# ECOLOGICAL OVERVIEW SUMMARY:
# FEDERAL PARCEL AND OFFERED LANDS PARCELS

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## EXECUTIVE SUMMARY

WestLand Resources, Inc. (WestLand) was retained by Resolution Copper Company to conduct a range of ecological studies of several parcels of land located within the state of Arizona. This report summarizes the biological resources of one parcel of US Forest Service land (the Federal Parcel) and five privately owned parcels (the Offered Lands). The work was conducted in anticipation of a possible land exchange: the five privately owned parcels would be exchanged for the Federal Parcel. In addition, a sixth privately owned parcel was similarly studied and its biological resources are summarized herein, but this sixth parcel, while not included in the offered lands package may have merits as a mitigation parcel to offset potential future resource impacts.

Our findings are as follows:

- Two biomes are present on the Federal Parcel while nine biomes are represented on the Offered Lands.
- The total area of the Federal Parcel is 1,225 hectares (3,025 acres) while the Offered Lands total 1,834 hectares (4,525 acres).
- Wetlands and floodplains on the Federal Parcel total 0.81 hectares (2 acres) and 0 hectares, respectively, and 715.1 hectares (1,767 acres) and 535 hectares (1,321 acres) are on the Offered Lands.
- No invasive/exotic plants and one exotic animal were observed on the Federal Parcel, while four invasive/exotic plants and four invasive/exotic animals were observed on the Offered Lands.
- One special status species was observed on the Federal Parcel and three were observed on the Offered Lands (plus one additional species on the sixth privately owned parcel).
- One additional special status was identified as potentially present on the Federal Parcel while 14 additional special status species were identified as potentially present on the Offered Lands.
- Formal cultural resources surveys conducted on the Federal Parcel identified Euro-historic and indigenous sites. No formal surveys were conducted on the Offered Lands; however, unique petroglyphs are present on one of the Offered Lands parcels.
- Recreational activities on the Federal Parcel include dispersed recreation and bouldering, while dispersed recreation (encroaching from adjacent public land) occurs on the Offered Lands.
- The Federal Parcel is under public ownership managed by the US Forest Service as part of the Tonto National Forest; the Offered Lands are private parcels which are generally in-holdings within public land managed by various federal and state agencies.
- Human impact to the Federal Parcel includes minimal direct impact from drilling and mining activities as well as indirect impacts from livestock grazing. The Offered Lands have been directly impacted minimally by human activities, while indirect impacts from livestock grazing has been significant in some areas.
- Other rare or unique biological characteristics associated with the Federal Parcel are related to the unique geology of the site (Apache Leap Tuff) which is represented as a fractal surface which

appears to uniquely organized the vegetation present. Within the Offered Lands, three rare or unique characteristics are present:

- A mesquite bosque on one parcel is one of the largest remaining in Arizona.
- Grassland on one parcel has been excluded from livestock grazing since 1969 and is one of the best studied grasslands in southern Arizona.
- Perennial streams on one parcel may include native fishes separated from predatory non-natives by ephemeral stream reaches.

The Offered Lands demonstrate a high level of species diversity and sustainability. The opportunities created by federal management of the Offered Lands (in the event of a land exchange) include:

- Seamless management,
- Restoration of a range of biotic communities impacted by livestock grazing,
- Preservation of intact biotic communities such as mesquite bosque and grasslands (both imperiled in the southwestern US),
- Preservation of an extremely rare cultural resource, and
- Exclusion or management of invasive non-native species.

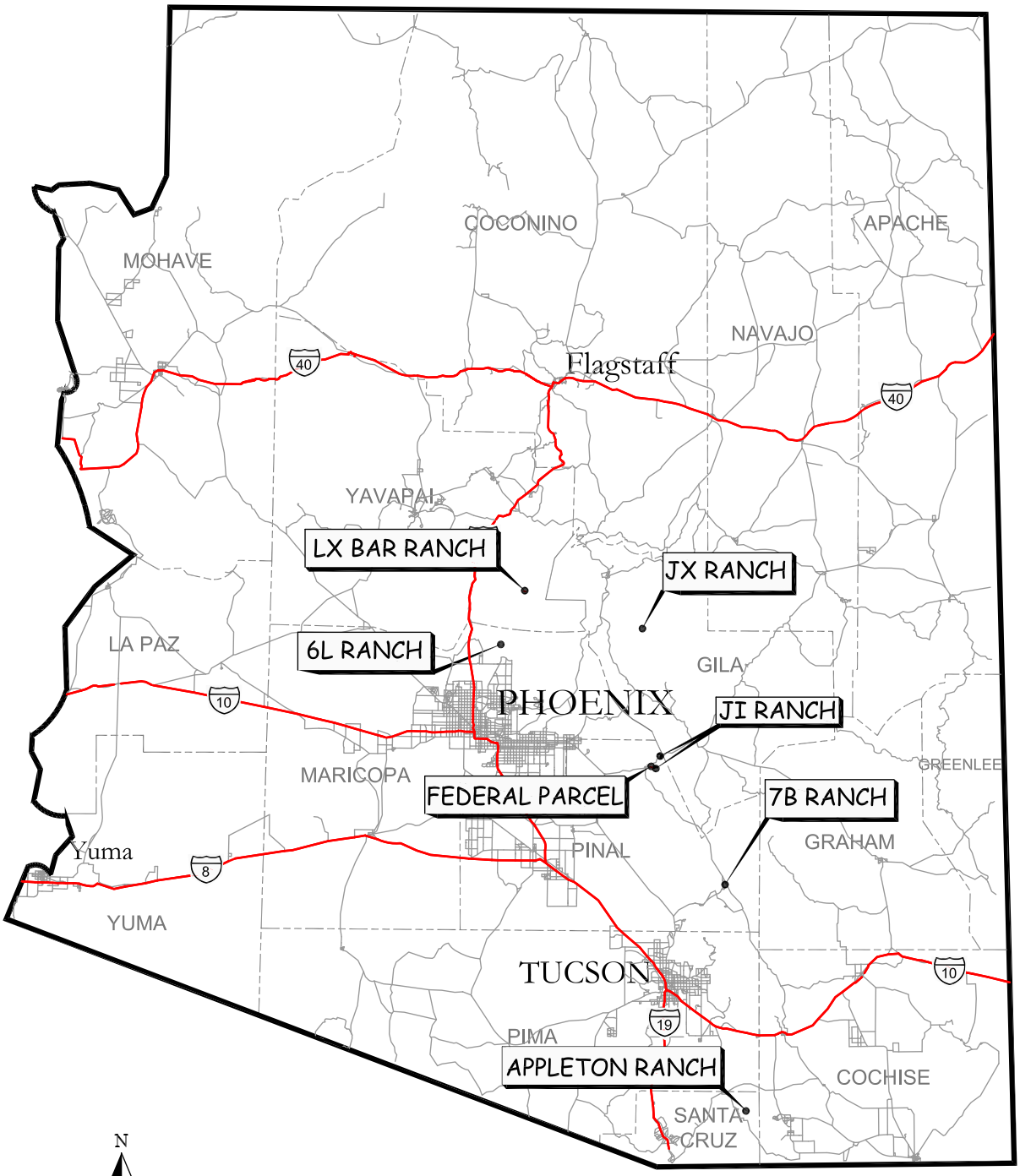
# 1.0 INTRODUCTION

WestLand Resources, Inc. (WestLand) was retained by Resolution Copper Company to conduct a range of ecological studies of several parcels of land located within the state of Arizona. Based on those individual studies, this report summarizes the biological resources of one parcel (the "Federal Parcel") and five privately owned parcels (the "Offered Lands"). In addition, a sixth parcel (the "Private Parcel"), while not a part of the Offered Lands package, has potential for use as a mitigation site. The locations of the parcels are depicted in Figure 1. The Federal Parcel is located on US Forest Service (USFS) land (i.e., within the Tonto National Forest) while the Offered Lands and the Private Parcel are private holdings generally within other federal- or state-managed land. The work was conducted in anticipation of a possible land exchange: the Offered Lands, as a package, would be exchanged for the Federal Parcel. The Private Parcel was similarly studied but is not a part of the possible land exchange.

This report is organized as follows:

- Section 1.0, Introduction (this section)
- Section 2.0, Ecological Overview Summary, presents the results of the ecological studies completed at each of the parcels
- Section 3.0, Comparison of Ecological Values and Opportunities, compares these aspects of the Federal Parcel to the Offered Lands
- Section 4.0, Conclusion, identifies the net benefits which may result from the land exchange
- Section 5.0, References, lists the key literature used in preparing this report. A detailed reference list is provided in each of the WestLand reports summarized in this document.

# ARIZONA

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ECOLOGICAL OVERVIEW SUMMARY

GENERAL LOCATION MAP

Figure 1


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# 2.0 ECOLOGICAL OVERVIEW SUMMARY

This chapter summarizes the ecological characteristics of the Federal Parcel, each of the Offered Lands parcels, and the Private Parcel. For each property, source documents are cited and background information provided. Given the importance of water availability on biological resources, the surface water resources (including wetlands and floodplains, based on Federal Emergency Management Agency [FEMA] and National Wetlands Inventory [NWI] mapping, where available, or our observations) at each property are described. Subsequent paragraphs summarize vegetation, wildlife, and special status species on each property, based on our observations and data review.

## 2.1 FEDERAL PARCEL

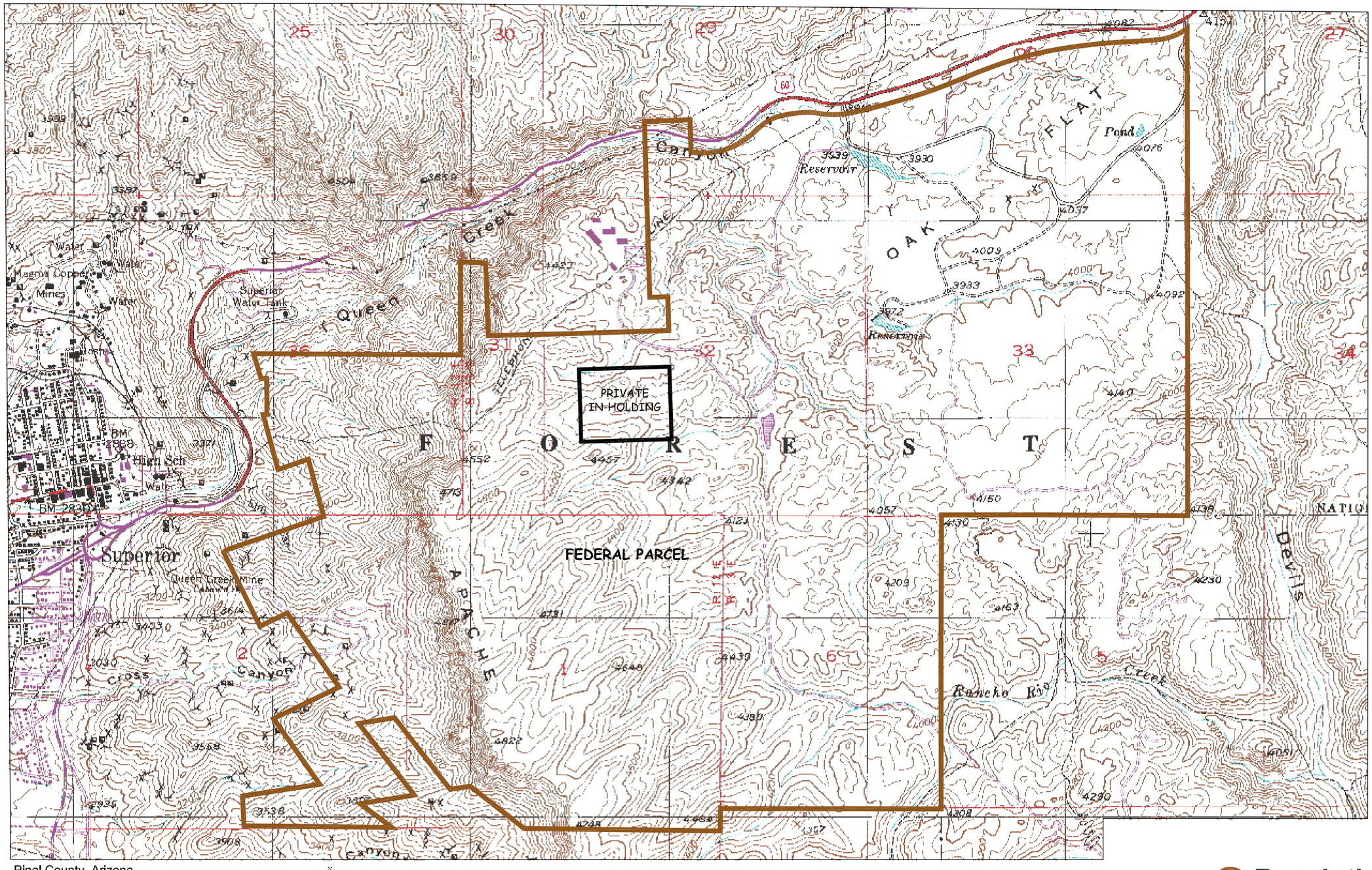
The ecological studies conducted at the Federal Parcel are documented in the following reports prepared by WestLand:

- *Federal Lands Biological Assessment/Evaluation* (2003),
- *Baseline Biology and Land Use Report* (2004), and
- *Wetlands and Floodplains Report* (2004).

This section summarizes these reports to provide comparison to the Offered Lands and Private Parcel ecological overview reports (which are summarized in Sections 2.2 and 2.3, respectively).

The Federal Parcel is comprised of approximately 1,225 hectares (3,025 acres) located in Pinal County, Arizona (Photograph 1; Figure 2). The Federal Parcel boundary is established along existing mining claim boundaries, staked as early as 1917. The parcel excludes a 40-acre in-holding of private land. Land within the Federal Parcel boundary is principally federal land managed by the USFS as the Tonto National Forest. Surrounding land includes additional Tonto National Forest lands (some with unpatented mining claims), state lands, and privately held land within the town of Superior. The Federal Parcel is divided along the western side by the Apache Leap escarpment, which forms a large west-facing cliff. East of the

**Photograph 1. Vegetation and rock outcrops on the Federal Parcel.**

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ECOLOGICAL OVERVIEW SUMMARY

FEDERAL PARCEL

Figure 2

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Apache Leap, volcanic outcrops of the Apache Leap Tuff formation dominate the landscape. The land west of the Leap is characterized by steeply dipping Paleozoic sedimentary limestone and quartzite.

The geological event that formed the Apache Leap Tuff was an immense pyroclastic (ash) flow 18.6 million years ago from the Superstition caldera in what is today the Superstition Mountains. This massive flow, cooling rapidly after placement, initially formed a relatively flat surface, sloping gently to the east and steeply to the west, with the Apache Leap cliff most notable. Since formation, fracturing, faulting, and erosion has transformed the exposed surface into a rugged terrain of bedrock outcrops bisected with narrow canyons such as Queen Creek and Devils Canyon. The rugged terrain is essentially a folded fractal surface of protrusions (outcrops) and incisions (canyons) of dramatic visual appearance and with a significant impact on biological resources.

For most of the Federal Parcel, the material produced by the geological processes that created these features does not accumulate; soil is absent or represented by only a thin veneer of coarse rock fragments. Soil has accumulated locally within the major drainages of the Federal Parcel, and it is here that tall Emory oaks, hackberries, and other trees are found. Elsewhere on the Federal Parcel the vegetation is low chaparral where shrubs have rooted into the soil-bearing fractures and faults. On the most stable exposed rock surfaces, only lichens can grow. Thus, many plant species (and their populations) on the Apache Leap Tuff are distributed today in accord with the fractal aspects of the once monolithic, now fractured and eroded, ash flow.

Land use on the Federal Parcel historically and currently includes mining, dispersed and concentrated recreational activities (at or near the Oak Flat Campground), and cattle grazing. It should be noted that cattle grazing has been reduced significantly in recent years. In the past, cattle grazing on the Federal Parcel was, in part, associated with allotments tied to the nearby JI Ranch described in Section 2.3. The following paragraphs summarize surface water, vegetation, wildlife, and special status species present on the Federal Parcel.

### *Surface Water*

Surface water within the Federal Parcel is limited to three stock water impoundments and storm water flows in the ephemeral washes. Water also collects in boulder pools and *tinajas* in the drainage bottoms. The stock ponds contain water seasonally, with the exception of one reservoir which even in the driest year on record (2002) still contained water year-round.

Based on our observations, there are no floodplains on this site. The headwaters areas of Queen Creek and Devils Canyon, as well as the named and unnamed tributaries to these watercourses, are ephemeral to intermittent streams. An estimated 20,000 meters (65,600 feet) of intermittent to ephemeral stream channels pass through the Federal Parcel. Hydro-, meso-, and xero-riparian habitat is present along stream channels and/or pools. Obligate and facultative species, and hydric soils, are present surrounding some of the pools. We estimate an area of 0.81 hectares (2 acres) of wetlands on this parcel.

### *Vegetation*

Vegetation within the Federal Parcel is transitional between Sonoran Desertscrub and Interior Chaparral (Brown 1994), with the Apache Leap being roughly the demarcation between the two plant communities. Typical of Interior Chaparral, vegetation east of the Leap is dominated by scrub live oak (*Quercus turbinella*) and pointleaf manzanita (*Arctostaphylos pungens*). Vegetation occurring west of Apache Leap includes jojoba (*Simmondsia chinensis*), foothill palo verde (*Cercidium microphyllum*), saguaro (*Carnegia gigantea*), and crucifixion thorn (*Canotia holocantha*). The Jojoba-Mixed Scrub series of Sonoran Desertscrub dominates the area west of the Leap. This series has a characteristic "chaparral-like" physiognomy which distinguishes it from other desertscrub series and aligns it more closely with the Interior Chaparral biotic community east of the Leap.

Vegetation in the Oak Flat Campground area has been impacted by recreation, camping, and off-road vehicle use. Damage in the form of loss of shrubs, young trees, and ground cover is most evident along washes and trails that cross the site. Cattle grazing has impacted vegetation throughout the property. Additionally, vegetation shows evidence of stress related to recent drought conditions. The years 2002 and 2003 were the driest in the 80-year precipitation record for Superior. Based on our observations in those 2 years, no berries were produced by pointleaf manzanita or one-seed juniper (*Juniperus monosperma*) throughout the property. Berries were also not present on the shrubs of chaparral honeysuckle (*Lonicera interrupta*), Wright silktassel (*Garrya wrightii*), and redberry buck-thorn (*Rhamnus crocea*). The vast majority of two common oaks, Emory oak (*Quercus emoryi*) and scrub live oak, did not produce acorns. Rainfall in 2004 was sufficient for berries and acorns to be produced by nearly all trees.

### *Wildlife*

Wildlife species observed[1] by WestLand on the Federal Parcel include the following amphibians: canyon tree frog (*Hyla arenicolor*), tiger salamander (*Ambystoma tigrinum*) (an introduced species), and red spotted toad (*Bufo punctatus*). Twelve reptile species were observed, including collared lizard (*Crotaphytus collaris*), regal horned lizard (*Phrynosoma solare*), ring-necked snake (*Diadophis punctatus*), black-necked garter snake (*Thamnophis cyrtopsis*), and tiger rattlesnake (*Crotalus tigris*). Active raptor nests were observed on the Federal Parcel for three species: Cooper's hawk (*Accipiter cooperii*), American peregrine falcon (*Falco peregrinus anatum*), and zone-tailed hawk (*Buteo albonotatus*). Also observed adjacent to the Federal Parcel were common blackhawks (*Buteogallus anthracinus*) and turkey vultures (*Cathartes aura*). Numerous other bird species were observed, including canyon wren (*Catherpes mexicanus*), Gambel's quail (*Callipepla gambelii*), verdin (*Auriparus flaviceps*), phainopepla (*Phainopepla nitens*), black phoebe (*Sayornis nigricans*), great blue heron (*Ardea herodias*), and Mexican jay (*Aphelocoma ultramarine*). Ten mammal species were identified within the

[1] Wildlife observations included direct visual observation and the observation of tracks and scat.

Federal Parcel, either through direct observation or identification of scat or tracks, including rabbit (*Sylvilagus* sp.), coyote (*Canis latrans*), and gray fox (*Urocyon cinereoargenteus*).

#### *Special Status Species*

One federally listed endangered species for Pinal County, the Arizona hedgehog cactus (*Echinocereus trigochidiatus* var. *arizonicus*), occurs on the Federal Parcel. Eight individual plants were located during survey, though the majority of the Parcel is not occupied by this species. This species is more abundant in the area north of US Highway 60, adjacent to the Federal Parcel. One other federally listed endangered species, the lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*), was determined to have the potential to occur on the property but was not observed.

### 2.2 OFFERED LANDS

The Ecological Overview studies for the Offered Lands are documented in the following reports, all prepared by WestLand:

- *Ecological Overview, Appleton Ranch Parcel, Santa Cruz County, Arizona* (2004)
- *Ecological Overview, JX Ranch Parcel, Gila County, Arizona* (2004)
- *Ecological Overview, LX Bar Ranch Parcel, Yavapai County, Arizona* (2004)
- *Ecological Overview, 6L Ranch Parcel, Yavapai County, Arizona* (2004)
- *Ecological Overview, San Pedro River* [7B Ranch] *Parcel, Pinal County, Arizona* (2003*)*, and
- *Wetlands and Floodplains Report* (2004).

Based on these reports, the following subsections introduce these properties, describe the types and relative condition of the biological resources found, and evaluate the ecological characteristics of each of the Offered Lands.

### 2.2.1 Appleton Ranch

The Appleton Ranch is an approximately 357-hectare (881-acre) site in Santa Cruz County, Arizona (Photograph 2; Figure 3). The Appleton Ranch is comprised of a set of three private tracts consisting of 10 parcels within the larger (3,240-hectare [8,000-acre]) Appleton-Whittell Research Ranch (Research Ranch). The Appleton Ranch is located in the Canelo Hills, on the western flanks of the Huachuca Mountains in southeastern Arizona. The Appleton Ranch is largely undisturbed by recent human activity, but historical cattle grazing has impacted natural vegetation throughout the property. Cattle grazing has been excluded from the Research Ranch since 1969; this exclusion has also applied to the contiguous Appleton Ranch. The following paragraphs describe the surface water, vegetation, wildlife, and special status species present on the Appleton Ranch.

**Photograph 2. Windmill in Vaughn Canyon on Appleton Ranch.**

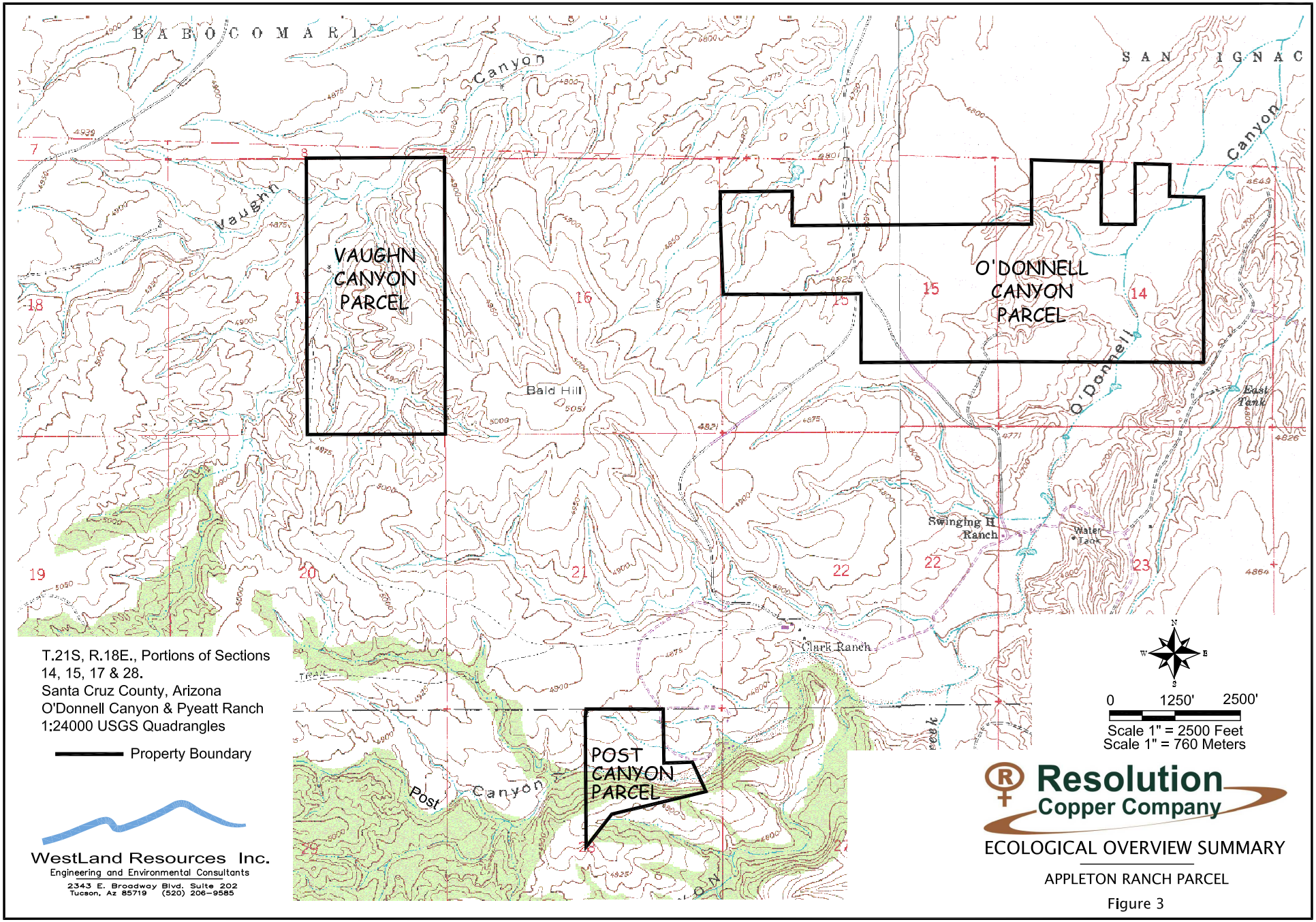
#### *Surface Water*

The Appleton Ranch is situated along the streambeds and adjacent upland areas of Post, Vaughn, and O'Donnell canyons, all of which include ephemeral streams. Several small, perennial (in some cases artificially enhanced) stock tanks are present.

Approximately 44 hectares (108 acres) of the Appleton Ranch are identified by FEMA as areas of 100-year flood. The three on-site streams are ephemeral watercourses totaling approximately 8,200 meters (26,900 feet) in length. Mesoriparian and xeroriparian habitat is present along the stream channels. No facultative or obligate wetlands species, and no hydric soils, were observed along the stream channels. The perennial stock ponds are bordered by hydro-riparian habitat, with hydric soils and obligate wetland species. We estimate an area of 0.04 hectares (0.1 acres) of wetlands surrounding the impoundments at this site.

#### *Vegetation*

The vegetation of the Appleton Ranch (Photograph 3) in the Vaughn Canyon and O'Donnell Canyon tracts is predominantly grassland while the Post Canyon Tract is predominantly Madrean Evergreen Oak Woodland. Grasslands are much more extensive on the Research Ranch (including the Appleton Ranch) than are the oak woodlands. The grassland varies markedly in species composition, density, and structure in the northern part of the Appleton Ranch, with short-grass grasslands found on south-facing slopes, medium sized grass stands in swales and north-facing ridges, and tall-grass stands of sacaton (*Sporobolous wrightii*) in the broader floodplains along several of the washes on the Appleton Ranch.

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Grazing by cattle has had a pronounced effect on grassland in the Sonoita Basin. Nearly everywhere in this grassland where cattle currently graze the grasses are short, with curly mesquite (*Hilaria belangeri*) predominant. This was also true at the time cattle were removed from the Appleton Ranch. Weeds were reportedly conspicuous in the years immediately after the grazing was stopped. Today much of the property is medium to tall grass. Additionally, large areas of the Research Ranch were contour plowed in the 1940s and 1950s and then seeded with two African grasses, Lehmann lovegrass (*Eragrostis lehmanniana*) and Boer lovegrass (*E. chlorometas*). The populations that established at the time of seeding persist and continue to spread today. Boer lovegrass, although occupying less of the grassland than Lehmann lovegrass, is more troublesome because it has displaced native grasses to form a nearly continuous monotypic stand of grass. Conversely, Lehmann lovegrass on the Appleton Ranch is usually part of a heterogeneous community of native forbs and grasses.

**Photograph 3. Grassland in O'Donnell Canyon within Appleton Ranch.**

### *Wildlife*

Wildlife species observed by WestLand on the Appleton Ranch include whitetail deer (*Odocoileus virginianus*), mule deer (*O. hemionus*), pronghorn antelope (*Antilopara americana*), javelina (*Tayassu tajuca*), coyote, mountain lion[2] (*Felis concolor*), skunk (species uncertain), non-native goldfish (*Carassius auratus*)[3], desert pupfish (*Cyprinodon macularius*), gilded flicker (*Coloptes auratus*), Mexican jay, meadowlark (*Sturnella* sp.), mourning dove (*Zenaida macroura*), raven (*Corvus* sp.), Cassin's sparrow (*Aimophila cassinii*), and white-crowned sparrow (*Zonotrichia atricapilla*).

### *Special Status Species*

The screening analysis conducted by WestLand indicates that at least three federally listed threatened, endangered, proposed, or candidate species for Santa Cruz County could likely occur on the Appleton Ranch. These species are the Huachuca water umbel (*Lilaeopsis schaffneriana*), desert pupfish, and lesser long-nosed bat. Ten additional threatened, endangered, proposed, or candidate species have some potential to occur on the property. These species are the Canelo Hills ladies'-tresses (*Spiranthes delitescens*), Gila chub (*Gila intermedia*), Gila topminnow (*Poeciliopsis occidentalis*), Chiricahua leopard frog (*Rana chiricahuensis*), bald eagle (*Haliaeetus leucocephalus*), Mexican spotted owl (*Strix*

[2] Mountain lion tracks were observed by WestLand personnel in the bottom of Post Canyon on March 17, 2004.
[3] WestLand personnel observed numerous feral goldfish in a tank above Post Canyon.

*occidentalis lucida*), yellow-billed cuckoo (*Coccyzus americanus*), ocelot (*Felis pardalis*), jaguar (*Pathera onca*), and Huachuca springsnail (*Pyrogulopsis thompsoni*).

### 2.2.2 JX Ranch

The JX Ranch is approximately 59.5 hectares (147 acres) of land along Turkey and Rock Creeks in Gila County, Arizona (Photograph 4; Figure 4). This parcel is located in the highlands of the Sierra Ancha, on the eastern side of the crest of the range. The JX Ranch is a private in-holding within the Tonto National Forest, and was historically used as a residence and for limited livestock grazing. The JX Ranch is currently vacant and is only used for unauthorized dispersed recreational activities by persons accessing the property from adjacent public lands. The following paragraphs describe the surface water, vegetation, wildlife, and special status species present on the JX Ranch.

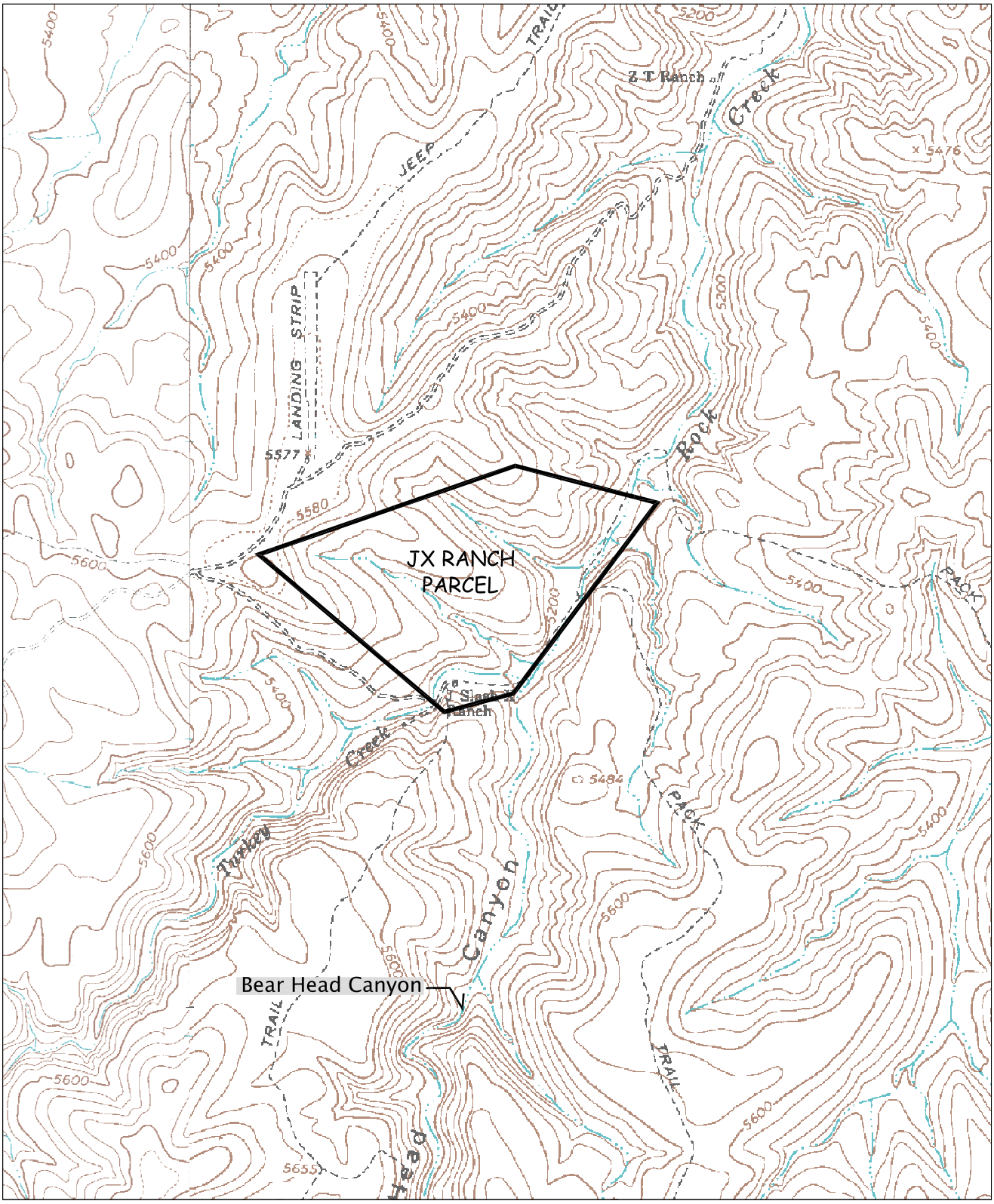
**Photograph 4. Homestead Site at JX Ranch.**

#### *Surface Water*

Turkey and Rock Creeks (Photograph 5) are perennial to intermittent streams. No ponds are present on the JX Ranch.

The floodplain on the site follows the Turkey Creek and tributary stream channels for a total length of 2.2 kilometer (km) (1.4 mile) within the property, and averaging approximately 0.1 km (0.06 mile) wide. Thus, the floodplain on this site is estimated to encompass 0.22 square km (0.08 square miles), equaling 0.002 hectares (0.005 acres). Based on our observations, Turkey Creek is a perennial stream for the 850-meter (2,800-foot) reach passing through the property. Mesoriparian habitat is present along the stream channel. Facultative wetlands species were present, but minimal obligate wetlands species (a few introduced willows) and no hydric soils were observed. Tributaries, approximately 1,350 meters (4,400 feet) in length, are intermittent to ephemeral, with meso- and xeroriparian habitat present. No wetlands were delineated on this parcel.

**Photograph 5. Rock Creek within the JX Ranch Parcel.**




Gila County, Arizona
T.7N.,R.12E. Portion of Sections 3 & 4
Located on the Copper Mt. USGS Quadrangle

Property Boundary

0 800' 1600'

Scale 1" = 1600 Feet
Scale 1" = 488 Meters

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ECOLOGICAL OVERVIEW SUMMARY

JX RANCH PARCEL

Figure 4

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### *Vegetation*

Drawing freely from Brown (1994), the four biotic communities and characteristic species on the JX Ranch are:

- Petran Montane Conifer Forest. Ponderosa pine (*Pinus ponderosa*) is the dominant species in this community, with Gambel oak (*Quercus gambelii*) and New Mexican locust (*Robinia neomexicana*) also present.
- Madrean Evergreen Woodland. This community includes Emory oak, Arizona white oak (*Quercus arizonica*), one-seed juniper, and netleaf oak (*Q. reticulata*).
- Interior Chaparral. The most characteristic woody species of this community is pointleaf manzanita; however, skunkbush sumac (*Rhus aromatica*), buckbrush (*Ceanothus fendleri*), and other species are also present.
- Montane Riparian Wetland. This is a "canyon bottom forest" which can occur along perennial and near-perennial streams at moderate elevations. Narrowleaf cottonwood (*Populus angustifolia*) is an unambiguous element of this biotic community. Willows (*Salix* spp.), New Mexican locust, and trees like pine and oaks found on the higher slopes are also constituents of this community.

Fires have had a significant effect on the vegetation in the Sierra Ancha. The 2003 summer fire in the Sierra Ancha burned, by our estimate, one-third of the vegetation on and near the JX Ranch. It appears that the drier chaparral and open woodlands experienced a greater percent loss of cover than the more mesic slopes and canyon bottoms. Some areas burned intensely, with the resulting loss of complete stands of one-seed juniper, Ponderosa pine, and manzanita. The several riparian tree species (narrow-leaf cottonwood, sycamore [*Platanus* spp.], willow) each appear to have been remarkably sensitive to the fire, with death of trunks even when evidence of fire was minimal. Each of these riparian species appears to be capable of soboliferous regeneration (resprouting at the base of the trunk).

### *Wildlife*

Wildlife species observed by WestLand on the JX Ranch include elk (*Cervus elaphus*), deer (*Odocoileus* spp.), Stellar's jay (*Cyanocitta stelleri*), Mexican jay, raven, wild turkey (*Meleagris gallopavo*), white-breasted nuthatch (*Sitta carolinensis*), sapsucker (*Sphyrapicus* sp.), northern flicker (*Coloptes auratus*), Hutton's vireo (*Vireo huttoni*), dark-eyed junco (*Junco hyemalis*), and caddisfly species in the order Trichoptera. It should be noted that the field reconnaissance at the JX Ranch was conducted in February, when wildlife activity is relatively low and migratory birds are not present. Wintering birds were noted. A more extensive list of wildlife (especially migratory birds) could be created in either spring or fall.

### *Special Status Species*

The screening analysis conducted by WestLand indicates that four federally listed threatened, endangered, proposed, or candidate species for Gila County have the potential to occur on the property. These species

are the Arizona agave (*Agave arizonica)*, Chiricahua leopard frog, bald eagle, and Mexican spotted owl. None are known to occur on the property.

### 2.2.3 LX Bar Ranch

The LX Bar Ranch is approximately 59.9 hectares (148 acres) of land along Tangle Creek in Yavapai County, Arizona (Photograph 6; Figure 5). The LX Bar Ranch is a private in-holding within the Tonto National Forest, in an area known as Bloody Basin. The property was reportedly homesteaded in the early 1890s for use as winter cattle grazing land. The majority of the LX Bar Ranch is undeveloped land historically used for cattle grazing; however, the property has not been actively used for cattle grazing since the mid 1990s. The following paragraphs describe the surface water, vegetation, wildlife, and special status species present on the LX Bar Ranch.

**Photograph 6. LX Bar Ranch, in mid-ground (darker vegetation) of Bloody Basin.**

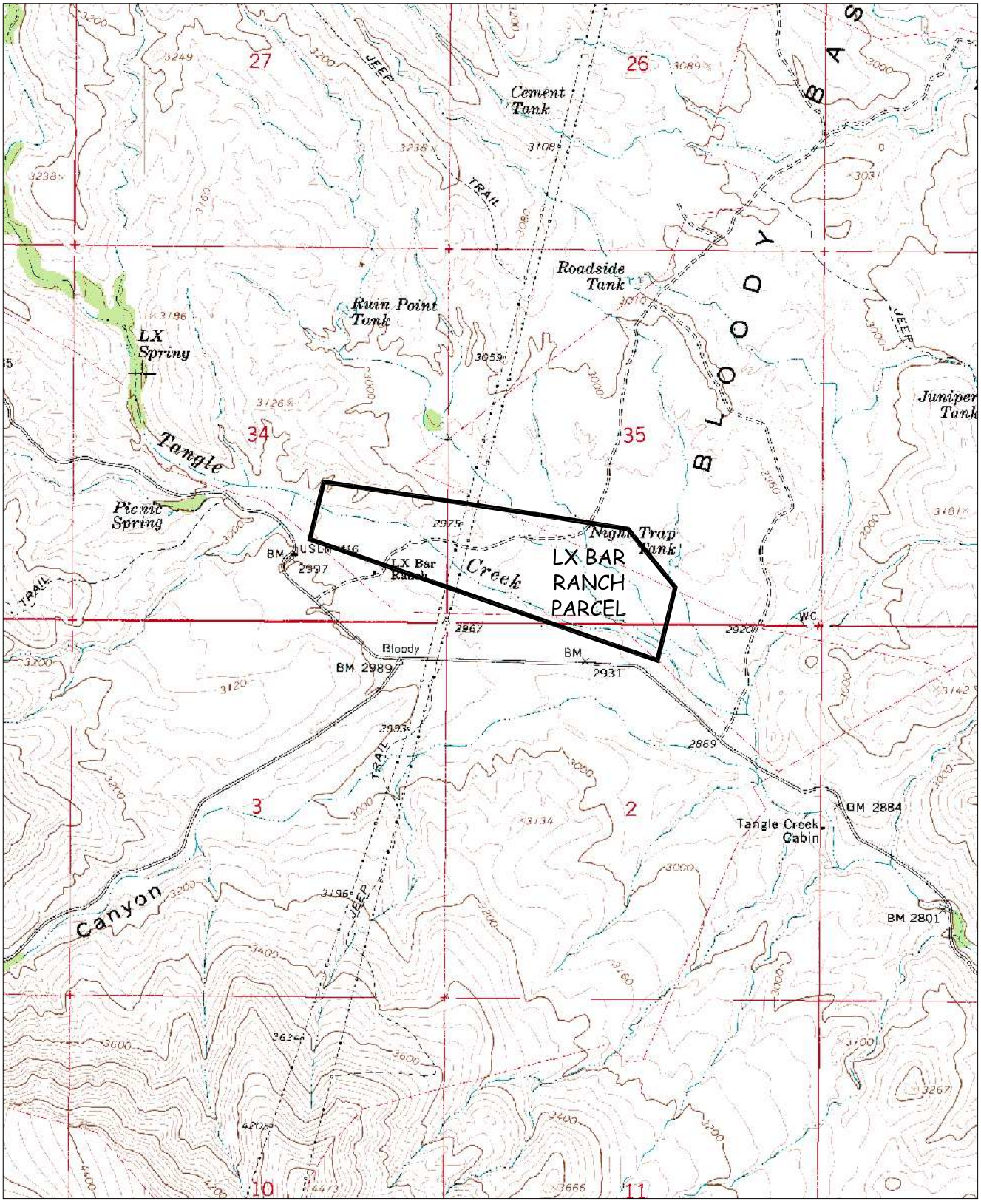
#### *Surface Water*

The LX Bar Ranch is located in the central portion of a broad valley known as Bloody Basin, and includes a reach of Tangle Creek as well as adjacent floodplains and upland areas. Tangle Creek is an ephemeral tributary to the Verde River.

Approximately 44 hectares (108 acres) of the LX Bar Ranch are identified by FEMA as areas of 100-year flood. Based on our observations, Tangle Creek (and its tributaries) is an ephemeral watercourse for the 3,200-meter (10,500-foot) reach passing through the property. Meso- and xeroriparian habitat is present along the stream channels. No obligate or facultative species, or hydric soils, were observed on this site. No wetlands were delineated at this site.

#### *Vegetation*

Vegetation on the LX Bar Ranch can be described in terms of several of Brown's (1994) biotic communities of the southwestern United States and northwestern Mexico. Generally, the area is an interdigitating assemblage of three biotas: Great Basin Conifer Woodland, the Arizona Upland Subdivision of the Sonoran Desertscrub, and Semidesert Grassland, with one final biotic community, the Sonoran Deciduous Riparian Forest, in a defined corridor. The Arizona Upland Subdivision of Sonoran




Yavapai County, Arizona
Bloody Basin 1:24000 USGS Map

Property Boundary

0 1000' 2000'

Scale 1" = 2000 Feet
Scale 1" = 609.5 Meters

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ECOLOGICAL OVERVIEW SUMMARY

LX BAR RANCH PARCEL

Figure 5

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Desertscrub appears to intrude into Bloody Basin along the lacustrine sediments and on bedrock outcrops (with fairly dense stands of saguaros only a mile or two farther east along Tangle Creek). Both the Great Basin Conifer Woodland (represented by one-seed juniper) and Semidesert Grassland (represented by a number of grass species, including the locally dominant side-oats grama [*Bouteloua curtipendula*]) are also clearly present on or adjacent to LX Bar Ranch. Two of these biotas, the conifer woodland and grassland, are evident throughout the property; the third biota occurs only on the cliffs of exposed lacustrine sediments in the northwestern portion. The deciduous riparian forest occurs in and along the floodplains of Tangle Creek.

The LX Bar Ranch has been grazed, probably intensely, in the past. The bare, grassless stream terrace surface and the lack of sapling sycamores and ash (*Fraxinus* spp.) trees may be directly or indirectly related to at least a century of cattle grazing. Historical use of the site as a residence and, more recently, transient worker housing has resulted in a modest amount of land disturbance, including agricultural land clearing. As the property is currently vacant, this disturbance has largely ceased and natural vegetation is gradually returning.

#### *Wildlife*

Wildlife species observed by WestLand personnel on the LX Bar Ranch include black phoebe, rufous crowned sparrow (*Aimophila ruficeps*), mule deer, deer mouse (*Peromyscus maniculatus*), and pack rat (*Neotoma albigula*). It should be noted that the field reconnaissance on this property was conducted in February, when wildlife activity is relatively low and migratory birds are not present. Wintering birds were noted. A more extensive wildlife inventory would be expected in spring and fall.

#### *Special Status Species*

The screening analysis conducted by WestLand indicates that three federally listed threatened, endangered, proposed, or candidate species for Yavapai County have the potential to occur on the LX Bar Ranch. These species are the Arizona agave, Arizona cliffrose (*Purshia subintegra*), and bald eagle. None are known to occur on the property.

### 2.2.4 6L Ranch

The 6L Ranch is approximately 60.4 hectares (149.3 acres) of land in Maricopa County, Arizona (Photograph 7; Figure 6). The 6L Ranch is a private in-holding within the Tonto National Forest. The 6L Ranch was reportedly settled in the 1880s and was used for cattle grazing until 2001. Early history of the 6L Ranch included residential use until the 1920s. Prehistorically, the property was apparently extensively used and occupied by indigenous cultures, as indicated by petroglyphs, stone structures, and grinding areas at several locations along Cave Creek and on ridge tops overlooking the stream. The following paragraphs describe the surface water, vegetation, wildlife, and special status species present on the 6L Ranch. Given the presence of significant cultural resources on this property, a discussion of archaeology is also provided.

**Photograph 7. 6L Ranch lies along the floor of the Cave Creek Canyon, center.**

### *Surface Water*

The 6L Ranch is located in the central portion of the narrow Cave Creek canyon, and includes an approximately 1.6-km (1-mile) reach of Cave Creek as well as adjacent floodplains and upland areas. Cave Creek is an ephemeral to intermittent (with some short perennial reaches on the property) tributary to the Salt River.

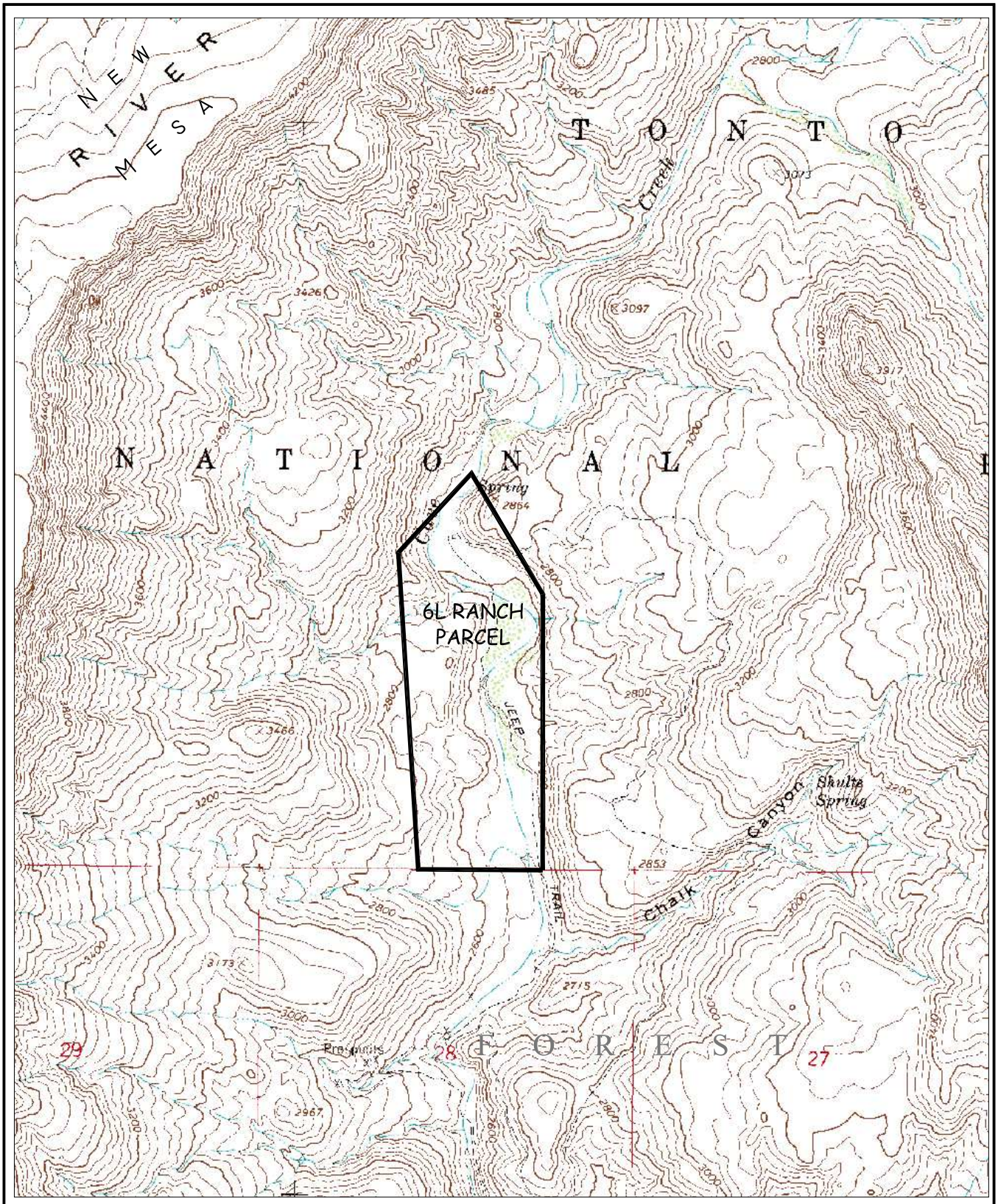
Based on our observations, the floodplain on the site follows the stream channel for the 2.3-km (1.4-mile) reach passing through the property, and averaging approximately 0.25 km (0.15 mile) wide. Thus, the floodplain on this site is estimated to encompass 0.58 square km (0.2 square miles) equaling 0.005 hectares (0.01 acres). Based on our observations, Cave Creek is intermittent along the 2,300-meter (7,500-foot) reach passing through the property, with some perennial pools. Hydro- and mesoriparian habitat is present along the stream channel. Facultative and obligate species, and (to a limited extent) hydric soils, were present surrounding the perennial pools and intermittently along the stream channel. We estimate an area of approximately 0.4 hectare (1 acre) of wetlands along Cave Creek at this site.

### *Vegetation*

The vegetation present on the 6L Ranch is described in terms of Brown (1994) and Turner (1974):

- Interior Chaparral,
- Arizona Upland Subdivision of Sonoran Desertscrub, and
- Deciduous Riparian Forest.

We observed several species that are common constituents of Interior Chaparral, most notably barberry (*Berberis haematocarpa*), buckbrush, and one-seed juniper. Several species that are important components of the Arizona Upland Subdivision of the Sonoran Desertscrub biotic community were




T.7N.,R.4E., Portion of Section 21,
Maricopa County, Arizona
New River Mesa USGS Quadrangle

Property Boundary

0 1000' 2000'

Scale 1" = 2000 Feet
Scale 1" = 609 Meters

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ECOLOGICAL OVERVIEW SUMMARY

6L RANCH PARCEL

Figure 6

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observed on or near the property, including saguaro, foothill palo verde, ironwood (*Olneya tesota*), velvet mesquite (*Prosopis velutina*), and crucifixion thorn. Additional species common to this biotic community observed on both the slopes and terraces included desert hackberry (*Celtis palida*), prickly pear (*Opuntia phaeacantha*), and jojoba. Deciduous Riparian Forest trees seen on the 6L Ranch included Arizona sycamore (*Platanus wrightii*), velvet ash (*Fraxinus velutina*), and Goodding willow (*Salix gooddingii*).

The immense (50+ square mile) Cave Creek watershed, much of it bare bedrock or shallow soils, provides conditions favorable for frequent high-water flood events in the stream above the 6L Ranch. There are several aspects to the vegetation along the Cave Creek channel that appear to be a consequence of strong flood events, most notably the general scarcity of mature ash and sycamores along the channel and a local abundance of smaller shrubs. There are very few of these trees in spite of the presence of perennial pools that would normally support these species. The geomorphology of the Cave Creek channel suggests adult sycamores, willows, and ash are hardly protected from the force of floodwaters. Adult mortality is apparently not offset by seedling recruitment. Perhaps because mortality due to high water floods affects both adults and seedlings, large riparian trees remain rather infrequent in this otherwise well-watered drainage. Non-native tamarisk (*Tamarix ramosissima*), so abundant elsewhere along channels in the southwest, is also infrequent along this portion of Cave Creek. Tamarisk's inability to aggressively colonize channels that receive the full force of flooding (Irvine and West 1979) assures that the 6L Ranch will remain relatively free of this invasive species.

### *Wildlife*

Wildlife species observed by WestLand on the 6L Ranch include mule deer, coyote, grey fox, skunk, raccoon (*Procyon lotor*), rock squirrel (*Citellus variegatus*), pack rat, Gambel's quail, great blue heron, cactus wren (*Campylorrhynchus brunneicapillus*), curve-billed thrasher *(Toxostoma curvirostre),* Gila woodpecker *(Melanerpes uropygialis),* turkey vulture, phainopepla, gilded flicker, mourning dove, raven, green sunfish (*Lepomis cyanellus*), and Sonoran mud turtle (*Kinosternon sonoriense*).

### *Special Status Species*

The screening analysis conducted by WestLand indicates that at least three federally listed threatened, endangered, proposed, or candidate species for Maricopa County have the potential to occur on the 6L Ranch. These species are the bald eagle, Gila topminnow, and cactus ferruginous pygmy-owl (*Glaucidium brasilianum*). None are known to occur on the property.

***Archaeology***

A petroglyph site is present on the 6L Ranch near its southeastern corner. The petroglyphs are carved in the large basaltic boulders that have rolled from the top of Skull Mesa. At least ten panels (rock faces) were found (Photograph 8). Most of the petroglyphs at the site are motifs more commonly used during pre-Ceramic cultural phases of indigenous cultures of southwestern North America. Most of the petroglyphs at this site also are well varnished[4]; some are as darkened by desert varnish as the surrounding rock surfaces. The motifs, the amount of varnishing, and the weathered (naturally pitted) appearance of the petroglyphs suggest these petroglyphs were made during the Archaic Period (circa 8,000 years before present [ca 8,000 ypb] to the beginning of the Ceramic Period, ca 1,800 ybp) or even earlier, by Paleoindians (late Pleistocene, 11,500 to ca 8,000 ybp). All indications are that this is a significant assemblage of archaic petroglyphs. Of particular note, there are two highly varnished, very weathered petroglyphs side by side that look very much like elephants, but probably actually represent Columbian mammoths (*Mammuthus columbi*). Mammoths were present in North America until at least the latest Pleistocene (11,000 ybp) before going extinct. If these petroglyphs actually represent mammoths, they are two of only a handful of known petroglyphs in North America that depict extinct late Pleistocene megafauna.

**Photograph 8. Igneous rock boulders with petroglyphs on the 6L Ranch parcel.**

## 2.2.5 7B Ranch

The 7B Ranch is approximately 1,295 hectares (3,200 acres) of land along the Lower San Pedro River near the town of Mammoth in Pinal County, Arizona (Photograph 9; Figure 7). The majority of the 7B Ranch is undeveloped and is being or has been used primarily for grazing and other agriculture. Approximately 15 percent of the property had been cleared of native vegetation for agricultural uses and was farmed primarily for alfalfa for livestock feed. The fields were fallow during our field reconnaissance. Evidence of past woodcutting exists throughout the 7B Ranch. The following paragraphs describe the surface water, vegetation, wildlife, and special status species present on the 7B Ranch.

[4] Desert varnish is the bacterial-mediated deposition of manganese oxyhydroxides on the surface of rocks. Over enough time, a varnished rock can eventually become dark black. The rate of accumulation of desert varnish is slow. For example, Bull (1991) suggests that 10,000 to 20,000 years would be required for varnish to significantly darken a rock.

**Photograph 9. The San Pedro River Valley; the 7B Ranch parcel lies along the flat valley bottom in mid-ground, with some extension onto the bluffs above (light-colored deposits).**

### *Surface Water*

The 7B Ranch is located in the northern portion of the San Pedro River basin within the floodplain and adjacent upland areas. This unique river is one of only two major rivers that flow north out of Mexico into the United States, and is one of the few remaining free-flowing rivers in the southwest.

Approximately 425 hectares (1,050 acres) are identified by FEMA as areas of 100-year flood; an additional 17 hectares (41 acres) are identified as areas between the limits of the 100-year and 500-year flood. The total area of FEMA-mapped floodplain on this site is 442 hectares (1,092 acres). The NWI map for the 7B Ranch parcel identifies 715 hectares (1,766 acres) of variably classified wetlands. Based on our observations and data review, the San Pedro River is an ephemeral watercourse along the 16,400-meter (53,800-foot) reach passing through the property. Meso- and xeroriparian habitat is present along the stream channel. Facultative wetland species were present. No obligate wetland species or hydric soils were observed.

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NORTH MAMMOTH

MAMMOTH

7B RANCH. PARCEL

inal County, Arizona

Property Boundary

0 1250' 2500'

Scale 1" = 2500 Feet
Scale 1" = 762 Meters

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ECOLOGICAL OVERVIEW SUMMARY

7B RANCH PARCEL

### *Vegetation*

**Photograph 10. Mesquite bosque within the 7B Ranch.**

The two biomes present on the 7B Ranch are described by Brown (1994) as the Sonoran Deciduous Riparian Forest and the Arizona Upland Subdivision of Sonoran Desertscrub. The dominant landscape features within the 7B Ranch, and among the most productive of habitats in the southwest, are the meso- and hydroriparian habitats that line the river corridor. As a component of the Sonoran Deciduous Riparian Forest, a remarkable mesquite *bosque* (Spanish for forest), Photograph 10, stretches for approximately 4.5 km (3 miles) on the east side of the San Pedro River in the center of the property. Once relatively common and of great extent, the mesquite *bosque* is now one of the rarest of riparian habitats in Arizona. Riparian species present within the mesquite *bosque* or the San Pedro river channel include velvet mesquite, desert willow (*Chilopsis linearis*), Goodding willow, graythorn (*Ziziphus obtusifolia*), Fremont cottonwood (*Populis fremontii*), and the non-native tamarisk.

The upland vegetation, described as Paloverde-Cacti Mixed Scrub Series of the Sonoran Desertscrub biome, is best represented on *bajadas* above the San Pedro River floodplain. Dominant plant species in this portion of the 7B Ranch include foothill palo verde, saguaro, velvet mesquite, triangle leaf bursage (*Ambrosia deltoidea*), creosote bush (*Larrea tridentata*), and several species of cholla cacti (*Opuntia* spp).

### *Wildlife*

Wildlife species observed by WestLand personnel on the 7B Ranch include spadefoot toads (*Scaphiopus couchii* and *Spea multiplicata*), red-spotted toad, Sonoran desert tortoise (*Gopherus agassizii*), cactus wren, curve-billed thrasher, Gambel's quail, hooded oriole (*Icterus cucullatus*), mourning dove, phainopepla, red-tailed hawk (*Buteo jamaicensis*), road runner (*Geococcyx californianus*), turkey vulture, vermillion flycatcher (*Pyrocephalus rubinus*), Wilson's warbler (*Wilsonia pusilla*), black-tailed jackrabbit (*Lepus californicus*), coyote, grey fox, desert cottontail (*Sylvilagus auduboni*), desert mule deer (*O. hemionus crooki*), javelina, and several species of skunks and rats.

### *Special Status Species*

The screening analysis conducted by WestLand indicates that three federally listed threatened, endangered, proposed, and candidate species for Pinal County have the potential to occur on the 7B Ranch. These species are the cactus ferruginous pygmy owl, southwestern willow flycatcher (*Empidonax trailii extimus*), and yellow-billed cuckoo.

## 2.3 PRIVATE PARCEL

The Ecological Overview study for the Private Parcel is documented in the following report, also prepared by WestLand:

- *Ecological Overview, JI Ranch Parcel, Gila County, Arizona*

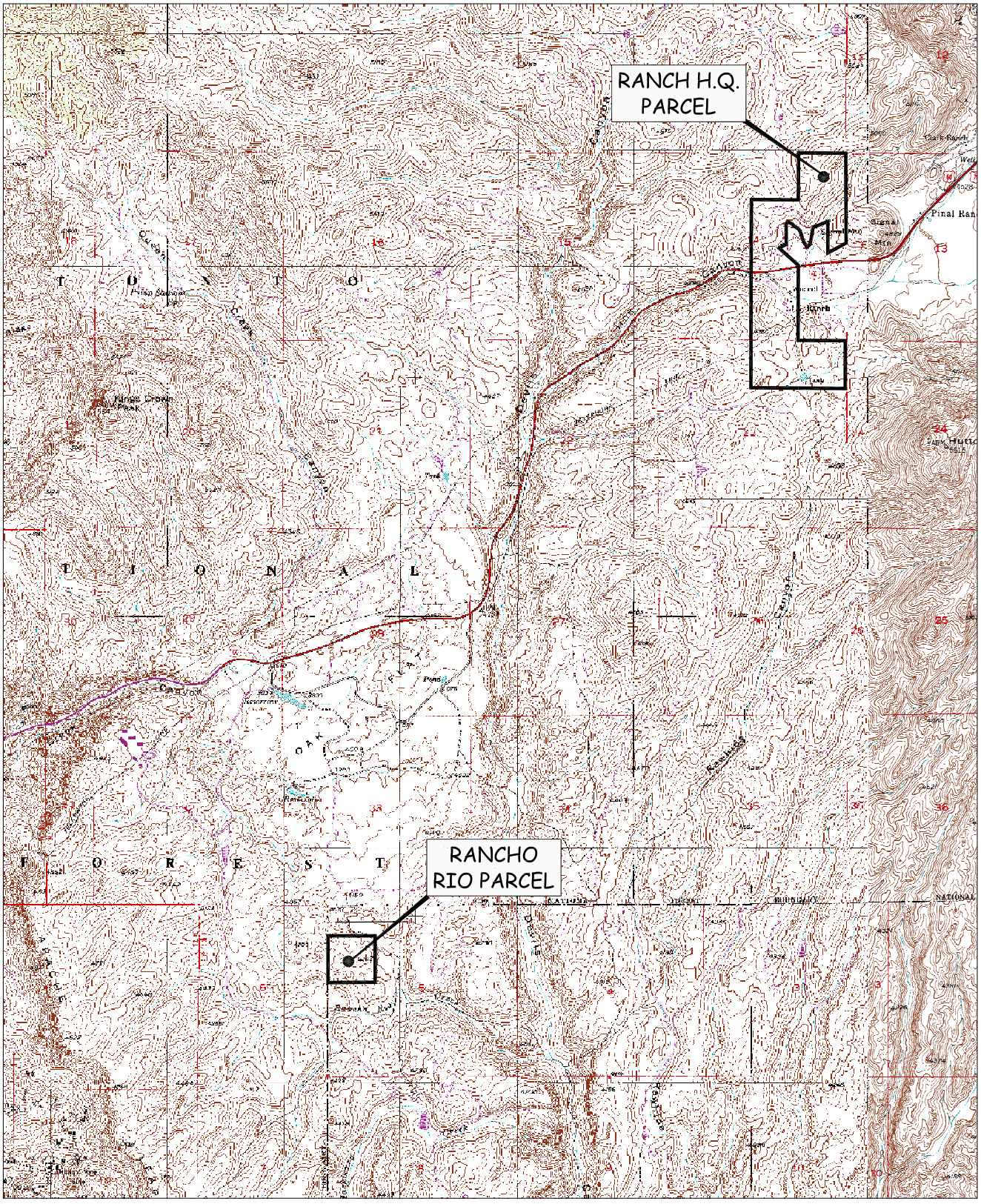
Similar to the Offered Land summary above and based on this report, the following subsections introduce this property, describe the types and relative condition of the biological resources found, and evaluate the ecological characteristics of the parcel.

**Photograph 11. JI Ranch, overview of northern portion.**

The JI Ranch is an approximately 124-hectare (306-acre) site in Pinal County, Arizona (Photograph 11; Figure 8). The JI Ranch was purchased for possible recreational off-setting characteristics. The JI Ranch is comprised of two parcels: a 108-hectare (266-acre) Ranch Headquarters parcel, and a 16-hectare (40-acre) undeveloped parcel. The Ranch Headquarters parcel is a private in-holding within the Tonto National Forest, located along Iron Canyon about 11 kilometers (7 miles) northeast of the town of Superior. Reportedly settled in the 1880s, the JI Ranch (and associated allotments on public land) has been used for cattle grazing throughout its history. The undeveloped parcel is surrounded by Arizona State Lands Department (ASLD) land on the north, east, and south, and by the Tonto National Forest on the west. The undeveloped parcel is located in Rancho Rio Canyon and is used by the Ranch Headquarters tenants for cattle grazing, and is likely also used for dispersed recreational activities from public use of the adjoining state and federal lands encroaching on this private in-holding. The following paragraphs describe the surface water, vegetation, wildlife, and special status species present on the JI Ranch.

### *Surface Water*

Streams in Iron and Rancho Rio Canyons are ephemeral to intermittent, but a perennial pool (stock tank) is present on the Ranch Headquarters parcel. Wetlands and floodplains were not specifically researched for this property; based on a cursory review of readily available maps and our field observations, we estimate approximately 0.4 km (0.25 miles) of ephemeral stream on the Ranch Headquarters parcel and




Pinal County, Arizona

N
W E
S

Property Boundary

0' 2000' 4000'

SCALE 1" = 4000 Feet
SCALE 1" = 1219 Meters

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ECOLOGICAL OVERVIEW SUMMARY

PRIVATE PARCEL (JI RANCH)

Figure 8

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no watercourses on the Rancho Rio parcel. Floodplain area on the Ranch Headquarters parcel is estimated at 0.4 hectares (1 acre), with none on the Rancho Rio parcel. Hydroriparian vegetation surrounding the stock tank on the Ranch Headquarters parcel suggests a perimeter wetlands area; we estimate 0.4 hectares (1 acre) of wetlands here, too. No other wetland areas were observed on the Ranch Headquarters or Rancho Rio parcels.

### *Vegetation*

In the most general terms, the JI Ranch and near vicinity are dominated by plant species associated with Interior Chaparral biotic community, as described by Brown (1994). The area to the east also includes the Madrean Evergreen Woodland biotic community; some of this vegetation may extend onto the Ranch Headquarters parcel. Relatively isolated patches of xero- and mesoriparian vegetation are located in association with the intermittent and ephemeral drainages. Narrow bands of hydroriparian vegetation are present around the margin of the stock tank. Typical of Interior Chaparral, vegetation on the property is dominated by scrub live oak and pointleaf manzanita. Pinyon pine (*Pinus edulis*), alligator juniper (*Juniperus deppeana*), and Emory oak are also abundant. WestLand encountered at least six Arizona hedgehog cacti on the site as well. Vegetation density increased in the vicinity of the stock tank, but we did not observe a significant change in species diversity. One notable species present near the stock tank but not elsewhere on the property is the non-native Bermuda grass (*Cynodon dactylon*).

### *Wildlife*

Wildlife species observed by WestLand on the JI Ranch include collared lizard*,* zebra-tailed lizard (*Callisaurus draconoides*)*,* mosquito fish (*Gambusia affinis*), bluegill (*Lepomis macrochirus*), crayfish (*Euastacus* sp.), coyote, deer, and gray fox. Fourteen bird species were observed, principally around the stock tank, including great blue heron, phainopepla, Gambel's quail, mourning dove, ash-throated flycatcher (*Myiarchus cinerascens*), western kingbird (*Tyrannus verticalis*), black phoebe, canyon wren, northern rough-winged swallow (*Stelgidopteryx serripennis*), and spotted towhee (*Pipilo maculates)*. Given the density of mammal and bird tracks observed around the perimeter of the stock tank and the diversity of bird species noted, the tank appears to be an important water resource for local wildlife.

No native amphibians were observed during the field visit and it is unlikely that any native amphibians persist. The stock tank has a high population of introduced predators including the aforementioned mosquito fish and bluegill.

### *Special Status Species*

The screening analysis conducted by WestLand indicates that two federally listed threatened, endangered, proposed, or candidate species for Pinal County have the potential to occur on the property. These species are the Arizona hedgehog cactus and Mexican spotted owl. As noted above, six Arizona hedgehog cacti were observed by WestLand. Suitable habitat for Mexican spotted owl was identified near the stock tank, but no individuals were observed.

# 3.0 ECOLOGICAL VALUES AND OPPORTUNITIES

## 3.1 FEDERAL PARCEL

The ecological values associated with the Federal Parcel are tied to its geographic location atop the Apache Leap Tuff. The vertical cliffs and the rounded hoodoos of the Apache Leap Tuff are relatively unique physical and visual characteristics of the property. Many plant species (and their populations) on the Apache Leap Tuff are distributed today in accord with the fractal aspects of the once monolithic, now fractured and eroded, ash flow.

Water resources on the Federal Parcel are relatively limited: most drainages and ponds are ephemeral to intermittent, with only one pond potentially perennial. An opportunity created by the proposed mining activity is the discharge of water, from mine dewatering activities, to watercourses on or near the Federal Parcel. The modest flow rate and perennial conditions created by this discharge will positively impact riparian habitat along the watercourse without dramatically altering the ecological landscape.

As described in Section 2.1, the biotic community present atop the Apache Leap is Interior Chaparral while Sonoran Desertscrub occupies the land west of the escarpment. These biotic communities are pervasive across mid- and low-elevation sites in Arizona, but the Federal Parcel is relatively unique in that the elevation gain represented by the Apache Leap and the shift from Paleozoic sedimentary rocks below to the Apache Leap Tuff above provides a more visually obvious transition between the two biomes than the gradational shift more typical elsewhere.

Historic livestock grazing is presumed to have impacted vegetation within the Federal Parcel. However, there are no ungrazed sites for comparison on or near the Federal Parcel because livestock grazing has occurred throughout this region, making it difficult to evaluate the impact from grazing. It is possible that livestock grazing has had only a modest effect on the vegetation because (1) water was made available through impoundments (stock tanks) rather recently (generally after 1930) for most of this area, and (2) large amounts of unpalatable plants (e.g., oak) may have warranted supplemental feeding. As elsewhere in the region, recent governmental policy shifts have restricted stocking rates for grazing on federal allotments.

Wildlife resources on the Federal Parcel include raptors and bats resident within the Apache Leap cliff face and rock outcrops atop the escarpment. The presence of these species is a value of the property that is not expected to be impacted by mining activities. Reclamation of the property in the post-mining period may enhance bat habitat by allowing access to new underground workings as well as construction of gates across openings to allow bats to pass freely while excluding human incursions.

One exotic species, the tiger salamander, is present on the Federal Parcel. The barred tiger salamander sub-species appears to have been introduced to the stock tanks and ponds for use as bait in a small scale commercial operation: the salamanders are seined from the ponds near the end of the season. These salamanders are likely predatory to native fish and amphibians.

It should be noted that the General Mining Law of 1872 allows development of the property as a mine on public land; thus, the Federal Parcel could be mined regardless of whether the land exchange occurs. The current array of environmental laws and regulations, at the federal and state levels, provides protection for the broad range of physical and environmental resources present on any property, including the Federal Parcel. Thus, transfer of the Federal Parcel to private ownership will not affect the environmental impacts that may occur as a result of mining the property.

## 3.2 OFFERED LANDS AND PRIVATE PARCEL

The Ecological Overview reports prepared for each of the Offered Lands (and the Private Parcel) present the set of values and opportunities unique to each parcel. For this summary study, the following paragraphs present the values and opportunities presented by the collection of the Offered Lands plus the Private Parcel. We first identify the common elements of the Offered Lands (including the Private Parcel), and then the unique elements in relationship to those commonalities.

Because water is the most limiting factor for biological productivity in the arid southwestern United States, where it is available at or near the ground surface riparian habitat quickly develops. The Offered Lands are no exception to this generality. Each site includes at least one stream or water body (although the bodies are typically artificial), whether perennial, intermittent, or ephemeral. Each site has been dramatically impacted by the nature (volume, frequency, and duration) of the water present: these effects are readily apparent on the land surface (through erosion and deposition), biology (vegetation and wildlife), and human use (residence, agriculture, and animal grazing). The land surfaces have been altered due to the effects of surface water flow, creating or affecting bedrock exposures, sediment erosion and accretion, soil development, and stream channel morphology. Floods and droughts have had specific, dramatic impacts on selected sites. All of the sites show significant variations in vegetation between riparian and upland habitats. The sites with perennial water generally exhibit higher species diversity and/or density proximate to water. Increased biological resources and the presence of water has also increased the human use of the sites. Thus, the presence of surface water on each site collectively increases the value of the Offered Lands. The opportunity presented by this value is the potential to preserve or restore this resource to benefit rare riparian habitat.

However, the presence of water has been both a blessing and a curse to these sites. The biotic communities have been impacted by human use: most commonly, from sheep and cattle grazing from the late 1800s until at least the latter part of the 1900s. The increased biological productivity near water sources and the resultant intensive land use has altered the biological landscape across the southwestern United States. Some biological resources have been irretrievably lost. Some overgrazed grasslands are

now dominated by exotic and/or invasive species. Soil structure and organic content has been altered or the soil has been lost to erosion. Many mesquite *bosques* elsewhere in Arizona have been significantly affected by woodcutting, agricultural clearing, or groundwater pumping. For millions of acres in the southwest, native species are not likely to return to dominance in the near future.

Conversely, within the Offered Lands many of these same biotic communities have displayed a remarkable resiliency. Although not expected to return to pre-disturbance conditions, natural recovery is evident once intensive human use is excluded. For example, current federal land management policy has severely restricted cattle grazing on public land, including allotments associated with private in-holdings such as the Offered Lands, allowing for some recovery of impacted vegetation. Land management practices exemplified by progressive public land stewardship offer a chance to allow natural recovery to continue, restoring and preserving biotic communities that, in the hands of private ownership, would be at risk for loss from development or intense land use.

The concept of seamless public land management also applies to strategies for issues such as fire control. Current forest science suggests that natural fires were frequent in grasslands and woodlands of the southwest. Grassland fires kill shrubs but allow fast-regenerating grasses to return. Woodland fires promote a more open savannah forest structure: large trees separated from one another minimize intense, killing fires. The USFS is attempting to establish management programs of prescribed burns on National Forest lands in order to reinstate fire as a factor in natural forest dynamics. But, current policy dictates a need to protect private in-holdings in the event of fire, contradicting natural burn patterns. Public ownership of the now-private in-holdings would allow the natural philosophy to be implemented on a broader scale, unencumbered by concerns to protect private land. This will allow restoration of upland biotic communities to a more natural state.

Furthermore, administration of water rights by land management agencies at each property will moderate development of water resources, protecting natural groundwater and surface water and, in turn, promoting the recovery of riparian biotic communities well represented within the Offered Lands. Public ownership of water rights on the parcels will specifically, and positively, promote the recovery of the riparian communities.

Although a number of federally listed species have the potential to occur on the Offered Lands properties, and at least three listed species are known to occur on the Offered Lands (and one listed species was found on the Private Parcel), available information does not suggest that the survival or recovery of any listed species is dependent upon public ownership of any of the Offered Lands. The potential presence of any listed species is a value to the Offered Lands, but no special opportunity is presented by this value.

It also should be noted that, excepting the Appleton Ranch property, the Offered Lands are remarkably free of invasive plants. Riparian communities throughout Arizona have commonly been invaded by exotic species such as tamarisk and tree-of-heaven. Though individuals of these species were noted on most of the parcels, most densely at the 7B Ranch site along the San Pedro River, the native plants appear

to be little impacted. The properties are valuable from this perspective in that the invasive species are either not present or at least are not dominant. The opportunity exists to reduce the likelihood of further invasion from nearby populations of exotics as well as prevent additional introductions that might occur from property development. The exception from this situation, the Appleton Ranch, includes significant stands of Boer and Lehman lovegrass introduced in the 1940s and 1950s. However, as explained in the Ecological Overview report for this site, the Research Ranch philosophy maintains a passive observation rather than active management approach.

Conversely, invasive animal species are present at some of the sites, in particular exotic fish and amphibians. Absent exotic species, we would expect that native amphibians such as leopard frogs would be present: we did not observe these natives. In Arizona, bullfrogs have extirpated Chiricahua leopard frogs from many ponds, and green sunfish (*Lepomis cyanellus*), large-mouthed bass (*Micropterus salmoides*), and mosquito fish (*Gambusia* spp.) have been major factors in the extirpation of native fishes in many streams. For example, the loss of native fish such as the once ubiquitous Gila topminnow (*Poeciliopsis occidentalis*) has occurred within one to two years of the introduction of exotic fish. Where exotics are not already present, perennial waters on each property are at risk of invasion by these exotic fish, threatening native species. Federal administration of properties with perennial waters provides an opportunity for increased management of native fish and amphibian species, safeguarding existing populations and facilitating the recovery of this biological resource.

Some of the Offered Lands have unique ecological values and opportunities that are independent of the properties as a group:

- The grassland of the Appleton Ranch, situated within the larger Research Ranch and excluded from cattle grazing as an ecological reserve for over 35 years, is valuable as a biological resource which is at risk for development should it be sold to a developer not sharing the Research Ranch mission. The opportunity to incorporate this in-holding into the Research Ranch property will likely not occur again.
- The aforementioned mesquite *bosque* of the 7B Ranch site, irrespective of its place within the range of other biotic communities represented by the Offered Lands package, is a unique value and opportunity. As detailed in the Ecological Overview for this property, extensive mesquite *bosques* formerly occurred along rivers and streams in Arizona. Mesquite *bosques* are very productive in terms of wood, flowers, and fruit, and support a huge array of animal species. The Upper San Pedro River is now largely set aside as a biological reserve in part to protect its *bosque*. The mesquite *bosque* on the 7B Ranch, situated on the Lower San Pedro River, would be an important extension of the riparian corridor already preserved on the Upper San Pedro River.
- The petroglyph site at the 6L Ranch includes two of only a handful of known depictions of extinct Pleistocene megafauna in North America. These two petroglyphs are likely Columbian mammoths. Because of their rarity and great age, this petroglyph site is a priceless value of this property. The opportunity for public ownership of this cultural resource will allow stewardship that cannot be duplicated in the private sector.

## 4.0 CONCLUSION

The characteristics of the Federal Parcel and the Offered Lands are listed in the following table.

**Table 1. Ecological Characteristics of Studied Parcels**

| Metric | Federal Parcel | Offered Lands Parcels |
|---|---|---|
| Biomes present | Interior Chaparral<br>Sonoran Desertscrub | Sonoran Desertscrub<br>Interior Chaparral<br>Sonoran Deciduous Riparian Forest (including mesquite *bosque*)<br>Semi-Desert Grassland<br>Great Basin Conifer Woodland<br>Madrean Evergreen Oak Woodland<br>Montane Riparian Wetland<br>Petran Montane Conifer Forest<br>Madrean Evergreen Woodland |
| Total Acreage | 1,225 hectares<br>(3,025 acres) | 1,834 hectares<br>(4,525 acres)<br>(excluding 124 hectares [306 acres] of the Private Parcel) |
| Area of wetlands and floodplains | Wetlands: 0.81 hectares (2 acres)<br>Floodplains: 0 hectares (0 acres) | Wetlands: 715.1 hectares (1,767.1 acres)<br>Floodplains: 535.4 hectares<br>(1,321.4 acres) |
| Invasive and/or Exotic Species present | Plants: None observed<br>Animals: Tiger salamander | Plants: tamarisk, tree-of-heaven, Lehmann's lovegrass, Boer lovegrass<br>Animals: bullfrogs, green sunfish, mosquito fish, large-mouthed bass |
| Special Status Species present (federally listed under ESA) | Arizona hedgehog cactus | Desert pupfish<br>Lesser long-nosed bat<br>Huachuca water umbel<br>Arizona hedgehog cactus (Private Parcel only) |
| Special Status Species potentially present (federally listed, candidate, or proposed under ESA) | Lesser long-nosed bat | Canelo Hills ladies'-tresses<br>Gila chub<br>Gila topminnow<br>Chiricahua leopard frog<br>Bald eagle<br>Mexican spotted owl<br>Yellow-billed cuckoo<br>Ocelot<br>Jaguar<br>Huachuca springsnail<br>Arizona agave<br>Arizona cliffrose<br>Cactus ferruginous pygmy-owl<br>Southwestern willow flycatcher |
| Cultural Resources | Euro-historic and indigenous sites | No formal surveys conducted.<br>Petroglyph site on 6L Ranch parcel is one of only a few early Archaic sites with putative extinct Pleistocene mammals depicted. |

| Metric | Federal Parcel | Offered Lands Parcels |
|---|---|---|
| Recreational Activities | Dispersed recreation<br>Bouldering | Dispersed recreation |
| Land ownership | Public: USFS-managed land within the Tonto National Forest, with little adjoining private land | Private: in-holdings within public land held by various federal and state agencies, with some adjoining private land. |
| Human Impact | Minimal direct impacts from drilling and mining activities; likely indirect impacts from livestock grazing. | Minimal direct; known indirect impacts from livestock grazing. |
| Other Rare or Unique Biological Characteristics | Fractal surface features appear to organize vegetation within the Interior Chaparral biotic community. Plant species are responsive to slope aspect and the limited presence of soil and water. | Grassland on Appleton Ranch has been excluded from grazing since 1969 and is one of the best studied grasslands in southern Arizona (Photograph 3, pg. 10).<br><br>Perennial streams on JX Ranch may include native fishes separated from predatory non-natives by ephemeral reaches (Photograph 5, pg. 11).<br><br>Mesquite *bosque* on 7B Ranch is one of the largest remaining in Arizona (Photograph 10, pg. 23) |

Conservation biologists place great importance on species diversity and sustainability. The Offered Lands demonstrate a high level of species diversity and sustainability. Based on these criteria and combined with the prospect of public agency management of the Offered Lands, the Offered Lands are valuable to the public. The opportunities created by federal management of the Offered Lands include the following:

- Seamless management,
- Restoration of a range of biotic communities impacted by livestock grazing,
- Preservation of intact biotic communities such as mesquite *bosque* and grasslands (both imperiled in the southwestern US),
- Preservation of an extremely rare cultural resource, and
- Exclusion or management of invasive non-native species.

## 5.0 REFERENCES

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