regarding roost abandonment and reduced numbers. Mainly as a result of disturbance by both recreationists and scientists at a number of well known and accessible roost sites. In addition, a number of old mines in southwestern Arizona have begun to be closed or are slated for closure in the future , which could affect roosting sites, if not monitored for presence at proper time of year.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS:
SC (USDI, FWS 1996)
[C2 USDI, FWS 1989, 1991, 1994]

STATE STATUS:
1B (AGFD SWAP 2012)
[WSC, AGFD, WSCA in prep]
[State Candidate AGFD, TNW 1988]

OTHER STATUS:
None. USDA, FS Region 3, 2013
Bureau of Land Management Sensitive (USDI, BLM AZ 2008, 2010)
[None (USDI, BLM AZ 2005)]
[Bureau of Land Management Sensitive USDI, BLM AZ 2000]
[Forest Service Sensitive (USDA, FS Region 3, 2007)]
[None USDA, FS Region 3, 1999]
[Forest Service Sensitive USDA, FS Region 3, 1988]

MANAGEMENT FACTORS: Susceptible to human disturbance which may cause abandonment of roosts. Loud noises in roosts may disorient the bats and also negatively affect reproductive success. Habitat destruction (closure by dynamiting, bulldozing, or

otherwise blocking of caves and mines) or modification (altering air movement, humidity, temperature, or interfering with bat access) by partial blocking or improper gating are all potentially serious concerns. Mine closure for hazard abatement and renewal of mining activity at previously abandoned mines both present threats to existing colonies.

PROTECTIVE MEASURES TAKEN: Some abandoned mines used as roosts, instead of being sealed, have been gated to allow access by bats.

SUGGESTED PROJECTS: Studies to determine home range, foraging areas and distances, and local, seasonal movements. Also, historical studies of roost site use and disturbance are needed.

LAND MANAGEMENT/OWNERSHIP: BLM - Havasu, Kingman, Phoenix, Safford, Tucson and Yuma Field Offices; FWS - Cabeza Prieta and Imperial National Wildlife Refuges; USFS - Coronado National Forest; NPS - Organ Pipe Cactus National Monument; DOD - Barry M. Goldwater Air Force Range and Yuma Proving Ground; BIA - Tohono O'odham Nation; State Land Department; Picacho Peak State Park; La Paz County Park; Private.

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ADDITIONAL INFORMATION: These bats are seldom netted over water or even in flyways; thus surveying for *M. californicus* seems to be most efficiently done at roosts using exit counts or other estimation methods.

Revised: 1991-08-08 (RBS)
1992-05-03 (BKP)
1992-09-29 (RBS)
1994-04-07 (DCN)
1997-12-31 (SMS)
2001-10-03 (GLR)
2014-01-29 (BDT)

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AMACC01050
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Myotis velifer* (J. A. Allen, 1890)
COMMON NAME: Cave Myotis; Cave Bat, Mexican Brown Bat
SYNONYMS: *Vespertilio velifer* J.A. Allen, *Myotis velifer velifer* (in part), *Vespertilio incautus*
FAMILY: Vespertilionidae

AUTHOR, PLACE OF PUBLICATION: *Vespertilio velifer* J. A. Allen, 1890. Bul. Amer. Mus. Nat. Hist., 3:177. *Myotis velifer* G. M. Allen, 1922. Jour. Mamm., 3:157.

TYPE LOCALITY: Mexico, Jalisco, Guadalajara, Santa Cruz del Valle.

TYPE SPECIMEN: A. C. Buller 1889.

TAXONOMIC UNIQUENESS: One of 88 species of *Myotis* in North American, one of 9 in Arizona (Hall 1981). Currently 5 subspecies recognized in *M. velifer* including *M. v. brevis*, *M. v. grandis* , *M. v. incautus*, *M. v. magnamolaris*, and *M. v. velifer*. Per Wilson and Reeder (2005), "Includes *magnamolaris*; see Dalquest and Stangl (1984). Apparently closely related to *yumanensis*; see Ruedl and Mayer (2001)." Hoffmeister (1986), following Hayward (1970) who regarded specimens assigned to the subspecies *Myotis velifer brevis* as the northern end of a cline and thus not deserving of subspecific recognition, considers this subspecies to be synonymous with *M. v. velifer* of southern and western Mexico.

DESCRIPTION: *Myotis velifer* is one of the larger *Myotis*. Females have significantly longer forearms than males, but are comparable in other measurements. The length of body and head is 4.42-5.5 cm (1.74-2.20 in), length of tail 3.9-4.7 cm (1.53-1.85 in), length of forearm 4.01-4.42 cm (1.58-1.74 in), wingspan 28-33 cm (11-13 in), and weight 9.0-14.0 g (0.32-0.49 oz). They have a long hindfoot (9.0-12.0 mm), stubby-nosed appearance, and their ears only reach to the end of the nose when bent foreward. On the skull, the sagital-crest is well-developed. Zygomatic breadth is 9.0-11.6 mm, while the breadth of braincase is 7.0-8.2 mm. They have robust teeth, and the length of the upper tooth row 6.0-7.0 mm. Breadth of maxillary teeth exceeds that of any other North American species of *Myotis* except *M. lucifugus occultus*. The color of the pelage is light brown to nearly black, but may be bleached if roosting in sites with high ammonia and humidity, such as found in guano caves. (Fitch, et al., 1981). This is the only *Myotis* with a bare patch on the back between the shoulder blades; may have to blow or brush bat's hair back to see it. Calcar well developed terminating in a minute lobule, but not keeled.

AIDS TO IDENTIFICATION: *M. velifer* distinguished by shorter ear (<18.0 mm), longer forearm (usually >4.0 cm), light brown to nearly black color and presence of bare spot, from *M. evotis* ((Long-eared Myotis) and *M. auriculus* (Southwestern Myotis), whos ears are >1.9 cm and forearm <4.0 cm. They are distinguished by lack of fringe on edge of tail membrane, light brown to nearly black color and bare spot from *M. thysanodes* (Fringed Myotis). M. velifer lacks a keeled calcar, is light brown to nearly black in, has shorter ears and a bare spot, and usually longer forearms than *M. volans* (Long-legged Myotis), *M. californicus* (California Myotis) and *M. ciliolabrum* (Western Small-footed Myotis). They are distinguished from *M. yumanensis* (Yuma Myotis) and *M. occultus* Arizona Myotis), by their longer forearm, light brown to nearly black color and bare spot.

ILLUSTRATIONS:

Drawing of skull, dorsal view (Hoffmeister 1986: 72)
Color photo (Tuttle, 1993)
Color photo (Wilson and Ruff, 1999)
Color photo (Barbour *in* http://www.enature.com/fieldguide/).
Color photo (*In* http://www.batcon.org/discover/species/myvelif.html)
Color photo (*In*
http://www.tpwd.state.tx.us/nature/wild/mammals/bats/species/cave_myotis.htm)

TOTAL RANGE: They range from Honduras north to Kansas (USA), west to SE California.

RANGE WITHIN ARIZONA: South of Mogollon Plateau from Lake Mohave, Burro Creek, Montezuma Well, San Carlos Apache Reservation and the Chiricahua Mountains south to Mexico. Although known from as far southwest as the Harquahala Mountains, Gila Bend, Organ Pipe Cactus National Monument and about 20 miles north of Yuma near the Colorado River, it has not been recorded from the extreme southwestern part of the state. Found in small numbers in southeastern Arizona in the winter. Hoffmeister (1986) suggests that most migrate farther south for the winter.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Apparently leaves roost after testing to see if it is dark enough outside. Although average time of roost exit in Arizona is early in the evening (about 37 minutes after sunset), exit time depends on a variety of environmental and physiological variables. Shortly after exiting the roost, they generally fly to water and drink. Near Carlsbad, New Mexico, they have been observed to fly in a straight line for several miles to water.

Some evidence indicates that populations in Arizona have home ranges of hundreds of square kilometers during non-migratory times of the year. Two estimates of home ranges in southeastern Arizona by Hayward (1970) were 932 and 1619 square kilometers.

Individuals probably return to the same locality every year. These bats are colonial and roost in clusters, usually near the entrance of a cave or mine. Population regulation not well understood. Both predation and disease may play a part in control. In other areas, sex ratio was reported as close to 1:1, with proportions varying with circumstances.
Predators include snakes, hawks, owls, raccoons, and foxes. *Myotis velifer* molts once a year during July and August. The males molt while the females are still rearing their young. Females molt subsequent to lactation. The molt in each sex takes about one month.

REPRODUCTION: Copulation occurs in fall, probably again in winter during arousal periods. Sperm stored in uterus; ovulation occurs in April. Gestation is 45-55 days in Arizona. Females congregate in maternity colonies of 50-15,000 individuals during May. Males, which arrived from southern hibernation roosts as early as March, form small groups of up to 100. Some adult males may be found in maternity colonies especially during June and July.

Single young born May to early July. Although the young are left when their mothers go to feed, if the colony is disturbed the mothers may carry the young in flight and move them to another part of the cave. During mass movements a few young may be left behind and die. Young are reported to fly at about 5 weeks according to some and 6-8 weeks according to others.

Colonies are often located in caves, but may also be found under bridges and in buildings. Nursery colonies may form either in hibernating or summer caves. Nursing females are found in the warmest and least accessible parts of caves in northwest Texas. Female and young have moved to the same roosts as the males by August, and in September, the females leave for the winter. Banding records indicate longevity is at least 6 years and a maximum life span of a single individual was just over 11 years.

FOOD HABITS: Opportunistic feeder. Small moths are the most common prey item, but they also eat weevils, antlions and small beetles. They have been observed to feed selectively on flying ants taking 12 per minute for five minutes. These bats forage just above the tops of vegetation, staying close to the vegetation six to 15 feet above the ground, flying strongly and steadily except when in pursuit of prey. Some individuals may forage back and forth over the same 50-70 m route or under streetlights. They feed twice nightly during the summer in some places.

HABITAT: Desertscrub of creosote, brittlebush, palo verde and cacti. Roost in caves, tunnels, and mineshafts, and under bridges, and sometimes in buildings within a few miles of water. There are a number of records of one or a few individuals roosting in cliff and barn swallow nests. In summer, they are apparently tolerant of high temperatures and low humidities. One group was found in an attic in Gila County where July temperatures were 37□C and relative humidity was 23%.

May be found in association and even clustering with *Tadarida brasiliensis* and *M. yumanensis*. In Arizona they enter hibernacula late September or early October, females

evidently hibernate several weeks before males (Fitch, et al. 1981). Winter roosts in Arizona are wet mine tunnels above 6000 feet. Preferred temperatures reported as 8□11□C. In other areas have been found to prefer hibernation roosts with high relative humidity's, usually above 55% in February and frequently in roosts over water with humidity's near 100%. In Kansas and Texas they appear to be year round residents hibernating in caves, however movements have been recorded between Oklahoma and Kansas and the distribution of the species apparently changes seasonally within Texas.

Studies in other areas indicate that even though they store fat prior to entering hibernation they may lose 25% during hibernation. Females go into hibernation heavier than males in Kansas. Females may then lose 25% and males 16% of their weight. In other areas individual bats have been shown to move around among different roosts during winter. Hibernating bats in northwest Texas occur in clusters of about 158 per square foot. They are usually in the open on walls or ceiling of a cave when temperatures are optimal and stable, but are likely to retreat to the more stable conditions of crevices when ambient temperatures fluctuate beyond their optimal range.

ELEVATION: Mostly between 300 and 5,000 feet (92 - 1,525 m) although there is at least one record from 5,800 feet (1,769 m) on the Nantan Plateau and at least 6 records between 6,000 and 8,800 feet (1,830 - 2,684 m) on Cane Ridge and in the Santa Rita, Patagonia, Pinaleno, and Huachuca mountains.

PLANT COMMUNITY: Predominantly desertscrub of creosote, brittlebush, palo verde and cacti, but sometimes up to pine-oak communities.

POPULATION TRENDS: Found in colonies of 2,000 to 5,000 throughout much of the range. Size of maternity colonies in Arizona varies from 50 to 15,000 females.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: SC (USDI, FWS 1996)
[C2 USDI, FWS 1985, 1989, 1991, 1994]

STATE STATUS: 1B (AGFD SWAP 2012)

OTHER STATUS: None (USDA, FS Region 3, 1999)
[Forest Service Sensitive USDA, FS Region 3, 1988]
Bureau of Land Management Sensitive (USDI, BLM AZ 2010)
[Not BLM Sensitive (USDI, BLM AZ 2008)]
[Bureau of Land Management Sensitive (USDI, BLM AZ 2000, 2005)]

MANAGEMENT FACTORS: Vulnerable to disturbance at roost sites, especially maternity roosts where they congregate in large numbers. Their populations are threatened in some areas, due to habitat loss caused by excessive development. Some of the potential threats to this species includes: recreational caving, mine closures, roost destruction and loss of foraging habitat in riparian zones.

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: Status survey to gain baseline data on roost locations and populations. Determine the degree of interspecific competition with associated species. Information needed regarding the status of historically identified colonies, trends in population numbers, on roosting and foraging requirements and basic life history.

LAND MANAGEMENT/OWNERSHIP: BLM - Havasu, Kingman, Phoenix, Tucson and Yuma Field Offices; DOD - Barry M. Goldwater Air Force Range, Fort Huachuca Military Reservation and Yuma Proving Ground; FWS - Buenos Aires, Havasu and Imperial National Wildlife Refuges; NPS - Coronado, Organ Pipe Cactus and Tumacacori National Monuments, Saguaro National Park, and Fort Bowie National Historic Site; USFS – Coronado, Kaibab, and Tonto National Forests; BIA - San Carlos and San Xavier Reservations, and Tohono O'odham Nation; State Land Department; Picacho Peak State Park; AGFD Cluff Ranch; La Paz County Park; Johnson Historical Museum; Private.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

Hayward (1970) placed this subspecies within the subspecies *M. v. velifer*. In USDI, FWS, 1994, not listed at subspecies level.

Revised: 1991-08-14 (RBS)

1992-05-06 (RBS)
1992-10-01 (RBS)
1994-03-25 (DCN)
1997-03-04 (SMS)
2002-11-15 (AMS)

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AMACC01090
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Myotis thysanodes* Miller
COMMON NAME: Fringed Myotis
SYNONYMS: None
FAMILY: Vespertilionidae

AUTHOR, PLACE OF PUBLICATION: Miller, 1897. N. Amer. Fauna, 13:80.

TYPE LOCALITY: Old Fort Tejon, Tehachapi Mountains, Kern County, California, USA.

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: There are 88 species of *Myotis* worldwide and 9 species in Arizona. There are 3 recognized subspecies of *M. thysanodes* including: *M. t. aztecus* Miller and G. M. Allen 1928; *M. t. pahasapensis* Jones and Genoways, 1967; and *M. t. vespertinus* Manning and Jones, 1988. Based on research conducted by Ruedi and Mayer (2001), *M. thysanodes* is apparently closely related to *M. lucifugus*. (Wilson and Reeder, 2005).

DESCRIPTION: The Fringed Myotis is part of the long eared *Myotis* group. Females have longer heads, bodies, and forearms than males. Total length ranges from 8.0-9.9 cm (3.15-3.90 in), length of forearm 4.03-4.53 cm (1.59-1.78 in), wingspread 26.5-30.0 cm (10.43-11.81 in), length of tail 3.5-4.5 cm (1.38-1.77 in), and weight 6.0-11.8 g (0.21-0.42 oz). ear 16.0-20.0 mm. Their long ears measure 16-20 mm and project 3-5 mm beyond the muzzle when laid forward; the ears and membranes are glossy black. The fur ranges in color from yellowish brown to darker olivaceous tones, with little difference between ventral and dorsal surfaces. Color varies geographically with tendency toward darker colors in the northwestern populations. They have a well-developed fringe of hairs on the posterior edge of the membrane, hence the reference to the common name given to this species. The robust calcar is not distinctly keeled. The wing membranes are moderately thick and elastic, making them resistant to puncture. This is a characteristic of bats that forage by gleaning from the ground or in areas of thick or thorny vegetation and is consistent with their short and broad wings and highly maneuverable flight (O'Farrell and Studier 1980). (Hall, 1981; Wilson and Ruff, 1999).

AIDS TO IDENTIFICATION: Although similar to *M. evotis* in overall appearance, this bat is larger, except in ear size. Forearm length is generally larger than 4.0 cm, while forearm length of *M. evotis* is typically shorter than 4.0 cm. They have a well-developed fringe of hair on the posterior edge of the uropatagium. This feature distinguishes them from all other North American *Myotis* species, though some *M. evotis* individuals also have a relatively inconspicuous fringe. The metaloph, protoconule, and paraloph are usually absent on the first

and second molars. This dental simplification is not observed in other American species of *Myotis*.

ILLUSTRATIONS:
B&W photo (Hoffmeister 1986:81, Fig. 5.24)
Color photo (Altenbach *in* Wilson and Ruff, 1999)
Color photo (Atlenbach *in* Harvey, 1999)

TOTAL RANGE: Western North America from British Columbia, Canada, to Veracruz and Chiapas in southern Mexico. A disjunct population occurs in the Black Hills of Wyoming and South Dakota.

RANGE WITHIN ARIZONA: Throughout much of state, though not known from northeast or southwest corners. Their winter range in Arizona shifts to the southernmost counties, and Mohave County.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Fringed *Myotis* tend to roost in the open in tightly packed groups. They roost in rock crevices, caves, mines, large snags, under exfoliating bark, and in buildings. In buildings, the sides of ceiling joints are preferred, although cracks between beams may also be used. Roost trees used were large diameter snags in early to medium stages of decay and were more likely to be near water sources than random trees. Thermoregulation of *M. thysanodes* in roosts is highly variable, with individuals shifting between regulating body temperatures and conforming to ambient temperatures. Lactating females tend to maintain lower body temperatures in day roosts than do post-lactating and pregnant females. Clusters of individuals tend to shift sites within the roost periodically in response to temperature changes or disturbance. Human disturbance can cause abandonment of the roost site.

Fringed *Myotis* are known to migrate, although little is known about migration patterns or destinations. Thought that fall migrations are short distances to lower elevation sites or more southern areas where bats could be periodically active in winter. Physiological studies indicate that *Myotis thysanodes* have a great deal of control over body temperature regulation and can fly at low ambient and body temperatures. Spring migration into a maternity roost is rapid, occurring from mid to late April. This migration takes place in less than a month. They are most active 1-2 hours after sunset. They fly at about 8.6 mph, with nearly vertical flight observed. According to Cockrum (1973), the greatest longevity recorded is 11 years, though most Fringed *Myotis* probably live for less than this.

REPRODUCTION: The only detailed description of reproduction is from O'Farrell and Studier (1973) for the region of northeastern New Mexico. According to this report, females do not copulate until after leaving the maternity roost in the fall. Copulation may occur at hibernacula, as in most other temperate Vespertilionids. Ovulation, fertilization, and

implantation occurs from late April to mid-May, with gestation lasting 50-60 days; births late June to mid-July. Evidence from other areas suggests similar reproductive timing throughout this species' range. Birth occurs in a head-down posture. The litter size is one, and the sex ratio at birth is equal. Young have open eyes and erect pinnae shortly after birth and are pink in color for approximately one week, after which the skin pigmentation process commences, followed by hair growth in the pigmented areas. During lactation two to ten adults are always present in the roost to care for the young. The neonate is huge in proportion to the mother, at 22% of her body mass and 54% of her total length. Females deposit newborns in a separate roost site and only visit them to nurse or to assist young in distress. Young are capable of limited flight at 16-17 days, and are indistinguishable from adults in both flight and form after 21 days. Colony size ranges up to several hundred. The colonies begin to disperse by October. (NatureServe 2010).

FOOD HABITS: *M. thysanodes* eat mostly small beetles (73% frequency), but moths are also taken. Observations indicated slow, highly maneuverable flight with foraging occurring in and around vegetation. These observations are consistent with their wing morphology. This bat may land to pick up prey from the ground.

HABITAT: Fringed *Myotis* occur primarily in middle elevation habitats ranging from deserts, grasslands, and woodlands. They occupy the lowest elevational range of all of the long-eared *Myotis* species (*M. auriculus, M. evotis*, *M. keenii*, *M. milleri*, and *M. septentrionalis*), and are most frequently captured in oak-pinyon woodlands and other open, coniferous, middle-elevation forests. They also have been captured in high-elevation habitats and at sea level in coastal areas. Roost sites found in caves, mine tunnels, in large snags, under exfoliating bark, and in buildings. These sites may be day or night roosts. Thought that Fringed *Myotis* use lower elevation caves and mines, as hibernation sites, but not much is known about their wintering whereabouts. All desert and steppe areas within the range of *M. thysanodes* are within an hour flight from forested or riparian areas.

ELEVATION: 4,000 - 8,437 feet (1,219-2,572 m).

PLANT COMMUNITY: Found from low desert scrub associations to higher elevation fir-pine associations. Oak and pinyon woodlands appear to be most commonly used vegetative association.

POPULATION TRENDS: Appears to be stable in Arizona, though they are rare in other areas.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None (USDI, FWS 1996)
[C2 USDI, FWS 1994]

STATE STATUS: 2 (AZGFD, AWCS 2022)

OTHER STATUS: [None (AGFD SWAP 2012)]
Not BLM Sensitive (USDI, BLM AZ 2008)
[Bureau of Land Management Sensitive (USDI, BLM AZ 2000, 2005)]

MANAGEMENT FACTORS: This species greatest threat is being disturbed by humans; mostly through recreational caving, mine exploration and vandals. Other threats include: closure of abandoned mines, renewed mining at historic sites, toxic material impoundments, pesticide spraying, vegetation conversion, livestock grazing, timber harvest, destruction if buildings and bridges used as roosts and destruction or disturbance of water sources and riparian habitat. Prior to parturition, females become very secretive and virtually impossible to approach. The lack of understanding of intra-specific variation within this species compromises the effectiveness of current management policy.

PROTECTIVE MEASURES TAKEN: None known.

SUGGESTED PROJECTS: The hibernation and migratory habits of this species, as well as many *Myotis* species, are unknown. It is important to understand more about the habitat requirements of this species throughout the year. The presence of appropriate roost sites may be the most critical factor determining *M. thysanodes* presence in an area. Throughout the range of this species, it is important for research on roosting and foraging habits to be conducted.

LAND MANAGEMENT/OWNERSHIP: BLM - Arizona Strip, Kingman and Safford Field Offices; DOD - Fort Huachuca Military Reservation; NPS-Pipe Springs National Monument; USFS – Apache-Sitgreaves, Coconino, Coronado, Kaibab, Prescott and Tonto National Forests; Private.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Ted Weller – Redwood Sciences Laboratory, Eureka, California.

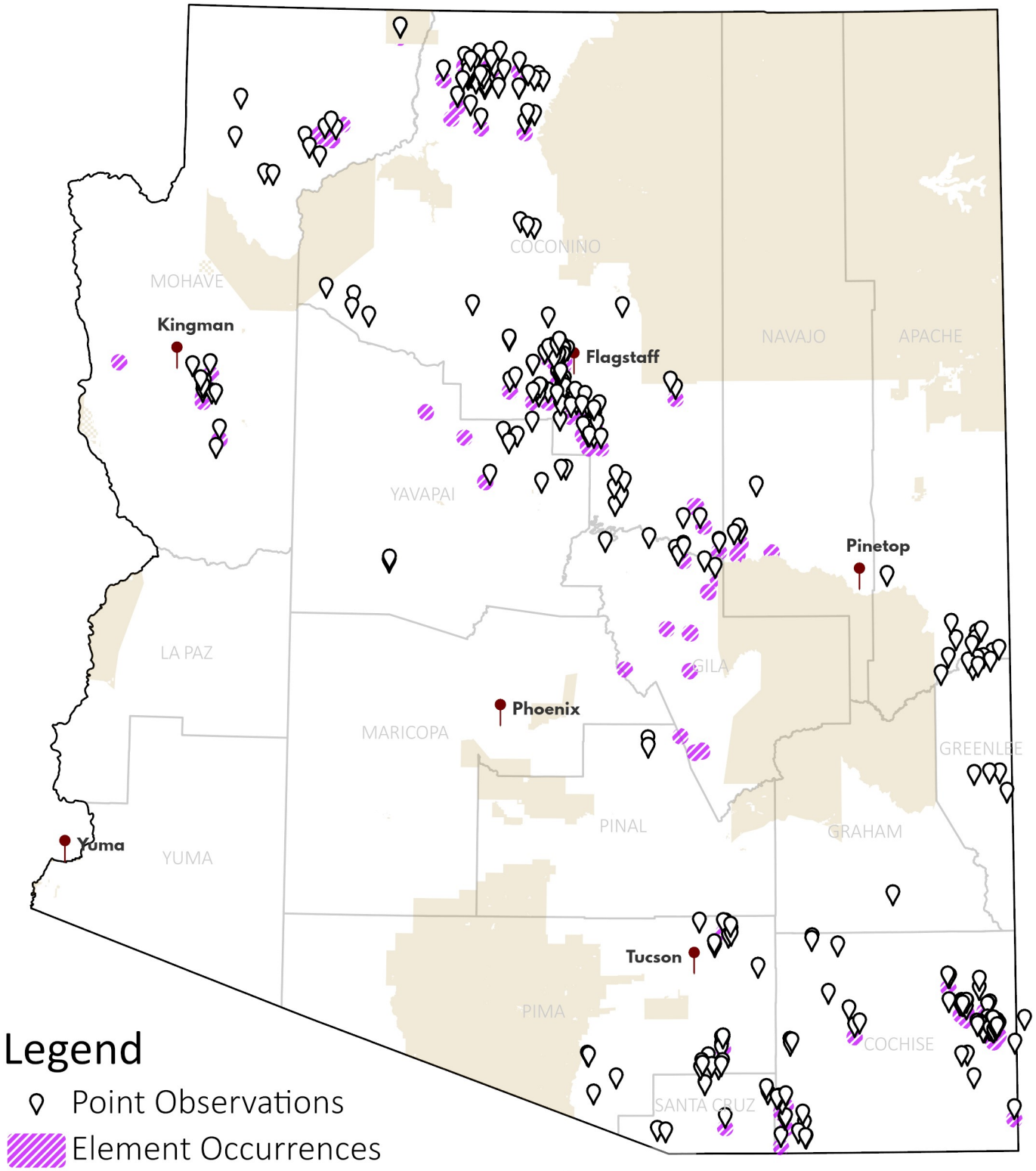
ADDITIONAL INFORMATION:

An analysis of genetic variation within *M. thysanodes* and among the six species of long-eared *Myotis* (*M. auriculus*, *M. evotis*, *M. keenii*, *M. milleri*, *M. septentrionalis*, and *M. thysanodes*) is currently underway. This research will provide managers with the information they need to understand the identity of unique populations within *M. thysanodes* and the boundaries among the long-eared *Myotis* species.

Revised: 1992-01-06 (JSP)
1994-04-04 (DBI)
1995-06-08 (DBI)
1994-04-07 (DCN)
1997-03-04 (SMS)
2002-06-02 (TD)
2002-11-15 (AMS)
2003-01-19 (AMS)
2011-01-21 (SMS)
2023-03-07 (MBL)

Myotis thysanodes

Fringed Myotis



Legend

- Point Observations
- Element Occurrences
- Tribal Lands
- Counties

N

0 50 100 Kilometers

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences.

Heritage Data Management System
2019-06-12

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AMACD02011
Data Sensitivity: YES

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Eumops perotis californicus*
COMMON NAME: Greater Western bonneted bat; Greater Western Mastiff bat; Greater Mastiff bat; Western Mastiff bat; bonnet bat
SYNONYMS: *Molossus californicus*
FAMILY: Molossidae

AUTHOR, PLACE OF PUBLICATION: *Eumops perotis californicus*, Sanborn 1932. J. Mamm. 13:351. *Molossus californicus,* Merriam. 1890. North America Fauna. 4:31.

TYPE LOCALITY: Alhambra, Los Angeles County, California.

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: One of six North American species of *Eumops*; one of 2 species of *Eumops* found in Arizona; the only subspecies of *E. perotis* occurring in North America is *E. p. californicus* (Hall 1981).

DESCRIPTION: Largest bat in the United States, with total length 14.0-18.5 cm (5.6-7.4 in), forearm 7.3-8.3 cm (2.9-3.3 in.), weight 53-61 g (1.87-2.15 oz). Their wings are long and narrow, with a wingspan of 53.0-57.0 cm (21.2-22.8 in.). The large ears protrude forward, 4.0 cm (1.6 in.) long, and are joined at base; tragus is broad and square, 3.6-4.7 cm (1.44-1.88 in.). The distal half of the tail is free from the interfemoral membrane. Their pelage is dark gray or brownish gray being slightly lighter underneath; hairs bicolor, nearly white at base. They have a strong odor partially due to a gland on the throat, which exudes oil.

AIDS TO IDENTIFICATION: Members of the family Molossidae are distinguished from all other families in Arizona by the presence of a tail extending more than 15.0 mm (0.6 in.) beyond tail membrane. In Arizona, the genus *Eumops* is distinguished from the other two genera (*Tadarida* and *Nyctinomops*) of the family, by a smooth upper lip which lacks vertical creases or wrinkles and lack of anterior emargination of the palate, both of which characteristics are found in both of the other genera. Distinguished from *E. underwoodi* (Underwood's bonneted bat) by larger size of *E. perotis californicus*, forearm longer than 7.3 cm (2.92 in.); ear measured from notch longer (approx. 40.0 mm (1.6 in.) in *E. p. californicus* and approx. 3.0 cm (1.2 in.) in *E. underwoodi*). *E. perotis californicus* is darker in color than *E. underwoodi* and lacks the long guard hairs on the rump which *E. underwoodi* possesses. *E. p. californicus* makes a distinctive, piercing, high-pitched '*cheep*' every 2 to 3 seconds during flight. The call is louder than that of any other U.S. bat and, unlike other bats, it is emitted almost continuously while flying. The calls are not as intense as those of *E. underwoodi*.

Once learned, call detection of *E. perotis californicus* can be used to determine its presence in an area (Cockrum 1960:83). Another possible means of identification is the sharp, swishing sound made by the wings during flight. This sound has been reportedly heard up to about 100 feet away. At roost sites, the massive, yellow urine stains and the large droppings are distinctive.

ILLUSTRATIONS:

Black and white photo (Barbour and Davis 1969: 218, 221)
Color photo (Barbour and Davis 1969: plate XXII)
Color photo (Whitaker 1980: plate 150)
Color photo:
http://www.bing.com/images/search?q=Greater+Western+Mastiff+Bat&FORM=RESTAB
Color photo (Wilson 1999)
Color photo (Harvey et al. 1999)
Color photo (Tuttle in AGFD 1993)

TOTAL RANGE: From California (San Francisco across to the Sierra Nevada and south) through Las Vegas, Nevada southern half of Arizona to Big Bend, Texas area and south to Sinaloa in northwestern Mexico and Zacatecas in central Mexico. This population is one of three widely separated populations; the other two are in South America and Cuba.

RANGE WITHIN ARIZONA: *E. p. californicus* is considered a year-round resident in Arizona based on collections, and calls heard in every month except January. They are observed in all Arizona counties except Yavapai, Navajo, Apache and Santa Cruz. Additional confirmed occupancy sites include one specimen collected after death near Flagstaff in December 1992 (Noel, 1993), and an echo location recorded and verified (by sonogram) by Dr. D. Pearson at Point Sublime on the North Rim of the Grand Canyon (Toone, pers. comm. 1992).

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Whether or not this bat hibernates during winter is unclear. Limited evidence suggests that during winter months it goes into torpor every day, but arouses and leaves the roost to forage at night when temperatures at dusk are above 5° C. This bat can tolerate ambient temperatures of 38° - 39°C (100° - 102°F) without undue heat stress (Barbour and Davis 1969).

Their hind legs are not as reduced as in other bats, allowing them to crawl rapidly. When crawling, the tail is extended at a 45° angle and may serve as a tactile organ when in a crevice. These bats are active within their roosts throughout the day. For the species, it emits many loud cheeping sounds while flying that are audible to the human ear. They are capable of fast and prolonged flight but cannot become airborne from the ground. They will scramble up a post or a tree in order to achieve a minimum height of some 5m necessary for launching into flight.

REPRODUCTION: Most likely breeds in early spring when male's testes are enlarged. The odiferous gland at the base of the throat is most active in males in March, and thought related to reproduction. Although the gland is present in all individuals, it is most conspicuous in males. Parturition time varies more in this bat than in any others in the U.S. Young have been found as early as June and as late as August. For the species, gestation is 80-90 days. Litter size is one young per year. For *Eumops perotis* the offspring are dull black in color at birth and are naked, except for the tactile hairs on the feet and the face. The timing and degree of separation of the sexes is unclear. While both sexes are found together throughout the year, males are found less commonly in maternity colonies.

FOOD HABITS: *E. p. californicus* usually leave daytime roosts about one hour after sunset (when completely dark) to forage. They feed on insects (moths, crickets, grasshoppers, dragonflies, leaf bugs, true bugs, beetles), especially Hymenoptera (bees, wasps, ants and sawflies). They forage at considerable heights (100 to 200 feet; sometimes to 1000 feet or more) over extensive areas for long (about 6½ hours) periods during the night. They don't seem to have activity peaks during the night, as do many other bats. They are known to forage at least 15 miles from the nearest likely roosting sites. They may forage on rainy nights and have been heard during a thunderstorm. This bat also prefers to forage over large open bodies of water (e.g. ponds, reservoirs etc), making them difficult to net. For the species, it has been found that sometimes they forage by crawling on the ground, with the tail held up in the air (http://home…westmast.html).

HABITAT: Lower and upper Sonoran desertscrub near cliffs, preferring the rugged rocky canyons with abundant crevices. They prefer crowding into tight crevices a foot or more deep and two inches or more wide. Colonies prefer crevices even deeper, to ten or more feet. These bats prefer to wedge themselves in the backs of cracks or crevices where they narrow down considerably. Entrances to roosting crevices are usually horizontal but facing downward which facilitates entry and exit.

The large body and narrow wings make ground launching difficult. According to Barbour and Davis, they regularly use roosts allowing them a vertical drop of 10 or more feet. These bats roost singly, in groups of two or more, but usually in colonies of up 100 individuals. Many roost sites do not seem to be occupied year-round, although they are likely to be occupied periodically. They often move around among several roost sites even when they have young. This is thought to be influenced by temperature as well as human disturbance.

ELEVATION: Elevation ranges from 240 – 8,475 ft. (73 - 2583 m) (AGFD, unpublished data accessed 2002).

PLANT COMMUNITY: Sonoran desertscrub.

POPULATION TRENDS: Poorly known. Some roost sites are no longer occupied.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: SC (USDI, FWS 1996)
[C2 USDI, FWS 1985, 1989, 1991, 1994]

STATE STATUS: 1B (AGFD SWAPS 2012)

OTHER STATUS: None. USDA, FS Region 3, 2013
Bureau of Land Management Sensitive (USDI, BLM 2008, 2010)
[Forest Service Sensitive (USDA, FS Region 3 2007)]
[None (USDA, FS Region 3 1999)]
[Forest Service Sensitive USDA, FS Region 3 1988]

MANAGEMENT FACTORS: Vulnerability of maternity colonies. According to Acker (*in* Chebes 2000) the species uses only select drinking sites and is severely limited by the availability of drinking water. Because its' wing structure is adapted for fast and straight-line flight, it is unable to drink from water sources less than 30m long. As a consequence, Western bonneted bats are no longer found in many previously occupied areas and populations may be in decline. According to the Texas Parks and Wildlife Department they are also threatened by urban/suburban expansion and by activities that disturb or destroy cliff habitat (e.g. water impoundments, highway construction, quarry operations). Recreational climbing is another potential threat. Pest control operations have eliminated most known building colonies in the Los Angelos basin. Grazing and pesticide applications in agricultural areas may impact foraging habitat.

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: Status survey. More information is needed on distribution of breeding colonies, seasonal movements, and roosting and foraging requirements.

LAND MANAGEMENT/OWNERSHIP: BIA - Hualapai Reservation; BLM - Arizona Strip, Kingman, Tucson and Yuma Tucson Field Offices; DOD - Barry M. Goldwater Air Force Range, and National Guard Military Reservation; FWS - Havasu National Wildlife Refuge; NPS - Casa Grande, Organ Pipe Cactus and Tonto National Monuments, Grand Canyon National Park, and Lake Mead National Recreation Area; USFS - Coronado and Kaibab National Forests; State Land Department; Hualapai Mountain County Park; John F. Kennedy Park; Private.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

P. Brown - Maturango Museum, Ridgecrest, California.

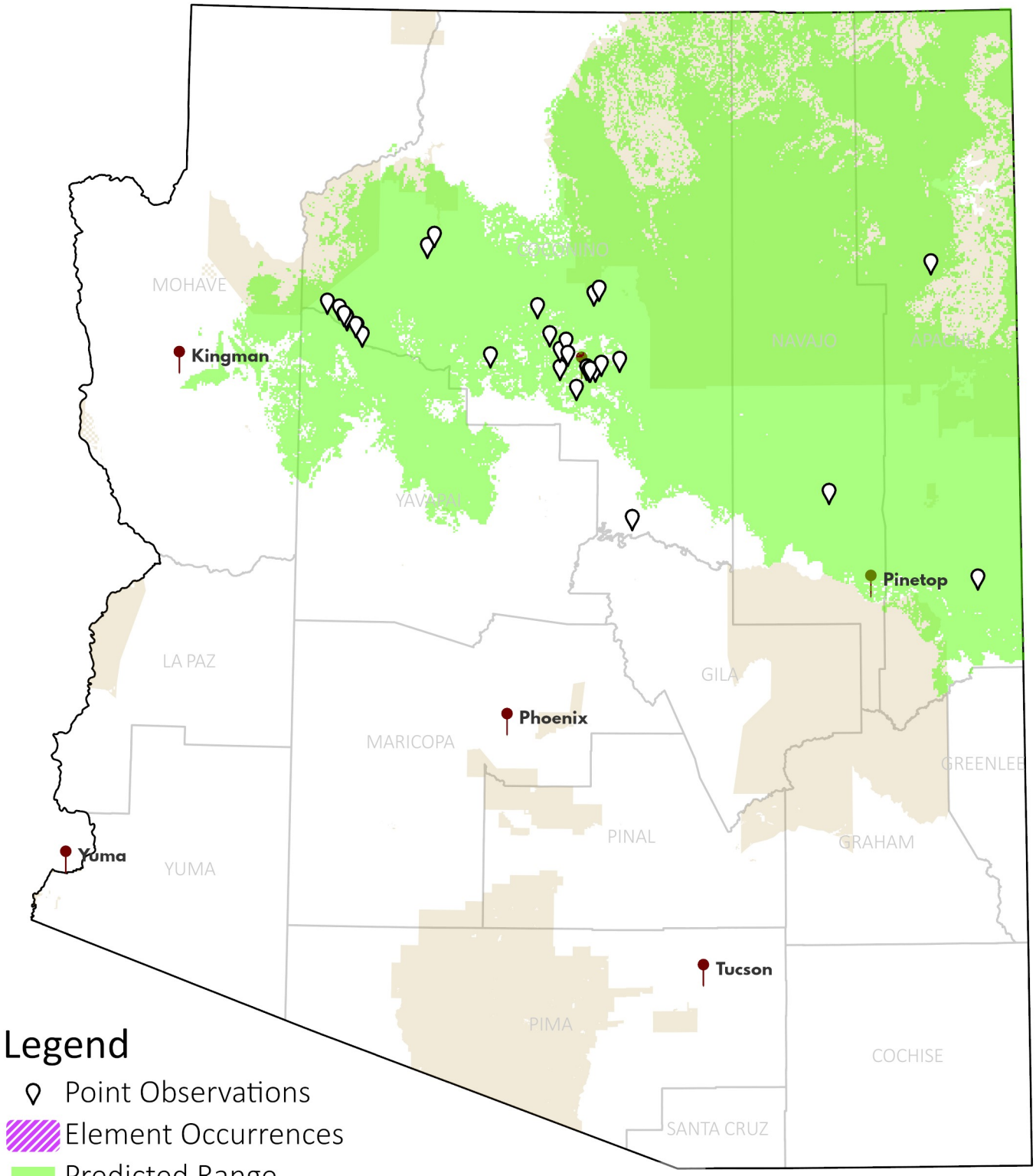
ADDITIONAL INFORMATION:

These bats are seldom netted over water or in flyways and their roosts are difficult to find or get to. However, since their echolocation calls are distinctive and field workers can be trained to identify them surveys may be most efficiently conducted by listening for their calls at selected localities.

Revised: 1991-08-08 (RBS)
1992-05-03 (BKP)
1992-10-01 (RBS)
1994-03-24 (DCN)
1996-06-19 (SMS)
1997-03-04 (SMS)
2002-11-20 (AMS)
2014-01-29 (BDT)

Cynomys gunnisoni

Gunnison's Prairie Dog



Legend

- Point Observations
- Element Occurrences
- Predicted Range
- Tribal Lands
- Counties

N

0 50 100 Kilometers

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences. Predicted ranges indicate likely habitat suitability, not presence.

Heritage Data Management System
2019-06-12

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AMAJH02010
Data Sensitive: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Panthera onca* Linnaeus
COMMON NAME: Jaguar, Blank panther, yaguar, jaguarete (Spanish)
SYNONYMS: *Felis onca*
FAMILY: Pantherinae (=Felidae)

AUTHOR, PLACE OF PUBLICATION: *Felis onca* Linnaeus, 1758: 42. *Felis onca arizonensis* Goldman, Proc. Biol. Soc. Wash. 45: 144. 1932.

TYPE LOCALITY: For Species *Panthera onca* (under *Felis onca*) "America meridionali"; restricted to Pernambuco, Brazil by Thomas (1911). For subspecies *Panthera onca arizonensis* (under *Felis onca arizonensis*), Cibecue, Navajo County, Arizona, in 1924.

TYPE SPECIMEN: Subspecies *Panthera onca arizonensis*, collected under *Felis onca arizonensis* by J. Funk in 1924, Navajo County, Arizona (USNM 244507).

TAXONOMIC UNIQUENESS: Eight subspecies are recognized (largely following Pocock, 1939, and not Cabrera, 1957) under *Panthera onca*, with *P. onca arizonensis* occurring in Arizona and New Mexico. *Panthera onca veraecrucis* is reported from Texas.

DESCRIPTION: This member of the cat family is allied with the "roaring" cats (African lion, tiger, and leopards), and is the largest cat native to the Western Hemisphere. This large heavy-bodied cat measures 3.7-4.8 ft (1.13-1.5 m) in head and body, while the tail measures 1.5-2.3 ft (0.5-0.7 m). Height at shoulder measures 2.3-2.5 ft (0.7-0.8 m), hind foot 9-12 in (22-30 cm), and weight is 150-225 lb (68-101 kg). Whitaker, Jr. (1997) reports weights of 119-300 lb (54-136 kg). Females usually are 10-20% smaller than males. There are five toes on each forefoot, the pollex or first toe is smaller and set above the others. Each hind foot has four toes, the first being represented only by a tiny vestigial metatarsal bone. Each digit including the pollex has a sharp retractile claw. Skull is robust, relatively short, broad in the rostrum (more so in males than females), and wide in the zygomatic arches, with 30 teeth (canines large). The saggital crest may become well developed, especially in males and older individuals.

This yellowish to tawny cat is uniformly spotted with black. Horizontal rows of spots on the sides and back form rosettes, a ring of black with a small black spot in the center; belly white with black spots. Occasional individual jaguars display a completely melanistic pelage with visible rosettes. Legs, head, and tail have smaller, solid spots, usually giving way to

incomplete bands near end of the tail. Ears are small, rounded, without tufts, and black on the back with small white or buff central spots. Pelage is rather short and bristly. The black pupil is round and the iris is golden to reddish yellow. There are four mammae. The os penis is a cylindrical or conical rod that is little ossified and quite variable.

Cubs have a long, coarse, woolly pelage, pale buff in color, and heavily marked with round black spots that may have pale-colored centers. They also have black stripes on their faces at birth. They take adult coloration around 7 months of age. Cubs are about 40 cm (16 in) long at birth, with a mass of 700 to 900 g.

AIDS TO IDENTIFICATION: Mountain Lion (*Puma concolor*) is unspotted, Ocelot (*Leopardus pardalis*) is smaller, and Margay (*Felis wiedi*) is much smaller and lacks rosettes. Although the mountain lion stands taller at the shoulder, it is considerably narrower through the body and neck, and far less heavily muscled than the jaguar.

ILLUSTRATIONS: Color drawing (Burt and Grossenheider 1976: plate 8).
Color photo (Whitaker, Jr. 1997: plate 267).
Color photo (Wilson 1999)
Color photo (*In* http://www.gf.state.az.us/w_c/jaguar_management.shmtl)
Color photo (*In* http://lynx.uio.no/catfolk//onca-01.htm)
Color photo of South America melanistic color phase (*In* http://www.bigcatrescue.org/jaguar.htm)
Line drawing of Jaguar and Leopard coat pattern (*In* http://www.bigcatrescue.org/jaguar.htm)

TOTAL RANGE: Mexico to Brazil and northern Patagonia. Very rare in the United States: southern Arizona, New Mexico and southern Texas.

RANGE WITHIN ARIZONA: Southeastern Arizona. Jaguars persisted in central Arizona as late as the early 1960's, when three were taken on the Fort Apache and San Carlos Indian Reservations. Individuals were reported from southeastern Arizona into the 1970's and 1980's. In 1996, photographs documented two individuals from the Baboquivari Mountains, Pima County, and the Peloncillo Mountains, Cochise County. Another individual was documented in 2001 and 2003 west of Nogales.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Pumas and jaguars are known to have overlapping ranges and little interaction; they seem to mutually avoid one another (this is not the case of jaguar and ocelot). Separation between pumas and jaguars appears to be based upon prey selection with jaguars selecting larger prey items. Their home range varies from 10 to 170 square km, with smaller ranges reported from the rain forest and larger ones from open habitats. They climb trees quite well. Jaguars have been characterized as primarily nocturnal, although radio telemetry

has shown that they are often active during the daytime, with activity peaks around dawn and dusk (IUCN-The World Conservation Union, 1996). Hunting primarily occurs at night, and on the ground. They usually catch their prey by stalking or ambush and kill it by cervical dislocation or by crushing the nasal area. They rarely kill by biting the throat or by asphyxiation as do the tiger or leopard. They sometimes move their kill to a more secluded or protected place, rarely in a tree, but usually make no attempt to hide their kill as do pumas.

Jaguars usually are solitary, except during mating or when the young are still dependent on their mothers. They are not known to migrate regularly, although lone males have been known to roam hundreds of kilometers. Local adjustments of range may take advantage of seasonal changes in habitat. Urination, scent marking, deposition of feces, and tree raking may function in communication or as territory markers.

In spite of their large size, jaguars are shy and retiring. They seldom, if ever, attack man unless cornered or at bay. In the wild, they have been reported to live as long as 11-12 years, while in captivity they have been reported to live up to over 20 years.

REPRODUCTION: The breed year-round range-wide, but at the southern and northern ends of their range there is evidence for a spring breeding season. In northern latitudes, jaguars are thought to breed from December to January. Gestation is about 100 days, with litter size ranging from 1-4 cubs (usually 2). Young are born in April-May, in dens in caves, dense brush or other heavy cover. They are covered with woolly fur, are heavily spotted at birth, and have their eyes closed. When about 6 weeks old, they are as large as house cats and begin to follow their parents about. The parent's mate at least for the season of parenthood, and both cooperate in rearing the young, although most of the burden falls on the mother. The family unit is maintained until the cubs are nearly a year old. Cubs remain with their mother for nearly 2 years. Females begin sexual activity at about 3 years of age, males at 4.

FOOD HABITS: In the U.S.-Mexico borderlands, peccaries (javelina) and deer are presumably dietary mainstays, as they are in Jalisco, Mexico. Range-wide, the list of prey taken by jaguars includes more than 85 species, such as javelina, armadillos, caimans, turtles, birds, fish, and various species of livestock.

HABITAT: These large cats are known from a variety of habitats, showing a high affinity to lowland wet habitats, typically swampy savannas or tropical rain forests. In the northern and southern periphery, they may occur in warmer, more arid habitat types, including oak-pine woodland. Unlike most cats, jaguars like water and were probably closely associated with the rivers and cienegas (marshes) once prominent in southern Arizona.

ELEVATION: Recent sightings in Arizona were recorded at 5,200 and 5,700 feet (1586 and 1739 meters).

PLANT COMMUNITY: Desert scrub to pine-oak woodland.

POPULATION TRENDS: Since 1890, more than 60 jaguars have been documented from Arizona.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: LE (USDI, FWS 1997) with CH.
[PE USDI, FWS 1996]
[PE USDI, FWS 1994]

STATE STATUS: 1A (AGFD SWAP 2012)
[WSC, AGFD, WSCA In prep]
[State Endangered AGFD, TNW 1988]

OTHER STATUS: Appendix I (CITES)
Near Threatened (IUCN)
P, Determined Endangered in Mexico (NORMA Oficial Mexicana NOM-059-SEMARNAT-2010)

MANAGEMENT FACTORS: For jaguars to persist in Arizona, they must be protected from being killed (poaching) and they must have an adequate prey base and movement corridors from source populations in Mexico. Abundance of prey and suitable resting sites are probably more important than a particular vegetation type. The core population in western Mexico must also be sufficient to provide for dispersal into the U.S.-Mexico borderlands. As cattle ranching has spread, jaguar populations have dwindled or been locally extirpated because of hunting by ranchers or because they have lost their natural prey. The most urgent conservation issue for the jaguar throughout its range is the rancher's intolerance of them, while the second is habitat destruction.

PROTECTIVE MEASURES TAKEN: There is a Conservation Agreement between 16 entities that was implemented through a Memorandum of Agreement. The 16 include: Arizona Game and Fish Department, Arizona Department of Agriculture, Arizona State Land Department, Cochise County (AZ), Pima County (AZ), Santa Cruz County (AZ), U.S. Forest Service, Bureau of Land Management, New Mexico Department of Game and Fish, New Mexico Department of Agriculture, New Mexico State Land Office, Hidalgo Soil and Conservation District, Otero County, U.S. Department of Agriculture, and National Park Service.

As part of the Conservation Agreement, the Jaguar Conservation Team (JAGCT), which overseas the Jaguar Management Program, was created. Arizona Game and Fish Department is a member of this team and the current chair. The JAGCT is a broad-based group of agencies and individuals from state, federal, and local governments, private individuals, and other entities with an interest in jaguar conservation. Activities of the JAGCT include: a compilation of scientific literature and occurrence information; development of a handling and kill verification protocol; and description of procedures for livestock reimbursement from

depredating jaguars. Members have assessed the risk to jaguars from various predator control methods, and have formed various working teams to deal with other issues related to conservation of the jaguar.

In Belize, the government aided by the WWF (World Wildlife Fund), have set aside 150 square miles of rain forest in the Cockscomb Basin Wildlife Preserve, which currently provides a protected environment for around 200 jaguars, the largest concentration of the wild cats species in the world. The WWF is also providing aid to protect some of the remaining rain forests areas of South America, which provide a refuge for the majority of the remaining jaguar population.

SUGGESTED PROJECTS: Field research, especially on habitat use and movement patterns, in Arizona, New Mexico, and Mexico is needed to provide a sound basis for management decisions.

LAND MANAGEMENT/OWNERSHIP: Bureau of Land Management; Department of Defense; National Park Service; USFS - Coronado National Forest; State Land Department; Private.

SOURCES OF FURTHER INFORMATION

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

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ADDITIONAL INFORMATION:

The species name *onca*, comes from Greek for hook or barb.

The jaguar was worshiped by various South and Central American cultures such as the Aztecs, Mayas, Olmecs, Toltecs, Zaptopecs, and Nahualistics. The name jaguar is apparently borrowed from one of the Tupi-Guarani languages: it was originally "yaguara" which means "wild beast that overcomes its prey at a bound." The Portuguese names for the jaguar are "onca verdadeira" and "onca pintada." The Spanish name is "el tigre."

The Borderlands Jaguar Detection Program of the Wildlife Conservation Society is designed to detect the presence of neo-tropical felids. If jaguars are to be allowed to have the chance to establish a breeding population in Southern Arizona, it is important to monitor habitat use of immigrating jaguars and other large carnivores indigenous to the area. Non-invasive methods such as camera traps, track transects and hair snares are being used. Important next steps include: conducting field surveys to monitor carnivore movement, concentrating on the basins between sky island mountain ranges in order to identify and help protect wildlife travel corridors. Seek funding to conserve or purchase critical jaguar breeding habitat, already identified in Sonora, Mexico, in order to persevere the gene pool of jaguars that migrate into Southern Arizona and New Mexico. Encourage studies that would seek out possible solutions to the illegal immigration problem along the southern border of the United States.

Revised: 1999-06-30 (SMS)
2004-06-11 (AMS)
2004-06-15 (BVP)

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AMACB03021
Data Sensitivity: YES

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Leptonycteris curasoae yerbabuenae* Arita and Humphrey
COMMON NAME: Lesser Long-nosed Bat; Sanborn's Long-nosed Bat; Little Long-nosed Bat
SYNONYMS: *Leptonycteris yerbabuenae* Martinez and Villa-R, 1940; *Leptonycteris sanborni* Hoffmeister 1957; *Leptonycteris nivalis sanborni*; *Leptonycteris curasoae* Miller 1900
FAMILY: Phyllostomidae (= Phyllostomatidae)

AUTHOR, PLACE OF PUBLICATION: *Leptonycteris yerbabuenae* Martinez and Villa-R., Anal. Inst. Biol. Univ. Nac. Autó. México, 11:313, August 1940. *L. curasoae yerbabuenae* Arita and Humphrey, Acta Zool. Mexicana (n.s.) 29:1-60. 1988.

TYPE LOCALITY: *L. c. yerbabuenae*: Mouth of Miller Canyon, Huachuca Mountains, 10 mi SSE Fort Huachuca, Cochise County, Arizona. Collected August 18, 1950. *L. yerbabuenae*: Mexico, Guerrero, Yerbabuena.

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: The nomenclatural history for this bat and the two other species in the genus has been rather confusing over the years. The currently accepted taxonomy for the Lesser Long-nosed bat is *Leptonycteris yerbabuenae*, however, it is listed Endangered under the U.S. Endangered Species Act (ESA) as *L. curasoae yerbabuenae*. (Wilson and Reeder, 2005). Therefore, the Heritage Data Management System (HDMS) continues to track this species as *L. c. yerbabuenae*, until such a taxonomic revision has taken place under the ESA.

Leptonycteris is 1 of 10 genera in the Subfamily Glossophaginae. The other two species of *Leptonycteris* are *L. curasoae* (Curaçaoan Long-nosed Bat) and the Listed Endangered (ESA) *L. nivalis* (Mexican Long-nosed Bat). Wilson and Reeder (2005) report the range of *L. nivalis* in the U.S. as SE Arizona, S New Mexico and W Texas; however, Arizona currently does not have records for this species. It potentially occurs in SE Arizona and is tracked as such.

DESCRIPTION: A medium-sized bat with total length of 7.5-8.5 cm (2.95-3.35 in), forearm 5.1-5.6 cm (2.0-2.2 in), wingspan of 36-40 cm (14-16 in), and weight between 15-25g (0.53-0.88 oz). The short, dense fur is yellowish-brown or pale brown above and cinnamon-brown below. They have an elongated snout, with a nose-leaf, an erect triangular flap of skin at the tip of the snout. There is no tail, and the interfemoral membrane is reduced to a narrow band along each hind leg. These bats have large eyes and reduced ears compared to other bats in Arizona. There are two molars above and below, molariform teeth in contact with one

another, zygomatic arch complete, and 4 lower incisors; sometimes these are lost. The loss of incisors might enable the bat to protrude the tongue more easily, to collect nectar.

AIDS TO IDENTIFICATION: The Lesser Long-nosed Bat is identified as a member of the Phyllostomidae family by the nose-leaf. It is distinguished from the other two Arizona Phyllostomids, by the lack of a conspicuous external tail. Its tail consists of three vertebrae that are not externally visible. Additionally, *L. c. yerbabuenae* is distinguished by its much smaller ears than *Macrotus californicus*, and by its shorter snout than *Choeronycteris mexicana*. This species is generally smaller in length of head and body, forearm, skull, and upper tooth row than its closely related relative *L. nivalis*. It is more brownish below and more reddish above than *L. nivalis*. *L. nivalis* is larger, with grayish pelage, longer wings, and a narrower uropatagium (tail). (Wilson and Ruff, 1999).

Spatters of thin yellow material on the floor or walls of a cave or mine likely indicate the recent presence of this bat or *Choeronycteris* (the other of the 2 nectar/pollen eating bats in Arizona). The yellow material is guano colored yellow by pollen, which the bats have ingested from plants visited for nectar.

The skull is distinguished from other Arizona bat skulls (except *Choeronycteris*) by the elongated rostrum. The presence of a complete zygomatic arch, lower incisors (usually), and 2 instead of 3 lower molars in *Leptonycteris* distinguish it from *Choeronycteris*.

ILLUSTRATIONS:

B&W photo (Barbour and Davis 1969:39)
Color photo (Barbour and Davis 1969: plate III)
B&W photo (Hoffmeister 1986:65)
Plate 180 (Whitaker 1980)
Color photo (Harvey 1999)
Color photo (Wilson 1999)
Color photo (Tuttle *in* Sidner 2000)

TOTAL RANGE: In the United States, they range from central California, southern Arizona, and New Mexico, south to Honduras and El Salvador.

RANGE WITHIN ARIZONA: Southern Arizona from the Picacho Mountains southwesterly to the Agua Dulce Mountains and southeasterly to the Galiuro and Chiricahua mountains and then southerly into Mexico and beyond. Also 2 late-summer records of immature individuals from the Phoenix area and 1 from the Pinaleno Mountains. Not present in Arizona during winter months.

There appear to be both sexual and seasonal differences in their Arizona range. During the early part of their stay (late April to late July) pregnant females congregate at traditional roost sites, give birth, and raise their young at lower elevations within the range of columnar cacti. Males and perhaps nonpregnant females do not arrive until sometime in July. By late July, most females and young have dispersed from the maternity colonies and some have moved to

higher elevations where they are found feeding on agave flowers. By late September or October all of these bats are migrating south in to Mexico, exactly where is not known.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: These bats do not hibernate. They cannot withstand prolonged exposure to cold. They migrate in September/October to Mexico and further south, where they breed and spend the winter. They return to Arizona in the spring to bear young.

The tongue is long and tipped with brush-like papillae that help mop up nectar. Like most nectar feeders, the teeth are much modified, having lost the cutting and crushing cusps of the insect feeding species of bats.

Unlike most other bats and rodents found in arid and semiarid areas, the kidneys of *Leptonycteris* are not adapted for water conservation and salt excretion. Maximum concentrations of urea and salts in the urine are the lowest reported for any mammal including an aquatic mammal such as the beaver (Carpenter 1969). This is related to *Leptonycteris* feeding on nectar with its high water and low salt content and the need to get rid of large amounts of water rapidly while retaining salts. Even still, its diet of nectar enables this bat to be essentially independent of free water.

The Lesser Long-nosed bat is considered an important pollinator of various agave species, columnar cacti and other Mexican plant species. Pollen collects on their heads and shoulders (sometimes making them look yellow) when they stick their head into a flower to get nectar. As they go from plant to plant, pollen is rubbed off on the pistils at each flower thus pollinating them. It is not yet clear just how important this bat is as a pollinator of saguaro and the agave species with which it is associated in Arizona, since some populations of these plants also exist well outside the known range of this bat.

These bats are strong flyers capable of flight speeds of up to about 14 mph. They are highly maneuverable which allows them to hover at flowers and often to evade both hand and mist nets. In roosting areas, they can be identified by distinctive roaring sound made by their wings as they fly. They hang with their feet so close together they can turn nearly 360 degrees to watch for predators. When launching into flight, it gives several strong wing beats, bringing the body into a horizontal position before releasing its grip. It is an agile flier and can fly nearly straight up while maintaining a horizontal body position. At the local scale, individuals can travel up to great distances. In Mexico, these bats fly up to 30km each night from their roosts on Isla Tiburon in the Sea of Cortez to their feeding grounds in mainland Sonora.

REPRODUCTION: Females arrive in Arizona pregnant and as early as the second week in April. They join other females in maternity colonies late in pregnancy, sometime in April or early May. Maternity colonies may number in the hundreds to thousands, and in a few places, in the tens of thousands. Males form separate, smaller colonies. One young per year is born

during May. Young can fly by the end of June. Maternity colonies break up by the end of July.

Immature *Leptonycteris* are dark grayish on the forehead and back whereas adults are browner. Neither maximum nor mean lifespan is known, however, one banded individual when recaptured was a minimum of 4 years old.

FOOD HABITS: In Arizona, they feed on nectar and pollen from flowers of saguaro and organ pipe cactus in early summer and agave later in the summer and early fall. They may feed on ripe cactus fruits at the end of the flowering season. They may also take a few insects incidentally when taking nectar. Lesser Long-nosed bats are known to feed on sugar water from hummingbird feeders at night, in Ramsey Canyon in the Huachuca Mountains, in Portal in the Chiricahua Mountains, and in Madera Canyon in the Santa Rita Mountains. During the winter period in Mexico, primary food plants, as identified by their pollen, appear to be *Ceiba, Bombax*, and *Ipomoea*. Their spring migration from central Mexico northward is thought to follow the sequential blooming of certain flowers from south to north.

They leave daytime roosts to feed about an hour after sunset. After filling their stomachs, sometimes to the point of appearing pregnant, they go to night roosts, which may be different from day roosts, to rest and groom. As they groom themselves, they remove the pollen sticking to their fur with their claws and then lick it off their claws. This ingested pollen provides proteins and other nutrients not obtainable from nectar. Observations by Howell (1979) indicate they spend about 6 hours a night foraging, alternating about 20 minutes of flying and feeding with about 20 minutes of roosting on plants or rocks and grooming. Additional observations indicate that feeding at agave flowers may often be done in groups. Individual bats may land on a panicle of flowers to feed or they may bury their snout in a flower and rapidly lap up nectar while hovering in front of it.

Although *Leptonycteris* and the other nectar/pollen feeder found in Arizona, *Choeronycteris*, feed on the same plants there are seasonal differences. *Choeronycteris* apparently prefers to feed on *Agave* flowers as it migrates northward and arrives in Arizona later than *Leptonycteris* and not until *Agave* has started blooming here. At this time and into the fall both bats feed primarily on *Agave*. During the winter in Mexico, *Choeronycteris* apparently prefers the columnar cacti flowers in contrast to *Leptonycteris*.

HABITAT: Desert grassland and shrubland up to the oak transition. They roost in caves, mine tunnels, and occasionally in old buildings; reported once in a culvert (M. Gilbert, USFS, pers comm September 1992) in Madera Canyon, Santa Rita Mountains. They forage in areas of saguaro, ocotillo, paloverde, prickly pear and organ pipe cactus and later in the summer among agaves. There appear to be seasonal differences in when certain habitats are occupied.

ELEVATION: They inhabit lower elevations below about 3,500 feet (1,068 m) from April to at least July. Range expands to include areas up to about 5,500 feet (1,678 m) from about July to late September or October. Based on records in the Heritage Data Management System, elevation ranges from 1,190 - 7,320 ft. (363 - 2,233 m) (AGFD, unpublished data accessed 2003).

PLANT COMMUNITY: Palo Verde/Saguaro, Semidesert Grassland, and Oak Woodland.

POPULATION TRENDS: Unknown. Populations presumed to have declined significantly.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: LE (USDI, FWS 1988) as *L. curasoae yerbabuenae* (reclassified as *L. yerbabuenae*).
[C2 USDI, FWS 1985]

STATE STATUS: 1A (AGFD SWAP 2012)
[WSC, AGFD, WSCA in prep]
[State Endangered AGFD, TNW 1988]

OTHER STATUS: Not Forest Service Sensitive (USDA FS Region 3, 2007)
[Forest Service Sensitive (USDA, FS Region 3, 1988, 1999)]
Determined Threatened (Secretaria de Medio Ambiente 2000, 2010)
[Listed Threatened, Secretaria de Desarrollo Social 1994]

REASONS FOR ENDANGERMENT: Population declines may be related to reduction in numbers of maternity colonies and decline in size of remaining maternity colonies in Arizona and Sonora due to exclusion and disturbance. Additionally, this bat may be negatively affected by large reductions in acreage of native agaves over large areas of northern Mexico, due to excessive harvesting for local manufacture of mescal and tequila. Excessive browsing on newly emergent flower stalks of *Agaves* has also been suggested as possibly decreasing foraging opportunities and thus contributing to declines among these bats.

MANAGEMENT FACTORS: Extreme northern edge of distribution, possible over-harvesting of native (as opposed to cultivated) agaves in northern Mexico, exclusion from some roost sites and disturbance at others. Easily disturbed at roost sites. Livestock grazing in areas with agaves may affect them, particularly if overgrazing is allowed (trampling of young agaves, feeding on the flowering stalks). Increase in border crossings from migrants, and the affect on their habitat unknown.

PROTECTIVE MEASURES TAKEN: Is designated as endangered by federal government (U.S. Fish and Wildlife Service), and is listed as a Priority vulnerable species in the Pima County Sonoran Desert Conservation Plan. When deemed safe, biologists continue searching for new colonies, and survey known maternity colonies in both Arizona and Sonora. Several caves and mine adits in southeastern Arizona have been gated with interpretive signs placed nearby by the Coronado National Forest and are monitored by forest, state and private bat biologists. At Colossal Cave (developed for tourism), located at the base of the Rincon

Mountains, some obstacles have been removed and attempts have been made to return parts of the cave to pre-disturbance conditions in hope of attracting *Leptonycteris* to use it as a maternity roost as it did until the 1960s.

SUGGESTED PROJECTS: Studies have been initiated of agave ecology, including fire relationships, on the Fort Huachuca military reservation; of foraging ecology in Sonora by researchers from Bat Conservation International; and of the effects of low-flying supersonic aircraft on the Barry M. Goldwater Air Force Range. Additional information is needed on dates of occurrence at specific localities and roosts, the variety and relative importance of food plants, the bat's migration routes, plant species and phenology along such routes, winter roost sites, and abundance of these bats at winter roosts.

LAND MANAGEMENT/OWNERSHIP: BIA - Tohono O'odham Nation; BLM - Safford and Tucson Field Offices; DOD - Fort Huachuca Military Reservation; FWS - Cabeza Prieta and San Bernardino National Wildlife Refuges; NPS - Chiricahua and Organ Pipe Cactus National Monuments, Saguaro National Park, Coronado National Memorial, and Fort Bowie National Historic Site; USFS - Coronado National Forest; State Land Department; Picacho Peak State Park; AMNH Southwestern Research Station; TNC - Muleshoe Ranch, Portal, and Ramsey Canyon Preserves; Private.

SOURCES OF FURTHER INFORMATION

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ADDITIONAL INFORMATION:

Because dates of presence and roost occupation can vary with season, with elevation and habitat, and with locale, surveying for this bat must be carefully planned. Population trend and presence surveys should coincide with known dates of occupation for particular roosts or localities. Although times of occupation or presence are known for some sites, they may be only partially known or remain to be determined for others.

Leptonycteris is from the Greek *lepto* for slender (referring to snout) and *nycteris* meaning bat.

Revised: 1991-08-13 (RBS)
1992-05-03 (BKP)
1992-10-18 (RBS)
1994-03-25 (DCN)
1995-06-12 (DBI)
1998-01-26 (SMS)
2003-05-09 (AMS)
2011-01-18 (SMS)

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Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X…X **(=taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AMAJAD1032
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Canis lupus baileyi*
COMMON NAME: Mexican Gray Wolf, Lobo
SYNONYMS: *Canis nubilus baileyi*, *C. lycoan baileyi*
FAMILY: Canidae

AUTHOR, PLACE OF PUBLICATION: Nelson and Goldman (*C. nubilus baileyi*), J. Mamm., 10:165. May 9, 1929.

TYPE LOCALITY: Colonia Garcia, 6,700 ft., Chihuahua, Mexico. July 10, 1899.

TYPE SPECIMEN: USNM 98312, skin and skull of adult male, collected by E.W. Nelson and E.A Goldman. Original number 13895.

TAXONOMIC UNIQUENESS: Only subspecies of gray wolf in genus to occur in Arizona, 1 of 5 subspecies in North America. The Mexican gray wolf is also the southern-most occurring and most endangered subspecies of gray wolf in North America.

DESCRIPTION: *Canis lupus baileyi* is the smallest and most genetically distinct of the five subspecies of gray wolf that once inhabited most of North America. Males are larger than females; the nose pad is 1 1/4" (33 mm) wide, height 26-38" (66-97 cm); length 4' 3" to 5' 6" (130-165 cm); tail is 13 3/4" - 17" (35-42.5 cm); hind foot 8 5/8"-12 1/4" (22-31 cm); weight 70-100 lbs (31.1-86 kg) (50-90 lbs per USFWS 1995). This is a small sized wolf both externally and cranially; they have a broad zygomatic arch, short thick muzzle, deep chest cavity, thick neck and forequarters, and a downward slope from shoulder to hindquarters. Their head and feet are large in proportion to the body, and their long legs look almost frail compared to their bodies. The color can range from most common grizzled gray to shades of black, brown, and buff; throat and area between forelegs whitish; has a long bushy tail with a black tip.

AIDS TO IDENTIFICATION: *C. l. baileyi* is smaller externally and cranially than *C. l. youngi* (intermountain Gray Wolf); the coyote (*C. latrans*) is smaller with a smaller nose pad, and it holds its tail downward whereas *baileyi* holds its tail straight out, and a domestic dog's (*C. familiaris*) tail curves upward. It is one-half the size of an arctic wolf; it is more narrow chested than a domestic dog; it looks like a shaggy German Shepard but has predominantly longer forefeet and legs.

ILLUSTRATIONS:

B & W photo (Johnson, 1990: 18).
Map (Busch, 1995: 172)
Color photo (Groebner, 2000:18-20).
Color photos (Johnson, 1992: 2)

TOTAL RANGE: Historically in Southeastern Arizona, New Mexico and West Texas, south through much of northern and central Mexico. Reintroduced to Arizona in 1990s and New Mexico soon after. A small remnant population remains in Mexico.

RANGE WITHIN ARIZONA: Historically in Southeastern corner of the Apache National Forest in Arizona, bordering New Mexico Gila National Forest, in Greenlee and Apache Counties. They had not been seen in the wild since 1970, until reintroductions in Apache County, Arizona.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: The Mexican gray wolf is a social animal that lives in packs of 2-15, but typically 4-7. The strongest male and strongest female, are the leaders (alpha). The male and female hierarchy: Alpha male is dominant over the entire pack, followed by the alpha female, then the beta male and beta female, and last the omega male and omega female. A wolf's social status can be determined as early as thirteen days old. Dominant behavior is an open mouth with bared teeth, hair raised along its back, and ears erect and pointed forward. Different packs tend to try and avoid each other. Each pack can travel over hundreds of miles, but their home range is unknown. Wolves howl most commonly during breeding season in late fall and early winter, but may howl any time of year. Howling is an important means of communication, letting pack members know the location of other pack members; as do scent posts marked by urination (Hoffmeister 1986). The way the wolf stands can say something to another wolf. Body gestures are very important in this way. Their sense of smell is over a hundred times greater than a human. Almost half of a wolf's time is spent sleeping and the rest is spent hunting and rearing its young.

They are mainly nocturnal, hunting along runways and hunting beats that follow stream beds, washes, old game trails, and old roads. Both parents forage for food to feed the young. When food is taken at a great distance from the den, the parents will fill themselves and regurgitate the food at the dens for the young. When young are about 3 months of age, they and the parents leave the den, and may begin to traverse established runways on hunting beats. (Hoffmeister 1986 *in* BISON 2000).

Pathogens to which wolves might be exposed in the wild include canine parvo virus, canine distemper, infectious canine hepatitis, leptospirosis and rabies. These pathogens do exist in canids, in areas of dense human population. Neither canine hepatitis nor leptospirosis is a concern in the southwest. The protocol for Mexican wolves released into recovery areas, is to

vaccinate them for rabies, parvo virus, distemper, hepatitis and leptospirosis while in captivity. Wild-born wolves would only be trapped and vaccinated in cases of serious outbreaks of a given disease. (Groebner 1995).

REPRODUCTION: Both the male and female are sexually mature by the age of 2 years (breeding occurs between 2-3 years of age). Only the dominant male and female mate and rear offspring; pairs usually mate for life. They breed once a year from December to March, when the female goes into estrus for 3-5 days. Pups numbering 4-8 are born from March to May after a gestation period of 63 days. The young are born blind, deaf, and completely helpless. Young are tended by both parents, although the entire pack helps in raising the pups. Dens are made under rock ledges, off the slopes of canyon walls or hills, with good visibility of surrounding area. Some offspring remain with the pack, while others disperse as they mature, probably in winter (December).

FOOD HABITS: They feed primarily on large mammals including elk, deer, javelina, and occasionally pronghorn, and bighorn sheep. Also may take, to a lesser degree, rabbits, hares, wild turkeys and small rodents (Groebner 1995); have been known to occasionally take cattle. They can go for weeks without food, and will gorge on kill when it is plentiful.

HABITAT: A significant vegetation type is probably not important for wolf survival. As long as the habitat is adequate to support sufficient prey populations, such as elk and deer, and human-induced mortality is controlled, the wolf should survive. Ungulate populations are most productive in ecosystems that contain a variety of forest successional stages. (Groebner 1995). Historically: montane woodlands in the southwestern U.S. and central and northern Mexico, and throughout southeastern Arizona in Upper Sonoran woodlands and grasslands; avoided desert areas (BISON 2000).

The Arizona reintroduction area consists of rugged topography, with steep canyons and high ridges, bisected by the Mogollon Rim. The most common vegetation types of the Blue Range area are petran montane and Great Basin conifer forests, plains and Great Basin grasslands, Madrean evergreen woodland, and semidesert grasslands. (Groebner 1995).

ELEVATION: Above 3,000 to 12,000 ft. (915 - 3660 m), or lower if they are in transit. Above 3,500 ft (1068 m) in Mexico.

PLANT COMMUNITY: In the Arizona recovery area, petran montane forests occur at higher elevations, and are comprised of ponderosa pine (*Pinus ponderosa*), aspen (*Populus* spp.) and fir (*Abies* spp.). Great Basin forests are characterized by pinyon-juniper stands, at slightly lower elevations. Madrean evergreen woodlands also occur below the pine forests, and are dominated by evergreen oaks, pinyon, and juniper. Grasslands occur between 3,600-7,500 feet, and consist of native and nonnative grasses, with mesquite (*Prosopis*), juniper, and forbs in areas where fire suppression and grazing are common. (Groebner 1995).

Upper reaches of riparian areas within the recovery zones support plant communities of narrowleaf cottonwood (*Populus angustifolia*), willows (*Salix* spp.), alders (*Alnus* spp.), maples (*Acer* spp.), and red osier dogwood (*Cornus stolonifera*). Lower elevations are dominated by Fremont cottonwood (*P. fremonti*), sycamore *(Platanus wrightii*), walnut (*Juglans major*), boxelder (*Acer negundo*), ash (*Fraxinus* spp.), and hackberry (*Celtis* spp.). (Groebner 1995).

POPULATION TRENDS: At one time, they were extirpated from Arizona, New Mexico, and Texas. Recovery efforts began more than 20 years ago with the establishment of a fledgling captive breeding program. They were reintroduced to Arizona (1998 and 1999) and New Mexico (2000) as experimental non-essential populations. Released animals are captive-reared wolves that are 'genetic surplus,' meaning their genes are already well represented by relatives in the captive population. A small wild population persists in Mexico.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: LE,XN (USDI, FWS 2015)
*XN=experimental non-essential

STATE STATUS: 1A (AGFD SWAP 2012)
[WSC, AGFD, WSCA in prep]
[Endangered, AGFD, TNW 1988]

OTHER STATUS: No Status (NNDRW, NESL 2008)
[Group 1, species level, NNDRW, NESL 2001, 2005]
E, probably Extinct in the wilds of Mexico (NORMA Oficial Mexicana NOM-059-SEMARNAT-2010)
[P, determined endangered in Mexico (MFESL 1994)]

MANAGEMENT FACTORS: Recovery of this species will require sound management that addresses the following areas: livestock industry, ranchers, prey base, habitat capabilities, multiple use conflicts, public education.

PROTECTIVE MEASURES TAKEN: Captive breeding program at 19 cooperating facilities in the U. S. and 5 facilities in Mexico.

SUGGESTED PROJECTS: Public education; additional field surveys to evaluate possible future reintroduction sites.

LAND MANAGEMENT/OWNERSHIP: USFS (Apache-Sitgreaves National Forest), and private in the Arizona recovery zone.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

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Bill Van Pelt, Arizona Game and Fish Department, Phoenix

ADDITIONAL INFORMATION:

Exterminated from essentially all of range through trapping and poisoning. Habitat is shrinking from human encroachment. (NatureServe 2000).

Most wolves that were (and are) reintroduced to Arizona and New Mexico, come from the U.S. Fish and Wildlife Service captive wolf management facility at Sevilleta National Wildlife Refuge in New Mexico. Cooperators in the captive propagation program include Arizona-Sonora Desert Museum and the Phoenix Zoo.

Per Arritt (1999), "The expected home range per wolf pack is about 250 square miles, and wolves will not share home ranges. After this year, we will have used most appropriate release sites in the 1,000 square-mile primary recovery zone in Arizona, which means we are running out of space for releasing wolves. A formal amendment to the plan would be required to open more remote areas for releases." **Note:** after this article was printed, they began releasing wolves in New Mexico.

Revised: 2001-03-06 (SMS)

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AMACB02010
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Choeronycteris mexicana*
COMMON NAME: Mexican Long-tongued Bat, Hog-nosed Bat
SYNONYMS:
FAMILY: Phyllostomidae

AUTHOR, PLACE OF PUBLICATION: Tschudi, J.J., 1844. Untersuchungen uber die Fauna Peruana. St. Gallen, parts 1-6, p. 72, 262pp.

TYPE LOCALITY: Mexico

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: In Arizona *Choeronycteris* is 1 of 3 genera in the family Phyllostomidae. *C. mexicana* is the only species in the genus that comes as far north as Arizona. *Choeronycteris mexicana* is regarded as a monotypic species by Koopman (in Wilson and Reeder 1993), and Simmons (in Wilson and Reeder 2005); nominal subspecies *ponsi* from northwestern Venezuela is now regarded as a subspecies of *Choeroniscus periosus* (Simmons, in Wilson and Reeder 2005). See Van Den Bussche (1992) for an analysis of phylogenetic relationships of phyllostomid bats based on restriction-site variation in the ribosomal-DNA gene complex.

DESCRIPTION: A rather large bat with a long, slender nose, and large eyes. It has a nose leaf that is broad at the base and pointed at the tip (looks like a small triangular bump near the nose tip), measuring about 5.0 mm high, which may help direct the ultrasonic echolocation signals the bat sends through its nostrils. Other measurements include the forearm between 42.0-48.0 mm (1.7-1.9 in.), a wingspan of 33-38 cm (13-15 in), the hind foot between 11.0-14.0 mm (0.44-0.56 in.), and the weights ranging between 10-25 grams. The tail is approximately 10 mm in length, about one-third the length of the naked interfemoral membrane. The dorsal pelage color varies from buffy brown to dark grayish-brown, palest on shoulders; venter is paler; ears pale brownish gray. The tongue is long and extendable, and can extend up to a third of their body length. Upper incisors are small, but do not fill the space between the canines. There are no permanent lower incisors, but one to four deciduous teeth may persist in adults. In flight, the wings make a swishing sound similar to that produced by long-nosed bats.

AIDS TO IDENTIFICATION: Species of the Phyllostomidae family found in Arizona, including *Choeronycteris mexicana,* are identified by the presence of a flap or leaf of skin extending from the tip of the nose. Bats of the other three families in Arizona lack such a

nasal leaf. *Leptonycteris curasoae yerbabuenae* lacks a visible tail and is larger (forearm 51.0-55.0 mm [2.04-2.2 in.]; hind foot 14.0-14.7 mm [0.56-0.59 in.]). The tail of *Macrotus* extends to slightly beyond the interfemoral membrane.

ILLUSTRATIONS:
B&W photo (Hoffmeister 1986:63)
Color photo (Whitaker 1980: plate 180)
Color photo (Wilson 1999)
Color photo (Harvey 1999)
Color photo (Whitaker 1996)

TOTAL RANGE: Southern California, southern Arizona, southwestern New Mexico, southern tip of Texas and much of northern and central Mexico. According to the Nevada Bat Working Group there was a single individual found in Las Vegas.

RANGE WITHIN ARIZONA: Southeast Arizona, from the Chiricahua Mountains extending as far north as the Santa Catalina Mountains and as far west as the Baboquivari Mountains. AGFD HDMS unpublished records show them in Pinal, Pima, Graham, Santa Cruz and Cochise counties.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Peak activity for *Choeronycteris mexicana* occurs 1.5 hours after sunset and then at low levels until about 3 hours after sunset. They are less gregarious than other colonial bats and less inclined to roost with other bat species. In roosts, they do not cluster closely together but hang 2.0-5.0 cm (0.8-2.0 in.) apart, usually by only one foot so they can swivel 360° to detect predators. Roosts usually consist of 15 or fewer individuals, but when considering roosts in close proximity to each other, population numbers may reach up to 40-50. This species is thought to migrate seasonally to take advantage of suitable sources of food. They normally migrate south across the border into Mexico to spend the winter. Southern Arizona is at the extreme northern edge of its range, where it is found in sexually segregated and nursery colonies during the summer.

REPRODUCTION: Females segregate from the males, and according to Cockrum and Petryszyn (1992), only adult females move north from Mexico into the United States with the males remaining "in the southern part of the range during the time that young are being nourished by the mothers in the north." The young (typically one baby) are born mid to late June and early July, but parturition may be as late as September in Mexico. As with many species of bats, the fetus is about 30% of the mother's weight. Parturition usually lasts about 15 minutes, resulting in the birth of a neonate in a remarkably advanced state of development. The newborn bat is surprisingly well furred on the dorsum with a dense, dark pelage; the venter is scantily furred with silvery hair. Young grow rapidly and can probably fly within 2-

3 weeks. After the young become volant, these bats move about opportunistically in search of food. Females are known to carry their young in flight.

FOOD HABITS: This bat feeds on nectar, pollen, probably insects, and occasionally fruit of columnar cacti (these bats are not typically found in low desert situations). They especially feed on the flowers of paniculate agaves. The bristle-like tongue and lack of lower incisors, aid this bat in lapping up flower nectar and pollen.

During winter some are reported to feed at hummingbird feeders. It is not known if they are feeding on other things at that time.

HABITAT: Mesic areas in canyons of mixed oak-conifer forests in mountains rising from the desert; in Mexico includes arid thorn scrub, and tropical deciduous forests. Caves and abandoned mines are favored daytime retreats where they prefer to roost in the dimly lit areas often near the entrance. They are also often found in shallow caves or rock shelters. A few are found in palo verde-saguaro areas. Some of their range overlaps with *Leptonycteris*, but is not great (see Hevly 1979). *Choeronycteris* usually occupies higher elevations than *Leptonycteris* when it arrives in spring, and they may use the same roost year after year. Based on a study conducted by Carter and Peachey in 1996, all roost sites in the Cienega Creek Natural Preserve, except one, were located immediately adjacent to the creek. The roost sites consisted of pocketed, eroded clay soil holes such as sink holes, or soil piping caves. The majority of the soil piping caves where only a few meters long and 1-2 meters high, having a characteristic dome ceiling which seems to be where the bats prefer to roost.

ELEVATION: Records from 2,540 - 7,320 ft. (774 - 2,233 m), but most are from 4,000 - 6,000 ft. (1,220 - 1,830 m).

PLANT COMMUNITY: In the northern part of this bat's range, roost sites are commonly associated with mesic areas in oak-conifer woodlands or semi-desert grasslands. Dominant species include: oaks (*Quercus*), alligator juniper (*Juniperus deppeana*), manzanita (*Arctostaphylos*), yucca and agave. Near Tucson, they feed predominantly on cactus and *Agave* species. Cryan and Bogan (2003) observed species of *Agave* as the consistent floral characteristic of all sites visited, with *Agave schottii* observed blooming at occupied sites before mid-June, after which blooming *A. palmeri* was encountered.

POPULATION TRENDS: Unknown. Based on a recent study by Cryan and Bogan (2003), there is not sufficient evidence to conclude that populations in Arizona and New Mexico have increased or decreased in recent years. Searches of rock crevices and shelters in historical roost areas often revealed multiple roosting groups, suggesting that aggregations of *C. mexicana* are dispersed among several proximate sites.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS:
SC (USDI, FWS 1996)
[C2 USDI, FWS 1989, 1991, 1994]

STATE STATUS:
2 (AZGFD, AWCS 2022)
[1C (AGFD SWAP 2012)]
[WSC (AGFD, WSCA 1996 in prep)]
[Threatened (AGFD, TNW 1988)]

OTHER STATUS:
Bureau of Land Management Sensitive (USDI, BLM AZ 2008, 2010, 2017)
[Not Bureau of Land Management Sensitive (USDI, BLM AZ 2005)]
[Bureau of Land Management Sensitive (USDI, BLM AZ 2000)]
Forest Service Sensitive (USDA, FS Region 3 2007, 2013)
[Not Forest Service Sensitive (USDA, FS Region 3, 1999)]
[Forest Service Sensitive USDA, FS Region 3, 1988]
NT (IUCN, Solari 2018)
[LR/nt (Chiroptera Specialist Group 1996, *In:* IUCN 2006)]
A, Determined Threatened (Secretaria de Medio Ambiente 2000, 2010)
[Determined Threatened, Secretaria de Desarrollo Social 1994]

MANAGEMENT FACTORS: This species is very wary of humans and easily disturbed. They are difficult to survey for because they roost in small (5-15) colonies. Threats include recreational caving, mine reclamation, renewed mining, and loss of riparian habitat. Because of its propensity for moving between roosts in a small area, the loss of riparian vegetation may be a greater threat to the species than disturbance at a particular roost (Cryan and Bogan 2003). In addition, the loss of food resources (Agaves in Mexico [over harvesting]) due to development, fire or grazing may also have an affect on this species.

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: Restrict human disturbances at known roost sites. Due to their susceptibility to population decline, bat populations should be monitored. Research is needed on habitat needs, food habits, pollination role, survivorship, distribution, roosting patterns, and life history. In addition, studies looking at movement and revisits, possibly through banding, are needed, along with the possible affects of artificial feeders on their health.

LAND MANAGEMENT/OWNERSHIP: BIA - Tohono O'odham and San Carlos Reservations; BLM - Safford and Tucson Field Office; DOD - Fort Huachuca Military Reservation; NPS - Organ Pipe Cactus National Monument and Saguaro National Park; USFS - Coronado National Forest; State Land Department; Kartchner Caverns State Park; Pima County; Agua Caliente County Park; Cienega Creek Nature Preserve; AMNH Southwestern Research Station; TNC - Ramsey Canyon and Muleshoe Ranch Preserves; Private.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Dr. Paul Cryan – USGS, Fort Collins Science Center, Fort Collins, CO.
Ronnie Sidner – Tucson, AZ.

ADDITIONAL INFORMATION:

In the 1980s (at least) in late August approximately 100 of these bats congregated in an old log homestead in Ramsey Canyon, Huachuca Mountains. Dr. E.L. Cockrum (pers comm 1992) speculated that the congregation may be due to the females and fledged young gathering near a food source, the numerous hummingbird feeders in the canyon.

Ronnie Sidner reports that they have been observing them more frequently at hummingbird feeders, and higher in the Santa Catalina Mountains.

Choeronycteris mexicana. From the Greek *choiros* meaning pig (refers to the pig-shaped snout) and *nykteris* meaning bat. The specific epithet, *mexicana*, refers to its major distribution, and where the species was first described.

Revised: 1991-12-26 (JSP)
1992-05-03 (BKP)
1992-09-28 (RBS)
1994-03-29 (DCN)
1997-03-03 (SMS)
2003-03-10 (AMS)
2006-09-27 (SMS)
2023-02-21 (MBL)

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Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AMAJH01030
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Leopardus pardalis*
COMMON NAME: Ocelot, Ocelote, Tigrillo, Painted leopard
SYNONYMS: *Felis pardalis*
FAMILY: Felidae

AUTHOR, PLACE OF PUBLICATION: 1758. Linnaeus, Syst. nat., ed. 10, 1:42. (*F. p. sonoriensis* 1925. Goldman, Jour. Mamm., 24:378, August 17).

TYPE LOCALITY: State of Veracruz (by restriction, J.A. Allen, Bull. Amer. Mus. Nat. Hist., 41:345, October 3, 1919). *F. p. sonoriensis*: type from Camoa, 800 ft., Rio Mayo, Sonora.

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: *Leopardus pardalis* is one of five species in genus *Leopardus*, which occurs or is thought to have once occurred in Arizona. *Leopardus pardalis* contains five subspecies, with *L. p. sonoriensis* reported in Arizona and Sonora Mexico, and *L. p. albescens* in Texas and eastern Mexico.

DESCRIPTION: A medium-sized slim cat, with body dimensions similar to a bobcat. The tail is about one-half the length of the head and body, and females are slightly smaller than males. In total length males range from 95.0 – 136.7 cm (37.4-53.82 in), females 92.0 – 120.9 cm (36.22-47.60 in); length of tail for males 28.0 – 40.0 cm (11.02-15.75 in), females 27.0 – 37.1 cm (10.63-14.60 in); weight for males 7.0 – 14.5 kg (15.43-31.96 lb), females 7.0 – 10.8 kg (15.43-23.81 lb). (Wilson & Ruff, 1999). The spots on this long tail cat do not have the rosettes of the Jaguar (*Panthera onca*). Ground colors of the upper pelage are grayish (subtle) to cinnamon brown. Dark markings form chain-like streaks, considered black-bordered elongated spots or nearly stripes than spots, running obliquely down sides. The head has small black spots and two black stripes on each cheek, and 4-5 parallel black stripes on neck. The backs of the rounded ears are black with a white central spot. Ground color of sides paler than dorsum, and under-parts and inner surfaces of limbs whitish; tail above marked with dark bars and blotches. Eye-shine is golden. The skull is similar to that of the bobcat but larger. Skull with elongated brainbox and prominent sagittal crest. The braincase is narrow across postorbital constriction, and the nasals long; skull has 30 teeth. They have 4 mammae.

Cahalane (1961) states that "no ocelot is exactly like another." The color of different individuals of one species, even in the same neighborhood, varies greatly, all the way from

ruddy yellow to grayish. No coat patterns are exactly alike. One side of an ocelot does not match its other side. The lines, spots and rings run in a crazy pattern."

AIDS TO IDENTIFICATION: Jaguar (*P. onca*) is much larger than *L. pardalis*, and marked almost entirely with rosettes. The ocelot is comparable in size to the Bobcat (*Lynx rufus*), but it is easily distinguished by its long tail and grayish or tawny coat covered with numerous dark spots and streaks. Their tracks are similar, but slightly larger and wider than the Bobcat's, about 2-2.5 in (5.0-6.2 cm) long, equally wide and with forefoot larger than hind foot. The other spotted cat found in North America north of Costa Rica is the Margay (*Leopardus wiedii*). The Margay is smaller, roughly half the size of the Ocelot, has longer tail, longer than hind leg, and lacks the two prominent black check stripes. (Wilson & Ruff, 1999).

ILLUSTRATIONS:

Color drawing (Burt and Grossenheider, 1976: plate 8)
Color photo (Whitaker, Jr., 1996: plate 268)
Color photo (*in* Wilson & Ruff, 1999: p. 229)
Color photos, multiple photographers © (*in* IUCN-The World Conservation Union, 1996; Accessed 2004)
Color photo (adult ©Tom Smylie USFWS, and kittens © Linda Laack USFWS; *in* Texas Parks & Wildlife web species account, accessed 6/30/1999 & 01/14/2011).

TOTAL RANGE: Listed endangered throughout its range in the western hemisphere, where it ranges from southern Texas and southern Arizona, through Central and South America into northern Argentina and Uruguay. (U.S. Fish and Wildlife Service, 2010). On the fringes of its range, they occupy a very limited region in both the United States (remnant populations in southern Texas, and transient populations in southeastern Arizona) and Argentina.

Historically, they ranged from Arkansas to Arizona south to Paraguay, Uruguay, and northern Argentina. This included eastern, central, and southern Texas, and possibly Louisiana. In USFWS (2010), "Fossils of ocelots have been reported from the U.S., primarily in California, Arizona, and Florida (Navarro-Lopez 1985)….There are no fossil records for Texas, but ocelot probably occurred there in prehistoric times and may have ranged over much of the southern U.S. (Navarro-Lopez 1985)."

RANGE WITHIN ARIZONA: At one time thought to be extirpated from the state, (Southeastern Arizona [Pima, Santa Cruz, and Cochise counties]). *L. pardalis* was recently documented in southeastern Arizona, from a photograph taken in Cochise County. In April of 2010, a specimen found DOR along highway 60 between Superior and Globe was collected, sent to Oregon for DNA testing, and determined to be a wild adult Ocelot. On February 8, 2011, a young healthy male was treed on a local ranch in the Huachuca Mountains. Photos were taken and the cat was allowed to leave the area.

In 1985, Brown (*in* Harwell and Siminski 1986 draft) believed that the ocelot may be repeating the northward expansion of the javelina, coati-mundi, and other neo-tropical

invaders into the San Pedro River Valley, Arizona. There may be a good possibility with the establishment of the TNC (The Nature Conservancy) San Pedro River Preserve, and the BLM (Bureau of Land Management) San Pedro River Natural Conservation Area that this is occurring. Both these management areas occur east of the Huachuca Mountains.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Ocelots are generally nocturnal, though it is not uncommon to see them during the day. They spend their days lying quietly in the branches of large trees and come out to hunt after dark. Though normally solitary, they frequently travel and hunt in pairs, probably as mates, maintaining contact and signaling each other with cries like those of domestic cats. Ocelots are good climbers and inhabit forested or brushy areas. They swim well, and often hunt along streams.

Texas studies suggest home ranges of about one square mile, although this may vary due to prey abundance. Wilson & Ruff (1999) report male territories of 4-18 square km, varying in size by habitat and season. Females occupy a smaller home range of 2-11 square km within the territory of a single male, though one or more females often occupy a single male's territory. Because of their mild manner, they are easily trapped or shot, and therefore is the most frequently hunted cat in Latin America.

REPRODUCTION: Minimum breeding age for females estimated to vary from 10 to 11 months in captives, to 18 months in captive and wild ocelots. Seasonality of breeding not known, but newborn kittens has been reported from every month of the year (Wilson & Ruff, 1999). It is thought that most births occur in September through January. Gestation averages 70-80 days, with 1-2 young born (3 exceptionally), fully furred with eyes closed. The natal den is usually a bare area in a dense thicket, though dens in caves, logs, and hollow trees have been reported. The female raises her young without any help from the male. When young are about two months old, they begin to accompany the mother on hunting forays. They remain dependent on her for meals for several months. Off spring remain on the mother's home range for the first years. At this time, young males disperse, probably forced out by the resident adult male. Females linger on and may settle on a portion of the mother's home range or on a neighboring site after reaching sexual maturity at 15-22 months. (Wilson & Ruff, 1999).

FOOD HABITS: Diet changes with the season throughout its range, but consists of a wide variety of small vertebrates and large invertebrates. Prey items include mammals, birds, reptiles, amphibians, fish, insects, and land crabs. Rodents are generally the principal food item. (Wilson & Ruff, 1999). They are known to eat armadillos, lesser anteaters, squirrel monkeys, and land tortoises. Ocelots hunt both on the ground and in trees, sometimes even catching birds perched in trees.

HABITAT: A habitat specialist that lives in areas of dense cover or vegetation, and high prey populations (Sunquist 2002, in USFWS 2010), avoiding open country. This suggests its use

of a narrow range of microhabitats. In Arizona and Sonora, little is known about ocelot habitat use. Lopez Gonzalez et al. (2003) found 27 of the 36 records (75%) of ocelots in Sonora were associated with tropical or subtropical habitat, namely subtropical thornscrub, tropical deciduous forest, and tropical thornscrub. Only males (11.1% of the total records) were recorded in temperate oak and pine-oak woodland. In south Texas, the species occurs predominantly in dense thornscrub communities (Navarro-Lopez 1985, Tewes 1986, Laack 1991; all in USFWS 2010). Much of the Lower Rio Grande Valley has been altered for agricultural and urban development (Jahrsdoerfer and Leslie 1988), with <1% of south Texas supporting extremely dense thornscrub that is used by ocelots (Tewes and Everett (1986). (USFWS 2010). Ocelots used primarily forest or woody communities in Tamaulipas, Mexico (Caso 1994, in USFWS 2010).

Ocelots in south Texas prefer shrub communities with canopy covers >95%, and avoided areas of 50-75% canopy cover. (Horne 1998, *in* USFWS 2010). Important microhabitat features chosen include canopy height (>2.4 m) and vertical cover (89% visual obscurity at 1-2 m). Ground cover used, was characterized by a high percentage of course woody debris (50%) and very little herbaceous ground cover (3%) (Horne 1998, in USFWS 2010).

ELEVATION: Generally found at elevations below 4,000 ft (1,200 m).

PLANT COMMUNITY: In Texas, ocelots occur in the dense thorny chaparral of the Rio Grande valley, with dominant species consisting of mesquite (*Prosopis glandulosa*), *Acacia* spp., *Condalia* spp., granjeno (*Celtis pallida*), cenizo (*Leucophyllum texanum*), and white brush (*Aloysia texana*) (Tewes and Schmidly, 1987).

POPULATION TRENDS: Unknown. According to the 2010 Draft Recovery Plan (U.S. Fish and Wildlife Service), the Texas population currently has fewer than 50 ocelots, found in 2 separated populations in southern Texas, at the northern limit of the species' distribution. As of February 2010, there were fewer than 25 total known individuals in the 2 populations in south Texas, with the possibility that more individuals inhabit surrounding ranches. "A third and much larger population of the Texas/Tamaulipas ocelot (*L. p. albescens*) occurs in Tamaulipas, Mexico, but is geographically isolated from ocelots in Texas. In November 2009, an ocelot (*L. p. sonoriensis*) was documented in Arizona (in Cochise County) with the use of camera traps (Sky Island Alliance 2010, unpubl. data)." In April 2010, a young male ocelot was found dead on the road near Globe, Arizona. Genetic analysis determined that the specimen was not of captive origin. (Arizona Game and Fish Department 2010, unpubl. data). The last known ocelot in Arizona, prior to these findings, was lawfully shot on Pat Scott Peak in the Huachuca Mountains in 1964 (Hoffmeister 1986, Lopez Gonzalez et al. 2003). In addition to these sightings, a number if ocelots have been documented just south of the U.S. border in Sonora, Mexico. (U.S. Fish and Wildlife Service, 2010).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: LE (USDI, FWS 1982)

STATE STATUS: 1A (AGFD SWAP 2012)
[WSC, AGFD, WSCA in prep]
[State Endangered AGFD, TNW 1988]

OTHER STATUS: P, Determined Endangered in Mexico (NORMA Oficial Mexicana NOM-059-SEMARNAT-2010)
[Endangered in Mexico (LEGEPA 1994)]

MANAGEMENT FACTORS: Management units have been set for two cross-border areas, the Texas/Tamaulipas Management Unit (TTMU) and the Arizona/Sonora Management Unit (ASMU). Establishing management units is a useful tool for species occurring across wide ranges with multiple populations, varying ecological pressures, or different threats in different parts of their range. In using this approach, the U.S. Fish and Wildlife Service were able to set recovery goals for each unit, and will be able to measure their contribution toward recovery. (U.S. Fish and Wildlife, 2010).

According to USFWS (2010), "Habitat conversion, fragmentation, and loss comprise the primary threats to the ocelot today. Human population growth and development continue throughout the ocelot's range. In Texas, more than 95% of the dense thornscrub habitat in the Lower Rio Grande Valley has been converted to agriculture, rangelands, or urban land uses. ...Connectivity among ocelot populations or colonization of new habitats is inhibited by road mortality among dispersing ocelots. Issues associated with border barrier development and patrolling the boundary between the United States and Mexico further exacerbate the isolation of Texas and Arizona ocelots from those in Mexico….Commercial exploitation and illegal hunting were significant threats to the species when the ocelot was originally listed…the harvest and export of ocelots has significantly declined and is controlled by the Convention on International Trade of Endangered Species (CITES)."

PROTECTIVE MEASURES TAKEN: Listed as Endangered throughout its range in the western hemisphere. Adoption of illegal hunting laws throughout majority of range. Creation of Recovery plan for U.S. populations in 1990, and initiation of the revision of 1990 Recovery Plan in 2010 (USFWS Draft).

Additional protective measures taken include the expansion of two National Wildlife Refuges in south Texas, and their ongoing restoration efforts to restore agricultural lands to native thornscrub. The acquisition of thousands of acres of land by the Nature Conservancy (TNC) to help protect ocelot habitat, and create corridors between existing habitats. The purchase in 2003 of a 4,047 ha ranch in northern Sonora, Mexico by the Mexican non-profit group, Naturalia, to help protect the jaguars and its habitat. Ocelots also occur there and will benefit from this protection. In 2008 Naturalia purchased an additional 14,164 ha making an 18,211 ha preserve called the Northern Jaguar Reserve. In northern Sonora, the Rancho El Aribabi where ocelot has been observed, is seeking to be recognized as a national reserve. In 2006, the USFWS approved a Safe Harbor Agreement (SHA) to encourage restoration of private lands to provide suitable habitat for the ocelot and to provide connectivity between areas currently occupied by ocelot. In 2005, a new USDA-Natural Resources Conservation

Services standard was written which describes how to establish thornscrub on cropland for the benefit of the ocelot. This program provides a financial incentive for landowners to restore ocelot habitat on their property. (USFWS, 2010).

RECOVERY STRATEGY The strategy as outlined in the USFWS 2010 draft Recovery Plan, "involves: the assessment, protection, reconnection, and restoration of sufficient habitat to support viable populations of the ocelot in the borderlands of the U.S. and Mexico; the reduction of effects of human population growth and development to ocelot survival and mortality; the maintenance or improvement of genetic fitness, demographic conditions, and health of the ocelot; the assurance of long-term viability of ocelot conservation through partnerships, the development and application of incentives for landowners, application of existing regulations, and public education and outreach; the use of adaptive management, in which recovery is monitored and recovery tasks are revised by the USFWS in coordination with the Ocelot Recovery Implementation Team as new information becomes available; and the support of international effort to ascertain the status and conserve the ocelot south of Tamaulipas and Sonora."

SUGGESTED PROJECTS: Little is known about the ocelot population in the ASMU. Field studies are needed to estimate the current population, examine population density, demographics, habitat use, food habits, and spatial ecology. Challenges (threats) to the oceolot concerning border issues such as fencing, lighting, U.S. Border Patrol and illegal immigrant activities including vehicle and pedestrian traffic, and habitat alteration to facilitate law enforcement and reduce illegal immigration into the U.S. are increasing. These challenges can be addressed through interagency cooperation and research. Recovery planning for the ASMU should focus on basic research that details habitat suitability, distribution, and threats. (USFWS, 2010). Authors of the USFWS 2010 draft Ocelot Recovery Plan recognize that many of the issues facing current ocelot populations in Texas will pertain to ocelots that may be in Arizona, or in populations that occur in Sonora. They also recognize that dramatic climatic and landscape differences will dictate original research and conservation planning for the ASMU.

LAND MANAGEMENT/OWNERSHIP: USFS, BLM, TNC, Private.

SOURCES OF FURTHER INFORMATION

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

Felis = cat, from Latin; *pardalis* = leopard-like, from Greek. Common name derived from Indian word for jaguar. Tigrillo is Spanish for small tiger.

Revised: 1999-07-01 (SMS)
2000-07-18 (SMS)
2004-01-24 (AMS)
2010-02-17 (SMS)

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Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AMACC08014
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Corynorhinus townsendii pallescens*
COMMON NAME: Pale Townsend's Big-eared Bat; Lump-nosed Bat; Western Big-eared Bat; Long-eared Bat; Pale Lump-nosed Bat, Western Long-eared Bat; Western Lump-nosed Bat, Mule-eared Bat
SYNONYMS: *Plecotus townsendii pallescens; Corynorhinus rafinesquii pallescens; Corynorhinus macrotis pallescens*
FAMILY: Vespertilionidae

AUTHOR, PLACE OF PUBLICATION: *Corynorhinus townsendii pallescens* Frost, American Museum Novitates 3034:1-16, 1992. *Plecotus townsendii pallescens* Handley, Proc. U.S. Nat. Mus., 110:190, 1959. *Corynorhinus macrotis pallescens* Miller, N. Amer. Fauna, 13:52, October 16, 1897.

TYPE LOCALITY: *Corynorhinus macrotis pallescens,* Keam Canyon, Navajo County, Arizona.

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: One of two species in the genus *Corynorhinus* that occurs in North America, and the only one that occurs in Arizona. All Arizona populations are considered from the subspecies *C. t. pallescens*, 1 of 5 subspecies in the species *townsendii*. According to NatureServe (2001), "Formerly known as *Corynorhinus rafinesquii*. Returned to the Genus *Plecotus* by Handley (1959). Frost and Timm (1992) evaluated morphological and karyological characters from a phylogenetic perspective; they re-elevated the subgenus *Corynorhinus* to full genus status—the North American species *Plecotus mexicanus, Plecotus rafinesquii* and *Plecotus townsendii* were once again placed in the genus *Corynorhinus*, leaving the Old World species *Plecotus auritus*, *Plecotus austriacus* and *Plecotus teneriffae* as the only members of the genus *Plecotus*. A morphological phylogenetic analysis by Tumlison and Douglas (1992) also concluded that the North American species should be placed in the genus *Corynorhinus*. Bogdanowicz et al. (1998) examined the morphological and chromosomal variation and found that *Corynorhinus* is strongly supported as a distinct genus, with *Plecotus* limited to Palearctic species; also, they concluded that *Idionycteris phyllotis* and *Euderma maculatum* should be regarded as generically distinct."

DESCRIPTION: Medium-sized bat, wingspan 30-34 cm (12-13 in), forearm 3.9-4.7 cm (1.56-1.88 in.), weight 8-14 g (0.3-0.5 oz). Dorsal hairs are slate or gray with pale cinnamon brown to blackish brown tips that contrast little with the base. The ventral hairs are slate, gray or brownish with brownish or buff tips. Large hairless ears, 3.0-3.9 cm (1.2-1.56 in.) in

length, are joined across the forehead. They have a large glandular lump on each side of the nose. The hairs on their toes do not project beyond the toenails.

AIDS TO IDENTIFICATION: *Corynorhinus townsendii* is distinguished from all but 4 species of Arizona bats by its large ears. Presence of a pair of glandular lumps on the nose distinguishes *C. townsendii* from the other 4 big-eared species: *Macrotus californicus* (California leaf-nosed bat)*, Euderma maculatum* (Spotted bat)*, Idionycteris phyllotis* (Allen's lappet-browed bat) and *Antrozous pallidus* (Pallid bat). *C. townsendii* distinguished by its unicuspid first upper incisor from *P. mexicanus*; a Mexican species with a bicuspid first upper incisor whose range in northeastern Sonora extends to within a few miles of Arizona's southeastern border.

Additionally when compared with *P. mexicanus, C. townsendii* is distinguished by its dorsal hairs having bases much lighter than tips rather than bases and tips being almost the same color; crossribs in tail membrane usually >9.0 mm (0.36 in.) rather than fewer; tragus usually >13.0 mm (0.52 in.) rather than less.

At day roosts this species may be suspected when guano is found in circular patches in open areas. *Macrotus californicus* may be suspected if the guano is found at the edges of open areas (i.e. near the base of the sides or walls of a mine or other roost).

ILLUSTRATIONS:
Color photo (Barbour and Davis 1969: plate XVIII)
Black and white photo (Barbour and Davis 1969:164, 176)
Color photo (Whitaker 1980: plate 145)
Color photo of species (Harvey, Altenbach, and Best, 1999: p. 55)
Color photo of species (Wilson 1999)

TOTAL RANGE: Central highlands of northern Mexico and southern California to the Edwards Plateau of Texas, with isolated populations in the Black Hills of South Dakota and the Gypsum Hills of south-central Kansas, western Oklahoma and northwestern Texas.

RANGE WITHIN ARIZONA: Widespread in Arizona. Their range includes Cochise, Coconino, Gila, Graham, La Paz, Maricopa, Mohave, Navajo, Pima, Pinal, Santa Cruz, Yavapai, and Yuma counties (AGFD, unpublished records accessed 2003).

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: These bats prefer to hang from open ceilings at roost sites and do not use cracks or crevices. At maternity roost's these bats apparently prefer dim light near the edge of the lighted zone. In Arizona, emergence times and especially return times and patterns probably vary as they do elsewhere depending on insect activity and development stage of young.

Winter roosts generally contain fewer individuals (usually singles or small groups and in Arizona occasionally as many as 50) than summer roosts. For hibernation, they prefer roost sites where the temperature is 12° C (54° F) or less. These may be near entrances and in well-ventilated areas of the roost. The bats may arouse and move to other spots in the roost during the winter, to be in areas of more stable cold temperatures. The ears are erectile, and can be collapsed and rolled up while at rest and expanded to usual size when alert.

REPRODUCTION: Males and females congregate separately in summer. Although males are thought to be mostly solitary, the females form maternity colonies of 12 to about 200 in the western U.S. and up to 1000 or more in the eastern U.S. In Arizona, 5 and possibly 2 additional maternity colonies have been found with numbers in one of about 100 and in another of several 100s. The most populous colony disappeared in the 1970s shortly after the roost site was gated to protect archeological and paleontological remains. After the gate was modified in the mid 1980s several bat species (but not *C. townsendii*) were observed flying inside the site. Current status of these sites is unknown.

In Arizona, females are pregnant in April, with maternity colonies reported in late April. Indirect evidence (near term embryos and presence of newborns) indicates the single young are born in June in Arizona. Dates of birth vary considerably throughout their range, anywhere from late April to mid July. In Arizona, most young are flying by the end of July; they can fly at 2.5-3 weeks of age. Elsewhere young are weaned at about 6 to 8 weeks. Nursery colonies begin to disperse during August. Following mating in fall and winter (sometimes it takes place while the female is torpid) sperm is stored in the female's reproductive tract until spring. Fertilization occurs when ovulation takes place.

Males in their first autumn produce few sperm and are thought to be essentially sterile and probably nonbreeding. Females in their first autumn however, do breed and then bear young the following summer. Gestation varies from 56 to 100 days after fertilization depending on climatic conditions and the resultant metabolic rates of the females (i.e. development is slowed when the female goes into daily torpor). Band recoveries in California suggest a maximum longevity of 16+ years.

FOOD HABITS: Small moths, 3-10 mm (average 6 mm), are the primary food of these bats. Neuropterans, coleopterans, dipterans and hymenopterans are also sometimes taken. They are reported to take prey from leaves and while in flight along forested edges. Following a late night peak of activity they usually go to a night roost. They may forage again in the early morning since they are reported not to return to their daytime roosts until shortly before sunrise. They may forage several miles (4-5 miles) from the roost site. They cull the wings of moths and other insects before consuming their abdomen.

HABITAT: In Arizona, summer day roosts are found in caves and mines from desertscrub up to woodlands and coniferous forests. Night roosts may often be in abandoned buildings. In winter, they hibernate in cold caves, lava tubes and mines mostly in uplands and mountains from the vicinity of the Grand Canyon to the southeastern part of the state.

ELEVATION: *Corynorhinus townsendii* have been observed between 550 and 7,520 feet (168 - 2294 m). Most records, however, seem to range above 3,000 feet (915 m). According to AGFD HDMS unpublished records (accessed 2003) *Corynorhinus townsendii pallescens* range between 550 - 8,437 ft (168-5272 m) in Arizona.

PLANT COMMUNITY: Desertscrub, oak woodland, oak/pine, pinyon/juniper, and coniferous forests.

POPULATION TRENDS: Thought to be declining due to loss of historic habitat of caves and mines.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: SC (USDI, FWS 1996)
[C2 USDI, FWS 1994]

STATE STATUS: 1B (AGFD SWAP 2012)

OTHER STATUS: Bureau of Land Management Sensitive – full sp. (USDI, BLM AZ 2010)
[Bureau of Land Management Sensitive (USDI, BLM 2008)]
Forest Service Sensitive (USDA, FS Region 3 2007, 2013)
Group 4, species level (NNDFW, NESL 2000, 2005, 2008)

MANAGEMENT FACTORS: The greatest threats are human disturbance and vandalism at maternity and hibernating sites, and loss of roosting (mine closures) and foraging habitats (deforestation).

PROTECTIVE MEASURES TAKEN: *Corynorhinus townsendii pallescens* is listed as a vulnerable species in the Sonoran Desert Conservation Plan (draft).

SUGGESTED PROJECTS: Surveys are needed to locate, census and monitor maternity colonies. More information is needed on summer and winter roost sits and foraging areas.

LAND MANAGEMENT/OWNERSHIP: BIA - Fort Apache, Hualapai, and San Carlos Reservations, and Tohono O'odham Nation; BLM - Arizona Strip, Havasu, Kingman, and Tucson Field Offices; DOD - Fort Huachuca Military Reservation; FWS - Havasu and Kofa National Wildlife Refuges; NPS - Grand Canyon and Saguaro National Parks, and Chiricahua, Montezuma Castle, and Organ Pipe Cactus National Monuments; USFS - Coconino, Coronado, Kaibab, Prescott and Tonto National Forests; State Land Department; Hualapai Mountain County Park; AMNH Southwestern Research Station; Colossal Cave; Tucson Mountain Park; Private.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

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ADDITIONAL INFORMATION:

These bats are versatile in flight, darting swiftly from place to place, or flying slowly and deliberately, or hovering. Their maneuverability can make it difficult to capture them with hand or mist nets or even to corner them in an enclosed mine tunnel or building.

Revised: 1991-08-17 (RBS)
1992-05-03 (BKP)
1992-10-06 (RBS)
1994-03-25 (DCN)
1998-01-26 (SMS)
2003-04-13 (AMS)

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AMALD01012
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Antilocapra americana sonoriensis*
COMMON NAME: Sonoran Pronghorn Antelope
SYNONYMS:
FAMILY: Antilocapridae

AUTHOR, PLACE OF PUBLICATION: E.A. Goldman. 1945. Proc. Bio. Soc. of Wash., 58:3-4.

TYPE LOCALITY: A ranch on north side of Rio de Sonora, 40 miles north of Costa Rica, southwest of Hermosillo, Sonora, Mexico, by Vernon Bailey and Frederic Winthrop on December 11, 1932.

TYPE SPECIMEN: USNM 256938 (original number 11291), Holotype.

TAXONOMIC UNIQUENESS: *Antilocapra americana* is the only genus and species of the family Antilocapridae. *Antilocapra* signifies that pronghorn share some characteristics of true antelopes (*antilo*) and goats (*capra*), although they are placed in a separate family; *americana* indicates this is a North American animal. *Antilocapra americana sonoriensis* is one of five subspecies of *A. americana*, and one of three that occur in Arizona, including *A.a. americana* and *A.a. mexicana*.

DESCRIPTION: For the species: a proportionately long-legged, small-bodied artiodactyl with conspicuous pronged sheath although the horn-core is unbranched. Horny sheath is shed annually. Conspicuous white areas of hair present, especially on the rump, sides of face, two bands on throat, underparts, and part way up sides; otherwise color of animal is yellowish tan except for blackish on top of nose. The skull, which has 32 teeth, has lacrimal and nasal bones separated by vacuity. Males are distinguished from females by a distinct black cheek patch, deep brownish-black color on top of nose, and by their much larger horns, the tips of which curve inward as they mature and have a forward projecting prong. Males average larger than females in size of the skull, although there is overlap between individuals (Hoffmeister 1986). Average height is 3 ft. (91 cm); weight 75-130 lb. (33.7 - 58.5 kg); record spread of horns is 22 5/16 in. (57 cm). Each foot (hoof) has two toes, and lack the declaws common to most ruminants. There are 4 mammae.

For the subspecies: This animal has been described as being the smallest of the 5 subspecies. It has a generally paler coloration, and distinctive cranial features that include a skull decidedly smaller, frontal depression shallower, molar teeth shorter and narrower, rostrum more slender,

premaxilla less extended posteriorly along the median line, and auditory bullae more flattened and less projecting below level of basioccipital. Some females lack horns.

AIDS TO IDENTIFICATION: The skull of *A. a. americana* is broad across the orbits, zygomata, and palate. The skulls of *A. a. mexicana* and *A. a. sonoriensis* are narrower. *A. a. sonoriensis* is smaller in zygomatic width, than *A. a. americana* and *A. a. mexicana*. See description of subspecies for other differences.

Four specimens collected in 1969 from northwest Sonora, Mexico, and deposited in the USNM #347452-347455, had marked similarities to the holotype, but differed from the other four subspecies (Paradiso and Nowak 1971 in USFWS 1982).

In comparison with similar species: Bighorn Sheep has massive coiled horns, and no white bands across the throat; Mule Deer has black on tail, and no white along sides; Whitetail Deer does not have a white rump patch, and no white along sides.

ILLUSTRATIONS:
Colored drawing of species (Burt and Grossenheider, 1976: plate 23)
B&W photos (AGFD 1981 Fig. 3-4, 10-14)
Colored photos (AGFD 1996 pp. 2-3, 5)

TOTAL RANGE: Historic: The historic range is difficult to determine since the subspecies was not described until 1945, many years after the population had declined and marginal populations were extirpated (AGFD 1981). Herds that were observed along the lower Gila River, Arizona, by early travelers are presumed to have been Sonoran pronghorn. They are thought to have ranged from Hermosillo to Kino Bay, Mexico to the south; Highway 15, Mexico to the east; Altar Valley and the Tohono O'odham Indian Reservation to the North; and Imperial Valley, California to the west (AGFD 1986).

Present: in Arizona, they are found on the Cabeza Prieta National Wildlife Refuge, the Organ Pipe Cactus National Monument, the Luke Air Force Barry M. Goldwater Gunnery Range, and possibly the Tohono O'odham Indian Reservation. In Mexico, they are believed to be confined to the northwest part of Sonora.

RANGE WITHIN ARIZONA: See "**Total Range**."

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Pronghorn antelope are the fastest land animal in North America, with speeds recorded up to 60 miles per hour. They have keen eyesight, with large eyes that are a dominant feature of the face. The eyes are set high and on the sides of the head to give a field of view of almost 300 degrees. They use their speed and eyesight as their main defense against predation, and thus are more suited for flat to rolling topography.

Based on a study conducted in 1984 (AGFD 1986) using collared Sonoran pronghorn, 4 males had home ranges ranging from 64.5 km² - 1213.6 km² (avg. 799.7 km²), while 6 females had home ranges ranging from 40.7 km² - 1143.7 km² (avg 465.7 km²). The large variation in home range size for this study appears to be tied to forage and possibe water availability. Hervert (1996) states that they are exhibiting a "nomadic behavior that is typical of other desert dwelling animals like the oryx of the Serengeti Desert or the Dorcas gazelle of the Saharai Desert. These animals must use large tracts of land to obtain adequate forage. These desert ungulates at times appear to be wandering randomly, but this movement is associated with living in desert conditions, where resources may be widely scattered or ephemeral."

Sonoran pronghorn exhibit the same social doe/fawn, territorial, and flight behaviors as noted for the other 4 subspecies. A heightened response to human traffic has been noted. Once aware of an observer, Sonoran pronghorn are quick to leave the area (AGFD 1986). As with the northern subspecies, hair on the large white rump patch erects and makes the animal more conspicuous, thus signaling other animals in the herd of potential danger (a type of alarm call) of predators.

Mortality in the Arizona Sonoran pronghorn population has been documented to include coyotes and bobcats. Other predators possibly in the area include mountain lions and golden eagles. The most common cause of fawn deaths has not been able to be determined, but appears to be the result of environmental conditions such as hot, dry weather and poor forage conditions rather than coyote predation (AGFD 1986).

Pronghorn have difficulty jumping or going through fences constructed to control livestock. Historically, habitat occupied by pronghorn contained no similar obstacles. Fences can be a significant factor of pronghorn mortality when they restrict the animals' movements to procure food and water, or to escape predation (Yoakum 1978).

REPRODUCTION: Pronghorn are polygamous; does usually breed for the first time at 16-17 months of age. The gestation period averages 252 days, although a 1986 AGFD report states that the gestation period averages 240 days. Northern populations breed from mid-September to early October, while southern populations breed from July to October (July - September for Sonoran pronghorn). Fawning for Sonoran pronghorn takes place from February to May, and as early as January for populations in Mexico. Although the stress of summer rutting on pronghorn is higher, spring drop is desirable to coincide with temperate weather and spring forage. Sonoran pronghorn fawns are nursed for 60 days, unlike northern populations, which nurse up to 90 days.

During the rutting season, large bucks join herds of does and defend their territory. Territory defense has been observed earlier in northern herds (April), and continues until the end of rut. After the rut, they return to their home ranges. Does maintain herd units year-round until the fawning period, when they break away individually to seek out areas of dense ground cover, where fawns will be best protected from predators. After a few weeks, when the fawns are mobile, the does rejoin other does to form nursery herds.

FOOD HABITS: Sonoran pronghorn were observed browsing on forbs, shrubs and cacti. Forbs and cholla were browsed during the summer and fall seasons, while shrubs, cholla and ocotillo were browsed on the remainder of the year (AGFD 1986). Chain-fruit cholla appears to be a key succulent forage item in their diet during the summer, constituting nearly 50% of their diet, apparently to meet their water requirements (Hervert 1996). Diet analysis of Sonoran pronghorn is currently being conducted.

Free-standing water is limited within range of the Sonoran pronghorn in Arizona. Pronghorn in this range have evolved with little or no permanent drinking water; apparently adapting to living with low quantities and infrequent access to free water, relying mostly on preformed and metabolic water (Lee et al. 1998). In 1984, collared Sonoran pronghorn were observed at water troughs in November, January, and August. Tracks were observed leading up to, then away from seasonal potholes during the monsoon season. The collared pronghorn exhibit movements apparently tied to water, as well as forage, availability. The observation of tracks and pronghorn around potholes and water sources, as well as the seasonal proximity of collared pronghorn to maintained water sources, suggests Sonoran pronghorn are opportunistic drinkers (AGFD 1986). During a study conducted in 1995 using collared animals, Sonoran pronghorn were observed using an ephemeral supply of water on a daily basis in a crater on the Barry M. Goldwater Gunnery Range, supporting the opportunistic drinker suggestion (Hervert et al. 1995).

HABITAT: Regional topography typifies that of the Basin and Range physiographic province of the western and southwestern U.S. and northern Mexico (Nations and Stump 1981 in AGFD 1986). The physiography of Sonoran pronghorn habitat is characterized by broad alluvial valleys separated by block-faulted mountains. These valleys are partially filled with clay, silt and alluvium deposited from sheet erosion and ephemeral streams. The valleys are fairly level, with drainage to the north and west through a braided wash system in the center of the valleys. Mountain ranges generally run in a northwest to southeast direction. The range of Sonoran pronghorn in Arizona is approximately 1 million ha in size.

The flat, sandy desert offers little protection from the excessive summer heat and provides little free water under today's conditions. Food plants are common throughout most of the Sonoran pronghorn's habitat, but often these food plants are in a dormant stage and are less desireable than they would be if rain had fallen and triggered fresh new growth. Rainfall is scanty and sporadic. The climate is characterized by winter rains, spring drought, summer rains and fall drought. Almost one-half of the normal yearly precipitation (avg. 12.7 cm), falls from July-September, in the form of intense localized thunderstorms. Winter storms from the Pacific Ocean sweep across southern Arizona via southern California. These storms usually produce the heaviest, most widespread and effective precipitation. Heat and aridity are dominant climatic characteristics. During July-August, daily maximum temperatures exceed 110 F°, with temperatures of 120 F° not uncommon. Winter daytime temperatures range in the mid 60's -70's, while nighttime temperatures remain above freezing (USFWS 1982).

ELEVATION: Mean elevations of the valleys vary from 400 - 1,600 feet (122 - 488 m).

PLANT COMMUNITY: Sonoran pronghorn habitat is within the Lower Sonoran Desert life zone (Shreve and Wiggins 1964). They occur in two divisions in this life zone in Arizona; the first is the Arizona Upland subdivision of the Sonoran Desert, with a paloverde-saguaro association, and the second is the Lower Colorado subdivision of the Sonoran Desert, with primarily a creosote-bursage association.

POPULATION TRENDS: Aerial surveys of the Arizona population in 1992 and 1994, resulted in estimates of 256 and 184 pronghorns, respectively. This is up from the estimates of 80 to 125 pronghorn from the 1984 to 1987 studies conducted by the AGFD's Research Branch. It appears that this increase in numbers may have been due to favorable rainfall patterns over the past 10 years (Hervert 1996). The range-wide survey conducted in December 1992 estimated 30-38 groups of Sonoran pronghorn in Arizona. In addition, the Sonoran pronghorn recruitment equaled 12 fawns per 100 does in 1995 (Hervert et al. 1995). A 1996 survey estimated 130 pronghorn, while a 1998 survey estimated 140 pronghorn. Drought conditions resulted in zero fawn recruitment in 1996 and 1997. Documented mortality of adults also occurred during that same time period. A significant downward trend in the population has been observed since 1994 (USFWS 1998). Based on 2002 surveys, numbers are hanging on at 25 individuals in Arizona. This drastic decline is due in part to the severe drought that has griped the area the last several years. Measures have been undertaken to help those animals remaining by clearing vegetation around water catchments, and by planting and irrigating fields of forage.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: LE (USDI, FWS 1970)

STATE STATUS: 1A (AGFD SWAP 2012)
[WSC, AGFD, WSCA in prep]
[Endangered AGFD, TNW 1988]

OTHER STATUS: P (Mexican Federal Endangered Species List, 1994, 2010)

MANAGEMENT FACTORS: In Arizona, the reason for population decline is attributed mainly to loss of habitat and drought. The drying of major rivers and overgrazing significantly altered Sonoran pronghorn habitat in southwestern Arizona by the 1930's. The population has not recovered since the establishment of three large public land withdrawals, and the removal of cattle from these areas in the early 1980's (AGFD 1986). The only significant loss of habitat in recent years in Arizona occurred on the Tohono O'odham Indian Reservation where severe overgrazing by cattle, coupled with recurrent drought, resulted in the loss of large areas of pronghorn habitat (USFWS 1982).

In Mexico, it is believed that economic exploitation of habitat (grazing and agriculture) and poaching are still causing population and habitat losses (USFWS 1982).

PROTECTIVE MEASURES TAKEN: One protective measure taken was the establishment of three large public land withdrawals in Arizona, which include Cabeza Prieta National Wildlife Refuge, Organ Pipe Cactus National Monument and Luke Air Force Gunnery Range (= Barry M. Goldwater Gunnery Range). The removal of hunting from these sites, and the restriction of vehicle traffic further protects the Sonoran pronghorn. The removal of fencing between the Cabeza Prieta NWR and Organ Pipe Cactus NM, and within the Cabeza Prieta NWR in the 1990's has allowed for easier natural movement of Sonoran pronghorn.

An initial recovery plan was prepared in 1982, and a final plan was completed in 1998.

Forage enhancement projects have been implemented as a way to enhance the survival of fawns during periods of below average rainfall, by providing high quality forage for lactating does and weaned fawns.

SUGGESTED PROJECTS: Continue collecting information on habitat use and preference, diet, dependence on free-standing water, and design configuration and/or habitat related variables of water developments.

LAND MANAGEMENT/OWNERSHIP: U. S. Fish and Wildlife, U. S. Air Force, National Park Service, Tohono O'odham Nation (Indian Reservation) and Bureau of Land Management.

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ADDITIONAL INFORMATION:

A major problem facing the recovery of the Sonoran pronghorn is that the recovery methods employed in Mexico may have to be quite different than those used in Arizona. The prime objective for recovery is to increase existing population numbers and distribution of Sonoran pronghorn while developing techniques which will result in a U.S. population of 300 animals (average for 5 year period) or numbers determined feasible for the habitat. Another major problem is increasing the population to a point where it is safe to remove animals for transplant into historic habitats. Assessment of historic habitats for suitability for future

transplant of pronghorn is difficult due to unsubstantiated assumptions regarding preferred habitat, reasons for extirpation, etc.

Revised: 1998-04-07 (SMS)
1999-06-28(DJG)
2002-12-23 (SMS)

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Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AMACC07010
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Euderma maculatum*
COMMON NAME: Spotted Bat; Pinto Bat; Death's Head Bat; Jackass Bat
SYNONYMS: *Histiotus maculatus; Euderma maculata*
FAMILY: Vespertilionidae

AUTHOR, PLACE OF PUBLICATION: Allen, J.A. 1891. Bull. Amer. Mus. Nat Hist. 3:195.

TYPE LOCALITY: Near Piru, Ventura Co., California. This is "probably [the] mouth of Castac Creek, Santa Clara Valley, 8 miles east of Piru, Los Angeles County, California" (Miller 1897:49).

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: *Euderma* is a monotypic genus. No subspecies have been described for *E. maculatum*. Chromosomal analysis (including G-banded karyotyping) indicates that this bat is most closely related to *Idionycteris* and less closely related to *Plecotus*. Chromosomes of all 3 plecotine genera show similarities to those of *Myotis* suggesting derivation from a common ancestor

DESCRIPTION: Medium sized bat, with 34 teeth. The average body length is 6.35 cm (2.5 in) and the forearm 4.8.-5.1 cm (1.9-2.0 in.). Upper parts blackish with three large white spots, one on each shoulder and one at base of tail. All hairs are black at base, but those on under parts are white tipped and conceal black bases. Their long ears are pinkish-red, 5.1 cm (2.0 in.) long, and are the largest of any North American bat. Ears are curled at rest but, erect and pointing forward when alert. The circular, bare throat patch is distinctive.

AIDS TO IDENTIFICATION: Black and white color pattern and enormous pink ears are unique and unmistakable. Researchers report that its voice is distinctive and that workers can learn to recognize it in the field. Its voice is described as a series of soft but high-pitched, metallic squeaks. *Idionycteris phyllotis* (Allen's lappet-browed bat) has been reported to have a similar voice, but *E. maculatum* is higher pitched.

ILLUSTRATIONS:
Black and white photo (Barbour and Davis 1969: 160-162)
Color photo (Barbour and Davis 1969: plate XVII)
Color photo (Whitaker 1980: plate 143)
Color photo (Tuttle *in* http://www.enature.com/fieldguide/)
Color photo (*In* http://www.wrc.ce.ttu.edu/henrypage/eu-ma.html)

Color photo (BCI *in* http://www.batcon.org/discover/species/emacula.html)
Color photo (Wilson 1999)

TOTAL RANGE: Locally distributed throughout central western North America from southern British Columbia and Montana, south through California and Big Bend, Texas to Durango and Queretaro, Mexico.

RANGE WITHIN ARIZONA: Specimens from near Yuma, Roll, Maricopa Junction, Tempe and Littlefield. Recorded from the Kaibab Plateau (Berna 1990); also 2 captured at a watershed SE of Seligman (Senn 1993). Appears to be a substantial population in Fort Pierce Wash area on the Utah-Arizona border, with 2 individuals netted nearby in Arizona (Herder and Price 1993, 1994). Two individuals captured at a known roost near Marble Canyon (AGFD 1996). Aural record exists for eastern Arizona.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: This species may be active in winter under some conditions. Netting in southwestern Utah from November to March, (Poche, no date) captured 7 spotted bats on 2 occasions in January and February at ambient temperatures of -5°C to -4°C and relative humidities between 41% and 76%. *Pipistrellus* (*Parastrellus*) *hesperus* (Canyon bat), *Tadarida brasiliensis* (Mexican free-tailed bat), *Myotis californicus* (California Myotis), and *Antrozous pallidus* (Pallid bat) were also taken at this time. In 2000, *E. maculatum* was a common species in the upper Moapa Valley, southern Nevada, from late spring through fall, and absent by the end of November (Williams, 2001). Apparently it is relatively solitary but may hibernate in small clusters (Whitaker 1980). In British Columbia, roosted solitarily during active season; appeared to maintain exclusive foraging areas (Leonard and Fenton 1983), foraging up to 6-10 km from day roost each night (Wai-Ping and Fenton 1989).

Poche (no date) suggested, "Winter activity of bats in this region is a result of the poor quality of hibernacula." By poor quality, he apparently meant low relative humidity in the hibernacula. Because bats usually hibernate in roosts with high levels of relative humidity, low levels would increase the need for drinking to maintain water balance during arousal. Large drops in ambient temperature, especially for bats in shallow or poorly insulated roosts, have shown to result in arousal of some bat species. Although flying insects were observed when bats were active and some bats were seen foraging, other studies have suggested that foraging and feeding is of minor importance for some species of winter active bats.

Monitoring echolocation calls in British Colombia indicated that during summer activity, temperature, cloud cover, wind, precipitation or phase of lunar cycle does not affect patterns (Leonard and Fenton 1983). Apparently this bat is a rapid flyer. Many of them are injured in the mist nets, indicating a high rate of speed at the collision (Snow 1974).

The spotted bat makes a wide variety of sounds in communicating and foraging. The voice has been described as sounding like a soft, extremely high-pitched metallic squeak; a hissing

noise and a ratlike squeak; and a typical bat chirp. This bat has also been heard clicking the teeth together and making grinding noises by gnashing the teeth. Before taking flight, the spotted bat makes clicking or ticking notes (Snow 1974).

The low frequency of the echolocation call is useful in both hunting and communications. Due to reduced attenuation and good propagation qualities, the call is good for long-range detection of prey and an increased range of audibility by other bats. The bat is also able to approach the moth more closely and enhance the chance of a successful pursuit due to the moth not being able to detect the low intensity of sound (van Zyll de Jong 1985). Similar calls are made by *Idionycteris phyllotis*, *Nyctinomops macrotis* (big free-tailed bat), and *Eumops perotis* (western mastiff bat) (Snow 1974).

REPRODUCTION: Reproduction is relatively unknown. Limited observations indicate one young per female per year. Young apparently born from late May to early July elsewhere (i.e., no records exist from Arizona). Lactating females have been captured in June, July and August. The young can weigh 20% of their mothers' nonpregnant weight. They are altricial and do not show the color pattern characteristic of adults. Their ears are large and floppy and not fully developed. One study showed that four hours after birth, a male appeared to nurse almost constantly for the first 48 hours. The mother exhibited great parental care to the young. She was gentle and attentive, licking the young's face, ears, wings, and back. The young stayed with her, attached to a teat, even when the female flew. She did not seem to be hindered by the additional weight. The female shielded the young with her wings when they were hanging upside down. No more is known about the young because the one born in captivity died at four and a half days when it became chilled after crawling through some drinking water (Snow *in* NatureServe, 2001).

FOOD HABITS: Limited evidence suggests that moths (5.0-11.0 mm (0.2-0.44 in.) in size) are dominant food item. These are taken by bats hunting alone, using echolocation calls of moderate intensity in the range of 8,000 to 15,000 cycles per second. Sounds in this frequency range are audible to humans, but are of too low a frequency for detection by tympanate moths. These moths have evolved thoracic "ears" which enable them to detect the higher frequency echolocation calls emitted by other insectivorous bats, and subsequently evade them. Other occasional prey items include June beetles and sometimes grasshoppers taken while on the ground.

Observations of four individuals in British Colombia indicate that they fly from 0-10 km from their roost to a foraging area (Wai-Ping and Fenton 1989). While in the foraging area they fly singly, and continuously in large ellipses 200-300 m long, 5-15 m above the ground. Foraging activity was not affected by moonlight. After leaving their roosts from 4 to 21 minutes after sunset, averaging 13 minutes, they spent from 4 to 7½ hours, averaging about 5½ hours, away from their roosts. Time of sunset had the greatest influence on exit times while ambient temperature had almost none. Foraging areas were found to overlap extensively.

In southwestern Utah, a single spotted bat was observed by Poche and Bailie (1974) for 4 minutes after release (about an hour before dark), as it fed within 2 meters of the ground, and twice hovered for a split-second and then dropped to the ground. The first time it seized and ate a grasshopper and flew within 10 seconds. It then proceeded to a crevice in a cliff. Monitoring of echolocation calls indicate this bat forages throughout the night in British Colombia and Colorado even though capture records from earlier years indicate late-night activity. It has also been observed in these areas foraging at about 10 m above the ground. In Colorado, it was heard foraging over pinyon-juniper, riparian vegetation, sand-and-gravel bars, over a river in a deep, steep-walled canyon, and campgrounds. In British Colombia, they were documented foraging over marsh areas. According to NatureServe (2001), the spotted bat hunts alone, and at least sometimes appears to maintain an exclusive foraging area (Leonard and Fenton1983). Neighboring bats show evidence of mutual avoidance, and have been observed to turn away when encountering one another near the boundaries of their hunting areas. This mutual avoidance, is interpreted as a mechanism to avoid competition. When the neighbor is absent, an individual may show no hesitation in flying into an area avoided earlier. It is believed that a combination of the bat's echolocation call and conspicuous color pattern are used to maintain the spacing between bats (van Zyll de Jong 1985).

HABITAT: Varied. In Arizona, most are captured in dry, rough desertscrub with a few captured or heard in ponderosa pine forest. This bat has been found from low desert in southwestern Arizona to high desert and riparian habitats in northwestern Arizona and Utah, and conifer forests in northern Arizona and other western states. One specimen in New Mexico was found in spruce-fir habitat. Considered by some biologists to be an elevational migrant. Roost site characteristics and site localities are poorly known, but limited observations suggest that they prefer to roost singly in crevices and cracks in cliff faces. Cliffs and water sources are characteristic of localities where it occurs. Observations from British Colombia suggest that *Euderma* may change roost sites after July. Williams (2001), collected 616 minutes of *E. maculatum* activity during a yearlong intensive acoustic based habitat preference study in the upper Moapa Valley, southern Nevada. In the study region, *E. maculatum* is primarily found over mesquite bosque habitat (62%, n= 381), secondarily over riparian marsh habitat (28%, n = 172), infrequently over riparian shrubland habitat (10%, N = 61), and avoids palm grove habitat (0.3%, n = 2). The only specimen captured was via mist net and was approximately 15 cm above riparian marsh habitat.

ELEVATION: Specimen localities in Arizona range from elevations of 110 to 8,670 feet (34 - 2,644 m). Over its entire range, it has been found at localities ranging from 180 feet below sea level in California to 10,600 feet above sea level in New Mexico.

PLANT COMMUNITY: Specimens known from a wide range of biotic communities, from desertscrub of all four North American deserts (Sonoran, Chihuahuan, Mohavean, and Great Basin) through riparian and pinyon-juniper to montane coniferous forests of Rocky Mountains, Sierra Nevada and scattered ranges in between.

POPULATION TRENDS: Not encountered by biologists until 1891 and then only as dead specimens. No specimens taken alive until the early 1960s after mist nets began to be used for netting bats. Initially thought to be extremely rare and in very low numbers. Increasing numbers of field workers focusing on the species and slowly improving understanding of habitat and roost occurrences, seem to have increased reports and captures. It is now known to occupy a wider total range than initially thought, and does not appear to be quite as rare as initially thought. Population abundance and densities are poorly known.

As of the late 1980s there seem to be five areas where *Euderma* has been taken in some numbers or fairly regularly. The localities are Fort Pierce Wash area of southwestern Utah and northwestern Arizona; Big Bend, Texas; New Mexico; Dinosaur National Monument, Colorado; and Okanagan Valley, British Colombia.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS:
SC (USDI, FWS 1996)
[C2 USDI, FWS 1985]

STATE STATUS:
1B (AGFD SWAP 2012)
[WSC, AGFD, WSCA in prep]
[State Candidate AGFD, TNW 1988]

OTHER STATUS:
Bureau of Land Management Sensitive (USDI, BLM AZ 2008, 2010)
[None (USDI, BLM AZ 2005)]
[Bureau of Land Management Sensitive (USDI, BLM AZ 2000)]
Forest Service Sensitive (USDA, FS Region 3 2007, 2013)
[None (USDA, FS Region 3, 1999)]
[Forest Service Sensitive USDA, FS Region 3, 1988]
None (NESL, NFWD 1997)
[Group 4 NESL, NFWD 1994]
Determined Subject to Special Protection (Secretaria de Medio Ambiente 2000, 2010)
[Listed Rare, Secretaria de Desarrollo Social 1994]

MANAGEMENT FACTORS: Limited numbers. Poorly known natural history requirements. According to NatureServe (2001), they are moderately threatened range-wide; habitat or community lends itself to alternate use. Because of the lack of sufficient information, only speculations can be made about threats. Fenton *in* NatureServe (2001) stated that the two highest threats to spotted bats appeared to be collection of specimens by

humans, and the use of pesticides that the bats may accumulate through their diet and that kill their prey.

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: Determine summer and winter distribution, roost characteristics, and foraging areas. According to NatureServe (2001) the following is recommended: determine the presence of the spotted bat by surveying likely habitat, establish and maintain waterholes in likely spotted bat habitat (it is well known that the bat will fly for several miles to find water, and a water hole will benefit many species), support and cooperate in studies to determine more about the impacts by humans.

LAND MANAGEMENT/OWNERSHIP: BIA - Hualapai Reservation and Navajo Nation; BLM - Arizona Strip Field Office; NPS - Glen Canyon National Recreation Area and Grand Canyon National Park; USFS - Apache-Sitgreaves and Kaibab National Forests; Private.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

M.B. Fenton - Carleton University, Ottawa, Canada.
G.A. Ruffner - Phoenix.
M. Herder - Bureau of Land Management

ADDITIONAL INFORMATION:

From the Greek *eu* meaning good or nice and *derm* meaning skin (refers to the unique color pattern) and the Latin *macula* meaning spotted.

Revised: 1991-08-08 (RBS)
1992-05-03 (BKP)
1992-09-30 (RBS)
1994-01-18 (SMS)
1994-03-25 (DCN)
1998-01-23 (SMS)
2002-11-20 (AMS)
2003-01-19 (AMS)

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AMACC05060
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Lasiurus blossevillii* (Lesson and Garnot)
COMMON NAME: Western Red Bat (in North America) otherwise Red Bat; Desert Red Bat
SYNONYMS: *Atalapha borealis* Allen; *Lasiurus borealis* Elliot; *L. bonariensis* Lesson, 1926; *L. enslenii* Lima, 1926; *L. brachyotis* J. A. Allen, 1882; *L. frantzii* Peters, 1871; *L. tetiotis* H. Allen, 1891; *L. ornatus* Hall, 1951.
FAMILY: Vespertilionidae

AUTHOR, PLACE OF PUBLICATION: (Lesson and Garnot, 1826). Ferussac's Bull. Sci. Nat. Geol., 8:95.

TYPE LOCALITY: Uruguay, Montevideo.

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: New World *Lasiurus* placed in the genus *Nycteris* by Hall (1981), who based the change on nomenclatural (rather than biological) concerns; few if any other authors have followed this change.

As reported by Wilson and Reeder (2005), "Subgenus *lasiurus*, *borealis* species group. Included in *borealis*by Koopman (1993, 1994) but see Schmidly and Hendricks (9184), Baker etal. (1988a), and Morales and Bickham (1995). Does not include *degelidus* (Baker et al., 1988a) but might include *minor*. Does not include *pfeifferi*; see Morales and Bickham (1995). Includes *brachyotis*; see Niethammer (1964) and McCracken et al. (1997). Does not include *varius*; see Barquez (1987), Barquez et al. (1993), and Mares et al. (1995). Does not include *salinae*, see Mares et al. (1995) and Tiranti and Torres (1998), but also see Barquez and Diaz (2001)."

DESCRIPTION: A medium-sized bat, forearm 3.8-4.3 cm (1.5-1.7 in), weight 7-15 g (0.25-0.5 oz); wings long, narrow and pointed, wingspan 29.0-33.2 cm (11.4-13.0 in). Ears short and rounded, 1.1-1.3 cm (0.43-0.51 in) in length; interfemoral membrane (uropatagium) completely furred on the dorsal surface. Pelage color ranges from bright orange to yellow-brown with white-tipped hairs, and whitish patches near the shoulder; wing membranes black. Males are usually more brightly colored than females. Distinct white bib under neck is in spectacular contrast to jet-black wing membrane.

AIDS TO IDENTIFICATION: Lasiurine bats distinguished from other bats in Arizona (except *Lasionycteris noctivagans*, the Silver-haired bat), by their short round ears and their

long tail membrane with at least the anterior portion well furred. *L. blossevillii* distinguished from *Lasionycteris* by hair color, which in *Lasionycteris* is black with silver tips. The hair of *Lasiurus* is never black, although some hairs may be silver-tipped. Compared to *L. blossevillii*, *L. cinereus* (Hoary bat) is larger (forearm 5.0-5.4 cm [2.0-2.13 in]), has an edging of black fur around the ears, and is grayish in color. *L. xanthinus* (Western Yellow bat) is larger (forearm 4.5-5.0 cm [1.8-2.0]), yellowish in color, and only the anterior half of the uropatagium is furred.

ILLUSTRATIONS:
Black and white photo (Barbour and Davis 1969: 131, 134, 135)
Color photo (Barbour and Davis 1969: plate XIV)
Black and white photo (Hoffmeister 1986: 100)
Color photo (Whitaker 1980: plate 157)
Color photo (Harvey 1999)

TOTAL RANGE: Their distribution includes Bolivia, N Argentia, Uruguay, and Brazil to W North America (but not North America). Also found in Trinidad and Tobago, and the Galapagos of Ecuador.

Per Williams (2001), in the Moapa Valley of southern Nevada, routine monthly sampling since May 1999 has produced six captures, all from July to September. Intensive acoustic sampling in the region identifies slightly longer seasonal presence, but in low abundance.

RANGE WITHIN ARIZONA: Generally distributed in south central to southern and southeastern Arizona, with a few observations along the Colorado River near Bill Williams, and occasionally in The Grand Canyon. Historic records include observations from the Grand Canyon, Sierra Ancha, Queen Creek, San Pedro Valley, Santa Rita Mountains, Canelo Hills, Huachuca and Peloncillo mountains, and San Bernardino Ranch. Hoffmeister (1986), reported that this is a summer resident only, with collections recorded from June 12 to August 21. E.L. Cockrum (pers. comm. 1992) reviewed 61 records for Arizona and found they ranged in date from May 30 to September 30.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Generally solitary though seems to migrate in groups and forage in close association with others. Males and females migrate at different times and have different summer ranges. Migrates to southern part of range and/or hibernates in winter, sometimes emerging to feed on warm days (air temperatures 55°-65° F). Winter roost sites found in dense foliage.

L. blossevillii responds to subfreezing temperatures by raising their metabolism to maintain their body temperature above the critical low limit of -5° C. The interfemoral membrane is wrapped over the body to provide 15% additional insulation. Migratory and winter status in

Arizona is unknown. In the southern part of their range ,they are thought to migrate altitudinally (E.L. Cockrum pers. comm. 1992).

Day roosts are among dense foliage, the hanging bat resembling a dead leaf. Roost sites are from a few feet to more than 40 feet high; and heavily shaded from above but open below to allow the bat to drop into flight.

Predators include birds of prey and opossums. Humans and human construction have also taken their toll on red bats in general. There have been documented cases of these bats impaled by barbed wire, entrapped on road surface oil, flying into lighthouses and the radiator grills of automobiles (Myers, undated).

REPRODUCTION: Copulates between August and October. General observations suggest that copulation may be initiated in flight. Females store the sperm until spring when fertilization occurs. Gestation period is on average, 60-70 days. In late May to mid-June, females give birth to one litter of 1-5 young (average 2.3; higher than any other bat). Lactation lasts about 38 days (5-6 weeks); a lactating female was netted in early August in the Santa Rita Mountains. Like other species of *Lasiurus*, females of this species have two pairs of mammae instead of the single pair found in most other species of bats. It is estimated, that young fledge between their third and fourth week.

FOOD HABITS: *L. blossivillii* emerges to forage 1 to 2 hours after dark and may forage well into the morning. They may hunt 600-1000 yards from their roosting site. Foraging flight pattern begins with slow, fluttering, erratic flight high in the air. After 15 to 30 minutes, they may begin flying in straight lines or wide circles over the same ground between tree top level and a few feet above ground level.

It is unclear whether they feed mainly on certain groups of insects or on any insect within a certain size class. Moths seem to be one of the more important prey items, however, they do take flies, bugs, beetles, cicadas, ground dwelling crickets and hymenopterans. They are commonly drawn to feed around city streetlights and floodlights on barns. Insects are caught using wing membranes, less often in interfemoral membrane. Occasionally they will land on vegetation to capture prey. There is a distinct body and head posturing change in this bat when in pursuit of prey. It has been said that if you observe a rural street light and see a bat dipping and diving, that you are most likely viewing a Red Bat.

Red Bats use echolocation to locate prey. They use both broadband and narrow band calls. Search phases of calls use long calls with low pulse repetition of narrow band frequencies. Red Bats make one pass through a concentration of potential prey, fixing on a target within 5 to 10 m. They attack insects on average, every thirty seconds and are successful forty percent of the time. If a bat is stalking a moth using echolocation, the moth can hear this and will try to flee the attack by diving. The bat will follow the moth into a steep dive and often pull away within inches of the ground. Humans observing the predator-prey interaction only see a bat and not the fleeing moth and may believe that the bat is acting aggressively towards them.

HABITAT: Preferred habitat includes riparian and wooded areas. They roost during the day in trees. Summer roosts usually in tree foliage, sometimes in leafy shrubs or herbs. Often found in trees of fruit orchards. They may also roost in saguaro boots, and occasionally in cave-like situations (E.L. Cockrum pers. comm. 1992); although they generally avoid caves and buildings during both summer/winter. Solitary females roost with young in tree foliage.

Many biologists who study this species feel that it is much less common in the southwest in recent decades. This species primarily roosts in cottonwood trees, and its notable decline in abundance is suspected to be attributable to the 70-98% loss of cottonwood habitat in North America. The Western Bat Working Group released a resolution in 2002 stating the concern of cottonwood loss and the perceived related decrease in abundance of *L. blossevillii*. Restoration in riparian corridors where cottonwoods historically existed thought to be necessary for the continued existence of this species. Cottonwood distribution throughout the range of this species is thought to determine this species ability to complete its annual migration.

ELEVATION: Observed at elevations from 1,900 - 7,200 ft. (580 - 2,196 m).

PLANT COMMUNITY: Broad-leaf deciduous riparian forests and woodlands.

POPULATION TRENDS: Unknown in Arizona.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None

STATE STATUS: 1B (AGFD SWAP 2012)
[WSC, AGFD, WSCA in prep]
[State Candidate AGFD, TNW 1988]

OTHER STATUS: Not BLM Sensitive (USDI, BLM AZ 2010)
[Bureau of Land Management Sensitive (USDI, BLM 2008)]
Forest Service Sensitive (USDA, FS Region 3 2007, 2013)
[None (USDA, FS Region 3, 1999)]
[Forest Service Sensitive USDA, FS Region 3, 1988]

MANAGEMENT FACTORS: Low numbers. The current loss of dense, mature cottonwood tree habitat throughout the western United States, is believed to be a key factor in the seemingly declining abundance of *L. blossevillii* across its range. In September 2001, the Western Bat Working Group produced a Cottonwood/Sycamore Resolution identifying this concern.

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: Status surveys and life history information, especially roost site selection, are needed. For proper status surveys to be conducted, efficient survey methods need to be developed.

LAND MANAGEMENT/OWNERSHIP: BLM - Phoenix, Safford and Tucson Field Offices; DOD - Fort Huachuca Military Reservation; FWS - Buenos Aires National Wildlife Refuge; NPS - Grand Canyon National Park, and Montezuma Castle National Monument; USFS - Coronado National Forest; BIA - Hualapai Reservation; State Land Department; AMNH Southwestern Research Station; Johnson Historical Museum; TNC - Aravaipa Canyon Preserve, and Ramsey Canyon; Private.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

J. A. Williams, Las Vegas, Nevada.

ADDITIONAL INFORMATION:

Has been timed in flight at 40 mph.

Ronnie Sidner has netted a juvenile in the Buenos Aires Wildlife Refuge, and several others in the Huachuca Mountains; mainly in Riparian Broad-Leaf habitat (AGFD 1996).

The genus epithet derived from the Greek *lasios* meaning shaggy and *oura* meaning having a tail. Derivation of the Latin specific epithet is unclear.

Revised: 1991-08-09 (RBS)
1992-05-02 (BKP)
1992-09-30 (RBS)
1994-03-25 (DCN)
1995-06-08 (DBI)
1996-06-19 (SMS)
2002-06-10 (JAW)
2002-11-15 (AMS)
2003-01-19 (AMS)
2011-01-13 (SMS)

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AMACC05070
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Lasiurus xanthinus*
COMMON NAME: Western Yellow Bat
SYNONYMS: *Nycteris ega; Dasypterus ega; Lasiurus ega xanthinus*; *Lasiurus ega ega* (*L. ega* now recognized as a distinct species)
FAMILY: Vespertilionidae

AUTHOR, PLACE OF PUBLICATION: Thomas, Ann. Mag. Nat. Hist. Ser. 6, 20:544, 1897.

TYPE LOCALITY: Mexico, Baja California, Sierra Laguna.

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: One of seventeen in the genus *Lasiurus* (Subgenus *Dasypterys*), and one of three *Lasiurus* species in Arizona. In the past, specimens from southern Arizona and northern Mexico were assigned to *L. e. xanthinus*, a smaller and lighter colored subspecies than *L. e. panamensis* from southern Mexico, and according to Baker et al. (1971), southern Texas. Genetic studies by Baker et al. (1988) resulted in elevating *L. e. xanthinus* to species level and applying to it the name *Lasiurus xanthinus*.

DESCRIPTION: Medium-large sized bat, sexually dimorphic in size, were females larger than male. Forearm 4.15 – 4.9 cm (1.6 - 1.9 in., n = 224); wings long, with wingspan 33.5-35.5 cm (13.4-14.2 in.); weight 9.2-22.5 g (0.32-0.79 oz). Their fur is yellowish-buff/light brownish, tipped with gray or white (color slightly darker than *Antrozous pallidus*). Ears short, longer than wide 17.0 mm (0.68 in) long. The anterior half of dorsal surface of interfemoral tail membrane (uropatagium) well furred, while posterior half is bare or with scattered hairs.

AIDS TO IDENTIFICATION: Lasiurine bats are distinguished from other bats in Arizona, except *Lasionycteris noctivagans* (Silver-haried Bat), by their short, round ears and their long tail membrane with at least the anterior portion well furred. Their hair color is never black although some hairs may be silver-tipped. In *Lasionycteris*, hair is black with silver tips. Uropatagium completely furred in other species of *Lasiurus* found in Arizona. *L. xanthinus* is smaller than *L. cinereus* (forearm 5.0-5.7 cm [2.0-2.24 in.]). The ears of *L. xanthinus* is not edged in black as in *L. cinereus*, and the pelage of *L. cinereus* is mahogany brown with hairs distinctively silver tipped. They are larger than *L. blossevillii* (forearm 3.8-4.3 cm [1.5-1.69 in]), which has a red pelage.

ILLUSTRATIONS:
Color photo (Barbour and Davis 1969: plate XVI)
Black and white photo (Hoffmeister 1986:101)
Color photo (Whitaker 1980: plate 156)
Color photo (Harvey et al., 1999)

TOTAL RANGE: Southern California, Arizona, and New Mexico south to Baja California, W and C Mexico. Recently recorded in Clark County, Nevada (NatureServe 2001). Woodland habitats, primarily palm tree groves, likely play a substantial factor in determining the range of this species (J.A. Williams, 2001).

RANGE WITHIN ARIZONA: Current range includes lower reach of Cave Creek in the Chiricahua Mtns; Sabino Canyon in the Santa Catalina Mtns; Glendale in Maricopa County; Palm Lake along Hassayampa River; Burro Canyon in the Kofa Mtns; Oak Grove Canyon in the Galiuro Mtns; and along the Lower Colorado River including Cibola and Parker Valleys and Mittry Lake. Unknown if still extant along the Bill Williams River; Lake Alex N of Red Bluff (Castle Dome Plain); along Silver Creek in the Chiricahua Mtns; and in Guadalupe Canyon in the Peloncillo Mtns. Historically found in Casa Grande, Tempe, Tucson, east of Sasabe, near the SW Research Station & Herb Martyr Dam along Cave Creek in Chiricahua Mtns; and along Hay Hollow Creek in Peloncillo Mtns.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: *Lasiurus xanthinus* is presumably a year-round resident in Arizona. They are solitary roosters. It has been suggested that in Tucson they hibernate among dead palm fronds (Barbour and Davis 1969); however E.L. Cockrum (personal communication 1992) considers this questionable although they may roost on the trunk or at the base of a frond during the day. Like their cousins, the Red bat (*L. blossevillii*) and the Hoary bat (*L. cinereus*), Yellow bats wrap themselves in their tail membrane for added thermal regulation while roosting. May be migratory in at least part of its range. Williams (2001, pers. comm.) suggests that this species is migratory in southern Nevada, as populations drastically decline during the winter months in the upper Moapa Valley, southern Nevada. Of these reduced populations, individuals captured during winter months are most always males. Moderate trimming of palm trees in the study area in November 2001, uncovered only a few individuals. None of these were hibernating, further suggesting partial migratory status. In 1992, Dr. E.L. Cockrum (pers. comm.) tallied records and found that there were only 18 records for Arizona: males in spring and summer and females from midwinter to mid spring.

They emerge at dusk. Mumford and Zimmerman (1963) report *L. xanthinus* flies steadily, in a straight line with slow wing beats.

REPRODUCTION: One litter of one to two (generally two) young, born in early June. Like other species of *Lasiurus*, females of this species have two pair of mammae instead of the

single pair found in most other kinds of bats. Although both males and females have been trapped in Arizona, no pregnant or lactating females have yet been reported from the state; although one juvenile male was netted in 1994. No females have been captured in the summer according to E.L. Cockrum (pers. comm., 1992). Gravid females were captured June 4-7, 1962, in Guadalupe Canyon in the Peloncillo Mountains of New Mexico. In southern Nevada, sex ratios are typically 2:1 favoring males, and reproductive females are not uncommon (n = 224) (Williams 2001, pers. comm.).

FOOD HABITS: Their feeding habits and diet, are poorly known. They probably feed on small to medium sized night-flying insects. A variety of insects including Hymenoptera, Diptera, Lepidoptera, and Coleoptera were found in the feces of a single specimen (Higgenbotham et al., 1999).

HABITAT: Their preferred habitat not clearly understood. They may be associated with Washington fan palm trees, other palms or other leafy vegetation such as sycamores, hackberries and cottonwoods, which provide roost sites. Individuals observed roosting about 15 feet above the ground in a hackberry (*Celtis reticulata*) and sycamores (*Platanus wrightii*). They were netted over a water hole in Guadalupe Canyon, New Mexico, and over a swimming pool in oak woodland habitat in the Chiricahua Mountains.

In the upper Moapa Valley of southern Nevada, *L. xanthinus* is clearly associated with exotic California fan palms (*Washingtonia filifera*). Of four habitats (riparian marsh, mesquite bosque, California palm groves, and riparian shrubland) investigated acoustically in the study area, *L. xanthinus* was detected in exotic California palm groves 80% (n = 2,972 minutes of activity) of the time (Williams, 2001). Several observations have been made of *L. xanthinus* roosting in the dead leaf skirts of palm trees. One record from Texas, reported a male roosting in a yucca (Higgenbotham et al., 2000).

ELEVATION: In Arizona, their distribution ranges in elevation from 550 - 6,000 feet (168 - 1,830 m).

PLANT COMMUNITY: Low-to-mid elevation riparian communities with broad-leaved deciduous trees. In urban situations, they will associate with palm trees.

POPULATION TRENDS: Apparently expanding its range into southwestern United States.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: 1B (AGFD SWAP 2012)
[WSC, AGFD, WSCA in prep]
[State Candidate AGFD, TNW 1988]
OTHER STATUS: Not BLM Sensitive (USDI, BLM AZ 2010)

[Bureau of Land Management Sensitive (USDI, BLM 2008)]
Forest Service Sensitive (USDA, FS Region 3 2007, 2013)
[None (USDA, FS Region 3, 1999)]
[Forest Service Sensitive, USDA, FS Region 3 1988]

MANAGEMENT FACTORS: The most obvious threat to this species is the loss of roosting habitat. For example, *L. xanthinus* roost in the dead leaf skirts of palm trees. Trimming of palm trees for aesthetic or fire management purposes in most cases completely removes viable roosting habitat. In addition, modification or possible destruction of riparian forest and woodland habitats, may be harmful by elimination of roosting habitat and habitat for their prey species.

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: Develop good survey methods, conduct status survey, and determine life history, range and ecological relationships.

LAND MANAGEMENT/OWNERSHIP: BLM - Safford Field Office; DOD - Yuma Proving Ground; FWS - Buenos Aires, Havasu and San Bernardino National Wildlife Refuges; USFS - Coronado National Forest; State Land Department; TNC - Hassayampa River and Muleshoe Ranch Preserves; AMNH Southwestern Research Station; Private.

SOURCES OF FURTHER INFORMATION

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

J.A. Williams – Las Vegas, Nevada

ADDITIONAL INFORMATION:

Not reported from Arizona until 1960. Barbour and Davis (1969) suggest that *L. xanthinus* seems to be extending its range northward into the United States from Mexico. Spencer et al. (1988) attributes the northward expansion of *L. xanthinus* into southern Texas to the introduction of ornamental palms.

The first Nevada state record of this species was in April 2000. Williams (2001) has identified a substantial breeding population in the upper Moapa Valley of southern Nevada. Although this population is active throughout the year, activity substantially decreases during winter months, suggesting that many of the animals migrate south for winter. Migration route into southern Nevada is presumed to follow the Colorado River drainage, but has not yet been verified.

In late summer one of these bats landed on a ship 208 miles off the coast of Argentina.

The genus epithet derived from the Greek *lasio* meaning shaggy and *oura* meaning having a tail. The specific epithet *xanthinus* refers to the overall yellow appearance.

Revised: 1991-08-14 (RBS)
1992-05-02 (BKP)
1992-05-23 (RBS)
1994-03-25 (DCN)
2002-04-01 (JAW)
2002-11-15 (AMS)
2003-01-19 (AMS)
2011-01-13 (SMS)

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** ARACJ02071
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Aspidoscelis arizonae* (Van Denburgh, 1896)
COMMON NAME: Arizona Striped Whiptail
SYNONYMS: *Aspidoscelis inornata arizonae* (Van Denburgh, 1896); *Cnemidophorus arizonae* Van Denburgh, 1896; *Cnemidophorus inornatus arizonae* Van Denburgh, 1896
FAMILY: Teiidae

AUTHOR, PLACE OF PUBLICATION: *Aspidoscelis arizonae* (Van Denburgh, 1896), Proc. California Acad. Sci., Ser. 2, Vol. 6, p. 344. *Aspidoscelis* Fitzinger, 1843.

TYPE LOCALITY: "Fairbank, Cochise County, Arizona," USA.

TYPE SPECIMEN: Unknown.

TAXONOMIC UNIQUENESS: As Crother et al. reports in the SSAR 2003 update to the 2002 edition, *Cnemidophorus*, as previously circumscribed, is not monophyletic as presented by Reeder et al. (2002, Am. Mus. Novit. 3365: 1-61). Thus they resurrected *Aspidoscelis* for the clade composed of the species native to North America, and the whiptails from South America retain the genus *Cnemidophorus*. The species *A. arizonae* is 1 of 22 in North America and 1 of 11 in Arizona, including the non-native *A. neomexicana*.

DESCRIPTION: A small, gracile, slim lizard with SVL up to 7.2 cm (2.8 in). The coloration ranges from dark brown to reddish-brown, with usually seven light cream to yellow stripes (mid-dorsal stripe often diminished) running down the back. While the tail is long, thin, and bright blue, the species is distinguished by pale blue coloration on the face, feet, and underside, lack of spots, and usually 2-3 enlarged pre-anals. (AZ PARC 2006; Brennan and Holycross 2006).

AIDS TO IDENTIFICATION: *A. arizonae* is found in low valleys and sandy flats within Semidesert Grasslands; is distinguished by pale blue coloration on the face, feet, and underside; lacks spots; usually has 2-3 enlarged pre-anals. The similar *A. pai* (Pai Striped Whiptail) has only six complete stripes and is found primarily in Plains and Great Basin Grassland, but also occurs in Interior Chaparral, Great Basin Conifer Woodland, and Petran Montane Conifer Forest. *A. uniparens* (Desert Grassland Whiptail) occupies habitat that overlaps with *A. arizonae*. It can be found in valleys and on slopes within Semidesert Grassland and Interior Chaparral, following drainages into the woodlands. They have six

light stripes, no spots, three enlarged, rounded preanals, and a long, thin muted blue to olive colored tail. (Brennan and Holycross, 2006).

ILLUSTRATIONS:

Color photo (Randy Babb, *in* AZ PARC 2006 http://www.reptilesofaz.com/Lizards-Subpages/h-a-arizonae.html).

Color photo (Erik F. Enderson, *in* Tucson Herpetological Society – Lizards, http://www.arts.arizona.edu/herp/AZAR.html).

Color photo (Brennan and Holycross, 2006: p. 83)

TOTAL RANGE: Arizona endemic with a small range in southeastern part of state.

RANGE WITHIN ARIZONA: The small range includes the area in the vicinity of Willcox, Cochise County, and the Hackberry Ranch in Whitlock Valley, Graham County (Wright and Lowe 1993, *in* NatureServe 1993).

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: This diurnal lizard is alert and fast moving. It is most active in the morning. It digs its own burrow where it lays its eggs or seeks shelter from the elements (e.g. extreme temperatures, storms, etc.).

REPRODUCTION: *A. arizonae* mates in the spring, and is oviparous (lays eggs). It lays one or two clutches of 1-3 eggs each in underground burrows (dens), in late spring or early summer.

FOOD HABITS: Forages for insects, spiders, centipedes, and small lizards by digging around the bases of bushes and under surface debris (Brennan and Holycross, 2006).

HABITAT: A grassland species, found in low valleys and sandy flats within Semidesert Grassland.

ELEVATION: Based on unpublished records in the HDMS, they have been found from 4080 – 4640 feet (1244-1415 m) elevation. There is one questionable observation in 2001 for the Tucson (2530 feet) area, that has of this time has not been verified.

PLANT COMMUNITY: A grassland species primarily in alkali sacaton and saltgrass, in low valleys within Semidesert Grasslands.

POPULATION TRENDS: NatureServe (2006) reports the total adult population is unknown but likely quite small, with the estimated number of element occurrences likely fewer than 10. The Global short-term trend is declining (decline of 10-30%). According to Wright and Lowe (1993 cited *in* NatureServe 2006), the species is "fairing badly" in Whitlock Valley,

where it occurs in syntopy with a healthy population of *Aspidoscelis tigris* in an overgrazed, shrubby habitat. The Global long-term trend is of moderate decline (decline of 25-50%). The area of occupancy has declined due to degradation of grassland habitat (Wright and Lowe 1993, *in* NatureServe 2006). Its range apparently continues to contract in response to invasion and growth of mesquite (Rosen et al. 1996, *in* BISON-M 2004).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: 1B (AGFD SWAP 2012) [WSC, AGFD, WSCA in press]
OTHER STATUS: Bureau of Land Management Sensitive (USDI, BLM AZ 2010)

MANAGEMENT FACTORS: Threats: Includes urban and agricultural development of vanishing habitats, and habitat degradation by livestock overgrazing (NatureServe 2006). Management Needs: Encourage developers, farmers, and ranchers in the Willcox area (this includes the desert grasslands of the Sulphur Springs Valley) to maintain favorable habitat (AGFD in press, cited *in* BISON-M 2004).

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: Conservation efforts would be benefited by further taxonomic study and better information on the lizard's current range, habitat status, trends, and threats (NatureServe 2006).

LAND MANAGEMENT/OWNERSHIP: Private.

SOURCES OF FURTHER INFORMATION

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USDI, Bureau of Land Management Region 2. 2010. Arizona BLM Sensitive Species List.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

Brian K. Sullivan – Arizona State University West, Dept. of Life Sci., Phoenix, AZ.

ADDITIONAL INFORMATION:

Revised: 2006-12-07 (SMS)

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Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X…X **(=taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** ARACK01060
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Xantusia bezyi*
COMMON NAME: Bezy's Night Lizard
SYNONYMS:
FAMILY: Xantusiidae

AUTHOR, PLACE OF PUBLICATION: Papenfuss, Theodore J., J. Robert Macey and James A. Schulte II. A new lizard species in the genus *Xantusia* from Arizona. 2001. Scientific Papers, Natural History Museum, The University of Kansas, No. 23:1-9. October 12, 2001.

TYPE LOCALITY: USA, Arizona, Maricopa County, 5.6 km S (by Highway 87) of Sunflower, elev. 948 meters. 33° 49.48' N, 111° 28.55' W, T6N, R9E, Sec 31, NE ¼.

TYPE SPECIMEN: Museum of Vertebrate Zoology: MVZ 232604 (holotype). T. J. Papenfuss (s/n). November 3, 2000. Note: 10 paratypes also at MVZ (Papenfuss et al 2001).

TAXONOMIC UNIQUENESS: NatureServe (2018) lists eight species of *Xantusia*. Three species are found in Arizona. *X. arizonae* and *X. bezyi* are only found within the State, while *X. virgilis* is also found in California, Nevada and Utah). The other five species are all California endemics. Genetic studies have confirmed that those occurring in Arizona are distinct species (Bezy 2005).

DESCRIPTION: A small (up to 60 mm or 2.4" from snout to vent) lizard with soft skin and a broad, somewhat flattened head. Its markings consist of dark blotches, spots, or speckles on a yellow to light olive background. The scales on the upper surface of the body are small and granular and a fold of skin runs along each lower side. The scales of the belly and tail are larger and rectangular. The scales on top of the head are large, smooth, and plate-like. The eyes are lidless, pupils are vertically elliptical, and the irises are orange or reddish brown (Brennan 2008).

AIDS TO IDENTIFICATION: *Xantusia* found east of the Verde River are *X. bezyi* (Bezy 2005). They are found in and around crevices in exfoliating granite boulders. The dorsal blotches are larger in *X. bezyi* than in *X. arizonae,* and contain 3-28 granular scales verses the 4-12 for the latter species, and there is a proportionately greater distance from the anterior margin of the eye to the tip of the snout in *X. bezyi* (Papenfuss et al 2001 includes diagrams and photos illustrating these diagnostic traits). *X. bezyi* differs from *X. virgilis* by its larger size, mottled coloration, more than 41 rows of dorsal granular scales and more than 26 lamellae under the fourth toe (Papenfuss et al 2001). Some populations of *X. virgilis* found in western

Arizona seem to be associated with yuccas rather than the granite habitat preferred by both *X. arizonae* and *X. bezyi*.

ILLUSTRATIONS:
Photos: http://www.reptilesofaz.org/Lizards-Subpages/h-x-bezyi.html
Photos: http://www.californiaherps.com/noncal/southwest/swlizards/pages/x.bezyi.html

TOTAL RANGE: Endemic to central Arizona.

RANGE WITHIN ARIZONA: Small chain of mountain ranges (Mazatzal to Galiuros) on either side of the Maricopa-Pinal-Gila county borders, between Yavapai and Graham counties. All populations east of the Verde River are *X. bezyi* (Bezy 2005).

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: The majority of this lizard's life is spent within the shelter of rock crevices. It thermo-regulates by basking near the sun-warmed edge of the crevice and under sun-warmed rocks, and rarely ventures away from shelter during daylight hours (Brennan 2008).

REPRODUCTION: Live bearing. Mating probably takes place in spring. A brood of about 3 young is probably born in summer (Brennan 2008).

FOOD HABITS: Feeds on ants, flies, beetles, a variety of other insects, and spiders (Brennan 2008).

HABITAT: Rugged, rocky slopes and boulder fields within the Arizona Upland Sonoran Desertscrub , Semi-desert Grassland and Interior Chaparral communities provide habitat for this lizard. Patches of Great Basin Conifer Woodland also occur within its range. This crevice-dweller frequents large outcroppings and large boulder clusters and is occasionally encountered in and under plant debris such as dead *Dasylirion* (Brennan 2008, Bezy 2005). This species is often found under exfoliating rock in granite outcrops (Papenfuss et al. 2001).

ELEVATION: 2400 – 5800 feet (730 – 1770 m). Brennan 2008.

PLANT COMMUNITY: Arizona Upland Sonoran Desertscrub (Saguaro-Paloverde Association), through the Semi-desert Grassland to the Interior Chaparral. Patches of Great Basin Conifer Woodland also occur within its range (Bezy 2005).

POPULATION TRENDS: Unknown. There are seven known collection sites in Arizona, but the last collection was a decade ago. IUCN (2018) considers the long-term and short-term trends to be "presumably relatively stable." This judgement is probably derived because the rocky habitat is not well suited to other uses, and almost all the collections are on Forest Service lands.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: 2 (AZGFD, AWCS 2022)
[1B (AGFD SWAP 2012)]
OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3, 2013)
IUCN Red List: Least Concern (IUCN 2018)

MANAGEMENT FACTORS: No specific management was recommended. IUCN (2018) states that current threats are unknown, but the species is probably not very threatened because its rocky habitat is not readily convertible to destructive human uses.

PROTECTIVE MEASURES TAKEN: *Xantusia bezyi* is listed as a 1B species by the Arizona Game and Fish Department and as a Sensitive Species by the USDA Forest Service. AGFD regulation R12-4-303-E prohibits the use of manual or powered jacking or prying devices to take
reptiles or amphibians, and this prohibition provides an important measure of protection for *Xantusia* in the State. The majority of known collections are within Tonto National Forest lands (and Tonto National Monument), and another is within the Nature Conservancy's Aravaipa Canyon Preserve. This land stewardship provides some measure of additional protection.

SUGGESTED PROJECTS: Since the last known collection was made in 2008, another survey at known sites and in other areas that appear to be suitable habitat would serve to <u>better define the status of this Sensitive species.</u>

LAND MANAGEMENT/OWNERSHIP: Five of the seven known sites are on USDA Forest Service lands (Tonto NF and Tonto National Monument), one is within The Nature Conservancy's Aravaipa Canyon Preserve, and the last is on USDI Bureau of Land Management land.

SOURCES OF FURTHER INFORMATION

LITERATURE CITATIONS:

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Papenfuss, Theodore J., J. Robert Macey and James A. Schulte II. A new lizard species in the genus Xantusia from Arizona. 2001. Scientific Papers, Natural History Museum, The University of Kansas, No. 23:1-9. October 12, 2001.

USDA, Forest Service Region 3. 2013. Regional Forester's Sensitive Species List.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

Robert L. Bezy, Natural History Museum of Los Angeles County, Los Angeles, CA.

ADDITIONAL INFORMATION: The species is named for Robert L. Bezy.

Revised: 2018-09-21 (bdt)
2023-05-05 (MBL)

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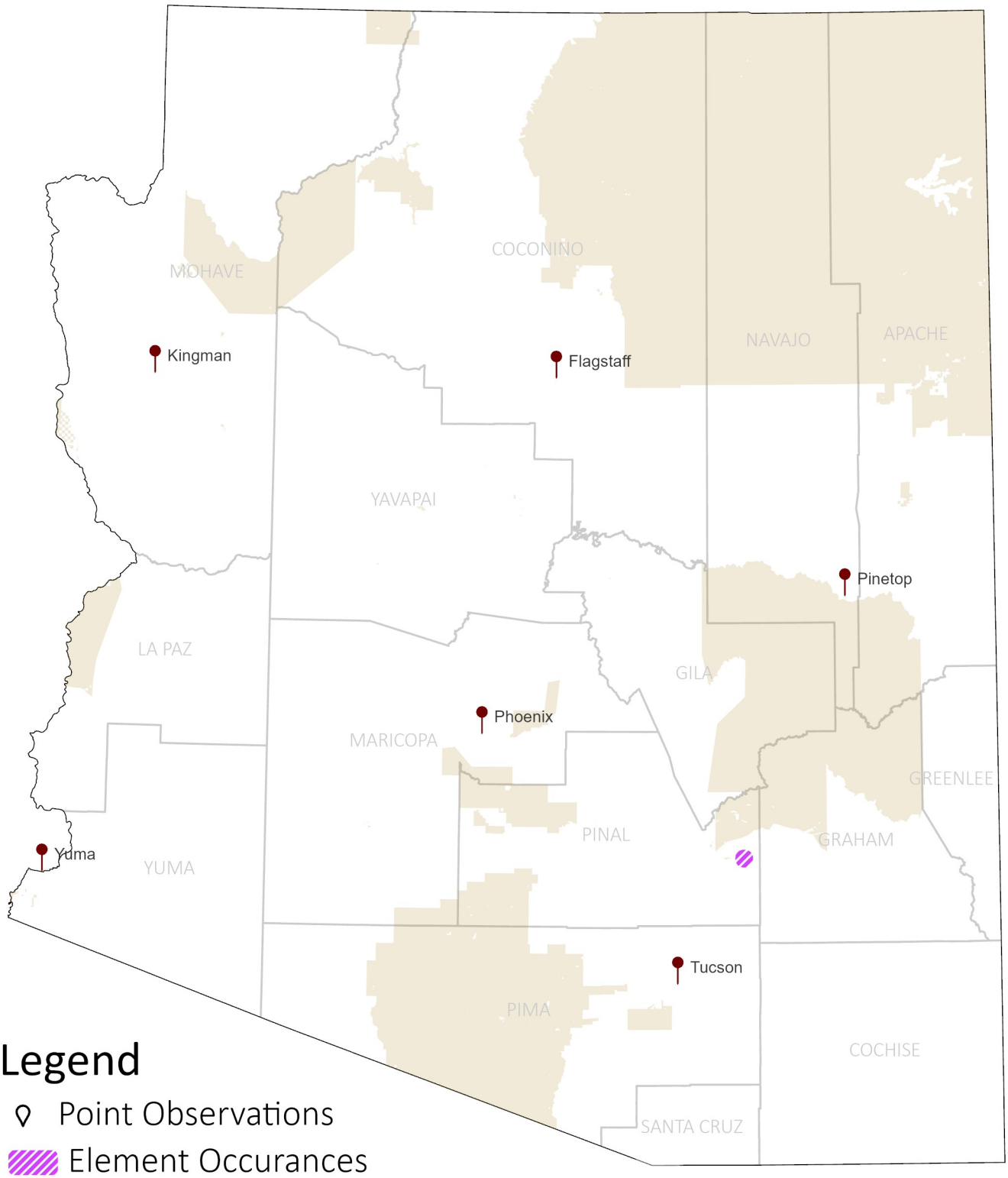
Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

Xantusia bezyi

Bezy's Night Lizard



Legend

- Point Observations
- Element Occurances
- Tribal Lands
- Counties

N

0 50 100 Kilometers

ARIZONA GAME & FISH

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences.

Heritage Data Management System
2022-07-26

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** ARADE03012
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Sistrurus tereminus edwardsii*
COMMON NAME: Desert Massasauga
SYNONYMS: *Crotalophorus catenatus edwardsii; Crotalophorus edwardsii; Crotalus milarius edwardsii; Crotalus edwarsii; Sistrurus catenatus tergeminus*
FAMILY: Serpentes: Crotalidae

AUTHOR, PLACE OF PUBLICATION: Baird and Girard. 1853. Catalogue of North American Reptiles in the Museum of the Smithsonian Institution. Part 1. Serpentes. Smithsonian Institution, Washington DC. p.15.

TYPE LOCALITY: Tamaulipas, Mexico. Type specimen USNM 507.

TYPE SPECIMEN: The holotype USNM 507 is presumed lost. USNM 506 from "Sonora, Mexico" collected by J.D. Graham and USNM 509 from "Tamaulipas, Mexico" collected by L.A. Edwards, were designated as syntypes (Cochran 1961, in Degenhardt et al. 1996).

TAXONOMIC UNIQUENESS: The genus *Sistrurus* contains three species. Of three subspecies of *S. tereminus*, only *S. t. edwardsii* occurs in Arizona.

DESCRIPTION: *S. t. edwardsii* is one of Arizona's smallest rattlesnakes (Lowe et al. 1986). The total length for the species ranges from 16-40.5 inches (40-100 cm; Stebbins 1985), but most adults in Arizona are under 18 inches in length (Lowe et al. 1986). The largest measured in Arizona is a male at 23.1 inches (588 mm) total length (Holycross 2001).

The desert massasauga has nine large plates on top of the head, and a conspicuous chocolate mask across the eyes and most of the face from snout to neck (Lowe et al. 1986). The ground color of large adults ranges from dark brown to dark gray, with 39-40 darker brown to blackish blotches down the middle of the back and three lateral rows of smaller, fainter, alternating spots (Stebbins 1985; Lowe et al. 1986). The belly is pale or whitish and often unmarked (Stebbins 1985) but is mottled with brown, gray-brown, and orange in Arizona specimens (Lowe et al. 1986). The dorsal scales are keeled, usually in 23 rows, and the anal plate is entire (Degenhardt et al. 1996; Ernst 1992). The young have a paler ground color, with a pattern more conspicuous than adults, and a yellowish white tail (Stebbins 1985).

AIDS TO IDENTIFICATION: Enlarged head scales and elongate head markings (extending onto neck) distinguish *S. t. edwardsii* from other Arizona rattlesnakes (Stebbins 1985).

ILLUSTRATIONS: Color drawing (Stebbins 1985: plate 45)
Color photo (Behler and King 1979: plate 632)
Color photo (Lowe et al. 1976:57)
Color photo (Campbell and Lamar 1989: figures 437-438)
Color photo (Degenhardt et al. 1996)

TOTAL RANGE: *S. catenatus* ranges from central New York (isolated populations) and southern Ontario south and southwest to northeastern Mexico, extreme southeastern Arizona and gulf coast of Texas (Ernst 1992; Degenhardt et al. 1996). *S. t. edwardsii* is found in disjunct populations in extreme southeast Arizona, southern New Mexico, and southeast Colorado, into northern Mexico (Stebbins 1985).

RANGE WITHIN ARIZONA: The desert massasauga is currently known from only two localized populations in extreme southeastern Arizona in San Bernardino and Sulphur Springs valleys and is very rare in the latter (Holycross and Douglas 1996; Rosen et al. 1996). Unsubstantiated records include a historical site at Fort Huachuca, sightings at "Hereford Crossing" areas on San Pedro and at Fairbanks School (Holycross and Douglas 1996; AGFD Heritage Data Management System, unpublished data).

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: This snake is primarily crepuscular and nocturnal and spends most of its time underground in rodent burrows or in the base of tobosa clumps, though occasionally it can be found under surface cover such as rocks, wood piles, and other litter (Holycross and Douglas 1996). In Arizona, it is active from April to October, with maximum activity during the summer rains. Most of these snakes are observed crossing roads during the early evening hours. If they are approached while crawling, they will usually flee rather than coil. When moving on smooth or sandy surfaces, they are fairly adept at “sidewinding” (Lowe et al. 1986).

No venom yield or toxicity data are available for *S. t. edwardsii* (Lowe et al. 1986). The eastern subspecies’ venom is one of the most toxic for rattlesnakes, based on studies conducted in the 1930's and 1940's. Their venom is about 10 times more toxic than the Western Diamondback rattlesnake and almost as toxic as the Mojave Rattlesnake. The desert massasauga’s small size and low venom yield, keep it from being more dangerous.

REPRODUCTION: Desert massasauga mate in both spring and fall, but mating has only been observed in captivity (Holycross and Douglas 1996; Lowe et al. 1986). Females probably do not reproduce every year (Goldberg and Holycross 1999). Young are born in late summer to

fall (Goldberg and Holycross 1999). Litter sizes range from four to eight young (Goldberg and Holycross 1999; Holycross and Douglas 1996), but broods of up to 19 young have been reported from a larger subspecies (Keenlyne 1978, in Ernst 1992). Newborns of the species as a whole range from 5.5 to 9.9 inches (140-252 mm) in total length (Ernst 1992).

FOOD HABITS: Mice and lizards make up the primary prey of desert massasaugas (Lowe et al. 1986). Holycross and Douglas (1996) identified 58 prey items from 51 desert massasauga from Cochise County, Arizona: lesser earless lizard (*Holbrookia maculata*, 13.8%), desert grassland whiptails (*Cnemidophorus uniparens*, 32.8%), southern prairie lizards (*Sceloporus undulatus consobrinus*, 27.8%), tree lizards (*Urosaurus ornatus*, 1.7%), small rodents (19.0%), and desert shrews (*Notiosorex crawfordi*, 5.2%). Centipedes (*Scolopendra*) are also eaten (A.T. Holycross, pers. comm. 2001).

HABITAT: In Arizona, the desert massasauga is found primarily in tobosa (*Hilaria mutica*) grassland along sloping bajadas with surface rocks (Holycross and Douglas 1996; Lowe et al. 1986). Populations in New Mexico tend to avoid rocky habitat (Degenhardt et al. 1996).

ELEVATION: The elevational distribution of the desert massasauga primarily ranges from 4,400 - 4,700 feet (1342 - 1434 meters) in the San Bernardino Valley (Lowe et al. 1986).

PLANT COMMUNITY: Desert grassland dominated by tobosa (*Hilaria mutica*).

POPULATION TRENDS: Quantified data are lacking, but the desert massasauga has almost certainly experienced long-term population declines and a general range contraction in Arizona. Lowe et al (1986) infer currently stable population along Highway US 80 based on fairly constant number of road kills observed (roughly several dozen per year).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None

STATE STATUS: 1A (AGFD SWAP 2012)
[WSC, AGFD, WSCA in prep]
[SE AGFD, TNW 1988]

OTHER STATUS: Not Forest Service Sensitive (USDA FS Region 3 2013)
[Forest Service Sensitive USDA, FS Region 3 1999]
[Forest Service Sensitive USDA, FS Region 3 1988]
PR, Determined Subject to Special Protection in Mexico, at the species level, (Proyecto de Norma Oficial Mexicana 2010)
[Determined Subject to Special Protection

Secretaria de Medio Ambiente 2000]
[Determined Subject to Special Protection, Secretaria de Desarrollo Social 1994]

MANAGEMENT FACTORS: The subspecies occurs in the extreme western edge of its range and has a limited distribution in Arizona (Stebbins 1985). Its reduced range in Arizona is primarily due to habitat loss from agricultural development (Lowe et al. 1986). Alteration of the grassland habitat via overgrazing could further impact Arizona populations (Holycross and Douglas 1996). Highway mortality is a significant source of non-natural attrition (Holycross and Douglas 1996).

PROTECTIVE MEASURES TAKEN: Desert massasaugas may not be collected from the wild in Arizona (Arizona Game and Fish Commission Order 43).

SUGGESTED PROJECTS: Recommended projects include monitoring desert massasauga habitat quality and quantity, constructing diversionary drift fences along highways through its range, and investigate its population genetic structure (Holycross and Douglas 1996). Understanding the effects of grazing and grassland composition change would also be valuable.

LAND MANAGEMENT/OWNERSHIP: State Land Department and Private owned lands in Arizona. One record from the Fort Huachuca Military Reservation is of questionable validity (Holycross and Douglas 1996).

SOURCES OF FURTHER INFORMATION

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

A. Holycross, Arizona State University, Tempe, Arizona.

T.R. Van Devender, Arizona-Sonora Desert Museum, Tucson, Arizona.

ADDITIONAL INFORMATION: Massasauga means "Great River Mouth" in the Chippewa language and probably alludes to the snake's habitat in Chippewa County: swampland

surrounding mouths of rivers (Minton 1983). Gotch (1995) attributes the common name as a corruption of "Missisauga", the name of a river in Ontario. *Sistrurus* is derived from *sistrum* (Latin), which is itself derived from *seistron* (Greek), a small rattle. The specific epithet *catenatus* comes from *catena* (Latin), a chain, in reference to the chain-like pattern along the back (Gotch 1995). The patronym *edwardsi* honors L.A. Edwards, a US Army surgeon who collected the type specimen (Minton 1983).

Revised: 1991-04-09 (DKW)
1997-01-12(SMS)
2001-05-02 (RAM)
2001-08-24 (SMS)

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract

Element Code: ARAAD08020
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Terrapene ornata*
COMMON NAME: Ornate Box Turtle, Western Box Turtle
SYNONYMS:
FAMILY: Testudines:Emydidae

AUTHOR, PUBLICATION: Agassiz 1857:445 (see SSAR account)

TYPE LOCALITY: Restricted to "Burlington (Des Moines County), Iowa".

TAXONOMIC UNIQUENESS: Two subspecies of *T. ornate*; only *T. o. luteola* occurs in Arizona.

DESCRIPTION: Stebbins 1966:86. A relatively small terrestrial turtle with a carapace length of 4-5 in, but may reach up to 6 in. Females grow larger than males. The carapace is high-domed with radiating yellowish lines or rows of spots, on a brown or black background. Carapace color lightens and lines fade as with age. Skin is dark to reddish- brown with yellow to orange spots and yellow jaws. Some individuals may possess a greenish head. Males have bright red eyes and a slightly concave plastron; females have yellowish- to reddish-brown eyes and a flat plastron. Plastrons have a single hinge near the front. Hind limbs may have 3-4 toes, males having an enlarged first toe to assist in copulation.

AIDS TO IDENTIFICATION:

ILLUSTRATIONS:
Black and white drawing (Stebbins 1966: plate 14)
Color photo (Behler and King 1979: plates 305, 307)
Color photo (Degenhardt, Painter, and Price 1996: plate 30)
Color photos (Brennan 2008: http://www.reptilesofaz.com)
Color photos (Tucson Herpetological Society 1996-2003: http://www.arts.arizona.edu/herp/TEOR.html)

TOTAL RANGE: Great Plains from western Indiana to southeastern Wyoming, southeast to Louisiana, although discontinuous; southwest to southeastern Arizona and into north-central Mexico.

RANGE WITHIN ARIZONA: Southeast corner of the state, from Winkelman to the Huachuca Mountains. Recorded from Cochise, Graham, Pima, Santa Cruz, Greenlee and Gila counties.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: A primarily diurnal species, box turtles are active in early morning hours then retreat from the heat to their burrows, or seek shelter until late afternoon when they re-emerge to forage. Often associated with the burrows of the Bannertail Kangaroo Rat (*Dipodomys spectabilis*) and with the Black Tail Prairie Dog (*Cynomys ludovicianus*) in New Mexico. Their active period may be lengthened during overcast or cloudy weather, and in the hottest parts of their range in Arizona, may be restricted to rainy periods. They can undergo a five month hibernation, often followed by a three month estivation, for an annual total of eight months in their subterranean refuge. Although a primarily terrestrial species, box turtles have been observed in ponds and small puddles and have an excellent ability to swim. They can live over 25 years.

REPRODUCTION: Maturity is reached at about 7-8 years of age, and mating usually takes place in the spring, upon emerging from hibernation, but turtles may mate at anytime during their active season. Turtles lay 2-8 (average 5) eggs per clutch, and may produce a second, smaller clutch of about 1-4 eggs. Females may retain eggs until the conditions are good for laying. Incubation lasts an average of 70 days and is dependent on the temperature. Sex is also temperature dependent, with males resulting from lower incubation temperatures and females resulting from higher incubation temperatures.

FOOD HABITS: Omnivorous with a preference for animals, and may favor mulberry. Box turtles will consume a large variety of foods including dead mammals, birds and eggs, other reptiles together with dead box turtles, tadpoles of the spadefoot toad, grass, cactus fruits and stems, melons, and insects such as beetles and caterpillars. Dung beetles, and others insects found when foraging beneath dung, have been an important food source since the time of the buffalo, and continue today from other livestock. They compete for food with other omnivorous species such as the mud turtle, but also raccoon, coati, ringtail, gray fox and skunks.

HABITAT: In Arizona, grassland of southeast corner of state. Occasionally in desertscrub.

ELEVATION: Found at elevations ranging from 2,000-7,100 ft. (610-2165m), although most abundant at elevations from 3,000-6,500 ft. (915-1980m).

PLANT COMMUNITY: Semidesert grasslands and Chihuahuan desertscrub.

POPULATION TRENDS: Believed to be declining (C.H. Lowe, pers. comm. 1980) in Arizona, but more information is needed. In 2009, the Turtles Project launched a citizen-scientist based Ornate Box Turtle Watch program to assist with data acquisition and eventually the development of a management plan (www.azgfd.gov/boxturtlewatch).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: None
OTHER STATUS: Bureau of Land Management Sensitive – full sp. (USDI, BLM AZ 2010)
PR (MEXFED 2000-10-16)
Pima County Priority Species (Sonoran Desert Conservation Plan, 2013).

MANAGEMENT FACTORS: Threats may include illegal poaching for the pet industry, habitat loss due to urban development and roadways, mortalities associated with roadways, and alterations to plant community. Released pets may also pose a problem from disease transmission and/or genetic hybridization.

PROTECTIVE MEASURES TAKEN: Since 2005, AZGFD Commission Order #43 has closed the collection season for *T. ornata.*

SUGGESTED PROJECTS: Distribution, habitat, population and life history studies. A full assessment of threats.

LAND MANAGEMENT/OWNERSHIP:

SOURCES OF FURTHER INFORMATION

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

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ADDITIONAL INFORMATION:

Revised: 1991-03-28 ( )
2008-04-26 (TFH)
2013-08-14 (BDT)

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Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** ARADB36110
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Thamnophis rufipunctatus*
COMMON NAME: Narrow-headed Gartersnake, Narrowhead Garter Snake
SYNONYMS: *Natrix rufipunctatus, Thamnophis angustirostris*
FAMILY: Serpentes: Colubridae

AUTHOR, PLACE OF PUBLICATION: Cope, 1875.

TYPE LOCALITY: Originally noted as "Southern Arizona" but Webb and Axtell (1986) later corrected this to "the vicinity of Fort Apache, Arizona."

TYPE SPECIMEN: HOLOTYPE: 8600 (formerly 1097), southern Arizona, H. W. Henshaw, September 1874 (Cochran, 1961).

TAXONOMIC UNIQUENESS: A member of the family *Colubridae*, the genus *Thamnophis* ranges from southern Canada to Costa Rica in Central America, and from the Pacific to the Atlantic coasts (Stebbins, 1985). There are more than 21 species that make up the genus *Thamnophis*, and *rufipunctatus* has been subjected to controversial classification status in the past. Lowe (1955) proposed reassigning *rufipunctatus* (as *angustirostris*) to the genus *Natrix* (=*Nerodia*), water snakes, due to the use of only one apparent diagnostic character—the divided anal plate, found in only some specimens. Since then, substantial research has been done to support this reclassification (Degenhardt, et al., 1996), yet it remains in the genus *Thamnophis.* Most herpetologists believe that this snake acts as a bridge between the two genera (Shaw and Campbell, 1974), and it may someday be placed in a separate genus.

DESCRIPTION: A medium-sized snake, reaching an average length of 112 cm (44 in). Females grow larger than males. Ground color olive, brown or tan, with distinct blackish, dark brown, dull brick-red, or orange paired spots on back and sides of body, fading toward the tail. Brownish gray below, paling on throat. Venter brownish-gray, or cream colored, often with two rows of blackish wedges, fading posteriorly. Scales keeled, usually 21 rows at mid-body. Anal plate usually single, but may be divided. Eight upper labials with dark bars on labial scales. Young have a dull yellowish belly, and often a cream-colored throat.

Because of their drab coloring and high set eyes, this species more closely resembles *Nerodia* (water snakes) than *Thamnophis*. Also, the head is narrow and more elongated than other *Thamnophis*.

AIDS TO IDENTIFICATION: No well-developed stripes or pale crescent behind corner of mouth as in other species of gartersnakes. Eyes high on blunt-nosed, elongated head separates this species from other gartersnakes in Arizona (Rosen 1988).

ILLUSTRATIONS:
Color drawing (Stebbins 1985: Pl. 43)
Color drawing (Stebbins 2003: Pl. 48)
Color photo (Behler and King 1979: Pl. 548)

TOTAL RANGE: In the U. S., range includes the mountains of central and eastern Arizona and west-central New Mexico in Mogollon Rim area; a disjunct population from those in Mexico. Range in Mexico includes Northern Sonora and Chihuahua, south in the Sierra Madre Occidental to central Durango.

RANGE WITHIN ARIZONA: Upland drainages from central and eastern Arizona from the White Mountains along the Mogollon Rim into Oak Creek Canyon at elevations from about 2,200-8,000 ft (Brennan, 2008). Counties include Apache, Coconino, Gila, Graham, Greenlee, Navajo, and Yavapai. Healthiest populations found in Oak Creek Canyon, and the East Verde River.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Regarded as one of the most aquatic of all garter snakes (Conant 1963). Found primarily in rocky stretches of canyon-bound headwater streams with perennial or nearly perennial flows. Found in or beside well-lit portions of clear, rocky streams where permanent water exists. May require large streams and rivers (Rosen and Schwalbe, 1988), lined with shrub-sized saplings and sheltered with broadleaf deciduous trees (alder, cottonwood, sycamore) in pinyon-juniper, oak-pine, or ponderosa pine communities. The narrow-headed gartersnake forages under water, seeking cover under rocks and boulders in the streambed when disturbed (Stebbins 1985). This snake basks on rocks, boulders and vegetation along stream banks, seeking shelter in crevices and under rocks (Degenhardt, et al., 1996).

Diurnal and evening crepuscular, snake is inactive in cold temperatures and extreme heat. Almost strictly aquatic, they are rarely seen more than a meter from water. However, hibernation takes place well above the flood line, in rocky outcroppings, during late fall and winter (Brennan, 2008). Rosen and Schwalbe (1998) found one gravid female more than 15 meters from the stream in July, and it is believed that they spend much of the gestation period on higher ground for sufficient thermoregulation. Research findings based on radio-telemetry data in Oak Creek, Arizona indicated that the species hibernates from November to April, and that the snakes do not likely travel more than 0.8km (0.5 mi) from their hibernation sites (USGS, 2006).

REPRODUCTION: Viviparous/ovoviviparous (live-bearing). 8-18 young are born in late July-early August, and likely earlier in the lower elevations. Males mature at about 2.5 years, Females at 2 years (Rosen and Schwalbe, 1988).

FOOD HABITS: Narrow-headed gartersnakes are only found in areas of high native fish concentration and primarily consume fish, including native fish species and soft-rayed nonnative fish species (USDI, FWS 2021), but specimens from Mexico have been known to eat ambystomatid salamander larvae (Stebbins, 1985).

HABITAT: Narrow-headed gartersnakes require perennial streams or spatially intermittent streams with pools and riffles. Cobble and boulder substrate with low amounts of fine substrate are preferred by the species. Structural features such as cobble bars, rock piles, boulders, logs, stumps, aquatic vegetation, vegetated islands, and debris jams are necessary in the stream channel to allow for basking, thermoregulation, shelter, protection from predators, and the maintenance of the aquatic prey base (USDI, FWS 2021). Hydrologic and geomorphic connection between the active stream channel and its adjacent terrestrial habitat is important for the species (USDI, FWS 2021). Important components of bank vegetation include shrub-sized and sapling Arizona alder (the most conspicuous species), velvet ash, willows and canyon grape. (Rosen and Schwalbe, 1988). In Arizona, this species is found in streams in pinyon-juniper and pine-oak woodland into ponderosa pine forest.

ELEVATION: 2,300 to 8,200 feet (700 to 2,500 meters) (USDI, FWS 2021)

PLANT COMMUNITY: Pinyon-juniper and oak-pine belts into forests of ponderosa pine.

POPULATION TRENDS: Many populations are declining. Believed to be extirpated from Flagstaff and Wall Lake, areas where it was formerly abundant. Snake is also becoming more difficult to find in historical strongholds like Oak Creek Arizona.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS:	LT with CH (USDI, FWS 2021) LT (USDI, FWS 2014) [None USDI, FWS 1996] [C2 USDI, FWS 1991, 1994] [C2 USDI, FWS 1985, 1989]
STATE STATUS:	1 (AZGFD, AWCS 2022) [1A (AGFD SWAP 2012)] [WSC (AGFD, WSCA 1996 in prep)] [State Candidate AGFD, TNW 1988]
OTHER STATUS:	Bureau of Land Management Sensitive (USDI, BLM 2008, 2017)

[Not Bureau of Land Management Sensitive (USDI, BLM AZ 2010)]
Forest Service Sensitive (USDA, FS Region 3 1988, 1999, 2007, 2013)

MANAGEMENT FACTORS: Threats to this species include lowering the water table, habitat modification, grazing along streambeds and increased recreational use in riparian areas. Other threats consist of the introduction of predators, such as bullfrogs, crayfish and predatory fishes (such as species of the families Centrarchidae and Ictaluridae), as well as habitat fragmentation.

PROTECTIVE MEASURES TAKEN: The Narrow-headed Gartersnake was listed as Threatened under the Endangered Species Act in July 2014. Critical habitat was designated in October of 2021.

This species is protected under Commission Order 43: Reptiles; it is illegal to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect it.

SUGGESTED PROJECTS: Research into the life history.

LAND MANAGEMENT/OWNERSHIP: BIA – Fort Apache and San Carlos Reservations; USFS – Apache-Sitgreaves, Coconino, Prescott, and Tonto National Forests; Red Rock State Park; AGFD Chevelon Canyon Ranches; Private.

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ADDITIONAL INFORMATION:

Revised: 1993-08-23 (SSS)
1995-03-24 (JMH)
1997-03-06 (SMS)

2002-11-07 (RHB)
2009-03-09 (TFH)
2012-07-20 (BDT)
2021-11-03 (KSL)
2023-05-03 (MBL)

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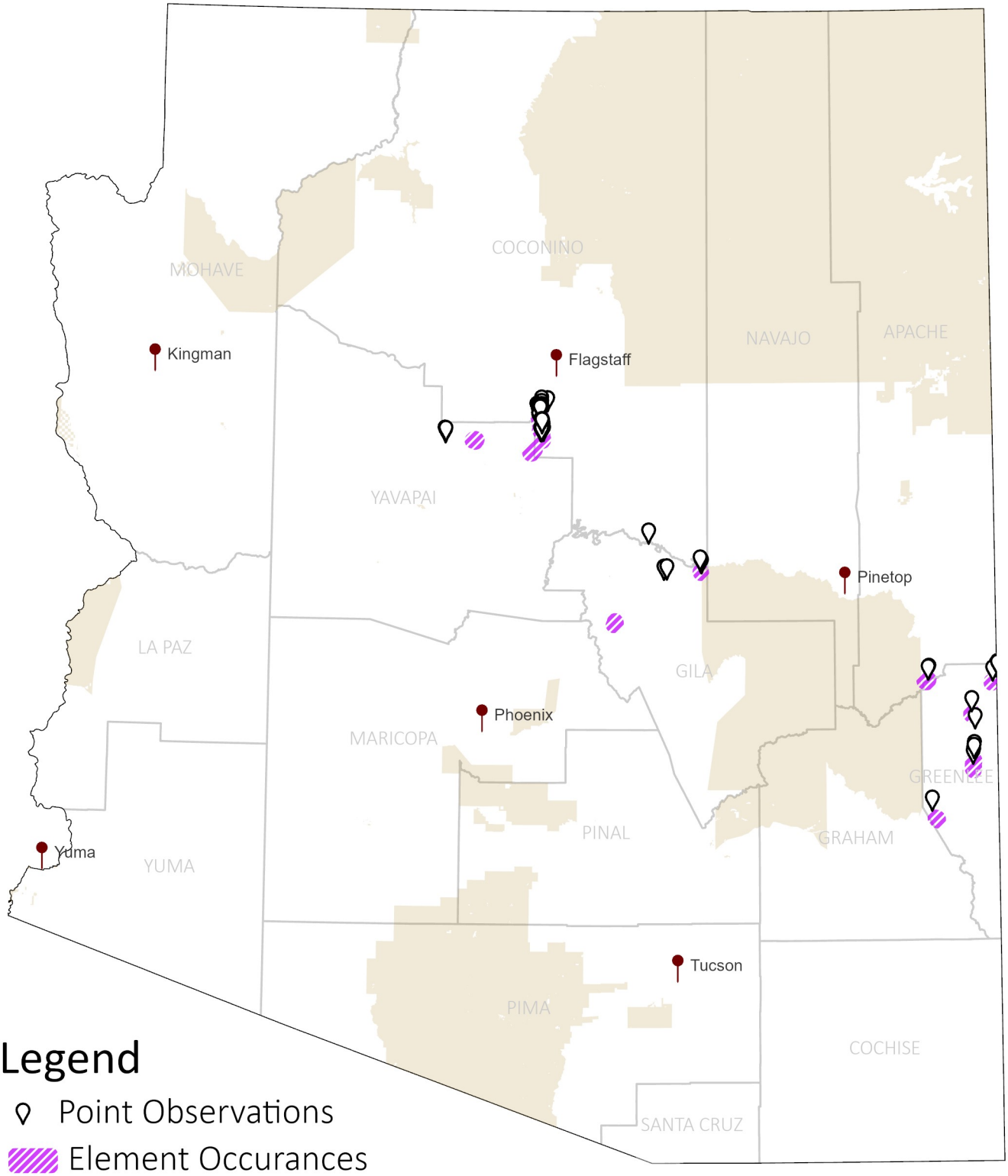
Thamnophis rufipunctatus

Narrow-headed Gartersnake



Legend

- Point Observations
- Element Occurances
- Tribal Lands
- Counties

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ARIZONA GAME & FISH

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences.

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2022-07-26

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** ARADE02130
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Crotalus willardi obscurus*
COMMON NAME: New Mexico Ridge-nosed Rattlesnake
SYNONYMS: *Crotalus willardi silus*
FAMILY: Serpentes: Viperidae

AUTHOR, PLACE OF PUBLICATION: *C. willardi* (Meek, S.E. 1905. Field Mus. Zool. Ser. 7(1):1-19); *C. w. obscurus* (Harris, H.S., Jr. and R.S. Simmons. 1976. Bull. Maryland Herp. Soc. 11(1):1-7).

TYPE LOCALITY: Indian Creek Canyon near Animas Mts., New Mexico (Bogert and Degenhardt 1961); originally referred to as *C. w. silus*, until formally renamed by Harris and Simmons (1976).

TYPE SPECIMEN: For the species it is FMNH 902, F.C. Willard.

TAXONOMIC UNIQUENESS: Approximately 30 species in genus *Crotalus*. Of the five subspecies of *willardi*, *C.w. willardi* and *C. w. obscurus* occur in Arizona.

DESCRIPTION: The New Mexico Ridge-nosed Rattlesnake is a small mountain rattlesnake, up to 668 mm (26.3 in) total length, but most specimens are smaller (Keegan et al. 1999). The color is generally grayish-brown, and a distinct ridge is present on the end of its snout. The upper surface has obscure, irregularly spaced white crossbars edged with brown in a dull pattern. The young are dark brown and have yellow-orange pigment on the labial scales (Degenhardt et al. 1996); they may have yellow or black tails (Holycross 2000).

C. willardi is typically gray in coloration with 18-45 dorsal blotches, but some individuals may be brownish or reddish (Degenhardt et al. 1996). *C. willardi* has 23-31 rows of keeled scales at mid-body (Degenhardt et al. 1996). Males have 140-156 ventrals and 24-36 subcaudals; females have 146-160 ventrals and 21-32 subcaudals (Barker 1991). Males have tails 9.1-11.5% of SVL; females only 7.9-9.8% of SVL (Degenhardt et al. 1996). There are 1-3 loreals, 2-3 preoculars, 3-4 postoculars, and 13-14 (12-17) upper and lower labials (Ernst 1992).

AIDS TO IDENTIFICATION: *C. willardi obscurus* lacks the vertical white stripe on the rostral and mental scales, and the lateral facial stripes are faded or absent, compared to *C. willardi willardi* (Ernst 1992). *C. w. obscurus* is gray to brownish compared to the brownish to reddish-brown *C. w. willardi* (Ernst 1992).

ILLUSTRATIONS:

Color photo (Ernst 1992: plate 55)
Color photo (Campbell and Lamar 1989: figure 435)
Color photo (Degenhardt et al. 1996: plate 122)
Color photo: http://www.reptilesofaz.org/Snakes-Subpages/h-c-willardi.html.
Color photo: http://www.californiaherps.com/noncal/southwest/swsnakes/pages/c.w.obscurus.html.

TOTAL RANGE: *C. willardi* occurs from south central Arizona and southwestern New Mexico south to Durango and Zacatecas (Lowe et al. 1986). *C. w. obscurus* is known only from the Animas and Peloncillo mountains of New Mexico (and the Peloncillos of Arizona; Holycross and Smith 1997) and the Sierra de San Luis of extreme northeastern Sonoran and western Chihuahua, Mexico (Ernst 1992).

RANGE WITHIN ARIZONA: *C. willardi* is found in most of the Sky Island mountain ranges throughout much of southeastern. The species is known from the Huachuca, Santa Rita, Patagoina, Canelo and Whetstone mountain ranges. (Brennan 2016). *C. w. obscurus* is known only from the Peloncillo Mountains in extreme SE Arizona (Holycross and Smith 1997).

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Ridge-nosed rattlesnakes are generally secretive and inconspicuous; when encountered they are more likely to rattle and attempt to escape rather than coil and strike (Degenhardt et al. 1996). Individuals from Sierra de San Luis were found hibernating 40-46 cm (16-18 in) deep in talus slopes, and observed basking at air temperatures of 6-9ºC (43-48ºF, shade) and 26ºC (79ºF, sun) (Degenhardt et al. 1996). The paleogeography and evolution of *C. willardi* complex were described by Harris and Simmons (1976). Morphology and biochemical characteristics of *C. willardi* complex, and specifically the acceptance of the *C. w. obscurus* taxon, were described by Barker (1992). It uses its venom by injecting it through long, hollow and retractable fangs. *C. willardi* is diurnal, can be crepuscular and is occasionally active during the night at lower elevations. This ground-dweller is occasionally found in tree trunks and on rock outcroppings. As with all other pit-vipers it uses heat sensing pits to detect warm-blooded prey and predators (Brennan 2016).

McAllister et al (1996) published the first report of two New Mexico ridge-nosed snakes passing oocycts and free sporocycts from the parasite Sarcocystis sp. in their feces.

REPRODUCTION: Mating occurs in midsummer to early fall. Brood size averages about 5.5 young (2-9), with the young born from late July through late August (Applegarth 1980; Holycross and Goldberg 2001). There is no maternal care, and the young disperse from the natal area within a few days of their birth. Female reproduction is typically biennial or longer (Holycross and Goldberg 2001). The shortest reproductively active specimens measured 402-406 mm (16 in) snout-vent length for females and males, respectively (Holycross and Goldberg 2001). An apparent natural hybrid between *C. w. obscurus* and *C. lepidus klauberi*

was reported from the Peloncillo Mountains, New Mexico (Campbell et al. 1989).

FOOD HABITS: Applegarth (1980) reported prey including various rodents, birds, lizards, snakes, and arthropods. Barker (1991) also found body parts of the large centipede, *Scolopendra*, in a fecal sample. The juvenile diet consists primarily of lizards and centipedes, while adults feed primarily on small mammals, lizards, and passerine birds (Holycross et al. in press). Its venom will kill and begin digesting its prey (Brennan 2016). In a study on *C.w. obscurus* (Holycross et al 2002), juvenile diets consisted of lizards (57%) and centipedes (33%), while adults preferred small mammals (62%), lizards (26%) and passerine birds (9%). The species is active during the day, and may use caudal or facial lures to attract prey. The juveniles have either black or yellow tail-tips, a feature that may assist in prey luring.

A recent diet study (Mocino-Deloya et al 2015) in two mountain ranges in northern Mexico found some different results from previous studies. Overall, prey items identified were 54.4% lizards, 13.6% scolopendromorph centipedes, birds 21.4% and mammals 10.7%. The diet of juvenile snakes (n = 32) consisted primarily of lizards (62.5%) and centipedes (25.8%), although large juveniles also consumed mammals (6.3%) and passerine birds (6.3%). Adult snakes (n = 71) fed primarily on lizards (50.7%) and passerine birds (28.2%) but also consumed mammals (12.7%) and centipedes (8.4%). *Crotalus willardi* in the Sierra San Luis and Sierra Pan Duro consumed more birds than has been reported from *C. willardi* in nearby populations and continued to consume centipedes as adults.

HABITAT: The New Mexico Ridge-nosed Rattlesnake occupies Madrean evergreen woodland and Petran montane forest communities (Holycross and Douglas 1997, and Brennan 2016). Most commonly found near drainages with plentiful leaf litter and canopy cover.

ELEVATION: *C. w. obscurus* occurs at elevations above 1525 m (5,000 ft) (Holycross and Douglas 1997).

PLANT COMMUNITY: The Ridge-nosed Rattlesnake is usually encountered within Madrean Evergreen Woodland or Petran Montane Conifer Forest (Brennan 2016). The species has been described as a montane generalist (Degenhardt et al. 1996; Lowe et al. 1986) but is primarily a denizen of pine-oak woodland. *C. w. obscurus* is found in habitat composed of various oaks, Apache and Chihuahua pines (*Pinus engelmannii* and *P. leiophylla*), alligator juniper (*Juniperus deppeana*), Arizona cypress (*Cupressus arizonica*), Arizona madrone (*Arbutus arizonica*), manzanita (*Arctostaphylos* sp.), and various grasses including *Sporobolus*, *Muhlenbergia*, and *Aristida* (Degenhardt 1972; Degenhardt et al. 1996).

POPULATION TRENDS: Population trends are unknown, but it is believed that the New Mexico population could be negatively impacted by habitat destruction or by overzealous and irresponsible collectors (Degenhardt et al. 1996). The subspecies was historically limited in range and never very common. The U.S. population was estimated at about 500 in the 1960s. Intensive collection (until 1974) may have reduced the population by one-fourth (NatureServe 2016). The USFWS listed the status as unknown in 1990. NatureServe considers the

subspecies to be critically imperiled due to its very small range, habitat disturbance and over-collecting.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: LT with Critical Habitat in New Mexico only (USDI, FWS 1978)

STATE STATUS: 1 (AZGFD, AWCS 2022)
[1A (AGFD SWAP 2012)]
State Endangered (New Mexico Game and Fish 1990)

OTHER STATUS: PR, Determined Subject to Special Protection in Mexico (NORMA Oficial Mexicana NOM-059-SEMARNAT-2010)
[Determined Subject to Special Protection Secretaria de Medio Ambiente 2000]
[Determined Subject to Special Protection, Secretaria de Desarrollo Social 1994]

MANAGEMENT FACTORS: Threats exist due to stand-replacing fire from years of fire suppression and overgrazing; fuel loads should be reduced before allowing or reintroducing large-scale summer fires (Smith et al. 2001).

Loss of habitat due to wildfire, improperly conducted prescribed fire, livestock grazing, and other land management actions that contribute to degraded watersheds have adverse effects to the rattlesnake. Human activity is also a threat, in part from illegal collection, but also from contacts between humans and snakes in the wild. The small size and limited habitat areas occupied by the extant populations increases the risks of extirpation due to loss of habitat or loss of individuals that come into contact with people.

A microsatellite DNA loci analysis conducted by Holycross and Douglas (2002) suggest that the populations occupying the three mountain ranges that comprise their total known range are genetically isolated and currently on independent evolutionary trajectories. Accordingly, it is recommended that each mountain population be managed as a distinct population segment (DPS). While data from the Animas Mountains suggests genetic cohesiveness and high levels of gene flow within the population, this may not apply to the Peloncillo Mountains. There, comparatively low levels of diversity suggest reductions in size of the Peloncillo population as well as a very small population. The possibility of a captive breeding program is raised, although several concerns are noted. Preservation of the limited woodland habitat remaining, and a conservative approach to the reintroduction of fire should be management priorities.

PROTECTIVE MEASURES TAKEN: This subspecies is listed as threatened, and critical habitat was designated in the Animas Mountains in Hidalgo County, New Mexico (FWS

1978). A recovery plan was completed in 1985. It is against Federal law and Arizona State law (Arizona Game and Fish Commission Order 43) to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect *Crotalus willardi obscurus* or to attempt to engage in any such conduct.

SUGGESTED PROJECTS: Determine presence/distribution within the Mule, Dragoon, and Chiricahua mountains (Holycross and Douglas 1997). Determine distribution within the Peloncillo Mountains. Population monitoring during the 10-year Peloncillo Programmatic Fire Plan. Habitat, population, and life history studies are needed.

LAND MANAGEMENT/OWNERSHIP: US Forest Service: Coronado National Forest.

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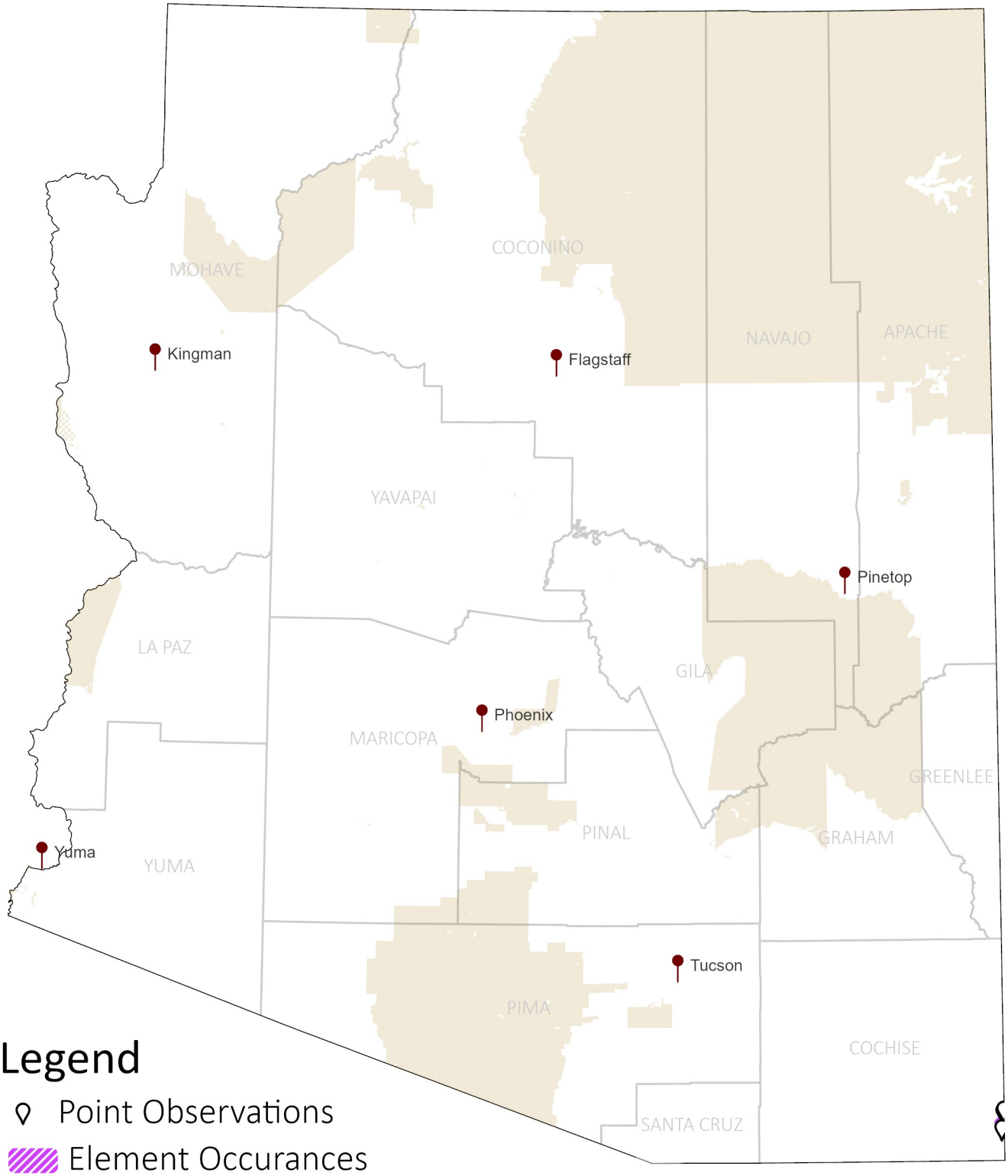
T.R. Van Devender, Arizona-Sonora Desert Museum, Tucson, Arizona.

ADDITIONAL INFORMATION: Venomous; mild mannered but will turn and bite if grasped; venom is of relatively low toxicity and snake can inject only a relatively small volume, so not especially dangerous to humans (Ernst 1992).

Revised: 2001-05-02 (JAS/RAM)
2013-01-30 (CFP)
2016-07-13 (BDT)
2023-04-05 (MBL)

Crotalus willardi obscurus

New Mexico Ridge-nosed Rattlesnake



Legend

- Point Observations
- Element Occurances
- Tribal Lands
- Counties

N

0 50 100 Kilometers

ARIZONA GAME & FISH

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences.

Heritage Data Management System
2022-07-25

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** ARADB36061
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Thamnophis eques megalops*
COMMON NAME: Northern Mexican gartersnake, Mexican gartersnake, Northern Mexican garter snake
SYNONYMS: *T. subcarinatus megalops*
FAMILY: Serpentes: Colubridae

AUTHOR, PLACE OF PUBLICATION: *Thamnophis eques* was first described as *Coluber eques* by Reuss (1834). Early misapplication of the name was corrected by Smith (1951). *T. e. megalops* was first described by Kennicott, R. 1860. Proc. Acad. Nat. Sci. Philadelphia 12(1861):331.

TYPE LOCALITY: The type locality of *T. e. megalops* was given as "Tucson, Arizona, or Santa Magdalena, Sonora," but it was later restricted to Tucson (Smith and Taylor 1950; Schmidt 1953).

TYPE SPECIMEN: The syntype is USNM 965, collected by Major Emory and A. Schott, date of collection unknown (Cochran 1961).

TAXONOMIC UNIQUENESS: There are about 19 species in the genus, which ranges from southern Canada to Costa Rica. Three subspecies in *T. eques* but only *megalops* occurs in Arizona (Stebbins 1985).

DESCRIPTION: The stout-bodied Northern Mexican gartersnake reaches a maximum length of 44 in (112 cm), with females larger than males. The background color ranges from olive to olive-brown to olive gray. A portion of the lateral stripe occurring on the fourth scale row, distinguish T. eques from other gartersnake species. (USFWS accessed 2011). A pair of large brown spots, extends along the dorsolateral fields, and a light-colored crescent extends behind the corners of the mouth. (Stebbins 1985, USFWS accessed 2011).

AIDS TO IDENTIFICATION: The midstripe separating the blotches behind the head may cause confusion with the black-necked gartersnake (*Thamnophis cyrtopsis*) which is found in the same area. However, the portion of the lateral strip occurring on the fourth scale row distinguished *T. eques* from other gartersnake species (USFWS accessed 2011). *T. e. megalops* is lighter, at least posteriorly, in color; has anterior side stripes on the third and fourth scale rows up from ventrals instead of the second and third; and has a more pronounced crescent-shaped greenish intrusion into the black blotch at the corner of the mouth (Shaw and Campbell 1974).

ILLUSTRATIONS:
Color drawing (Stebbins 1985: plate 42)
Color photo (Behler and King 1979: plate 528)
Color photo (Degenhardt et al. 1996: plate 108)
Color photo (Jeff Servoss, USFWS
http://www.fws.gov/southwest/es/arizona/MexGartersnake.htm).

TOTAL RANGE: Current Range: The species current distribution in Mexico is uncertain; it is likely extirpated from New Mexico. In Arizona, its distribution has been reduced to less than 10 percent of its former range along mainstem rivers. The species is likely extant in fragmented populations within the middle/upper Verde River drainage, middle/lower Tonto Creek, and the Cienega Creek drainage, as well as a small number of isolated wetland habitats in southeastern Arizona. (USFWS accessed 10-31-2011).

Historic Range: Historical distribution in the U.S. included the Santa Cruz, San Pedro, Colorado, Gila, Salt, Agua Fria, Rio Yaqui, and Verde river watersheds in Arizona. In New Mexico, it occupied the upper Gila and San Francisco headwater streams in western Grant and Hidalgo counties. Within Mexico, they historically occurred within the Sierra Madre Occidental and the Mexican Plateau in the Mexican states of Sonora, Chihuahua, Durango, Coahila, Zacatecas, Guanajuato, Nayarit, Hidalgo, Jalisco, San Luis Potosí, Aguascalientes, Tlaxacala, Puebla, México, Michoacán, Oaxaca, Veracruz, and Querétaro. (USFWS accessed 2011).

RANGE WITHIN ARIZONA: *T. e. megalops* occurs in fragmented populations within the middle/upper Verde River drainage (including Oak Creek and the Verde River), middle/lower Tonto Creek, and the Cienega Creek drainage, as well as a small number of isolated wetland habitats in southeastern portions of the state.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: *Thamnophis eques* is active during the warmer months of the year. They may be observed foraging along watercourses, but they are quick to seek shelter in streamside vegetation or in the stream. When threatened, they will flatten their heads and bodies and will strike repeatedly. They will also emit a foul-smelling musk from glands at the base of the tail when handled roughly (Degenhardt et al. 1996). On several occasions at Bubling Ponds Hatchery, Northern Mexican gartersnakes (*T. eques meglops*) have been observed preyed upon by Largemouth Bass (*Micropterus salmoides*) in a holding pond (Young and Boyarski, 2012).

REPRODUCTION: Sexual maturity of the larger females occurs in two to three years, and males in two years. They are ovoviviparous, mating in April and May in the northern distribution, giving birth live birth to between 7 and 26 neonates (average 13.6 inches) in July and August. (USFWS accessed 2011; also Rosen and Schwalbe 1988; Stebbins 1985). There

is a record of a wild-caught female birthing 38 live young, but this record number may have been influenced by the artificially dense prey based afforded by a fish hatchery which served as the habitat for this individual (Nowak and Boyarski, 2012).

FOOD HABITS: *T. e. megalops* requires a stable native prey base. They are surface-active at ambient temperatures ranging from 71° F to 91° F and forages along banks of waterbodies primarily feeding upon native fish (e.g. Gila topminnow, desert pupfish, etc.) and adult and larval native ranid frogs (e.g. lowland leopard frog, Chiricahua leopard frog, etc.). Their diet is also supplemented with earthworm and vertebrates such as small rodents, lizards, salamanders, and hylid frogs (treefrogs); and where they co-occur, on juvenile nonnative bullfrogs and/or bullfrog tadpoles. (Rosen and Schwalbe 1988, USFWS accessed 2011). In 2008 and 2011, snakes were observed near Bubbling Ponds Hatchery, attempting to prey upon nonnative Chinese Mystery Snails (*Cipangopaluina chinensis*). (Herpetological Reviews, 2012). In both instances, the snake's lower jaw had become stuck in the snail. The snake from 2008 died after being run over by a car.

HABITAT: In Arizona, three general habitat types are used: 1) source area ponds and cienegas; 2) lowland river riparian forests and woodlands; 3) upland stream gallery forests. *T. eques megalops* avoids steep mountain canyon stream habitats (Rosen and Schwalbe 1988). It is most abundant in densely vegetative habitat. This snake uses densely vegetated cienegas, cienega streams, and stock tanks in the southern part of its distribution in Mexico and within its historical distribution in New Mexico (USFWS accessed 2011).

ELEVATION: Usually ranges between 3,000 and 5,000 ft (914 - 1525 m) (Rosen and Schwalbe 1988), but may reach elevations of 8,500 feet (2593 m).

PLANT COMMUNITY: Rosen and Schwalbe (1988) documented *T. e. megalops* occupying cienegas, and marsh areas in desert grassland, and occasionally in desert and lower oak woodland habitats.

POPULATION TRENDS: Population numbers are decreasing, with extirpations at several localities since 1950 as habitat is changed and introduced predators invade habitat (Rosen and Schwalbe 1988). It is likely extirpated from New Mexico and its current distribution in Mexico is uncertain. In Arizona, its distribution has been reduced to less than 10 percent of its former range along large mainstem rivers, and is extant in fragmented populations; found in small isolated populations in southeastern portion of state. (USFWS accessed 2011)

Reasons for decline include the following threats: 1) destruction or modification of its habitat; 2) predation from nonnative bullfrogs; significant reductions in its native prey base, from predation/competition associations with nonnative species; and 4) genetic effects from fragmentation of populations caused by the first 3 threats listed. (USFWS accessed 2011).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: LT (USDI, FWS 2014) with Proposed CH
[C USDI, FWS 2008]
[C USDI, FWS 2009-2011]
[None USDI, FWS 1996, 2006]
[C2 USDI, FWS 1991, 1994]
[C2 USDI, FWS 1985, 1989]

STATE STATUS: 1, at full species level (AZGFD, AWCS 2022)
[1A (AGFD SWAP 2012)]
[WSC (AGFD, WSCA 1996 in prep)]
[State Candidate AGFD, TNW 1988]

OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 2007, 2013)
[Forest Service Sensitive USDA, FS Region 3 1988, 1999]
A, Determined Threatened in Mexico (Proyecto de Norma Oficial Mexicana 2010)
[Determined Threatened, Secretaría de Medio Ambiente 2000]
[Listed Rare, Secretaría de Desarollo Social 1994]

MANAGEMENT FACTORS: Threats include: 1) destruction and modification of its habitat; 2) predation from nonnative bullfrogs; 3) significant reductions in its native prey base from predation/competition associations with nonnative species; 4) genetic effects from fragmentation of populations cause by the previous three threats listed. (USFWS accessed 2011).

PROTECTIVE MEASURES TAKEN: There is no open season for the take of this species. (Arizona Game and Fish Commission Order 43). This species is protected in Arizona and it is illegal to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect it.

The Northern Mexican Gartersnake was listed as Threatened under the Endangered Species Act in July 2014. Critical habitat has been proposed, but not yet determined.

SUGGESTED PROJECTS: Monitoring of current distribution, habitat use, and population numbers to aid in management of the species. Management should consider cienega restoration and protection, including exotic species control or eradication.

LAND MANAGEMENT/OWNERSHIP: US Fish and Wildlife: San Bernardino NWR; US Forest Service: Coconino, Coronado, and Tonto National Forests; Bureau of Land

Management: Phoenix, Tucson, and Yuma Field Offices; Bureau of Indian Affairs: Fort Apache Reservation; Department of Defense: Fort Huachuca Military Reservation; State Land Department; Private.

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Young, M.E. and V.L. Boyarski. 2012. *Thamnophis eques megalops*, Predation. Herpetological Review 43(3).

MAJOR KNOWLEDGEABLE INDIVIDUALS:

Phil Rosen, University of Arizona, Tucson, Arizona.

Cecil Schwalbe, US Geological Survey, Sonoran Desert Field Station, University of Arizona, Tucson, Arizona.

Tom Van Devender, Arizona Sonoran Desert Museum, Tucson, Arizona.

Jeff Servoss, US Fish and Wildlife Service, Arizona Ecological Services Office, Phoenix, AZ.

Erika M. Nowak, Colorado Plateau Research Station and Department of Biological Sciences, Northern Arizona University, Flagstaff, AZ.

ADDITIONAL INFORMATION:

The past range at its northern end has been confused by nomenclature (Black-necked Garter Snake was named *T. eques cyrtopsis*). Much of the earlier literature on this species is found under the names *Eutaenia megalops*, *T. subcarinatus megalops*, or *T. macrostemma megalops* (Degenhardt et al. 1996).

Revised: 1991-03-28 ( )
1995-03-24 (JMH)
1997-03-06 (SMS)
1998-01-30 (SMS)

2001-05-02 (RAM)
2011-10-31 (SMS)
2012-07-20 (BDT)
2023-05-03 (MBL)

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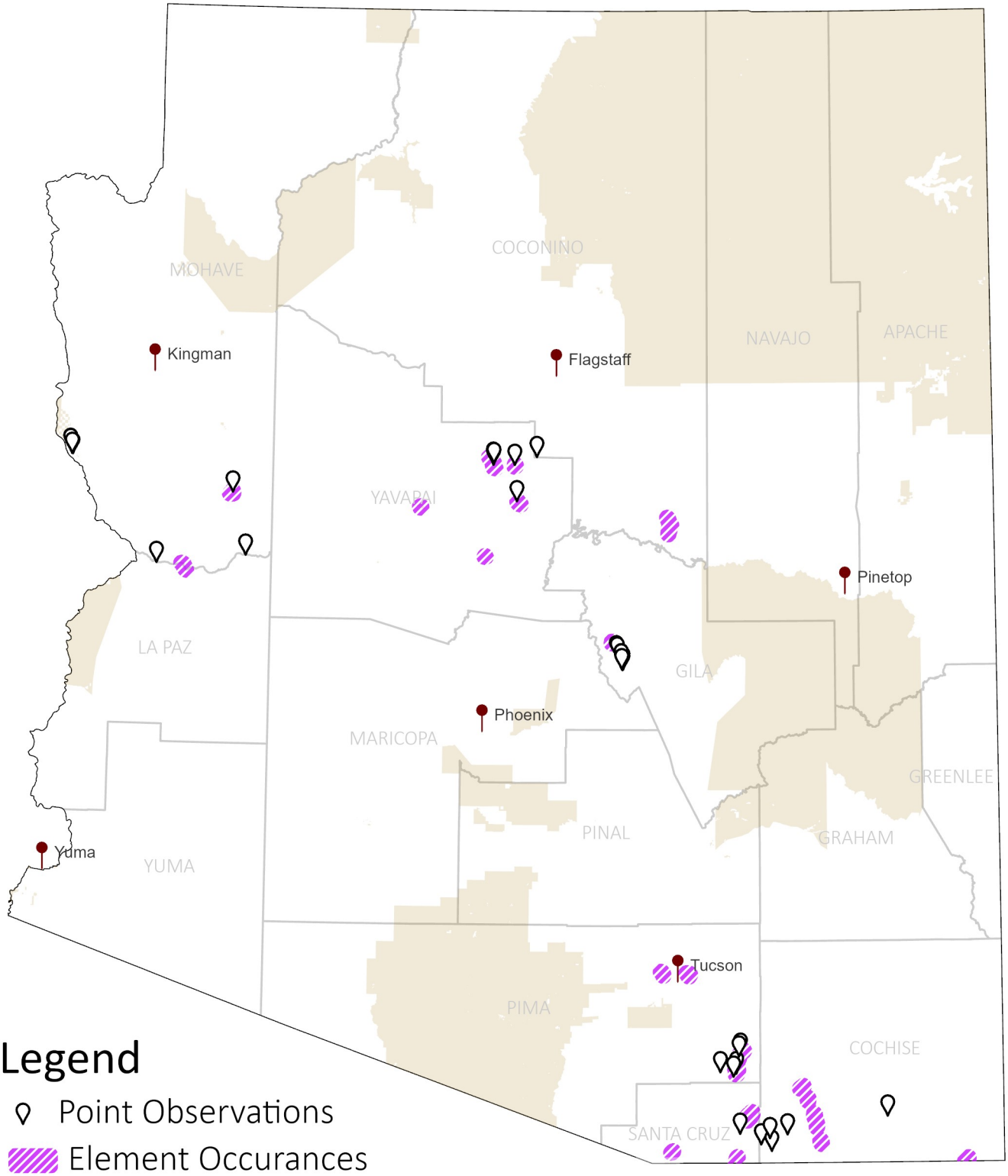
Thamnophis eques megalops

Northern Mexican Gartersnake



Legend

- Point Observations
- Element Occurances
- Tribal Lands
- Counties

N

0 50 100 Kilometers

Element Occurrence data represent areas where a population occurs. Point Observations are not guaranteed to have the same quality control as Element Occurrences.

Heritage Data Management System
2022-07-26

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** ARACF14180
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Sceloporus slevini*
COMMON NAME: Slevin's Bunchgrass Lizard, Bunch Grass Lizard
SYNONYMS: *Sceloporus scalaris*
FAMILY: Sauria: Iguanidae

AUTHOR, PLACE OF PUBLICATION: Smith 1939.

TYPE LOCALITY:

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: Some 54 species in genus *Sceloporus*, from southern Canada to Panama.

DESCRIPTION: Snout-vent length 1.6 – 2.75 inches (4.1-7.0 cm). Ground color various shades of brown above, with white or orange strip on each upper side and brown blotches on back; rear edge of each dorsal blotch black, edged with lighter color; dark blotch at front of shoulder. Some male and female individuals may lack blotches. Males usually have blue belly patch, which is absent or reduced in the female. Lateral scales parallel dorsal rows; in other species they are diagonal upward. (Stebbins 2003).

AIDS TO IDENTIFICATION: A mountain form distinguished from all our other Spiny Lizards by arrangement of femoral-pore rows, and scales on sides of the body. Femoral rows are separated at midline by only 1 or 2 scales rather than 3 or more, and the lateral scale rows parallel the dorsal rows. In other Spiny Lizards the lateral scale rows extend diagonally upward. In the Striped Plateau Lizard (*S. virgatus*) with which the Bunchgrass Lizard coexists in some areas, no blue markings exist on the belly and the lateral scales are in diagonal rows. (Stebbins 2003).

ILLUSTRATIONS:
Color drawing (Stebbins 1966: Pl. 22)
Color drawing (Stebbins 2003: Pl. 30)
Color photo (Behler and King 1979: Pls. 367,368)

TOTAL RANGE: Mountains of extreme southeast Arizona and southwest New Mexico, south into Sierra Madre Occidental to Pueblo, Mexico.

RANGE WITHIN ARIZONA: Huachuca, Dragoon, Santa Rita, Whetstone and Chiricahua mountains; also at lower elevations in Empire Valley, San Rafael Valley, and vicinity of Elgin, Santa Cruz County, and Santa Rita and Mustang mountains, Pima County.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Most active during periods of summer rains. Look for them in late morning on warm, bright days.

REPRODUCTION: Clutch of 9-13 eggs laid from June to August.

FOOD HABITS: Eats insects (hemipterans, ants, beetles, wasps, grasshoppers) and spiders.

HABITAT: In Arizona, inhabits primarily coniferous forest to 10,000 feet, rarely desert-grassland. Can be found on the ground in and among bunchgrass, usually in open sunny areas.

ELEVATION: Based on unpublished records in the HDMS (AGFD, accessed 2003), elevation in Arizona ranges from 4,300 – 9,480 ft. (1311-2890 m). Over its entire range, it is found mainly above 6,000 ft. (1830 m) in sunny patches of bunchgrass in open coniferous woods; also occurs as low as 4,000 ft. (1220 m), on grassy plains (Stebbins 2003).

PLANT COMMUNITY: Coniferous forest to grassy plains.

POPULATION TRENDS: Thriving at many localities within very limited Arizona range.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: 1B (AGFD SWAP 2012)
OTHER STATUS: Bureau of Land Management Sensitive (USDI, BLM AZ 2010)
Forest Service Sensitive (USDA, FS Region 3 2007, 2013)
[Not Forest Service Sensitive (USDA, FS Region 3 1999)]
[Forest Service Sensitive (USDA, FS Region 3 1988)]

MANAGEMENT FACTORS: None

PROTECTIVE MEASURES TAKEN: None

SUGGESTED PROJECTS: Distribution, habitat, population and life history studies needed.

LAND MANAGEMENT/OWNERSHIP: BLM – Tucson Field Office; DOD – Fort Huachuca Military Reservation; USFS – Coronado National Forest; San Rafael Ranch Natural Area; Private.

SOURCES OF FURTHER INFORMATION

REFERENCES:

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

T.R. Van Devender – Arizona-Sonora Desert Museum, Tucson.

R.E. Ballinger - University of Nebraska, Lincoln.

J.D. Congdon - Savannah River Ecology Lab., Aiken, SC.
F.R. Gelbach - Baylor University, Waco, Texas.

ADDITIONAL INFORMATION:

Revised: 1991-03-28( )
2000-04-03 (SMS)
2003-12-22 (SMS)

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** ARAAE01040
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Kinosternon sonoriense sonoriense*
COMMON NAME: Sonora Mud Turtle
SYNONYMS:
FAMILY: Testudines:Kinosternidae

AUTHOR, PUBLICATION: Le Conte 1854:184

TYPE LOCALITY: "Tucson in Sonora" Arizona

TAXONOMIC UNIQUENESS: Two subspecies in Arizona, *K. s. longifemorale* and *K. s. sonoriense*; *K. s. longifemorale* (Sonoyta Mud Turtle) restricted to Quitobaquito Spring, Organ Pipe Cactus National Monument.

DESCRIPTION: Stebbins 1985: plate 17.

AIDS TO IDENTIFICATION:

ILLUSTRATIONS:

TOTAL RANGE: Lower Colorado and Gila rivers eastward throughout Gila drainage in Arizona and New Mexico. Drainages in Mexico between and including the Sonoyota and Yaqui Rivers. From near sea level to about 6700 feet.

RANGE WITHIN ARIZONA: Gila River drainage of central and southeast Arizona; Quitobaquito Spring, Pima County; Laguna Dam area, Yuma county; and Big Sandy-Burro River drainages.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY:

REPRODUCTION: Lays 2-9 eggs from May - September. Eggs buried in soil on land.

FOOD HABITS: Insects, crustaceans, snails, fish, frogs and some plant material.

HABITAT: Springs, creeks, ponds and waterholes of intermittent streams.

ELEVATION: Sea level to about 6,700 ft. (2,044 m).

PLANT COMMUNITY:

POPULATION TRENDS:

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: 1B (AGFD SWAP 2012)
OTHER STATUS: Bureau of Land Management Sensitive (USDI, BLM AZ 2010)

MANAGEMENT FACTORS:

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: Distribution, habitat, population and life history studies.

LAND MANAGEMENT/OWNERSHIP:

SOURCES OF FURTHER INFORMATION

REFERENCES:

Arizona Game and Fish Department. 2012. Arizona's State Wildlife Action Plan 2012-2022. Phoenix, AZ.

Behler, J.L. and F.W. King. 1979. The Audubon Society field guide to North American reptiles and amphibians. Alfred A. Knopf, New York.

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USDI, Fish and Wildlife Service. 1999. Endangered and Threatened Wildlife and Plants; Review of Plant and Animal Taxa that are Candidates or Proposed for Listing as Endangered or Threatened; Annual Notice of Findings on Recycled Petitions; Annual Description of Progress on Listing Actions; Proposed Rule. Federal Register 64(205):57538.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

Phil Rosen - University of Arizona, Tucson.

ADDITIONAL INFORMATION:

Revised: 1991-03-27( )
1997-12-26 (SMS)
1999-12-20(DJG)

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ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** ARAAF01010
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Gopherus morafkai*
COMMON NAME: Sonoran Desert Tortoise
SYNONYMS: *Gopherus agassizii, Xerobates agassizii*, *Scaptochelys agassizii*
FAMILY: Testudines: Testudinidae

AUTHOR, PLACE OF PUBLICATION: Brown. 1912. Proceedings of the Californian Academy of Natural Science Identified by R.W. Murphy et al., 28 Jun 2011.

TYPE LOCALITY: From Tucson (approximate location 32°7'N, 110°56'W, elevation 948 m), Pima County, Arizona, U.S.A.

TYPE SPECIMEN: CAS (California Academy of Sciences) 33867; juvenile collected on 9 July 1912 by H. Brown and preserved in ethanol.

TAXONOMIC UNIQUENESS: The genus *Gopherus* contains five extant species in the southern US and Mexico (Crumly 1994). Although previously recognized as being taxonomically unique, "Mojave" and "Sonoran" populations of the desert tortoise differ genetically (Jennings 1985; Lamb et al. 1989; Glenn et al. 1990) and morphologically (Germano 1993). These two species are distinctly recognized under the Endangered Species Act (USDI, FWS 1990).

DESCRIPTION: Adults reach sizes of about 20-36 cm (8-15 in) and flat, pear-shaped shell, usually a brownish carapace, with definite pattern and prominent growth lines on both the plastron and carapace (Stebbins 1985). The plastron is yellowish without a hinge. The limbs are very stocky, including elephant-like rear limbs; the forelimbs are covered with large conical scales. The tail is short. Males have elongate gular (throat) shields, and chin glands on each side of the lower jaw are larger than that of the female.

AIDS TO IDENTIFICATION: Two species occur in Arizona. Individuals from the Sonoran desert tortoise tend to be more pear-shaped, with more narrow front ends, wider (flared) rear ends, and flatter carapaces. Mojave desert tortoises tend to be more oval and have a higher domed carapace (Germano 1993).

ILLUSTRATIONS:
Black and white drawing (Stebbins 1966: plate 15)
Color photo (Behler and King 1979: plate 328)
Black and white photos (Bury and Germano 1994: pp. vi, 56, 72, 94, 108)

TOTAL RANGE: *Gopherus morafkai* occurs south and east of the Colorado River through Arizona and Mexico. This species occurs from Northern Sinaloa north to Northern Arizona. The distribution of the desert tortoise covers the broadest range of latitude, climate, habitats, and biotic regions of any North American tortoise (Germano et al. 1994).

RANGE WITHIN ARIZONA: *Gopherus morafkai* includes those tortoises south and east of the Colorado River, from locations near Pearce Ferry in Mojave County, to the south beyond the International Boundary, and at many scattered locations in between (Arizona Interagency Desert Tortoise Team [AIDTT] 2000). The northeastern-most tortoise records in Arizona occur along the Salt River near Roosevelt Lake in Gila County, although populations here have not been confirmed with recent observations. The middle San Pedro River drainage in Cochise County harbors the eastern-most substantial tortoise populations. Desert tortoise observations have been confirmed in extreme southeastern Cochise County, but most probably represent released captives (pets). Tortoises have been found as far southwest as the Barry M. Goldwater Range, Yuma Proving Ground, and the Cabeza Prieta National Wildlife Refuge.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Adequate shelter is one of the most important habitat features of the Sonoran desert tortoises in the Sonoran Desert (Averill-Murray et al., *in press* a). Tortoises escape extreme temperatures in burrows, which stay cooler in the summer and warmer in winter than outside temperatures. Tortoises require loose soil to excavate (usually shallow) burrows below rocks and boulders, but they may also use rock crevices, which they may or may not be able to modify. Tortoises occasionally burrow under vegetation, less often dig soil burrows on more or less open slopes, and use caliche caves in incised wash banks. They will also rest directly under live or dead vegetation without constructing a burrow.

Activity begins in the spring as temperatures warm, then decreases as the season moves into the summer drought in May and June (Averill-Murray et al., *in press* a). Much more time is spent in burrows where they conserve water and energy. The onset of the summer monsoon season signals the beginning of peak tortoise activity, dramatically rising in early August and peaking during August-September (Averill-Murray et al., *in press* a). Activity decreases sharply after mid-October, as tortoises withdraw to winter hibernacula, which are similar shelters to those they use during activity seasons (Averill-Murray et al., *in press* a). Even during the winter, some individuals may bask, move, or even forage on warm winter days. Females may terminate hibernation as early as late February, while some males may remain inactive through the entire spring (Bailey 1992; Martin 1995; Vaughan 1984).

Tortoises grow relatively rapidly early in life and reach about 1/2 their maximum size at 5-10 years of age (Murray and Klug 1996). The growth rate tapers off as individuals slowly approach their maximum size. After 10-20 years of age, tortoises reach sexual maturity at about 220 mm (8.7 in) carapace length. Males reach larger sizes than females in some populations but not in others.

Some hatchlings emerge in late summer, but some may overwinter in the nest before emerging in the spring (Averill-Murray et al., *in press* b). Little information exists on survivorship of young tortoises, but given adult longevity and their capacity to produce more offspring than necessary to replace mortalities in the population, juvenile survivorship is probably very low (Averill-Murray et al., *in press* b). The Adult tortoise carapace provides protection against potential predators, contributing to their high survivorship. Mountain lions appear to be the primary natural predator on adult tortoises in the Sonoran Desert, but lions usually have not contributed to elevated rates of mortality in population studies so far (Averill-Murray et al., *in press* b).

REPRODUCTION: Mating occurs during the summer monsoon season. Females begin laying eggs, which are fertilized by sperm stored from the previous summer's mating, just before or during the onset of the summer rains in late June or early July (Averill-Murray and Klug 2000). They lay only one clutch of about six eggs, although larger clutch sizes have been reported. The proportion of females reproducing is related to the amount of recent rainfall and vegetation available for forage. Females usually lay their eggs inside burrows with adequate soil development, and many remain at and defend their nests against predators.

FOOD HABITS: Desert tortoises eat a variety of annual and perennial grasses, forbs, and succulents (see references in Grover and DeFalco 1995). Sonoran tortoise forage includes (in order of relative abundance in scat fragment analysis) dicot annuals, grasses, herbaceous perennials, trees and shrubs, subshrubs/woody vines, and succulents (Van Devender and Schwalbe 1999). The most common food items in microhistological analyses included the woody vine *Janusia gracilis* and various mallows (Malvaceae) (Van Devender and Schwalbe 1999).

HABITAT: *Gopherus morafkai* occurs primarily on rocky slopes and bajadas of Mojave and Sonoran desertscrub (see references in AIDTT 2000). In the Lower Colorado River Valley subdivision, caliche caves in cut banks of washes (arroyos) are also used for shelter sites. Shelter sites are rarely found in shallow soils.

ELEVATION: *Gopherus morafkai* occurs at elevations ranging from about 155 m (510 ft) in Mojave desertscrub to semidesert grassland and interior chaparral at about 1615 m (5300 ft; AGFD unpubl. data).

PLANT COMMUNITY: *Gopherus morafkai* is found within Sonoran and Mojave desertscrub, including a variety of biotic communities within or extending from the Sonoran Desert but most often in paloverde-mixed cacti associations. Tortoises are found in the Arizona Upland and Lower Colorado River subdivision of the Sonoran Desert, desert grassland, and ecotonal areas consisting of Sonoran desertscub with elements of Mojave desertscrub and juniper woodland, interior chaparral, and desert grassland (Averill-Murray and Klug 2000).

POPULATION TRENDS: *Gopherus morafkai*'s density varies greatly among 18 tortoise plots surveyed in Arizona, ranging from about 15 to over 150 adult tortoises per square mile (Averill-Murray and Klug 2000). Abundance at 17 of these sites appears to be stable or increasing; only one (Maricopa Mountains) has been observed to decrease radically in size. A localized die-off also apparently occurred in the late 1990s at Ragged Top Mountain on the Ironwood Forest National Monument (R. Repp, pers. comm. 1999).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: CCA (USDI, FWS, 2015)

Status Listings as subspecies:
[Mohave Desert pop. LT (USDI, FWS 1990)]
[Sonoran Desert pop. C (USDI, FWS 2010)]
[Sonoran Desert pop. C (USDI, FWS 2011)]
[Sonoran Desert pop. None (USDI, FWS 1996)]
[Sonoran Desert pop. C2 USDI, FWS 1991, 1994]
[Both populations C2 USDI, FWS 1985, 1989]

STATE LIST STATUS: 1A (AGFD SWAP 2012)
[WSC (AGFD, WSCA in prep)]
[State Candidate AGFD, TNW 1988]

OTHER STATUS:
Not Bureau of Land Management Sensitive – Sonoran Pop. (USDI, BLM AZ 2010)
[Bureau of Land Management Sensitive – Sonoran Pop. (USDI, BLM AZ 2008)]
Forest Service Sensitive for Sonoran Desert pop. (USDA, FS Region 3 2007; Coronado, Prescott & Tonto National Forests)
Determined Threatened (Secretaria de Medio Ambiente 2000)
[Determined Threatened, Secretaria de Desarrollo Social 1994]

MANAGEMENT FACTORS: The *Management Plan for the Sonoran Desert Population of the Desert Tortoise in Arizona* provides a list of recommendations from which managers may choose when developing management prescriptions for specific areas (AIDTT 1996). These recommendations include options for species management (including collecting; reintroduction, repatriation, and translocation; and predator control) and habitat management (including forage and surface management and spatial considerations).

PROTECTIVE MEASURES TAKEN: Desert tortoises may not be collected from the wild in Arizona (Arizona Game and Fish Commission Order 43). Desert tortoises possessed without a special license prior to April 28, 1989, may be possessed, transported, and given away (Arizona Game and Fish Commission Rule R12-4-407.A.1). Desert tortoises possessed pursuant to R12-4-407.A.1 may be propagated, progeny may be held in captivity for 24 months from the date of hatching, when they shall be disposed of by gift or as directed by the Arizona Game and Fish Department. The person receiving a desert tortoise given away pursuant to this rule is also exempt from special license requirements.

SUGGESTED PROJECTS: A continuing state-wide monitoring program is of primary importance in collecting the data necessary for effective desert tortoise management in Arizona (AIDTT 1996). Additional research is also necessary to develop a more complete understanding of tortoise populations and how they respond to different land management actions, including research on population dynamics (reproductive ecology, life tables, population viability, population genetics), habitat (effects of exotic vegetation, fire, and grazing), disease (URTD, cutaneous dyskeratosis), and effectiveness of mitigation measures (AIDTT 1996). The extent of desert tortoise distribution in extreme northwest, southwest, southeast Arizona is needs extensive survey efforts and monitoring.

LAND MANAGEMENT/OWNERSHIP: Bureau of Indian Affairs: Fort McDowell Reservation, Gila River Reservation, Salt River Pima Reservation, San Carlos Apache Reservation, San Xavier Reservation, Tohono O'Odham Nation. **Bureau of Land Management**: Kingman Field Office, Lake Havasu Field Office, Phoenix Field Office, Tucson Field Office, Safford Field Office, Tucson Field Office, Yuma Field Office. **Department of Defense**: Barry M. Goldwater Range, Yuma Proving Ground. **US Forest Service**: Coronado National Forest, Prescott National Forest, Tonto National Forest. **US Fish and Wildlife Service**: Buenos Aires National Wildlife Refuge, Cabeza Prieta National Wildlife Refuge, Cibola National Wildlife Refuge, Havasu National Wildlife Refuge, Imperial National Wildlife Refuge, Kofa National Wildlife Refuge. **National Park Service**: Organ Pipe Cactus National Monument, Saguaro National Park, Lake Mead National Recreation Area. **State Land Department**. **Arizona Game and Fish Department:** Powers Butte Wildlife Area. **Arizona State Parks Department**: Picacho Peak State Park. **Private land**. **Other lands**: McDowell Mountain Regional Park, Phoenix South Mountain Park, White Tank Regional Park.

SOURCES OF FURTHER INFORMATION

REFERENCES:

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Arizona Interagency Desert Tortoise Team. 1996. Murray, R.C., and V. Dickinson (eds.). Management Plan for the Sonoran Desert population of the desert tortoise in Arizona. Arizona Interagency Desert Tortoise Team. 55pp.

Arizona Game and Fish Department. 2012. Arizona's State Wildlife Action Plan 2012-2022, Phoenix, AZ.

Arizona Interagency Desert Tortoise Team. 2000. Averill-Murray, R.C. (ed.). Status of the Sonoran populations of the desert tortoise in Arizona: an update. Arizona Interagency Desert Tortoise Team and Arizona Game and Fish Department, Phoenix. 48 pp.

Auffenberg, W., and R. Franz. 1978. *Gopherus agassizii*. Catalogue of American Amphibians and Reptiles 212.1-212.2.

Averill-Murray, R.C., and C.M. Klug. 2000. Monitoring and ecology of Sonoran desert tortoises in Arizona. Nongame and Endangered Wildlife Program Technical Report 161. Arizona Game and Fish Department, Phoenix. 104pp.

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ADDITIONAL INFORMATION:

The genus *Gopherus* is said to derive from gaufre (French)-a honeycomb-due to the many holes made by members of the genus (Gotch, A.F. 1995. Latin Names Explained: A Guide to the Scientific Classification of Reptiles, Birds, and Mammals. Facts on File, New York. p. 56.). The specific name *agassizii* is in honor of the Swiss zoologist J.L.R. Agassiz (1807-1873).

Revised: 1991-04-02 ( )
1993-05-25 (LAJ)
1997-11-13 (SMS)

2001-03-28 (RAM)
2010-12-14 (SMS)
2013-04-02 (CFP)
2015-10-07 (BDT)

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Arizona Game and Fish Department. 20XX **(= year of last revision as idicated at end of abstract)**. X…X **(=taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.