ECOLOGICAL OVERVIEW
EAST CLEAR CREEK PARCEL
COCONINO COUNTY, ARIZONA

Resolution Copper

Prepared for:

RESOLUTION COPPER

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EXECUTIVE SUMMARY

WestLand Resources, Inc. (WestLand) was retained by Resolution Copper Mining, LLC (Resolution Copper) to prepare an Ecological Overview for approximately 640 acres (259 hectares) in Coconino County, Arizona. The East Clear Creek parcel ("the Property") is a private inholding within the Coconino National Forest, located along East Clear Creek about 38 miles (61 kilometers [km]) southwest of the town of Winslow. The Property encompasses uplands of the Colorado Plateau as well as an approximately 2.3-mile (3.7-km) reach of East Clear Creek in a narrow canyon. East Clear Creek is a perennial stream that flows toward the northeast to a confluence with the Little Colorado River near Winslow.

This ecological evaluation was conducted to:

- Identify the type and relative condition of the biological resources,
- Evaluate ecological characteristics of the Property to identify remarkable resource attributes, and
- Briefly assess the conservation values of these attributes in reference to local and regional contexts.

The Property has not been developed but has been subject to logging, grazing, and dispersed recreational (hunting, fishing, camping) use. There is no evidence of homesteading or other residential use of the East Clear Creek parcel. The upland areas exhibit mature, possibly second growth, forest whereas the canyon floor is characterized by riparian vegetation. The perennial stream supports aquatic fauna (i.e., fish and crayfish) and is known as a fishing destination both on- and off-site.

Value #1: Potential Habitat for Special-Status Species

The East Clear Creek parcel lies within the known, current geographic range of, and displays potentially suitable habitat for eight special-status species.[1] Three species listed by the U.S. Fish and Wildlife Service (USFWS) as endangered, threatened, proposed for listing, or candidate for listing, under the Endangered Species Act (ESA) with potential to occur include:

- Little Colorado spinedace (*Lepidomeda vittata*),
- Mexican spotted owl (*Strix occidentalis lucida*), and
- Roundtail chub (*Gila robusta*).

The East Clear Creek parcel also lies within the known, current geographic range of, and displays potentially suitable habitat characteristics for, five species identified by the U. S. Forest Service (USFS) as sensitive species:

[1] For the purpose of this screening, special-status species are those currently listed by the USFWS as endangered, threatened, proposed for listing, or candidate for listing under the ESA, and species identified as sensitive by the USFS. Several of these species are listed by more than one of these agencies.

- American peregrine falcon (*Falco peregrinus anatum*),
- bald eagle (*Haliaeetus leucocephalus*),
- Little Colorado sucker (*Catostomus* spp. 3),
- northern goshawk (*Accipiter gentilis*), and
- rock fleabane (*Erigeron saxatilis*).

Value #2: Difficult to Access Inholding

The East Clear Creek parcel is a private inholding not serviced by any improved roads or trails; access to the Property is only afforded by lengthy primitive dirt roads or overland hiking across rugged terrain. The relatively remote location has minimized human use of the Property for recreation or resource extraction. The East Clear Creek parcel has not been subjected to overuse by hikers, off-road vehicle enthusiasts, hunters, miners, or ranchers. Old-growth forest on the Property has been preserved and there is little evidence of anthropogenic effect to the on-site ecosystem.

Opportunity #1: Protecting Special-Status Species

The East Clear Creek parcel would be incorporated into the Coconino National Forest and managed by the USFS instead of being managed under private ownership. The eight special-status species that may occur on the East Clear Creek parcel would be protected by public land management policies that would not be present under private ownership.

Opportunity #2: Managing Public Lands

The East Clear Creek parcel is relatively isolated from other private inholdings, with one exception: the Starlight Pines residential subdivision occupies a section of land adjoining to the northwest. USFS management of the Property would ease management issues, allowing the agency to include the East Clear Creek parcel in landscape-level management plans, including fire. Recreational or resource use of the Property could be managed in a manner consistent with the adjacent National Forest System land that is administered by the USFS. As part of the National Forest System, the on-site resources would not be subject to different usage demands than the adjacent Coconino National Forest.

Additionally, public ownership of the Property would prevent development similar to that which has occurred at the Starlight Pines subdivision. The USFS is obligated to provide reasonable access to allow private property owners the use and enjoyment of such inholdings. A private owner of the East Clear Creek parcel could develop the Property (in accordance with Coconino County zoning ordinances) and request that the USFS improve access to the Property (e.g., an all-weather road). Such development would not occur under USFS administration of the East Clear Creek parcel.

1. INTRODUCTION AND METHODS

1.1. PURPOSE AND ORGANIZATION OF REPORT

WestLand Resources, Inc. (WestLand) was retained by Resolution Copper Mining LLC (Resolution Copper) to prepare an Ecological Overview for approximately 640 acres (159 hectares) in Coconino County, Arizona. In this report, the site is referred to as the East Clear Creek parcel or "the Property." The East Clear Creek parcel is a private inholding within the Coconino National Forest (**Figure 1**). The Property occupies the entirety of Section 9 of Township 14 North, Range 12 East of the Gila and Salt River Baseline and Meridian. The East Clear Creek parcel is accessible from Arizona State Route 87, about 38 miles (61 kilometers [km]) southwest of the town of Winslow and 36 miles (58 km) northeast of the town of Pine. The Property encompasses uplands of the Colorado Plateau and is bisected by an approximately 2.3-mile (3.7-km) reach of East Clear Creek in a narrow canyon (**Figure 2**). East Clear Creek is a perennial stream that flows toward the northeast to a confluence with the Little Colorado River near Winslow.

This ecological overview was conducted to:

- Identify the type and relative condition of the biological resources,
- Evaluate ecological characteristics of the Property to identify remarkable resource attributes, and
- Briefly assess the conservation values of these attributes in reference to local and regional contexts.

This report is presented in seven sections:

- Section 1 – Introduction and Methods (this section)
- Section 2 – Regional Setting
- Section 3 – Existing and Adjacent Land Uses
- Section 4 – Physical Resources
- Section 5 – Biological Resources
- Section 6 – Conservation Value and Opportunities
- Section 7 – References

1.2. METHODS AND APPROACH

WestLand completed this evaluation by conducting background research of available natural history information and aerial photography of the Property and surrounding region, and through field reconnaissance to identify, map, and photograph vegetation and habitat types. WestLand also

interviewed representatives from the U.S. Forest Service (USFS) Coconino National Forest to determine the ecological and anthropogenic resources of the surrounding area.

WestLand obtained and reviewed available literature pertaining to biotic communities of the southwest, riparian ecosystems, and the East Clear Creek area. Primary sources of information that were reviewed include *Biotic Communities of the Southwestern United States and Northwestern Mexico* (Brown 1994; a comprehensive reference of the desert southwest), wildlife abstracts from the U.S. Fish & Wildlife Service (USFWS), and various documents prepared and websites maintained by the USFS Coconino National Forest, Arizona Department of Water Resources (ADWR), and other agencies and conservation organizations. These references and aerial photographs were reviewed to identify potential and confirm observed vegetation communities on the Property. We also reviewed a previous study of the site, *Phase I Environmental Site Assessment, Forested Land, T14N, R12E, Section 9, Coconino County, Arizona* (Golder 2005) to obtain information about recent human use of the Property.

WestLand biologists conducted field reconnaissance of the Property on May 19, 2015 to observe current site conditions, biological resources, and abiotic factors affecting biota distribution and relative habitat value within the Property. The reconnaissance consisted of a pedestrian survey that focused on areas of interest identified during the background research phase of the evaluation. Inaccessible areas were scanned using binoculars to observe distant vegetation communities. Field observations were recorded and photographs taken to document the various physical and biological resources present on the Property. In particular, vegetation patterns were noted and observed species recorded. The general vegetation patterns were delineated on an aerial photograph and transcribed onto a vegetation map of the Property. Direct and indirect (tracks, scat, burrows, etc.) observation of wildlife were noted.

Specific attention was paid to the Property's potential to provide habitat for special-status species. Information such as the Property's elevation range, habitat type, water resources, climate, and other related information was compiled and compared to background research information. To identify special-status species with some potential to occur on the Property, we used the Information, Planning, and Conservation (IPaC) online environmental review tool maintained by USFWS and other federal agencies, and records of special-status species occurrences from the Arizona Game and Fish Department (AGFD) Heritage Data Management System (HDMS; **Appendix A**). The life history of each of these species was then reviewed to determine habitat requirements such as vegetation communities, elevation ranges, presence of surface water, and other landscape features. This information was used to eliminate those species that were unlikely to occur. Additional literature research was conducted and summarized for those species with known ranges and habitat requirements close to the Property or which have potential to occur there. The screening analysis resulted in a list of target species that have potential to occur on the Property (**Appendix A**).

2. REGIONAL SETTING

The Property lies within the Colorado Plateau physiographic province and is bisected by the narrow East Clear Creek canyon (**Figure 2; Appendix B, Photograph 1**). The Colorado Plateau physiographic province is bounded on the south by the Mogollon Rim and is characterized by nearly horizontal, stratified sedimentary rocks that have been eroded into numerous canyons, plateaus, and scarps (Nations and Stump 1996). The nearby upland areas of the Colorado Plateau, including within the Property, include gently rolling to steeply sloped terrain, generally about 6,800 feet (ft) (2,100 meters [m]) above mean sea level (amsl) and regionally sloping to the north. East Clear Creek is the dominant stream in the immediate area; numerous named and unnamed tributaries feed East Clear Creek within as well as up- and downstream of the Property. East Clear Creek flows in a northeasterly direction from the Mogollon Rim to join the Little Colorado River near Winslow; the Little Colorado River joins the Colorado River in the Grand Canyon over 100 miles northwest of the Property.[2]

East Clear Creek, as previously mentioned, flows through the Property from west to east. Approximately 15 river miles (24 km) upstream of the Property, East Clear Creek's flow is interrupted by the C.C. Cragin Dam (**Figure 1**). The dam was constructed by Phelps Dodge Corporation in 1964-1965 (then known as the Blue Ridge dam) to offset water extracted for mining purposes in other watersheds (Watershed Monitor 2015). East Clear Creek water collected in the reservoir is pumped through an aqueduct and then piped to the East Verde River at a rate between 2,693 and 15,710 gallons per minute (gpm) (170 and 991 liters per second [L/sec]) during the summer months (Arizona Central 2012). Phelps Dodge Corporation transferred dam operations to the Salt River Project (SRP) in 2005 as part of the Arizona Water Settlements Act of 2004[3], but the reservoir still functions similarly to how it did originally. The Act requires that up to 3,500 acre-feet of water per year from the reservoir be available for municipal and domestic uses in northern Gila County, Arizona, but does not include an obligation for base flow releases into East Clear Creek. As currently operated by SRP, water is released from the dam through a 2-inch diameter pipe that, combined with seepage through the dam, sustains permanent flow in East Clear Creek downstream to Leonard Canyon (USFWS 2011b).

When full, the C.C. Cragin Reservoir contains 15,000 acre-feet of water at a depth of 100 ft (30.5 m) (Watershed Monitor 2015). Available data suggests that the reservoir is typically operated at between 40 and 90 percent capacity. During the period when Phelps Dodge operated the dam, it rarely spilled (USFWS 2011b). During SRP's operational period, beginning in 2005, spills have been recorded in 2005, 2008, and 2009. The watershed above the reservoir measures 71.1 square miles (184.1 square

[2] West Clear Creek is not hydrologically connected to East Clear Creek. West Clear Creek lies west of and across a topographic divide from East Clear Creek, and flows in a southwesterly direction to join the Verde River near Camp Verde; the Verde River joins the Salt River east of Phoenix, which then connects to the Gila River and flows west to the Colorado River at Yuma.

[3] Public Law 108-451, December 10, 2004. 108th Congress. 118 Stat. 3478, 43 US Code 1501.

km [km^2]), comprising 65 percent of the 108.8-square mile (281.8 km^2) East Clear Creek watershed that reports to the Property. Although there is no obligation for base flow releases, nor a stream gauge between the dam and the Property that documents discharges from the reservoir, it appears that the C.C. Cragin Dam has a substantive effect on downstream flows in East Clear Creek including through the Property. Regulated discharge from the dam provides for a constant base flow in the stream and minimizes flood extremes during storm events.

The closest metropolitan area is Flagstaff, Arizona (city population 69,000; metropolitan area population 136,500) approximately 72 miles (116 km) to the northwest. Coconino County, in which the Flagstaff metropolitan area lies, has some 138,000 residents. The unincorporated community of Happy Jack, Arizona, lies northwest of the Property; the Starlight Pines subdivision occupies approximately 1.25 sections (797 acres [323 hectares]) of land immediately northwest. The subdivision features lots ranging from 0.84 to 1.25 acres (0.34 to 0.51 hectares), and homes are occupied by both vacationers and year-round residents (Happy Jack Arizona Real Estate 2015). The permanent population of Happy Jack or the Starlight Pines subdivision is not readily available. There are no significantly populous communities within 10 miles (16 km) of the Property.

3. PROPERTY AND ADJACENT LAND USES

The East Clear Creek parcel has been used for recreation, grazing, and timber harvesting (Golder 2005). The Coconino National Forest road network accesses the Property from the south, with Forest Road (FR) 137G entering the Property near the midpoint of the southern boundary (**Figure 2**). FR 137G appears to be used by high clearance vehicles and off-highway vehicles (OHVs) to access the southern portion of the Property for recreationists' camping and hunting. A stock tank near the southern Property boundary indicates that the parcel has been used for grazing; the parcel is within the Bar T Bar grazing allotment (AGFD 2015a) which is held under the Diablo Trust, but has not been used for grazing for at least 10 years (Dan Mead pers. comm.). Specific records of timber harvesting (logging) are not readily available, but anecdotal information refers to timber harvesting in the past (Golder 2005). Timber on the East Clear Creek parcel does not appear to have been harvested recently.

There is no designated access into the Property from the north, although FR 319 leads from State Route 87 into the Starlight Pines subdivision described above, and two informal roads from Elk Lane in the subdivision enter the northern portion of the Property along the ridge above the canyon. Additionally, a pack trail from the southwestern corner of the subdivision leads into the East Clear Creek canyon immediately west of the Property. The trail is used by hikers and OHV riders to access the stream, which is a popular fishing site as well as natural area for scenic views. The trail was originally a road (abandoned in the 1940s [Arizona Hiking 2015]) descending the northern canyon wall from the uplands to the canyon floor, crossing the stream at Macks[4] Crossing and ascending the southern canyon wall, eventually joining FR 717 to continue south. Neither the designated trail nor FR 717 enter the Property, but an informal extension of the trail continues from Macks Crossing into the East Clear Creek parcel for about 0.25 mile (0.4 km) along the canyon floor on terraces on the north side of the stream (**Appendix B, Photograph 2**). This extension is a two-track trail used by OHV riders. Additional very primitive trails (**Appendix B, Photograph 3**), likely game trails also used by hikers, continue east through the Property along the floodplains and terraces, crossing the stream as necessary to avoid cliffs that descend directly to the stream.

A USFS water quality monitoring station was observed off-site, in Section 8 of the same range and township as the site, near the northwestern corner of the Property (**Appendix B, Photograph 4**). The ADWR online well registry (ADWR 2015) does not identify any wells within Section 8, even though all wells must be registered with the ADWR. Data from the EPA suggests that water quality in East Clear Creek is fully supportive of agricultural use; fish, shellfish, and wildlife protection and propagation; and primary contact recreation (Golder 2005).

Bureau of Land Management (BLM) records maintained by the General Land Office include a Record of Patent (BLM 1955) granting title to the Property (and extensive other tracts of land) to the Santa Fe

[4] Occasionally spelled "Mack's."

Pacific Railroad Company pursuant to the Act of July 27, 1866, for the purpose of constructing a railroad and telegraph line from Missouri and Arkansas to the Pacific Coast. The timber harvesting noted above may have supported this purpose. According to Coconino County, the Property (identified as assessor parcel number 403-13-006E) was split from parcel 403-13-006C and owned by Phelps Dodge Company until 2001, when it was sold to Blue Ridge LLC and on the same day Canyon Point LLC (Coconino County 2016). The Coconino County Assessor (2015) reports that Clear Creek 640 LLC acquired the Property in 2002 and sold it to the Trust for Public Land in 2005, and on the same day the Trust for Public Land sold the Property to Swift Current Land & Cattle LLC (a subsidiary of Resolution Copper). Available information suggests that none of these latter owners used the Property for any active purpose. It is likely that after divestment by the railroad company the Property was held for water rights or investment purposes, but has been used informally by the public (e.g., trespassers) for the recreational purposes outlined above.

The USFS administrates the Coconino National Forest that surrounds the Property. As part of the National Forest System, the Coconino National Forest is managed for multiple uses, ranging from recreation (as described above) to resource procurement (such as logging). Logging has historically been conducted in the vicinity of the East Clear Creek parcel, with the most recent timber sale (identified as the Holder sale, along FR 137 south of the Property) in the late 1980s (USFS 1987). A project to reduce fuel loads in the 64,000 acres (26,000 hectares) comprising the watersheds upstream of the C.C. Cragin Dam was planned for late 2015 (USFS 2015a) and was under analysis as of December 2016 (USFS 2016). The Coconino National Forest is included in the Four Forest Restoration Initiative (4FRI), a comprehensive plan to create landscape-scale restoration approaches that will provide for fuels reduction, forest health, and wildlife and plant diversity (USFS 2015b). Although 4FRI is a long-range (10-year) planning effort, only the plans for the period from 2013 to 2015 have been published and no projects along East Clear Creek in the vicinity of the Property are planned for that period.

4. PHYSICAL RESOURCES

4.1. LANDFORM AND TOPOGRAPHY

The East Clear Creek parcel is situated within the Colorado Plateau physiographic province north of the Mogollon Rim in central Arizona. Through and within the vicinity of the Property, East Clear Creek has carved a canyon approximately 600 ft (200 m) deep through Precambrian sedimentary rocks of the plateau. Numerous named and unnamed tributaries both on- and off-site display similar landform characteristics. The Property elevation ranges from about 6,195 ft (1,887 m) amsl in the streambed as it exits the Property near the northeastern corner to about 6,820 ft (2,077 m) amsl in the uplands near both the southwestern and the northwestern corners.

The East Clear Creek watershed between C.C. Cragin Dam and the Property encompasses about 37.7 square miles (97.6 km^2) (**Figure 3**). The highest elevations within the upper reaches of this watershed are Moqui Ridge (7,435 ft [2,266 m]) and an unnamed point on the Mogollon Rim above the headwaters of Yeager Canyon (7,905 ft [2,409 m]), both southwest of the Property. The main upstream tributaries are streams in Moqui Draw, Yeager Canyon, Barbershop Canyon, Dick Hart Draw, Houston Draw, Bear Canyon, General Springs Canyon, and Miller Canyon. Downstream tributaries are streams in Leonard Canyon and Wilkins Canyon, as well as Willow Creek.

Similar to most streams in this area of the Colorado Plateau, East Clear Creek follows a meandering path in a generally northeasterly direction toward the Little Colorado River. The Little Colorado River drains the Holbrook Basin, a large geologic feature tilted slightly to the northwest. At the landscape scale the Colorado Plateau surface in this area is flat to gently rolling, but is locally incised by small- to medium-sized streams. The stream canyons are up to 600 ft (200 m) deep and, depending upon geologic substrate, canyon walls may be steeply sloped up to and including vertical cliff faces.

Throughout the Property, East Clear Creek displays characteristics similar to up- and downstream segments. The channel displays a high degree of sinuosity, 2.24, as it travels approximately 12,150 ft (3,700 m) over a straight-line distance of 5,400 ft (1,646 m). The channel bed of East Clear Creek within the Property is relatively level (0.005 percent gradient), dropping only about 65 ft (20 m) in that distance. The elevation of East Clear Creek channel as it enters the western, upstream portion of the Property is about 6,260 ft (1,908 m). As it leaves the eastern, lowest portion of the Property, the elevation is 6,195 ft (1,888 m).

Floodplains and terraces (**Appendix B, Photograph 5**) adjacent to the stream are up to 10 ft (3 m) above the active channels, but vary substantively in slope and degree of erosion depending upon location within the canyon. In the narrowest segments, the rocky cliff face of the canyon may abut the active channel while gently to steeply sloped alluvial deposits are on the other side (**Appendix B, Photograph 6**).

In wider segments, alluvial deposits are flatter and present on both sides of the canyon (**Appendix B, Photograph 7**). Canyon walls display moderate to steep slopes, in some places vertical (**Appendix B, Photograph 8**).

4.2. GEOLOGY AND GEOMORPHOLOGY

The East Clear Creek parcel lies in the Colorado Plateau physiographic province, which is bounded on the south by the Mogollon Rim and is characterized by nearly horizontal, stratified sedimentary rocks that have been eroded into numerous canyons, plateaus, and scarps (Nations and Stump 1996). Canyon walls rise steeply from East Clear Creek and upland areas are rugged. The entire parcel is mapped as Permian Sedimentary Rocks (**Figure 4**; Richard et al. 2000). Unconsolidated materials (soil) within the Property are limited.

4.2.1. Surficial Deposits

Soil data provided by the National Cooperative Soil Survey (NCSS) through Web Soil Survey (Soils Survey Staff 2015) indicate that the East Clear Creek parcel encompasses six soil complexes, although only three soil types compose 98 percent of the unconsolidated material on the Property (**Figure 5**). The soil complexes occur on high mountainous areas on the Coconino Plateau. However, limestone and sandstone rock outcrops and talus form some 80 percent of the site's acreage, as described in the following section. Substantive soil resources are mapped only in the north-central and southern portions of the Property.

The soil resource along the north-central boundary and southeastern corner of the East Clear Creek parcel is identified by the NCSS as two soils comprising the Jacks-Tortugas complex. This soil type extends north to cover the southwestern quadrant of the adjacent Section 4 and south along drainages into adjoining Sections 16 and 17. Within the Property, this soil covers the headwaters sections of three small unnamed tributaries to East Clear Creek, but each of the tributaries pass over bedrock before reaching the stream. The Jacks-Tortugas complex is described by NCSS as well-drained with moderate to low permeability. Jacks soils comprise 30 percent and Tortugas soils approximately 25 percent of this complex. The Jacks series consists of deep, well-drained soils on uplands. Slopes are dominantly 0 to 15 percent and range from 0 to 45 percent. Permeability is slow.

The Tortugas series consists of very shallow and shallow, well-drained, moderately rapid permeable soils formed from limestone, calcareous sandstone, and shale on gently rolling ridges to very steep hills. Slopes are 0 to 75 percent.

The soil resource within the Property near the south-central boundary is identified by NCSS as Wildcat soils. This soil type extends south along ridgelines of the adjoining Section 16. Within the East Clear Creek parcel, Wildcat soils are present along two ridgelines and encompass the headwater area of a small unnamed tributary to East Clear Creek. Wildcat soils are described by NCSS as formed in

residuum weathered from Coconino sandstone or the Kaibab formation. Wildcat soils are on upland exposures of sandstone with slopes that range from 1 to 15 percent. They are gravelly fine sandy loam and are somewhat poorly drained, with slow to very slow permeability.

Although NCSS maps the East Clear Creek canyon, as well as the canyons of the unnamed tributaries, as limestone and sandstone rock land, WestLand observed some soil on the slopes—enough to support vegetation at varying densities—and substantive soil resources in the canyon bottom as alluvial deposits. This suggests that the on-site soils on the steep slopes are colluvium sourced from eroded upland soils that have been transported to the slopes by water or gravity. Except insofar as the source deposit is directly upgradient from the soils on the slopes, it is not possible to differentiate the soils on the slopes between the three soil types described by the NCSS.

The alluvial deposits in the canyon bottom are not separately mapped by NCSS. WestLand observed silty, sandy, and gravelly deposits, typically well-sorted along the floodplain (**Appendix B, Photograph 9**) according to position within the canyon, as would be expected from fluvial deposition. Terrace deposits include rocks and boulders (**Appendix B, Photograph 10**), likely talus from the steep slopes above. Although depth measurements were not made, the alluvial deposits likely range up to 10 ft (3 m) or more thick in some locations (i.e., where flood flows are low energy) as suggested by the trees growing on the upper terraces along the canyon floor. However, bedrock exposures even within wide areas of the canyon (**Appendix B, Photograph 11**) suggest that alluvial soil depths are shallow elsewhere. The gravel and loose rock alluvium appear to consist principally of unconsolidated material derived from sedimentary rocks; no volcanic sand, gravel, or rocks were observed. It is likely that the alluvium is sourced from on-site or nearby upstream areas of sedimentary rocks, between the Property and the C.C. Cragin Dam. Although volcanic rocks are present west of the Property, defining the western edge of the Holbrook Basin where East Clear Creek rises, any volcanic material that progressed to the Property by stream transport before the dam was constructed in the 1960s has apparently washed farther downstream in the interim.

4.2.2. Bedrock

The geology of East Clear Creek within the Leonard Canyon 7.5-minute quadrangle has not been mapped in detail. Darton (Darton 1910) was the first to map the region, and named many of the major geologic units. At the regional level, Darton mapped the reach of East Clear Creek that encompasses the Property as Permian-age Kaibab limestone. This unit covers a broad swath of the Colorado Plateau in an arc through the southwestern portion of the Holbrook Basin. Quaternary and Tertiary volcanic rocks lie farther to the west and southwest, defining the western edge of the basin. Later mapping has identified the Kaibab unit extending throughout the southwestern U.S., ranging from northern Arizona into southern Utah, eastern-central Nevada, and southeastern California.

Permian Kaibab limestone—Darton indicates that the Kaibab unit ranges up to 855 ft (261 m) thick and, although he refers to it by name as "Kaibab limestone" the unit also includes chert, gypsum,

sandstone, and shale. Subsequent analysis and mapping by later geologists subdivided Darton's unit into separate members, and differentiated one portion as the Toroweap Formation (McKee 1938). Currently, the unit is identified as the Kaibab Formation, and is predominantly limestone and dolomite, although some members are or include sandstone, mudstone, conglomerate, and chert components (Blakely and Knepp 1989). In some locales, the lowermost member of the unit is pure limestone overlying the Coconino sandstone. Darton states that the Kaibab limestone contains abundant fauna fossils of Pennsylvanian age. Virtually all descriptions of the Kaibab unit refer to its cliff-forming characteristics and note that the limestone forms the rim of the Grand Canyon.

WestLand observed the Kaibab Formation as the capstone of the East Clear Creek canyon, demarcating a clear vertical to near-vertical cliff line along the canyon wall (**Appendix B, Photograph 12**). The limestone member is readily apparent in exposures along the pack trail accessing the site. A sample collected includes diagnostic recrystallized calcite in a cavity that probably formed by dissolution of the limestone in diagenesis (**Appendix B, Photograph 13**).

Permian Coconino sandstone—The Coconino sandstone underlies the Kaibab limestone in the Mogollon Rim region within which the East Clear Creek parcel lies. Darton also mapped this unit, and described it as a cross-bedded grey to white sandstone underlying the entire Coconino Plateau as well as the plateau country north of the Grand Canyon. The formation varies in thickness over its range; Darton cites a maximum thickness of 525 ft (160 m) at Canyon Creek on the south face of the Mogollon Mesa, about 25 miles (40 km) southeast of the Property. The sandstone consists primarily of fine, well sorted quartz arenite grains, with minor amounts of potassium feldspar (Blakely and Knepp 1989). This unit is principally eolian sedimentation of sand blown from the north and deposited along the shore of the Holbrook Basin craton, but some Coconino strata were waterlain along the edge of an ancient sea. Cross-strata (dune faces) dip to the southeast, while sand-flow and grain-fall strata near the base of the unit transition into nearly horizontal strata.

WestLand observed Coconino sandstone along the lower walls of the East Clear Creek canyon (**Appendix B, Photograph 14**). The exposed sandstone bedrock within the Property is consistent with the general description provided above. The sandstone is broadly exposed along the canyon walls; there is little to no soil overlying this unit on the steep slopes. Alluvium has accreted on top of the bedrock along much of the canyon floor. However, as noted above, some bedrock exposures on the floor of the canyon indicate that overlying alluvial deposits are relatively shallow.

4.2.3. Structural Features

No faults have been mapped by the Arizona Geological Survey on or near the East Clear Creek parcel. As described above, East Clear Creek follows a sinuous path for much of its length, including through the Property, and likely does not follow a fault line.

4.3. CLIMATE

The closest weather station to the East Clear Creek parcel is at the Chevelon Ranger Station, approximately 12.4 miles (20 km) southwest of the Property. The Chevelon Ranger Station is at an elevation of 7,010 ft (2,137 m) amsl, an insignificant 200 ft (60 m) higher than the highest elevation of the East Clear Creek parcel. The average annual temperatures at the station range from 35.4 to 61.7 degrees Fahrenheit (1.9 to 16.5 degrees Celsius). The average annual precipitation is approximately 18.6 inches (in) (47.2 centimeters [cm]) (WRCC 2015). The highest average seasonal rainfall occurs in summer (July through September).

The Chevelon Ranger Station's climate probably resembles that of the East Clear Creek parcel. Although the Property includes the deep East Clear Creek canyon, it is dominantly an upland area similar to that surrounding the Chevelon Ranger Station and thus is likely to experience similar thermal regimes throughout the year. The canyon portion of the East Clear Creek parcel, however, may experience cold air drainage during winter nights and higher daytime summer temperatures than the surrounding upland areas.

4.4. WATER RESOURCES

4.4.1. General Considerations of Water Resources

Several features of this segment of East Clear Creek are likely to contribute to a complex and interesting hydrological system. Some of these features include:

- Shallow soil depths in upland areas that likely do not store enough infiltrated stormwater to contribute substantively to surface flow in on-site drainages after storm events;
- A simple assemblage of two sedimentary bedrock types that are likely water permeable to some degree;
- Lack of (known) faults and fractures in the bedrock, which minimizes water flow through the basal rocks;
- A dam upstream of the Property that releases water in East Clear Creek through the year at a constant rate, resulting in a consistent perennial base flow through the Property;
- A large watershed upstream, a large amount of exposed bedrock, and topography that can intercept winter storm fronts – all factors that under natural conditions would be conducive to enhancing flood events in the narrow canyon of East Clear Creek but are apparently offset by the upstream dam; and
- Limited deposits of channel terrace alluvium, and little to no slope colluvium that would otherwise absorb water and provide a long period of release downstream.

These features each may play a role in structuring the riparian vegetation along this portion of East Clear Creek. The following subsections describe the known unique characteristics of East Clear Creek

surface water and groundwater resources in the vicinity of the Property, forming the basis for riparian vegetation description in **Section 5.1.3**.

4.4.2. Surface Water Resources

As observed during WestLand's May 19, 2015 field reconnaissance, East Clear Creek was flowing throughout the length of the reach through the Property. WestLand did not measure the rate of flow at this time but a reasonable estimate is approximately 50 gpm (3 L/sec). As described in **Section 2**, the C.C. Cragin Dam upstream of the East Clear Creek parcel apparently releases a relatively constant base flow, contributing to the perennial character of East Clear Creek downstream of the dam—including through the Property. However, a U.S. Geological Survey (USGS) stream flow gauge on East Clear Creek below the confluence with Willow Creek, some 9.5 miles (15.3 km) downstream of the Property and within a 317-square mile (821-km^2) watershed, indicates wide monthly variations in flow over the course of the year (USGS 2015). Peak flows at the station occur in February and March; the lowest flows occur in June and July. Notably, low flows in these and other months can be zero, indicating that whatever base flow is released from the C.C. Cragin Dam is lost over the distance from the dam to the gauge. Peak flows are likely due to snowmelt in higher elevation portions of the basin, flowing through numerous tributaries to East Clear Creek. It appears that the mainstem of East Clear Creek itself does not contribute substantively to the peak flows, as the dam intercepts snowmelt from upstream of that location and apparently does not typically overtop. Surface water resources in the vicinity of the Property are depicted in **Figure 6**.

Within the Property, observations suggest that East Clear Creek is perennial in this reach and does not experience frequent high-energy flood flows during snowmelt or storm events. Aquatic species (fish, crayfish) were observed in quiet water sections of the stream (as described in **Section 5**), indicating perennial water at least in pools if not throughout the reach through the Property. Further, the segment of the stream accessible from the pack trail immediately west of the Property is anecdotally known as a fishing site, suggesting multiple-year occupancy by fish to grow to sufficient size. Conversely, there was conflicting evidence regarding high-energy flood flows: there is no "debris line" of material deposited in the stream or on the floodplains or terraces, vegetation growing on the floodplains and terraces is small stature but did not display damage or force effects from floodwaters, and eroded surfaces of the floodplains and terraces appeared to be from local stormwater runoff rather than stream flow. These indicators suggest a modest yet consistent base flow throughout the year, with low- to moderate-energy flood flow during snowmelt (spring) or monsoon (summer) seasons. High-energy flood flows may occur irregularly: frequently enough to remove large-stature vegetation from the canyon floor, but not so frequent that the channel is regularly scoured of alluvium and vegetation. The C.C. Cragin Dam upstream of the Property likely mitigates the natural streamflow variation that would otherwise occur, as is evident at the USGS stream gauge well downstream.

As described in **Section 4.2**, soil resources on and in the vicinity of the Property are limited, and bedrock is extensively exposed. We assume therefore that stormwater runoff is high, with little infiltration, and further that East Clear Creek neither gains nor loses substantive volumes of water from or to the subsurface. The shallow gradient of the stream and the alluvial deposits within the East Clear Creek canyon appear to be sufficient to slow and at least temporarily absorb flood flows; the canyon floor is not stripped of unconsolidated material that would suggest frequent high-energy flood flow. Given the relatively low annual precipitation recorded in the region, however, and relatively dry climate, surface water is likely lost to evaporation. Bedrock fractures, if present, may drain some water from the stream as well.

As noted above, the USGS stream gauge in East Clear Creek at Willow Creek, well downstream from the Property, records a more variable stream flow at that location than expected here. It is possible that natural conditions present broadly through the 317-square mile (821-km^2) watershed that reports to that gauge outweigh the effects of the C.C. Cragin Dam on the 109-square mile (282-km^2) watershed that reports to the Property.

4.4.3. Groundwater Resources

As described above, there are perennial pools along East Clear Creek within the Property, and bedrock is either exposed or is not deeply buried by alluvium. Depth to groundwater along the channel is likely to be very shallow and on the terraces is likely to be less than 15 ft (5 m) in most places.

The sedimentary (sandstone) bedrock is likely permeable as compared to igneous or metamorphic rocks. However, WestLand did not observe any seeps or springs along the canyon walls indicating that water is present in bedrock above the stream elevation. Numerous wells are registered with the ADWR in the adjacent (to the northwest) Section 5, which contains a portion of the Starlight Pines subdivision described above. These wells presumably produce enough water to support the residences in the subdivision.[5] Most of these wells are between 600 ft (183 m) and 800 ft (244 m) deep, with water levels typically between 500 ft (152 m) and 650 ft (198 m) below ground surface. Compared to the East Clear Creek canyon depth of about 600 ft (200 m), these well and water level depths suggest that groundwater present in the area is within a bedrock aquifer with a piezometric surface that in some cases is above the stream elevation. Thus, the bedrock aquifer could be regional and may discharge to the stream, supplementing the base flow released from the upstream dam. This discharge is most likely not substantial, however, given the lack of visible seeps and springs in the canyon walls and the apparent diminishment in flow over the distance between the Property and the gauging station downstream at Willow Creek.

[5] As mentioned above, WestLand did not determine how many residents are permanent (i.e., year-round), but it is known that the subdivision is marketed as for both permanent and temporary (vacation or seasonal) occupancy. Water requirements for temporarily occupied homes would be less than for permanent. WestLand did not observe water-intensive landscaping (e.g., lawns) at the homes. The conclusion is that water use for the residents is relatively low and therefore high-production wells are not necessary.

5. BIOLOGICAL RESOURCES

5.1. VEGETATION AND HABITAT DESCRIPTION

The East Clear Creek parcel lies within one biotic community as mapped by Brown and Lowe (1980): Petran Montane Conifer Forest (**Figure 7**). However, during field reconnaissance on May 19, 2015, WestLand also noted vegetation characteristic of Interior Riparian Deciduous forest and Great Basin Conifer Woodland (Brown 1994a). In this section, a brief description of each community is provided. The following descriptions are synoptic, based on field observations, and on the general outlines provided by Brown (Brown 1994a).

5.1.1. Petran Montane Conifer Forest

Vegetation found on generally north facing slopes within the East Clear Creek parcel is representative of the Petran Montane Conifer Forest biotic community (**Appendix B, Photograph 15**). Within the Property, north-facing slopes include fairly open-canopied hillsides and steep, rocky cliffs. Vegetation within these areas is best represented by ponderosa pine (*Pinus ponderosa*), Gambel's oak (*Quercus gambelii*), and New Mexico locust (*Robinia neomexicana;* **Appendix B, Photograph 16**), which are three of the most common (diagnostic) species of Petran Montane Conifer Forest. Understory shrubs in this community are typically few and rarely dense, but may be present in scattered populations. Grasses and sedges often prevail in areas of open canopy (Pase and Brown 1994). Additional species common to this biotic community that were observed within the Property include Wood's Arizona rose (*Rosa woodsii* ssp. *arizonica*), muhly grass (*Muhlenbergia* spp.), Western wallflower (*Erysimum capitatum*), lotus (*Lotus* spp.), false Solomon's-seal (*Maianthemum racemosum*), wax currant (*Ribes cereum*), and various species of grass.

5.1.2. Great Basin Conifer Woodland

South-facing slopes within the Property are more xeric, open, and rocky than slopes that are generally north-facing. Vegetation on these slopes is best described as an ecotone of Petran Montane Conifer Forest and Great Basin Conifer Woodland (**Figure 7; Appendix B, Photographs 17 and 18**). The Great Basin Conifer Woodland biotic community can be characterized by two conifers: juniper (*Juniperus* spp.) and pinyon (*Pinus* spp.), although junipers are generally more prevalent. These trees are typically short in stature, rarely (if ever) exceeding 12 m (39 ft) in height, and are typically openly spaced. Areas where Great Basin Conifer Woodland meets Petran Montane Conifer Forest often include species such as Gambel's oak, barberry (*Berberis* spp.), and yucca (*Yucca* spp.) (Brown 1994b). These species, as well as one-seed juniper (*Juniperus monosperma*), elkweed (*Frasera speciosa*), Rocky Mountain juniper (*Juniperus scopulorum;* **Appendix B, Photograph 19**), ponderosa pine, and fernbush (*Chamaebatiaria millefolium*) were observed within the Property in these transitional areas.

5.1.3. Interior Riparian Deciduous Forest

Vegetation within the Property along East Clear Creek is representative of Interior Riparian Deciduous Forest (**Appendix B, Photograph 20**). Riparian species that are indicative of this vegetation type include Arizona sycamore (*Platanus wrightii*), velvet ash (*Fraxinus velutina*), Fremont's cottonwood (*Populus fremontii*), Arizona alder (*Alnus oblongifolia*), Arizona walnut (*Juglans major*), and willow (*Salix* spp.). In higher elevations, boxelder (*Acer negundo*), bigtooth maple (*Acer grandidentatum*), and narrowleaf cottonwood (*Populus angustifolia*) are often the dominant species (Minckley and Brown 1994). Within the East Clear Creek parcel this biotic community is best characterized by: Bondpland's willow (*Salix bonplandiana*), boxelder, and Arizona alder (**Appendix B, Photograph 21**). Other riparian (or at least terrace) species observed within the Property are redosier dogwood (*Cornus sericea*), blackberry (*Rubus* spp.), horsetail (*Equisetum* spp.), Arizona walnut, sticky starwort (*Pseudostellaria jamesiana*), and various sedges (*Carex* spp).

Within the Property, the East Clear Creek canyon is characterized by steep, rocky cliffs and a narrow channel. Review of aerial photography and observations made during the field reconnaissance indicate that the riparian vegetation present within this portion of the Property consists of fairly low-statured, open canopied species in non-contiguous narrow patches (**Appendix B, Photographs 22 and 23**). The structure and composition of these species suggests this portion of the creek is subject to high velocity flooding events that regularly scour vegetation and preclude the development of large stands of riparian vegetation.

5.1.4. Human Altered Aspects of Vegetation on the East Clear Creek Parcel

WestLand reviewed available information including historical use records, aerial photography, and USGS topographic maps to estimate the amount and type of human disturbance present within the Property. Results of this review, as well as observations made during the field reconnaissance, indicate historical use of the East Clear Creek parcel likely consisted of grazing, timber harvesting, and recreational use. Disturbed vegetation resulting from these activities is estimated to be less than approximately 6.5 acres.

As discussed in **Section 3**, the presence of a stock tank near the southern Property boundary indicates that the parcel may have been historically used for grazing. However, the parcel has not been used as such for at least 10 years. No evidence of grazing is apparent within the East Clear Creek parcel. Historical records of timber harvesting in the area indicate the Property may have been used for timber harvesting in the past. WestLand did not observe any sign of recent timber harvesting within the Property.

Access to the East Clear Creek parcel from the south consists of several dirt roads that are largely overgrown, except FR 137G, which appears to still be used by high clearance vehicles and OHVs. This portion of the Property is likely utilized for recreational activities such as camping and hunting.

While there is no designated access from the north, two unnamed dirt roads enter the Property near the midpoint of the northern boundary from Elk Lane. These roads are likely used for recreational activities. Access to the Property can also be attained from the west by way of FR 319. This road leads to a pack trail (formerly a road) that is used by hikers and OHV riders to access the canyon. An informal extension of the trail beginning at Macks Crossing enters the Property where it continues for only a short distance. One dirt road, which appears to be largely overgrown and is no longer accessible, enters the parcel from the northwest corner. Primitive trails along the creek, likely game trails that are also used for recreational purposes, were also observed.

5.2. WILDLIFE

As described above and identified by Brown (1994a) the biotic communities on the East Clear Creek parcel are:

- Petran Montane Conifer Forest,
- Great Basin Conifer Woodland, and
- Interior Riparian Deciduous Forest.

Mammal species that can be expected to occur in these biotic communities on or adjacent to the Property include elk (*Cervus elaphus*), mule deer (*Odocoileus hemionus*), white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), ringtail (*Bassariscus astutus*), Nuttall's cottontail (*Sylvilagus nuttallii*), eastern cottontail (*Sylvilagus floridanus*), spotted skunk (*Spilogale putorius*), striped skunk (*Mephitis mephitis*), American black bear (*Ursus americanus*), big brown bat (*Eptesicus fuscus*), deer mouse (*Peromyscus maniculatus*), and Mexican woodrat (*Neotoma Mexicana*).

Reptiles and amphibians that are likely to occur include western rattlesnake (*Crotalus viridis*), ring-necked snake (*Diadophis punctatus*), many-lined skink (*Plestiodon multivirgatus*), Plateau striped whiptail (*Aspidoscelis velox*), canyon treefrog (*Hyla arenicolor*), and Arizona treefrog (*Hyla wrightorum*). Common bird species expected to occur on or near to the Property include flammulated owl (*Otus flammeolus*), northern pygmy owl (*Glaucidium gnoma*), broad-tailed hummingbird (*Selasphorus platycercus*), Steller's jay (*Cyanocitta stelleri*), pygmy nuthatch (*Sitta pygmaea),* western bluebird (*Sialia mexicana*), Scott's oriole *(Icterus parisorum*), gray vireo *(Vireo vicinior),* black-throated gray warbler (*Setophaga nigrescens*), yellow warbler (*Dendroica petechia*), summer tanager (*Piranga rubra*), common black hawk (*Buteogallus anthracinus*), and cliff swallow (*Petrochelidon pyrrhonota*) (Brown 1994a).

Wildlife species observed[6] by WestLand within the East Clear Creek parcel include elk, yellow-breasted chat (*Icteria virens*), common raven (*Corvus corax*), canyon wren (*Catherpes mexicanus*), yellow warbler, American robin (*Turdus migratorius*), black-throated sparrow (*Amphispiza bilineata*), mallard (*Anas platyrhynchos*), black-headed grosbeak (*Pheucticus melanocephalus*), Steller's Jay, rufous hummingbird

[6] Wildlife observations included direct visual/ aural observations and the observation of tracks and scat.

(*Selasphorus rufus*), Plateau fence lizard (*Sceloporus tristichus*), ornate tree lizard (*Urosaurus ornatus*), elk, gray fox (*Urocyon cinereoargenteus*), virile crayfish (*Orconectes virilis*), and an unidentified fish species (**Appendix B, Photographs 24, 25, 26**).

5.3. SPECIAL-STATUS SPECIES

A preliminary screening analysis was conducted to determine the potential for occurrence of special-status species in the East Clear Creek parcel. For the purpose of this screening, special-status species are those currently listed by the USFWS as endangered, threatened, proposed for listing, or candidate for listing under the Endangered Species Act (ESA), as well as species identified as sensitive by the USFS, due to the proximity of USFS lands to the Property.

Federally listed special-status species included in this evaluation were obtained using the IPaC online environmental review tool maintained by USFWS and other federal agencies (**Appendix A**). USFS sensitive species were identified from the AGFD HDMS Online Environmental Review Tool (**Appendix A**). The presence of proposed or designated critical habitat for special-status species in the Property was also evaluated. No specific surveys for special-status species were conducted as part of this effort.

Determinations of the potential for special-status species to be present and to utilize habitats within the East Clear Creek parcel were based upon:

- Field observations;
- Review of the natural history of the special status species;
- Evaluation of known range and distribution for the special-status species;
- Comparisons of this information with habitats present in the East Clear Creek parcel;
- Review of records of occurrences in published or gray literature; and
- Review of the results of the AGFD HDMS on-line environmental review tool query (**Appendix A**).

The criteria used to determine the potential of occurrence of the species included in this screening analysis within the East Clear Creek parcel are defined as follows:

Present – The species has been observed in the Property during site visits or has been documented in the Property based on records from recent, reliable sources (e.g., AGFD, USFWS, museum records), and habitats required by the species are known to be currently present.

Possible – The species has not been documented in the Property, but the known, current geographic and elevational range of the species includes the Property and habitat required by the species appear to be present in the Property.

Unlikely – Generally, the known, current geographic range of the species does not include the Property, but the range of the species is close enough such that the Property may be within the dispersal distance of the species. The required habitat characteristics of the species may be present in the Property, however, the potential for occurrence of these species is insignificant and detailed discussion in this screening analysis was not deemed warranted.

None – The Property is outside the known geographic and/or elevational range of the species and the habitat required by the species is not present.

Table 1 includes the species' common and scientific name, federal listing status, and WestLand's evaluation of the likelihood of occurrence within the East Clear Creek parcel.

Table 1. Screening Analysis for the East Clear Creek Parcel

Species	Status		Potential Occurrence Within the East Clear Creek Parcel and Basis for Potential Occurrence Determination
	USFWS	USFS	
American peregrine falcon (*Falco peregrinus anatum*)	SC	S	**Possible**: The Property is within the known, current geographic (AGFD 2015e) and elevational range and contains potentially suitable habitat for this species. Peregrine falcons typically nest on steep, sheer cliffs overlooking open areas for foraging in a variety of habitats including woodlands, riparian areas, and even very xeric areas. It breeds in the state wherever sufficient prey is available near cliffs (Corman and Wise-Gervais 2005). The HDMS has records for this species within 5 miles of the Property (**Appendix A**). The Property contains areas of steep cliffs overlooking East Clear Creek, where an abundance of avian prey species is likely to be present.
Bald eagle (wintering population) (*Haliaeetus leucocephalus*)	SC, BGA	S	**Possible**: The Property is within the known, current geographic and elevational range and contains potentially suitable habitat for bald eagles. This species' wintering population inhabits lakes, reservoirs, perennial streams, and rivers throughout central and northern Arizona where they are known to nest in large riparian trees (e.g. cottonwoods, willows, sycamores), pines, and on ledges and cliff faces. Nest locations are typically in areas of low human disturbance with unimpeded views and are located near foraging areas with abundant prey (AGFD 2011). In Arizona, this species feeds primarily on fish, but waterfowl, small mammals, and carrion also constitute a portion of the diet (USFWS 2011a). The Property contains areas of potentially suitable habitat for bald eagles; large ponderosa pine trees for nesting and areas of steep cliffs overlooking East Clear Creek for foraging. HDMS also has records for this species within 5 miles (**Appendix A**).
Black-footed ferret (*Mustela nigripes*)	EXPN, non-essential		None: The Property is outside of the known, current geographic range and does not contain suitable habitat for this species. Black-footed ferrets are highly dependent on prairie and grassland habitat where prairie dog colonies are present. Prairie dogs are this species' primary food source and prairie dog burrows are required for shelter (USFWS 2010a). Known populations in Arizona are currently limited to those reintroduced into Aubrey Valley, Coconino County, and on the privately-owned Espee Ranch, 40 miles northwest of Williams (USFWS 2014d). There are also no records for this species within 5 miles (8 km) of the Property (**Appendix A**).

Table 1. Screening Analysis for the East Clear Creek Parcel

Species	Status		Potential Occurrence Within the East Clear Creek Parcel and Basis for Potential Occurrence Determination
	USFWS	USFS	
California floater (*Anodonta californiensis*)	SC	S	None: There are records for this species within 5 miles (8 km) of the Property (**Appendix A**); however, the Property is outside the known, current geographic range. This species prefers shallow areas in unpolluted lakes, reservoirs, and perennial streams with stable water levels and low velocity flow. It is typically found in mud or sand within pools, near channel banks, and in sedge occupied substrates (AGFD 2012). A host fish appears to be required for metamorphosis of the larvae into juvenile mussels and aids in dispersal. California floaters are believed to be severely restricted in the Upper Black River drainage of east-central Arizona (Wells and Allen 2014).
Chiricahua leopard frog (*Lithobates chiricahuensis)*	T		Unlikely: The HDMS has records for this species within 5 miles (8 km) of the Property (**Appendix A**); however, the Property is not within the known, current distribution, and provides only marginal habitat for this species. This species' known, current Arizona range includes the central and southeastern portion of the state in aquatic habitats such as headwater streams, springs, and livestock tanks, into which nonnative fish and predators have not yet invaded (USFWS 2012b). Though the Property contains aquatic habitat within the historically known geographic range, it also contains nonnative predators such as crayfish and fish, which minimize the suitability of habitat for this species (USFWS 2007). Moreover, it is likely that Chiricahua leopard frogs are now extirpated from the Little Colorado River Watershed (Brennan and Holycross 2006).
Little Colorado spinedace (*Lepidomeda vittata*)	T		**Possible:** The Property contains potentially suitable habitat and the known, current geographic range of the species is close enough such that it may be within the dispersal distance of the species. Little Colorado spinedace occupy clear/clean, permanently flowing water with pools and a fine gravel or silt-mud substrate (USFWS 2008a). The HDMS has records for this species within 5 miles (8 km) of the Property (**Appendix A**). It has been documented in areas along the East Clear Creek drainage upstream and downstream of the Property. Its known, current geographic range includes disjunct locations within the East Clear Creek, Chevelon Creek, Little Colorado River, and Silver Creek Watersheds; including several populations in tributaries to the East Clear Creek drainage near the Property (USFWS 2011b).

Table 1. Screening Analysis for the East Clear Creek Parcel

Species	Status		Potential Occurrence Within the East Clear Creek Parcel and Basis for Potential Occurrence Determination
	USFWS	USFS	
Little Colorado sucker (*Catostomus* spp. 3)	SC	S	**Possible**: The Property contains potentially suitable habitat for this species and is within the known, current geographic and elevational range. The Little Colorado sucker occupies pools and riffles within creeks and small to medium-sized rivers, as well as impoundments. It prefers habitat areas with abundant cover (AGFD 2001). The species has been documented within 5 miles (8km) of the Property (**Appendix A**); more specifically at Macks Crossing, just west of the Property (USFWS 2011a).
Mexican spotted owl (*Strix occidentalis lucida*)	T		**Possible**: The Property occurs within the known, current geographic and elevational range of the species and contains areas of potentially suitable habitat. Mexican spotted owls occur in mature montane forest and woodland, and narrow canyons dominated by vertical-walled rocky cliffs within complex watersheds. Roosting and nesting habitat includes large trees, uneven-aged tree stands, multi-storied canopy with medium to high closure, numerous snags, woody debris and ground litter, and a sloped terrain. Nesting typically occurs near a water source due to cooler temperatures and higher humidity (USFWS 2004). The species' present range is thought to be similar to the historical range; patchily distributed, wherever appropriate habitat is present, throughout all but the arid southwestern portion of the state. HDMS has records for this species within 5 miles (8 km) of the Property (**Appendix A**), which is located within designated critical habitat for the species.
Northern goshawk (*Accipiter gentilis*)	SC	S	**Possible**: The Property lies within the known, current geographic (AGFD 2015b) and elevational range, and contains areas of potentially suitable habitat for this species. Northern goshawks nest in a wide variety of forest types including mature or old-growth deciduous, coniferous and mixed forests. Arizona range includes high, forested mountains and plateaus, usually above 6,000 ft. (AGFD 2013). The HDMS has records for this species within 5 miles (8 km) of the Property (**Appendix A**).

Table 1. Screening Analysis for the East Clear Creek Parcel

Species	Status		Potential Occurrence Within the East Clear Creek Parcel and Basis for Potential Occurrence Determination
	USFWS	USFS	
Northern leopard frog (*Lithobates pipiens*)	--	S	Unlikely: The Property is not within the known, current geographic range and provides only marginal habitat for this species. Northern leopard frogs typically occupy permanent waters with rooted aquatic vegetation, ponds, springs, streams, marshes, and canals. Vegetation communities include woodland, grassland, brush land, and forests ranging high into mountains (AGFD 2002b). Though the Property contains permanent waters with rooted aquatic vegetation, it also contains nonnative predators such as crayfish and fish which minimize the suitability of habitat for this species (USFWS 2011b). The HDMS has records for this species within 5 miles (8 km) of the Property (**Appendix A**); however, results of surveys at historically occupied sites within the upper stretch of the East Clear Creek drainage and its tributaries indicate that northern leopard frogs are likely no longer present in these areas (USFWS 2011b).
Northern Mexican gartersnake (*Thamnophis eques megalops*)	T	--	None: The Property is not within the documented historic or known, current geographic range, and provides only marginal habitat for this species. This species is strongly associated with perennial aquatic environments (e.g., streams, cienegas, and occasionally stock tanks) that support dense riparian or wetland vegetation and forages primarily on native fish and leopard frogs. Though the Property contains permanent waters with riparian vegetation and potential prey species, it also contains nonnative predators such as crayfish and fish, both of which are a significant threat to the species (USFWS 2014c). The known, current geographic range of northern Mexican gartersnakes in Arizona includes the Page Springs and Bubbling Ponds State Fish Hatcheries along Oak Creek, lower Tonto Creek, the upper Santa Cruz River in the San Rafael Valley, the Bill Williams River, and the upper and middle Verde River (USFWS 2014a). There are no records for this species within 5 miles (8 km) of the Property (**Appendix A**).

Table 1. Screening Analysis for the East Clear Creek Parcel

Species	Status		Potential Occurrence Within the East Clear Creek Parcel and Basis for Potential Occurrence Determination
	USFWS	USFS	
Rock fleabane (*Erigeron saxatilis*)	--	S	**Possible**: The Property is within the known, current geographic range and elevational, and contains potentially suitable habitat for this species. The rock fleabane grows on steep, shaded canyon walls, moist north-facing slopes, and steep rock outcrops and boulders in the stream beds of shady canyons. The species is typically found between 5,000 and 8,350 ft (1525-2547 m) elevation (NatureServe 2015). In Arizona, it is known from Coconino and Yavapai Counties, including East Clear Creek (AGFD 2003). The HDMS also has records for this species within 5 miles (8 km) of the Property (**Appendix A**).
Roundtail chub (*Gila robusta*) (Lower Colorado River Basin Population)	C	--	**Possible**: The Property is within the known, current geographic and elevational range, and contains potentially suitable habitat for roundtail chub. Preferred habitat includes open areas of deep pools and eddies within cool to warm rivers and streams. It is often found associated with cover such as boulders, overhanging cliffs, undercut banks, or vegetation (USFWS 2010b). In Arizona, this species is known to occur in the lower Colorado River basin, the Bill Williams River basin, the Salt and Verde Rivers and several of their tributaries, Aravaipa Creek, and Eagle Creek. In the lower Colorado River basin, the species is known to occur in Chevelon and East Clear Creeks (USFWS 2009). The HDMS has no records for this species within 5 miles (8 km) of the Property (**Appendix A**), though it has been documented at Macks Crossing, immediately west of the Property, and downstream to the Clear Creek Reservoir (USFWS 2011b).
Southwestern willow flycatcher (*Empidonax trailii extimus*)	E	--	Unlikely: The Property is not within the known, current geographic range (AGFD 2015d) and lacks dense riparian vegetation suitable for nesting. The Property contains potentially suitable habitat for migrating individuals; however, HDMS does not have any records for the species within 5 miles (8 km) (**Appendix A**). Nesting habitat includes willow and/or tamarisk communities with dense under- and mid-story vegetation, along streams, rivers, lakesides, and wetlands. Additional species include cottonwood, boxelder, Russian olive, buttonbush, and mesquite. The species uses riparian habitats along major drainages during migration; often with small areas of riparian patches that would be unsuitable for nest placement (USFWS 2013a).

Table 1. Screening Analysis for the East Clear Creek Parcel

Species	Status		Potential Occurrence Within the East Clear Creek Parcel and Basis for Potential Occurrence Determination
	USFWS	USFS	
Yellow-billed cuckoo (*Coccyzus americanus*)	T	S	Unlikely: The Property is not within the known, current geographic range (AGFD 2015c) and lacks suitable nesting habitat for this species. The Property contains potentially suitable habitat for migrating individuals; however, HDMS does not have any records for the species within 5 miles (8 km) (**Appendix A**). The species is typically associated with dense riparian forest and woodland environments including cottonwood-willow galleries and mesquite bosques with a relatively high canopy closure. Contiguous, or nearly contiguous patches greater than 325 ft (100 m) in width and 200 ac (81 ha) or more in extent, have been identified as necessary for breeding and foraging. During movements between nesting attempts, this species can often be found at riparian sites that are similar to breeding sites, but are typically smaller, narrower, and lack understory vegetation (USFWS 2014b).

USFWS: E = Endangered, T = Threatened, C = Candidate, SC = Species of Concern, BGA = Bald and Golden Eagle Protection Act
USFS: S = Sensitive

The screening analysis conducted by WestLand indicates that eight special-status species have the potential to occur, or are present within the Property. Three species listed by the USFWS as endangered, threatened, proposed for listing, or candidate for listing, under the ESA with potential to occur include: Little Colorado spinedace, Mexican spotted owl, and roundtail chub. Five species identified by the USFS as sensitive including: American peregrine falcon, bald eagle, Little Colorado sucker, northern goshawk, and rock fleabane, also have potential to occur. The portion of the Property occupied by East Clear Creek is designated critical habitat for Little Colorado spinedace. The Property is also located within designated critical habitat for the Mexican spotted owl.

The life history and potential for occurrence of the Little Colorado spinedace, Mexican spotted owl, and roundtail chub are discussed further in the following sections.

5.3.1. Little Colorado Spinedace

Life History

The Little Colorado spinedace is a small, silvery minnow that typically grows to be between 4 and 5 inches long. It has darker coloration on its back, with a light-colored belly, and often has a dark spot at the base of its tail fin. This species is omnivorous, typically feeding on aquatic and terrestrial insects including midge larvae, small flies and crustaceans (amphipods), and filamentous green algae. Spawning occurs between late spring and early summer, but may sometimes continue through early

autumn (Hedwall and Sorensen 2012). Females may spawn more than once in a year, and are known to lay up to 5,000 eggs (AGFD 2001).

Historically this species is believed to have inhabited the northward flowing Little Colorado River tributaries of the Mogollon Rim in Apache, Coconino, and Navajo counties. Records indicate the species was extirpated from much of its historical range between 1939 and 1960. The species currently exists in disjunct populations within portions of the East Clear Creek watershed, Chevelon Creek, the upper Little Colorado River (including Nutrioso and Rudd Creeks), and Silver Creek. Within the East Clear Creek Watershed, Little Colorado spinedace are currently known to occur in small, perennial pools in West Leonard Canyon, Leonard Canyon (includes Dines Tank), Bear Canyon, Dane Canyon, and Yeager Canyon. Of these, West Leonard and Leonard Canyons continue to be the most dependable locations to find the species within the entire watershed (USFWS 2011b).

Little Colorado spinedace are found in a variety of habitats; however, its known, current geographic range appears to be highly dependent on the presence of clear/clean, permanently flowing water with pools and a fine gravel or silt-mud substrate. In these areas, the species often seeks cover provided by undercut banks or large rocks, which help them to avoid predation from other fish. Little Colorado River spinedace have been found in mountain streams and lower-gradient streams, river, pools, and springs. Its ability to quickly colonize new areas during wetter periods has been noted (USFWS 2008c).

The Little Colorado spinedace is federally listed under the ESA as threatened with designated critical habitat. A portion of this critical habitat includes 18 miles of East Clear Creek from its confluence with Leonard Canyon, upstream to the C.C. Cragin Reservoir, and approximately 13 miles of the stream extending from the upper end of the reservoir, upstream to Potato Lake (USFWS 1987). The portion of the Property occupied by East Clear Creek is included in this critical habitat unit.

Potential for Occurrence within the East Clear Creek Parcel

The HDMS has records of Little Colorado spinedace within 5 miles (8 km) of the East Clear Creek parcel (***Appendix A***). Critical habitat for the species also exists within the Property. The species has historically been documented in areas along the East Clear Creek drainage upstream and downstream of the Property (USFWS 2011b). Its known, current distribution along East Clear Creek, however, is limited to tributaries of the stream. As mentioned above, these tributaries include West Leonard, Leonard, Bear, Dane, and Yeager canyons, all of which are near the Property. These canyons flow during spring runoff but are usually reduced to dry stretches and or isolated pools in the summer (USFWS 2011b).

Though Little Colorado spinedace has not been documented recently from the East Clear Creek drainage, the exact locations of the species and population size for any occupied stream are largely unknown due to yearly fluctuations and difficulty in locating the species (USFWS 2008c). Potentially suitable habitat for this species, including areas of clear, permanently flowing water with pools over

fine gravel and silt-mud substrates, exist within the Property. During the field reconnaissance, WestLand observed the claw of a predatory crayfish, and anecdotes indicate that crayfish are abundant in the stream. Several non-native fish are also likely to occur. The presence of crayfish and non-native fish minimizes the suitability of habitat for Little Colorado spinedace (USFWS 2011b). The exact number of these non-native predators, however, is unknown. Due to the availability of potentially suitable habitat and proximity of existing populations, it is possible for Little Colorado spinedace to occur within the Property, especially after heavy rains and spring runoff.

5.3.2. Mexican Spotted Owl

Life History

The Mexican spotted owl is one of three subspecies of spotted owl recognized by the American Ornithologists' Union (AOU). The other two are the northern and the California spotted owls. The Mexican subspecies is geographically isolated from both the California and northern subspecies. Studies suggest that it is also genetically isolated from the other subspecies (USFWS 2012a). The Mexican spotted owl is a medium-sized owl with large dark eyes and no ear tufts. Their plumage is mottled, having numerous white spots, and their posterior underparts have short horizontal bars or spots (USFWS 2008b). Adult male and female Mexican spotted owls are similar in plumage; however, females are larger, on average, than males (USFWS 2012a). The species roosts during the day, and typically hunts at dusk and at night. Mexican spotted owl diets vary largely by geographic location. In Arizona, the species' diet mainly consists of cottontail rabbits, deer mice, woodrats, and voles, but it has also been known to prey upon various birds, bats, lizards, and snakes (AGFD 2005).

Mexican spotted owls are mostly solitary outside of the breeding season (AGFD 2005). In Arizona, courtship behavior typically begins in March and eggs are laid in late March or early April. The female incubates the eggs shortly after the first egg is laid, while the male does most or all of the foraging. Incubation lasts approximately 30 days before eggs hatch in early May. For the first few weeks after hatching, the females constantly brood their young, but by early- to late-June, approximately 4 to 5 weeks after hatching, the nestling owls are ready to fledge. Mexican spotted owl fledglings depend on their parents for food during the early fledging period, but typically disperse from mid-September to early October (USFWS 2012a).

The species' historical range extended from the southern Rocky Mountains in Colorado and the Colorado Plateau in southern Utah, southward through Arizona, New Mexico, and far western Texas, and in Mexico through the Sierra Madre Occidental and Oriental, to the mountains at the southern end of the Mexican Plateau. Its known, current geographic range is generally the same as its historical extent, with the exception of lowland riparian areas along major rivers, where it is no longer documented (USFWS 2012a). In Arizona, it occupies a broad geographical area, but does not occur uniformly throughout its range (AGFD 2005)

Mexican spotted owl distribution is heavily dependent on mixed-conifer, pine-oak, and riparian forests with a variety of tree species. Suitable nesting and roosting habitats are typically in mature, old-growth forests with fairly dense canopy cover (approximately 40 percent or more), large snags, and a high volume of fallen trees. The species may also be observed in younger stands, where large trees or patches of large trees are present. Mexican spotted owls are also associated with landscapes dominated by vertical-walled rocky cliffs within complex watersheds, where there are many tributary side canyons. These areas are typically near water where temperatures are cooler and humidity is higher than in the surrounding areas (USFWS 2013b).

Mexican spotted owls do not construct their nests. In Arizona, they are known to use abandoned platform nests or cavities in coniferous trees, cliff ledges, caves, or steep-walled canyons (AGFD 2005). The species appears to use a wider variety of habitats for foraging than for roosting or nesting, including managed and unmanaged forests, pinyon-juniper woodlands, mixed-conifer and ponderosa pine forests, cliff faces and terraces between cliffs, and riparian zones (USFWS 2012).

The Mexican spotted owl is federally listed as threatened (USFWS 1993), with designated critical habitat (USFWS 2004). A portion of this critical habitat includes the East Clear Creek parcel.

Potential for Occurrence within the East Clear Creek Parcel

The East Clear Creek parcel lies within the known, current geographic and elevational range and contains potentially suitable habitat for this Mexican spotted owl. The Property contains areas of tall, pine-oak forest vegetation with fairly dense canopy cover, snags, and fallen trees, as well as steep, vertical-walled rocky cliffs near water. These areas may provide suitable nesting and foraging habitat for the species. The Property is also located within a portion of the species' designated critical habitat. USFWS designated critical habitat for Mexican spotted owl in areas determined to be essential to the conservation of the species, and that may require special management or protection. The areas designated were devised around the majority of known Mexican spotted owl nesting sites (USFWS 2004). The HDMS also has records of Mexican spotted owl within 5 miles (8 km) of the East Clear Creek parcel (**Appendix A**). Therefore, due to the availability of potentially suitable habitat and proximity to known nesting sites, it is possible for Mexican Spotted owl to occur within the Property.

5.3.3. Roundtail Chub

Life History

The roundtail chub is a member of the minnow family (Cyprinidae) characterized by its robust body and tail. The species is olive gray in color, with silvery sides and a white belly, and is similar to trout in appearance. Individuals average around 9.8 to 11.8 in (25 to 30 cm) in length, but may reach up to 19.3 in (49.0 cm). Roundtail chub are an omnivorous species. They mostly feed on aquatic insects, but have been known prey on fishes and other vertebrates as well (USFWS 2010b).

Spawning typically occurs from February through June (USFWS 2009), during which females broadcast around 2,000 eggs over gravel and cobble stream bottoms. Individuals typically mature around 2 and 3 years of age and are likely to live for about 7 years. Breeding males often develop red or orange coloration on the lower half of the cheek and at the bases of their paired fins (USFWS 2010b).

The historic range of roundtail chub included both the upper and lower Colorado River basins in Arizona, Nevada, Utah, New Mexico, Colorado, and Wyoming. Historically, the species occurred in the Colorado River basin in two population centers; one each in the upper and lower basins, with little to no mixing of the two populations. Historical information on collections of the species suggests there was limited contact between the two population centers even before the construction of the Glen Canyon Dam. In 2009, the lower Colorado River Basin population of the roundtail chub was listed as a Distinct Population Segment (DPS; USFWS 2009).

The historical distribution of the Lower Colorado River DPS is believed to have included the Black, Colorado (though likely only as a transient), Little Colorado, Bill Williams, Gila, San Francisco, San Carlos, San Pedro, Salt, Verde, White, and Zuni Rivers, as well as numerous tributaries within those basins. The known, current geographic range of the Lower Colorado River DPS includes two tributaries of the Little Colorado River (Chevelon and East Clear Creeks), the Bill Williams River basin, the Salt and Verde Rivers and several of their tributaries, Aravaipa Creek, and Eagle Creek (USFWS 2009). Although the HDMS has no record of this species within 5 miles (8 km) of the Property (**Appendix A**), documentation of surveys conducted in the area show it has been observed at Macks Crossing, immediately west of the Property (USFWS 2011b).

Individuals of the Lower Colorado River DPS are typically found in cool to warm waters in mid-elevation rivers and streams, often within the deepest available pools and eddies. It is typically associated with various cover features including boulders, vegetation, and undercut banks. Smaller roundtail chub generally occupy shallower, low velocity waters adjacent to overhead bank cover (AGFD 2002a).

The Lower Colorado River Basin DPS is federally listed under the ESA as a candidate species (USFWS 2009), without critical habitat.

Potential for Occurrence within the East Clear Creek Parcel

The East Clear Creek parcel is located within the known, current geographic range, and contains potentially suitable habitat for roundtail chub. The Property contains areas of cool to warm waters, and deep pools and eddies with various types of cover. The HDMS has no records of roundtail chub within 5 miles (8 km) of the Property (**Appendix A**); however, the species has been documented along East Clear Creek at Macks Crossing, immediately west of the Property, and downstream to the Clear Creek Reservoir (USFWS 2011b). Though abundance is unknown, recent surveys have indicated the persistence of the species along East Clear Creek despite the presence of predatory crayfish and non-

native fish, which minimize the suitability of habitat for the species (USFWS 2009). Due to the availability of potentially suitable habitat and documented occurrences along the portion of East Clear Creek in which the Property is located, it is likely roundtail chub is present within the East Clear Creek parcel.

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6. CONSERVATION VALUES AND OPPORTUNITIES

6.1. VALUES

Value #1: Potential Habitat for Special-Status Species

The East Clear Creek parcel lies within the known, current geographic range of, and contains potentially suitable habitat for eight special-status species. These species include three listed by the USFWS as endangered, threatened, proposed for listing, or candidate for listing under the ESA, and five species identified by the USFS as sensitive.

The Little Colorado spinedace (*Lepidomeda vittata*) is listed by the USFWS as threatened, with designated critical habitat. This fish occupies clear/clean, permanently flowing water with pools and a fine gravel or silt-mud substrate. There are records of Little Colorado spinedace within 5 miles (8 km) of the Property; specifically, from areas along East Clear Creek, and from tributaries up- and downstream of the Property. The portion of the Property occupied by East Clear Creek contains potentially suitable habitat for the species. This portion of the East Clear Creek channel is also designated critical habitat for the fish. The known, current geographic range of Little Colorado spinedace is close enough such that the Property may be within the dispersal distance of the species; however, the presence of predatory crayfish and non-native fish in East Clear Creek diminishes the suitability of habitat for this species.

The Mexican spotted owl (*Strix occidentalis lucida*) is listed by the USFWS as threatened, with designated critical habitat. This species occurs in mature montane forest and woodland, and narrow canyon habitat dominated by vertical-walled rocky cliffs within complex watersheds, including many tributary side canyons. Roosting and nesting habitat includes large trees, uneven-aged tree stands, multi-storied canopy with medium to high closure, numerous snags, woody debris and ground litter, and a sloped terrain. There are records of this species within 5 miles (8 km) of the Property. The East Clear Creek parcel contains suitable habitat, is within the known, current geographic and elevational range, and is located within designated critical habitat for this species.

The roundtail chub (*Gila robusta*) is identified by the USFWS as a candidate for listing under the ESA. Preferred habitat for this fish includes open areas of deep pools and eddies within cool to warm rivers and streams. This species is often found in streams with cover such as boulders, overhanging cliffs, undercut banks, or vegetation. In the lower Colorado River basin, the species is known to occur in Chevelon and East Clear Creeks. This fish has been documented at Macks Crossing, immediately west of the Property, and downstream to the Clear Creek Reservoir. The East Clear Creek parcel is within the known, current geographic and elevational range, and contains potentially suitable habitat for this species.

The American peregrine falcon (*Falco peregrinus anatum*) is identified by the USFWS as a species of concern and by the USFS as a sensitive species. This species typically nests on steep, sheer cliffs

overlooking open areas for foraging in a variety of habitats including woodlands, riparian areas, and even very xeric areas. Optimum habitats support an abundance of avian prey species. There are records of this species within 5 miles (8 km) of the Property. The East Clear Creek parcel contains areas of steep cliffs overlooking East Clear Creek, where an abundance of avian prey species is likely to be present, and is within the known, current geographic and elevational range of the falcon.

The wintering population of the bald eagle (*Haliaeetus leucocephalus*) is identified by the USFWS as a species of concern and by the USFS as a sensitive species. This species' wintering population inhabits lakes, reservoirs, perennial streams and rivers throughout central and northern Arizona where they are known to nest in large riparian trees (e.g., cottonwoods, willows, sycamores) pines, and on ledges and cliff faces. Nest locations are typically in areas of low human disturbance with unimpeded views, and are located near foraging areas with abundant prey. There are records of this species within 5 miles (8 km) of the Property. The East Clear Creek parcel is within the known, current geographic range of this species and contains potentially suitable nesting and foraging habitat; including large ponderosa pine trees for nesting, and areas of steep cliffs overlooking the creek for foraging.

The Little Colorado sucker (*Catostomus* spp.) is identified by the USFWS as a species of concern and the USFS as a sensitive species. Habitat for this fish includes pools and riffles within creeks and small to medium-sized rivers, and impoundments. This species prefers areas with abundant cover. There are records of the Little Colorado sucker within 5 miles (8 km) of the Property, specifically at Macks Crossing. The East Clear Creek parcel contains suitable habitat and is within the known, current geographic and elevational range of this species.

The northern goshawk (*Accipiter gentilis*) is identified by the USFWS as a species of concern and the USFS as a sensitive species. This raptor nests in a wide variety of forest types including mature or old-growth deciduous, coniferous and mixed forests. Its Arizona range includes high, forested mountains and plateaus, usually above 6,000 ft. There are records of this species within 5 miles (8 km) of the Property. The East Clear Creek parcel lies within the historic and known, current geographic and elevational range, and provides areas of potentially suitable habitat for this species.

The rock fleabane (*Erigeron saxatilis*) is identified by the USFS as a sensitive species. This plant grows on steep, shaded canyon walls, moist north-facing slopes, and steep rock outcrops and boulders in the stream beds of shady canyons. Its elevational range is typically between 5,000 and 8,350 ft (1,525 to 2,547 m). In Arizona, it is known from Coconino and Yavapai Counties, including East Clear Creek. There are records of this species within 5 miles (8 km) of the Property. The East Clear Creek parcel is within the known, current geographic and elevational range, and contains potentially suitable habitat for this species.

Value #2: Difficult to Access Inholding

The East Clear Creek parcel is a private inholding not serviced by any improved roads or trails; access to the Property is only afforded by lengthy primitive dirt roads or an abandoned road across rugged terrain. The relatively remote location has minimized human use of the Property for recreation or resource extraction. Accordingly, the East Clear Creek parcel does not appear to have been subjected to overuse by hikers, OHV enthusiasts, hunters, miners, or ranchers.

Road access to the southern portion of the Property is available via 18 miles of primitive roads of the Coconino National Forest network (USFS 2015c). From FR 95 at the USFS Mogollon Rim District Office on SR 87 west of the Property, vehicles would travel south to FR 96, then east to FR 137. North from that point, vehicles would travel on FR 137, FR 137B, FR 717, and FR 137G to reach the southern Property boundary. Although these roads are evidently used, the distance and rugged drive apparently discourages casual—and therefore frequent—use to access the East Clear Creek parcel from the south. It is unlikely that the USFS would improve these roads to ease access to the Property.

A considerably shorter (1.3 miles) and correspondingly more popular route to the Property is available from the north. The abandoned road (vehicle use prohibited per USFS signage) from the Starlight Pines subdivision into the East Clear Creek canyon is listed on several public websites as a hiking or OHV trail to Macks Crossing, which is situated near the northwestern corner of the East Clear Creek parcel. East Clear Creek is identified on those websites as a destination for fishing and camping. We observed OHV tire tracks on the road and a few fire rings on the terraces above the stream, indicating recent low-intensity camping. Large still pools suggest swimming opportunities as well. However, none of these recreational activities appear to have been intense to the extent that ecological resource values have been lost or seriously degraded.

The presence of the adjacent Starlight Pines subdivision suggests that the area is desirable as a second home/cabin site, if not for year-round residence. Private property, such as the East Clear Creek parcel, may be subdivided in like manner (assuming zoning approval by Coconino County). The lack of easy access to the Property may be a contributing factor to its undeveloped state. Although access could be improved—either by an easement across National Forest System land and a bridge over the East Clear Creek canyon—the cost of such improvements is likely prohibitive, thus preserving its undeveloped state.

6.2. OPPORTUNITIES

Opportunity #1: Protecting Special Status Species

The East Clear Creek parcel would be incorporated into the Coconino National Forest and would be managed by the USFS instead of being managed under private ownership. The eight special-status species that may occur on the East Clear Creek parcel would be protected by public land management policies that would not be present under private ownership.

The portion of the Property occupied by East Clear Creek is designated critical habitat for the Little Colorado spinedace. This designation continues up- and downstream from the Property. The Property is also located within designated critical habitat for the Mexican spotted owl. Incorporating the East Clear Creek parcel in the surrounding Coconino National Forest would simplify the USFWS's administration of the designated critical habitat in that a single counterpart governmental entity, the USFS, would administrate much of the land encompassing the designated critical habitat.

Furthermore, any effort by the USFS to control invasive species, in particular crayfish in East Clear Creek, would be simplified by incorporating the Property into the Coconino National Forest. There would be no need to coordinate with a private owner to institute an eradication program that may require an intense effort along the invaded segment of East Clear Creek (which may extend well up- and downstream of the Property). Crayfish eradication is notoriously difficult, and application of any control measure along a continuous segment is more likely to result in success than a discontinuous program that would leave source populations in place.

Opportunity #2: Managing Public Lands

The East Clear Creek parcel is relatively isolated from other private inholdings (the exception being the Starlight Pines residential subdivision, which occupies a section of land adjoining to the northwest). USFS management of the Property would ease management issues, allowing the agency to include the East Clear Creek parcel in landscape-level management plans. Recreational or resource use of the Property could be managed in a manner consistent with the adjacent National Forest System land that is administered by the USFS. As part of the National Forest System, the on-site resources would not be subject to different usage demands than the adjacent Coconino National Forest.

Additionally, public ownership of the Property would prevent its development as a single residence or as a rural subdivision similar to that which has occurred at the Starlight Pines subdivision. Although the constraints described above limit access to the East Clear Creek parcel, a private owner could require the USFS to provide "reasonable access for the use and enjoyment" of the Property, per USFS regulations and policy. Although the definition of "reasonable access" is debatable, it is conceivable that a private owner could require year-round access (i.e., all-weather roads) to the Property. Incorporating the East Clear Creek parcel into the National Forest System would prevent this possibility.

Further, private development of the East Clear Creek parcel for residential purposes would affect the USFS policy for managing forest fires. Typically, the USFS protects structures from fires on National Forest System land, even if the structure is on a private inholding. This policy diverts firefighting resources that may be better used elsewhere. If the East Clear Creek parcel were incorporated into the National Forest System, fire management practices could incorporate the Property in a regional fire management plan.

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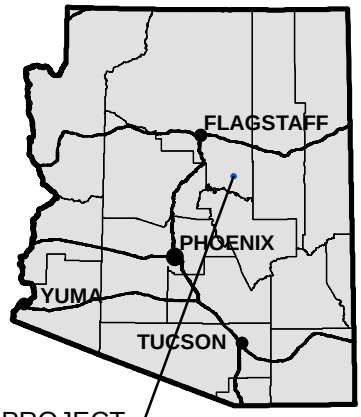
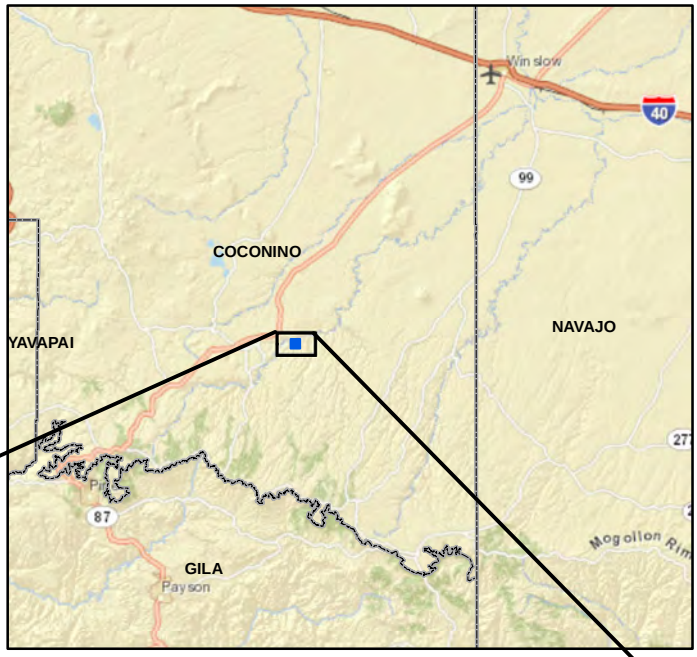
FIGURES

ARIZONA



PROJECT LOCATION

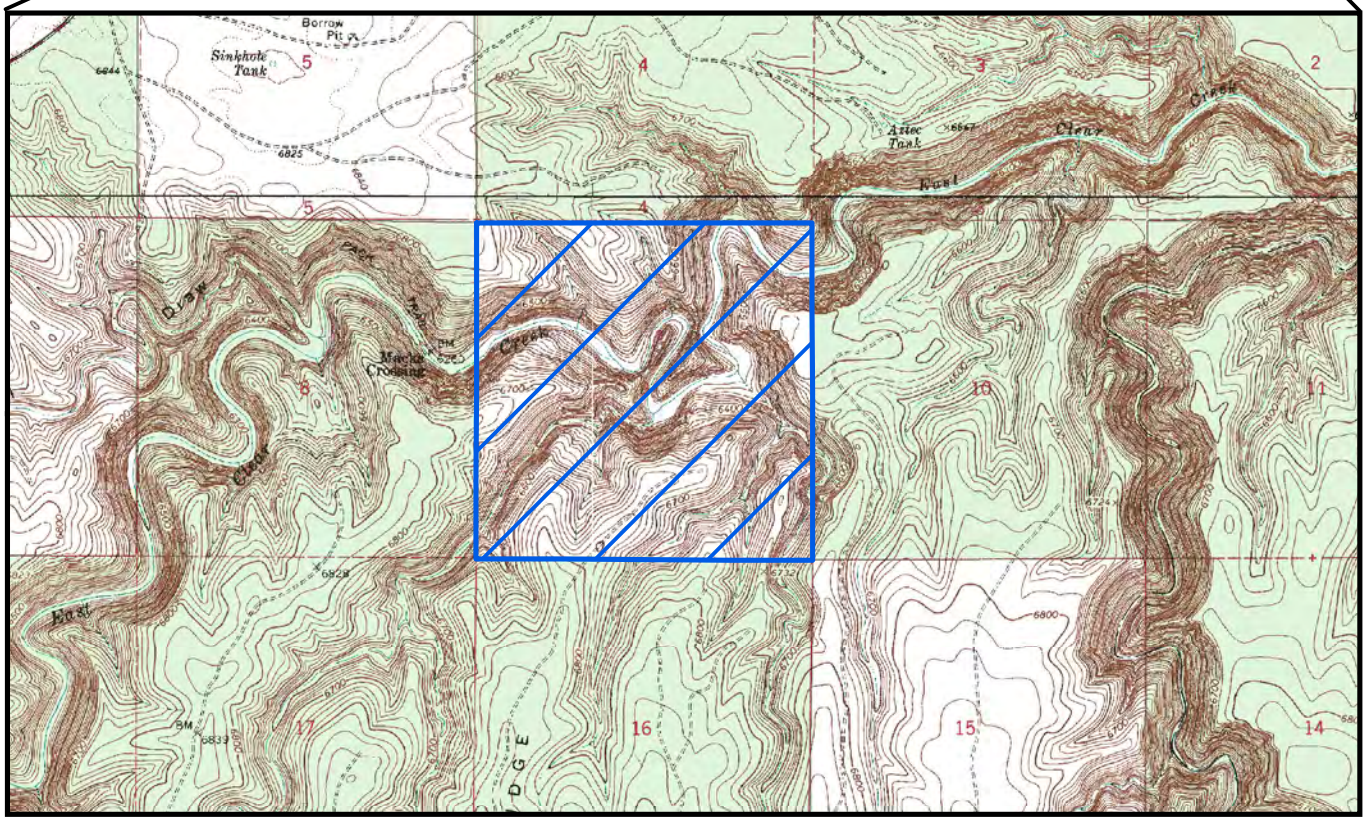
SOUTHEAST COCONINO COUNTY



Approximate Scale 1 Inch = 10 Miles

Legend

- East Clear Creek Parcel
- Other Private Ownership (No Color)
- USFS (Tonto National Forest)



T14N, R12E, Section 9,
Coconino County, Arizona.
Image Source: Quayle Hill & Leonard Canyon
1:24,000 USGS Quadrangles
Data Source: BLM Surface Management 2012

N

0 1,500 3,000 Feet

WestLand Resources, Inc.
Tucson • Phoenix • Flagstaff
4001 E. Paradise Falls Drive
Tucson, Arizona 85712 (520) 206-9585

RESOLUTION COPPER
Ecological Overview

VICINITY MAP
EAST CLEAR CREEK PARCEL
Figure 1

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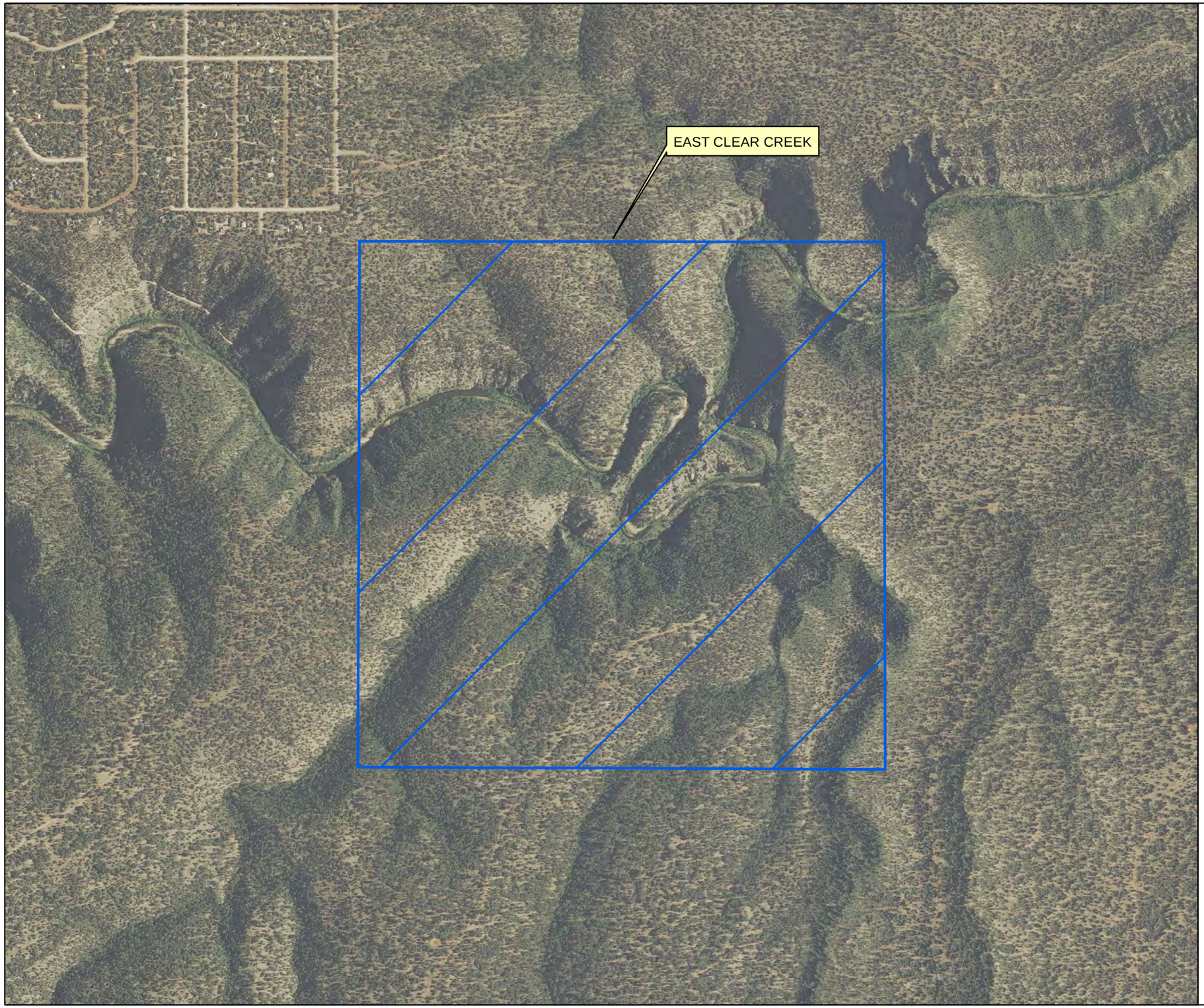


East Clear Creek:
640 Acres of Resolution Copper Property offered to the USFS,
T14N, R12E, Section 9,
Coconino County, Arizona.
Image Source: NAIP Imagery, 2013
Disclaimer: Map boundaries are based on best available data.
Legal descriptions pending field verfication by professional surveyors.

Legend

Offered Lands

N

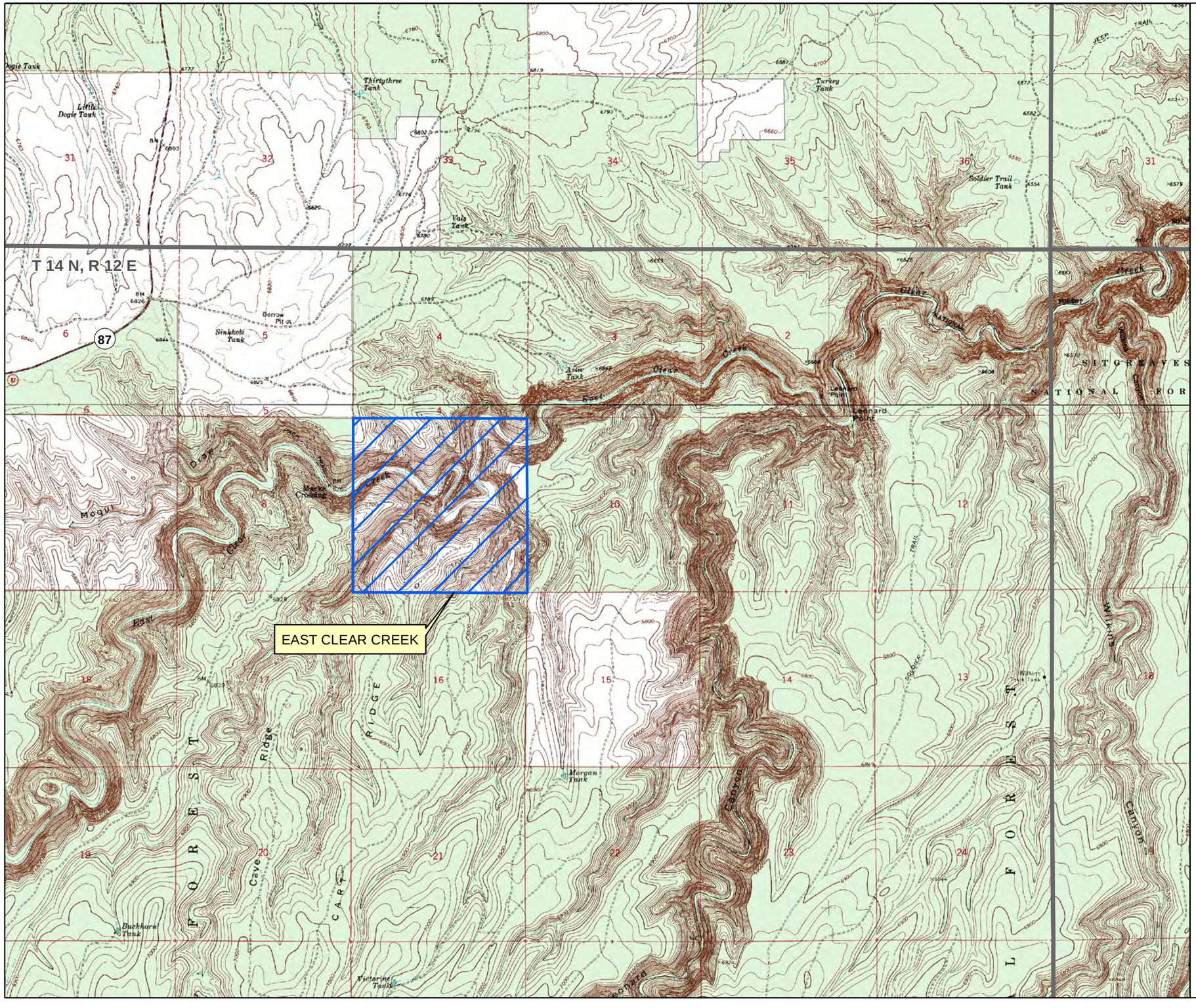
0 500 1,000 Feet

0 150 300 Meters

RESOLUTION COPPER
Ecological Overview

SITE MAP
EAST CLEAR CREEK PARCEL
Figure 2

Path: M:\Jobs\800's\807.98\ENV\LandExchangeMaps\MXD\EcoOverviewReport\ReportFiguresEClearCk\Fig3_Topo_EClearCk.mxd



East Clear Creek:
640 Acres of Resolution Copper Property offered to the USFS,
T14N, R12E, Section 9, Coconino County, Arizona.
Image Source: Quayle Hill & Leonard Canyon 1:24,000 USGS Quadrangles
Data Source: BLM Surface management 2012
Disclaimer: Map boundaries are based on best available data.
Legal descriptions pending field verfication by professional surveyors.

Legend

Offered Lands

Surface Management (BLM 2012)

Other Private Ownership (No Color)

USFS (Coconino National Forest)

N

0 1,500 3,000 Feet

0 500 1,000 Meters

RESOLUTION COPPER
Ecological Overview

TOPOGRAPHICAL OVERVIEW
EAST CLEAR CREEK PARCEL
Figure 3

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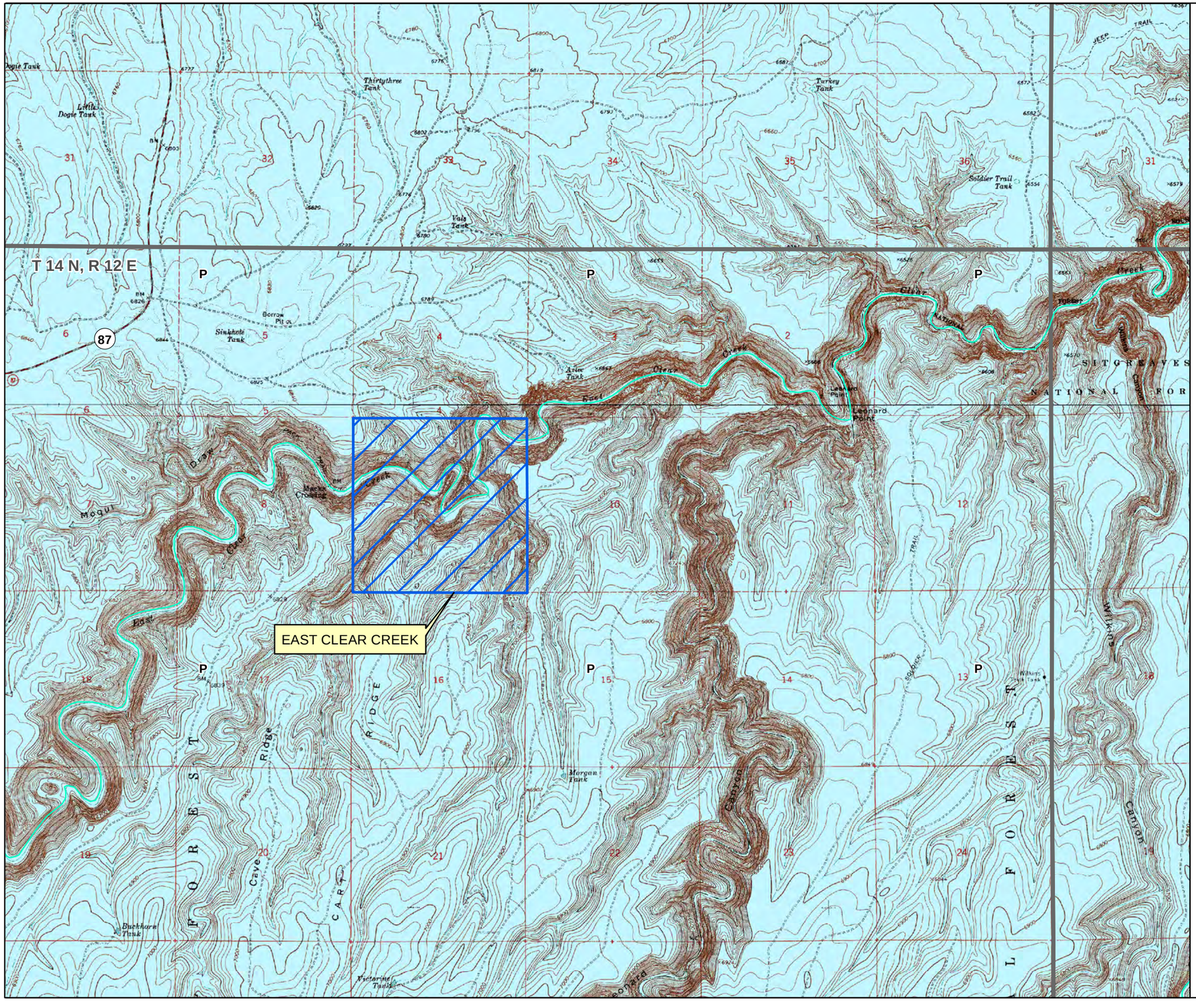

East Clear Creek:
640 Acres of Resolution Copper Property offered to the USFS,
T14N, R12E, Section 9,
Coconino County, Arizona.
Image Source: Quayle Hill & Leonard Canyon 1:24,000 USGS Quadrangles
Data Source: Arizona Geological Survey 2011.
http://www.azgs.az.gov/services_azgeomap.shtml
Disclaimer: Map boundaries are based on best available data.
Legal descriptions pending field verfication by professional surveyors.

Legend

Offered Lands

Arizona Geological Survey, 2011

Description

P - Permian Sedimentary Rocks (270-280 Ma)

N

0 1,500 3,000 Feet

0 500 1,000 Meters

RESOLUTION COPPER
Ecological Overview

GEOLOGIC MAP
EAST CLEAR CREEK PARCEL
Figure 4

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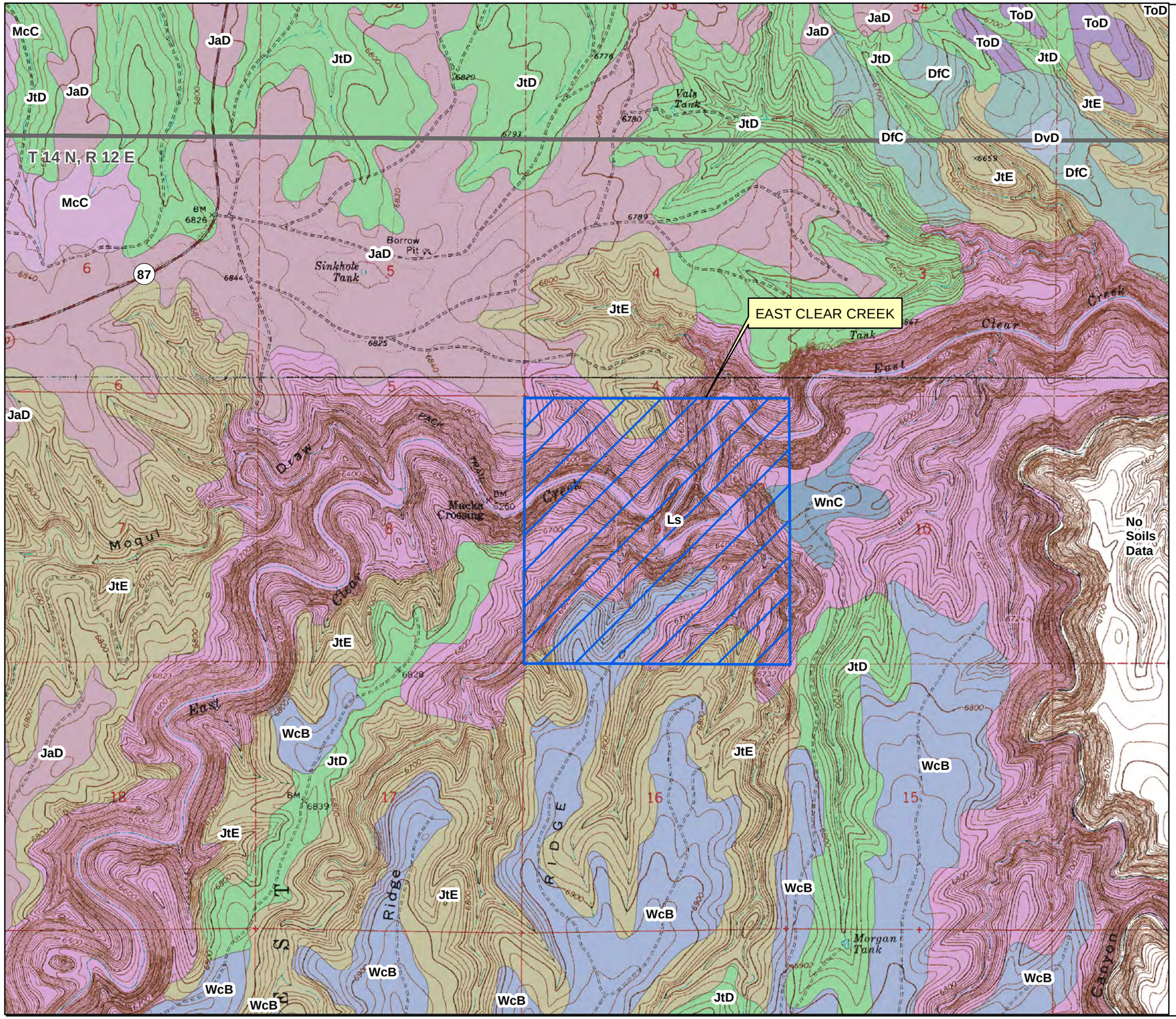

East Clear Creek:
640 Acres of Resolution Copper Property offered to the USFS,
T14N, R12E, Section 9,
Coconino County, Arizona.
Image Source: Quayle Hill & Leonard Canyon 1:24,000 USGS Quadrangles
Data Source: Soil Data Source: U.S. Department of Agriculture, NRSC
Soil Survey Geographic (SSURGO) AZ 643
http://websoilsurvey.nrcs.usda.gov
Acquired 5-2015
Disclaimer: Map boundaries are based on best available data.
Legal descriptions pending field verfication by professional surveyors.

Legend

- Offered Lands

USDA, NRSC Soil Data

- DfC-Dye fine sandy loam, 0 to 10 percent slopes
- DvD-Dye very stony fine sandy loam, 0 to 20 percent slopes
- JaD-Jacks fine sandy loam, 0 to 20 percent slopes
- JtD-Jacks-Tortugas extremely rocky complex, 0 to 20 percent slopes
- JtE-Jacks-Tortugas extremely rocky complex, 20 to 45 percent slopes
- Ls-Limestone and sandstone rock land
- McC-McVickers very fine sandy loam, 0 to 10 percent slopes
- ToD-Tortugas very stony loam, 0 to 30 percent sloeps
- WcB-Wildcat gravelly fine sandy loam, 0 to 5 percent slopes
- WnC-Winona gravelly loam, 0 to 10 percent slopes

N

0 1,500 3,000 Feet

0 500 1,000 Meters

RESOLUTION COPPER
Ecological Overview

SOILS MAP
EAST CLEAR CREEK PARCEL
Figure 5

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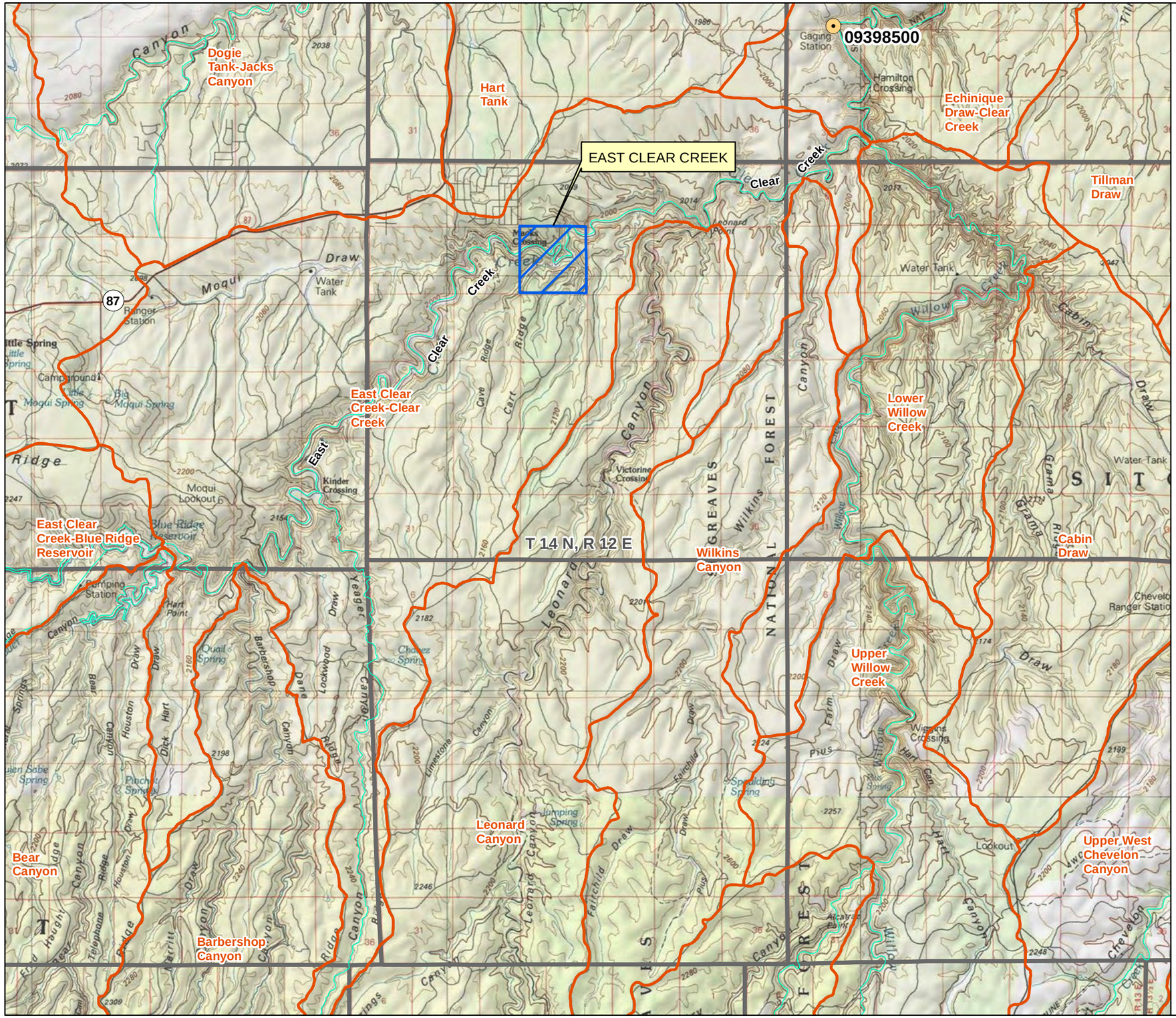
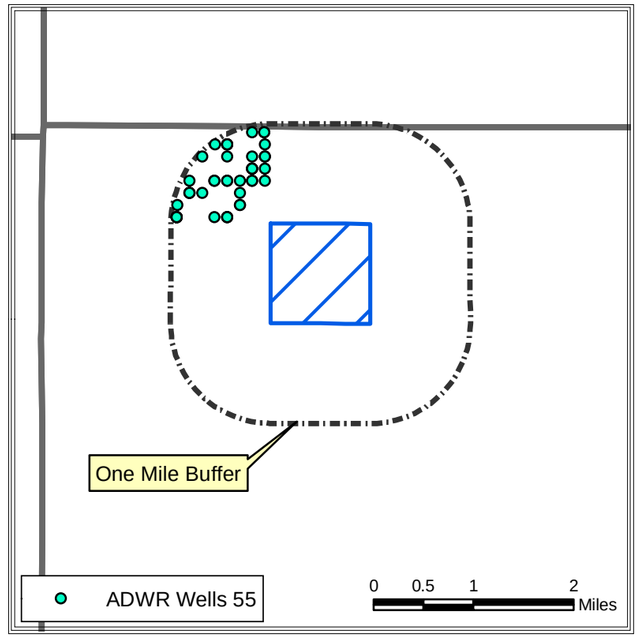


East Clear Creek:
640 Acres of Resolution Copper Property offered to the USFS,
T14N, R12E, Section 9,
Coconino County, Arizona.
Image Source: ESRI Online USA Topo Maps
Data Source: ADWR, USGS, NHDH HUC 12
Disclaimer: Map boundaries are based on best available data.
Legal descriptions pending field verfication by professional surveyors.

Legend

- Offered Lands
- USGS Gage Sept 30, 2011
- HUC 12 Watershed

ADWR Well Locations
Within a 1-Mile Buffer of Parcel



The ADWR Wells 55 Registry contains all wells registered in the state.
Dowloaded from ADWR Website 4/2/2013 -Http://www.azwater.gov/azdwr/gis/

N

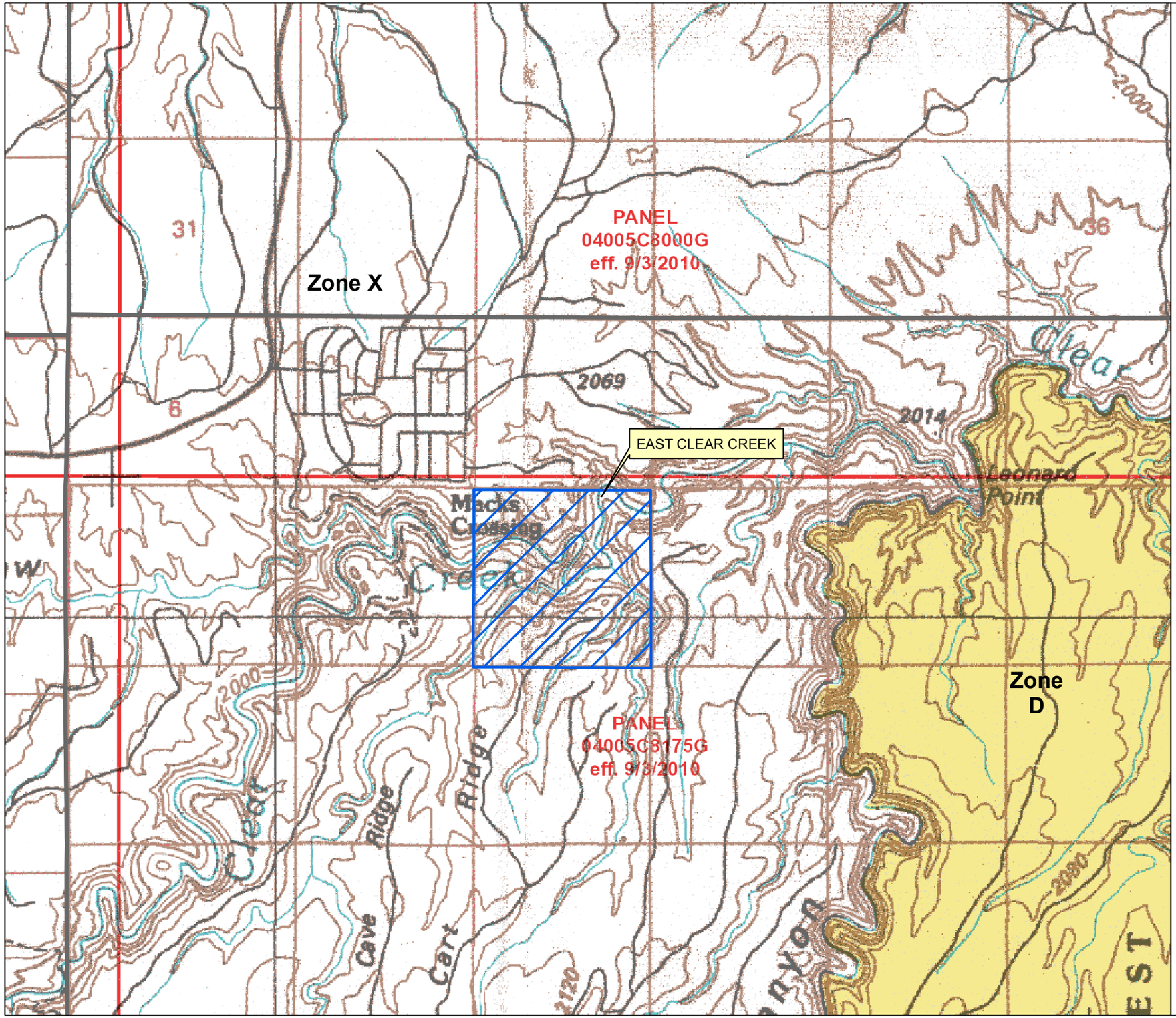
0 4,000 8,000 Feet

0 1,500 3,000 Meters

RESOLUTION COPPER
Ecological Overview

SURFACE WATER RESOURCES AND WELLS
EAST CLEAR CREEK PARCEL
Figure 6

Path: M:\Jobs\800's\807.98\ENV\LandExchangeMaps\MXD\EcoOverviewReport\ReportFiguresEClearCk\Fig7_FEMA_EClearCk.mxd



East Clear Creek:
640 Acres of Resolution Copper Property offered to the USFS,
T14N, R12E, Section 9,
Coconino County, Arizona.
Image Source: Sedona & Holbrook1:100,000 USGS Quadrangles
Data Sources: FEMA Flood Hazard Zones
Disclaimer: Map boundaries are based on best available data.
Legal descriptions pending field verfication by professional surveyors.

Legend

Offered Lands

Flood Hazard Zones

Area of Undetermined Flood Hazard (Zone D)

Zone X - Area of Minimal Flood Hazard

https://hazards.fema.gov/gis/nfhl/services

N

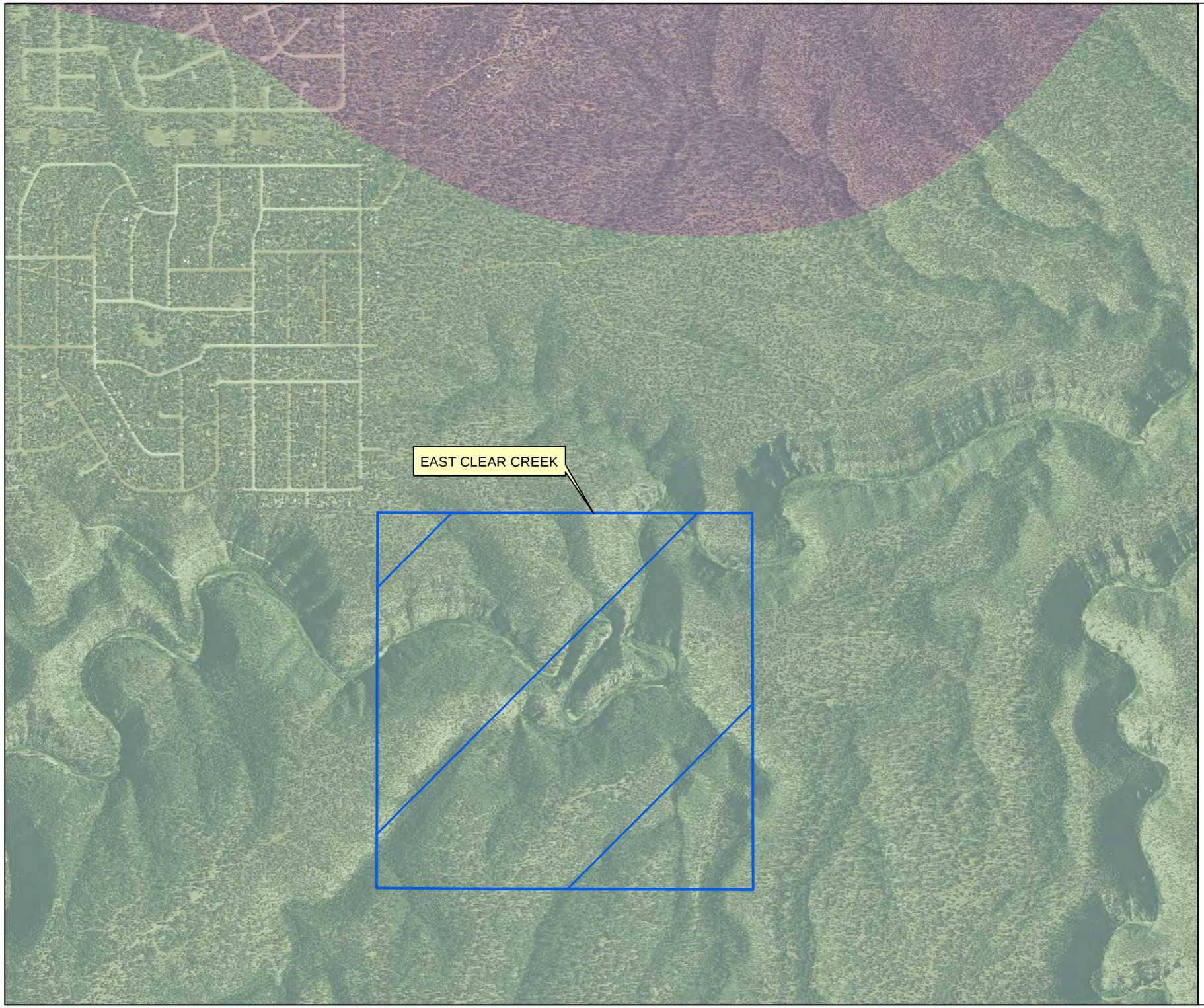
0 1,500 3,000 Feet

0 500 1,000 Meters

RESOLUTION COPPER
Ecological Overview

FEMA FLOOD MAPS
EAST CLEAR CREEK PARCEL
Figure 7

Path: M:\Jobs\800's\807.98\ENV\LandExchangeMaps\MXD\EcoOverviewReport\ReportFiguresEClearCk\Fig8_BioCommAerial_EClearCk.mxd



East Clear Creek:
640 Acres of Resolution Copper Property offered to the USFS,
T14N, R12E, Section 9,
Coconino County, Arizona.
Image Source: NAIP, 2013
Data Sources: Vegetation Communities based on Biotic Communities of the Southwest, Brown & Lowe, August 1980.
Vegetation within the East Clear Creek parcel is representative of three biotic communities: Petran Montane Conifer Forest, Great Basin Conifer Woodland, and Interior Riparian Deciduous Forest. North-facing slopes consist of vegetation characteristics of the Petran Montane Conifer Forest biotic community. Sorth-facing slopes consist of vegetation that is best described as an ecotone or transition zone between Petran Montane Conifer Forest and Great Basin Conifer Woodland. Vegetaion along East Clear Creek is typical of the Interior Riparian Deciduous Forest biotic community.
Disclaimer: Map boundaries are based on best available data. Legal descriptions pending field verfication by professional surveyors.

Legend

Offered Lands

Biotic Communities

DESCRIPTION

GREAT BASIN CONIFER WOODLAND

PETRAN MONTANE CONIFER FOREST

N

0 700 1,400 Feet

0 250 500 Meters

RESOLUTION COPPER
Ecological Overview

BIOTIC COMMUNITIES
EAST CLEAR CREEK PARCEL

Figure 8

APPENDIX A

AGFD HDMS and USFWS IPaC System Special Status Species Records Online Query

Arizona Environmental Online Review Tool Report

Arizona Game and Fish Department Mission
To conserve Arizona's diverse wildlife resources and manage for safe, compatible outdoor recreation opportunities for current and future generations.

Project Name:
Land Exchange - East Clear Creek

Project Description:
Land Exchange

Project Type:
Mining, Extraction Other minerals (copper, limestone, cinders, shale, salt), Other minerals (copper, limestone, cinders, shale, salt)

Contact Person:
Jessica Gilligan

Organization:
WestLand Resources, Inc.

On Behalf Of:
CONSULTING

Project ID:
HGIS-00728

Please review the entire report for project type and/or species recommendations for the location information entered. Please retain a copy for future reference.

Disclaimer:

1. This Environmental Review is based on the project study area that was entered. The report must be updated if the project study area, location, or the type of project changes.
2. This is a preliminary environmental screening tool. It is not a substitute for the potential knowledge gained by having a biologist conduct a field survey of the project area. This review is also not intended to replace environmental consultation (including federal consultation under the Endangered Species Act), land use permitting, or the Departments review of site-specific projects.
3. The Departments Heritage Data Management System (HDMS) data is not intended to include potential distribution of special status species. Arizona is large and diverse with plants, animals, and environmental conditions that are ever changing. Consequently, many areas may contain species that biologists do not know about or species previously noted in a particular area may no longer occur there. HDMS data contains information about species occurrences that have actually been reported to the Department. Not all of Arizona has been surveyed for special status species, and surveys that have been conducted have varied greatly in scope and intensity. Such surveys may reveal previously undocumented population of species of special concern.
4. HabiMap Arizona data, specifically Species of Greatest Conservation Need (SGCN) under our State Wildlife Action Plan (SWAP) and Species of Economic and Recreational Importance (SERI), represent potential species distribution models for the State of Arizona which are subject to ongoing change, modification and refinement. The status of a wildlife resource can change quickly, and the availability of new data will necessitate a refined assessment.

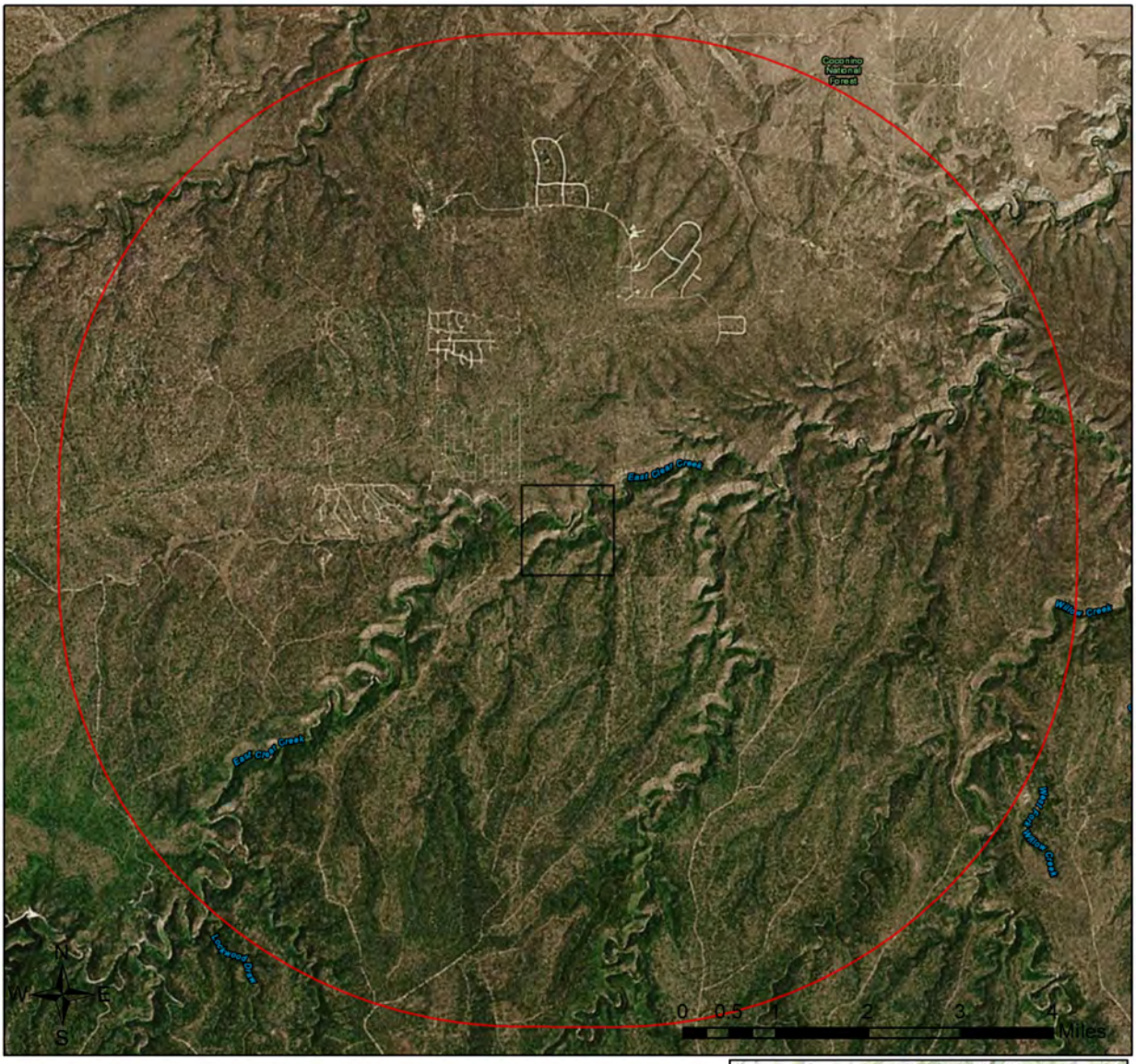
Locations Accuracy Disclaimer:
Project locations are assumed to be both precise and accurate for the purposes of environmental review. The creator/owner of the Project Review Report is solely responsible for the project location and thus the correctness of the Project Review Report content.

Recommendations Disclaimer:

1. The Department is interested in the conservation of all fish and wildlife resources, including those species listed in this report and those that may have not been documented within the project vicinity as well as other game and nongame wildlife.
2. Recommendations have been made by the Department, under authority of Arizona Revised Statutes Title 5 (Amusements and Sports), 17 (Game and Fish), and 28 (Transportation).
3. Potential impacts to fish and wildlife resources may be minimized or avoided by the recommendations generated from information submitted for your proposed project. These recommendations are preliminary in scope, designed to provide early considerations on all species of wildlife.
4. Making this information directly available does not substitute for the Department's review of project proposals, and should not decrease our opportunity to review and evaluate additional project information and/or new project proposals.
5. Further coordination with the Department requires the submittal of this Environmental Review Report with a cover letter and project plans or documentation that includes project narrative, acreage to be impacted, how construction or project activity(s) are to be accomplished, and project locality information (including site map). Once AGFD had received the information, please allow 30 days for completion of project reviews. Send requests to:
   Project Evaluation Program, Habitat Branch
   Arizona Game and Fish Department
   5000 West Carefree Highway
   Phoenix, Arizona 85086-5000
   Phone Number: (623) 236-7600
   Fax Number: (623) 236-7366
   Or
   PEP@azgfd.gov
6. Coordination may also be necessary under the National Environmental Policy Act (NEPA) and/or Endangered Species Act (ESA). Site specific recommendations may be proposed during further NEPA/ESA analysis or through coordination with affected agencies

Land Exchange - East Clear Creek

Aerial Image Basemap With Locator Map



Project Boundary

Buffered Project Boundary

Project Size (acres): 633.87

Lat/Long (DD): 34.6167 / -111.0813

County(s): Coconino

AGFD Region(s): Flagstaff

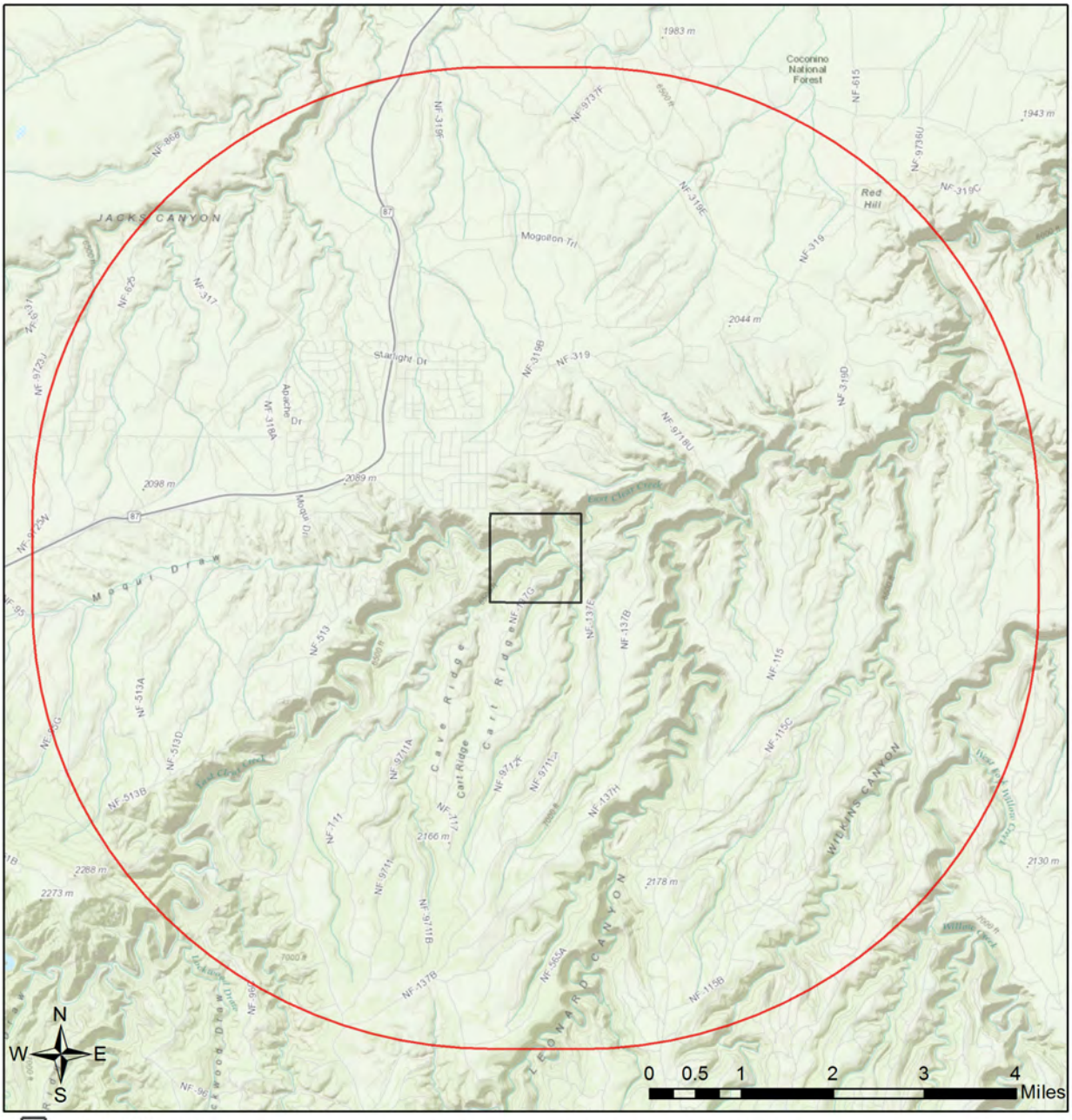
Township/Range(s): T14N, R12E

USGS Quad(s): LEONARD CANYON

Service Layer Credits: Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong),

Land Exchange - East Clear Creek

Web Map As Submitted By User



Project Boundary

Buffered Project Boundary

Project Size (acres): 633.87

Lat/Long (DD): 34.6167 / -111.0813

County(s): Coconino

AGFD Region(s): Flagstaff

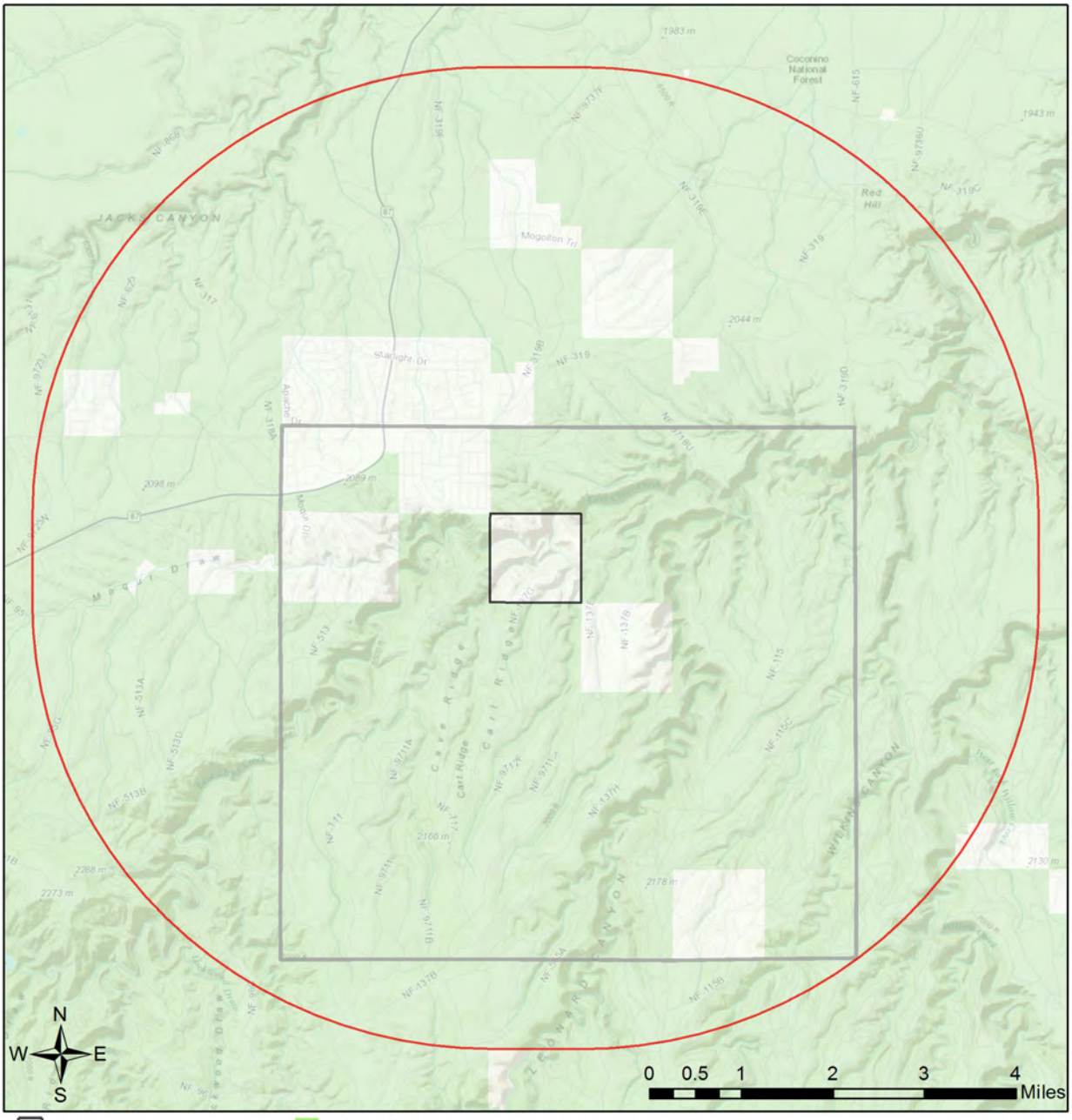
Township/Range(s): T14N, R12E

USGS Quad(s): LEONARD CANYON

Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Land Exchange - East Clear Creek

Topo Basemap With Township/Ranges and Land Ownership



- Project Boundary
- Buffered Project Boundary
- Township/Range
- AZ Game and Fish Dept.
- BLM
- BOR
- Indian Res.
- Military
- Mixed/Other
- National Park/Mon.
- Private
- State and Regional Parks
- State Trust
- US Forest Service
- Wildlife Area/Refuge

Project Size (acres): 633.87
Lat/Long (DD): 34.6167 / -111.0813
County(s): Coconino
AGFD Region(s): Flagstaff
Township/Range(s): T14N, R12E
USGS Quad(s): LEONARD CANYON

Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Special Status Species and Special Areas Documented within 5 Miles of Project Vicinity

Scientific Name	Common Name	FWS	USFS	BLM	State	SGCN
Accipiter gentilis	Northern Goshawk	SC	S	S	WSC	1B
Anaxyrus microscaphus	Arizona Toad	SC				1B
Anodonta californiensis	California Floater	SC	S			1A
CH for Lepidomeda vitatta	Little Colorado spinedace Designated Critical Habitat					
CH for Strix occidentalis lucida	Mexican spotted owl Designated Critical Habitat					
Catostomus sp. 3	Little Colorado Sucker	SC	S	S	WSC	1A
Erigeron saxatilis	Rock Fleabane		S			
Falco peregrinus anatum	American Peregrine Falcon	SC	S	S	WSC	1A
Haliaeetus leucocephalus (wintering pop.)	Bald Eagle - Winter Population	SC,BGA	S	S	WSC	1A
Lepidomeda vittata	Little Colorado Spinedace	LT			WSC	1A
Lithobates chiricahuensis	Chiricahua Leopard Frog	LT			WSC	1A
Lithobates pipiens	Northern Leopard Frog		S	S	WSC	1A
Rhinichthys osculus	Speckled Dace	SC		S		1B
Strix occidentalis lucida	Mexican Spotted Owl	LT			WSC	1A

Note: Status code definitions can be found at http://www.azgfd.gov/w_c/edits/hdms_status_definitions.shtml.

Species of Greatest Conservation Need
Predicted within Project Vicinity based on Predicted Range Models

Scientific Name	Common Name	FWS	USFS	BLM	State	SGCN
Accipiter gentilis atricapillus	Northern Goshawk	SC	S		WSC	1B
Ambystoma mavortium nebulosum	Arizona Tiger Salamander					1B
Anaxyrus microscaphus	Arizona Toad	SC				1B
Anodonta californiensis	California Floater	SC	S			1A
Antilocapra americana americana	America Pronghorn					1B
Buteo regalis	Ferruginous Hawk	SC		S	WSC	1B
Castor canadensis	American Beaver					1B
Catostomus clarkii	Desert Sucker	SC	S	S		1B
Catostomus discobolus	Bluehead Sucker	PS		S		1A
Catostomus sp. 3	Little Colorado Sucker	SC	S	S	WSC	1A
Chordeiles minor	Common Nighthawk					1B
Coccothraustes vespertinus	Evening Grosbeak					1B
Corynorhinus townsendii pallescens	Pale Townsend's Big-eared Bat	SC	S	S		1B
Crotalus cerberus	Arizona Black Rattlesnake					1B
Cynomys gunnisoni	Gunnison's Prairie Dog	SC		S		1B
Euderma maculatum	Spotted Bat	SC	S	S	WSC	1B
Falco peregrinus anatum	American Peregrine Falcon	SC	S	S	WSC	1A
Geothlypis tolmiei	MacGillivray's Warbler					1B
Gila intermedia	Gila Chub	LE			WSC	1A
Gila robusta	Roundtail Chub	C*	S		WSC	1A
Gymnorhinus cyanocephalus	Pinyon Jay			S		1B

Species of Greatest Conservation Need
Predicted within Project Vicinity based on Predicted Range Models

Scientific Name	Common Name	FWS	USFS	BLM	State	SGCN
Haliaeetus leucocephalus	Bald Eagle	SC, BGA	S	S	WSC	1A
Idionycteris phyllotis	Allen's Lappet-browed Bat	SC	S	S		1B
Lasiurus blossevillii	Western Red Bat		S		WSC	1B
Lepidomeda vittata	Little Colorado Spinedace	LT			WSC	1A
Lithobates chiricahuensis	Chiricahua Leopard Frog	LT			WSC	1A
Lithobates pipiens	Northern Leopard Frog		S	S	WSC	1A
Melospiza lincolnii	Lincoln's Sparrow					1B
Microtus mexicanus	Mexican Vole					1B
Mustela nigripes	Black-footed Ferret	LE,XN			WSC	1A
Myiarchus tuberculifer	Dusky-capped Flycatcher					1B
Myiodynastes luteiventris	Sulphur-bellied Flycatcher		S			1B
Myotis occultus	Arizona Myotis	SC		S		1B
Myotis yumanensis	Yuma Myotis	SC				1B
Neotamias cinereicollis	Gray-collared Chipmunk					1B
Neotoma stephensi	Stephen's Woodrat					1B
Odocoileus virginianus	White-tailed Deer					1B
Panthera onca	Jaguar	LE			WSC	1A
Rhinichthys osculus	Speckled Dace	SC		S		1B
Sciurus arizonensis	Arizona Gray Squirrel					1B
Strix occidentalis lucida	Mexican Spotted Owl	LT			WSC	1A
Tadarida brasiliensis	Brazilian Free-tailed Bat					1B
Troglodytes pacificus	Pacific Wren					1B
Vulpes macrotis	Kit Fox					1B

Species of Economic and Recreation Importance Predicted within Project Vicinity

Scientific Name	Common Name	FWS	USFS	BLM	State	SGCN
Antilocapra americana americana	America Pronghorn					1B
Cervus elaphus	Elk					
Meleagris gallopavo	Wild Turkey					
Odocoileus hemionus	Mule Deer					
Odocoileus virginianus	White-tailed Deer					1B
Patagioenas fasciata	Band-tailed Pigeon					1C
Pecari tajacu	Javelina					
Puma concolor	Mountain Lion					
Sciurus aberti	Abert's Squirrel					
Tamiasciurus hudsonicus mogollonensis	Red Squirrel					
Ursus americanus	American Black Bear					

Project Type: Mining, Extraction Other minerals (copper, limestone, cinders, shale, salt), Other minerals (copper, limestone, cinders, shale, salt)

Project Type Recommendations:

Fence recommendations will be dependant upon the goals of the fence project and the wildlife species expected to be impacted by the project. General guidelines for ensuring wildlife-friendly fences include: barbless wire on the top and bottom with the maximum fence height 42", minimum height for bottom 16". Modifications to this design may be considered for fencing anticipated to be routinely encountered by elk, bighorn sheep or pronghorn (e.g., Pronghorn fencing would require 18" minimum height on the bottom). Please refer to the Department's Fencing Guidelines located on the home page of this application at http://www.azgfd.gov/hgis/guidelines.aspx.

During the planning stages of your project, please consider the local or regional needs of wildlife in regards to movement, connectivity, and access to habitat needs. Loss of this permeability prevents wildlife from accessing resources, finding mates, reduces gene flow, prevents wildlife from re-colonizing areas where local extirpations may have occurred, and ultimately prevents wildlife from contributing to ecosystem functions, such as pollination, seed dispersal, control of prey numbers, and resistance to invasive species. In many cases, streams and washes provide natural movement corridors for wildlife and should be maintained in their natural state. Uplands also support a large diversity of species, and should be contained within important wildlife movement corridors. In addition, maintaining biodiversity and ecosystem functions can be facilitated through improving designs of structures, fences, roadways, and culverts to promote passage for a variety of wildlife.

Consider impacts of outdoor lighting on wildlife and develop measures or alternatives that can be taken to increase human safety while minimizing potential impacts to wildlife. Conduct wildlife surveys to determine species within project area, and evaluate proposed activities based on species biology and natural history to determine if artificial lighting may disrupt behavior patterns or habitat use. Use only the minimum amount of light needed for safety. Narrow spectrum bulbs should be used as often as possible to lower the range of species affected by lighting. All lighting should be shielded, cantered, or cut to ensure that light reaches only areas needing illumination.

Minimize potential introduction or spread of exotic invasive species. Invasive species can be plants, animals (exotic snails), and other organisms (e.g., microbes), which may cause alteration to ecological functions or compete with or prey upon native species and can cause social impacts (e.g., livestock forage reduction, increase wildfire risk). The terms noxious weed or invasive plants are often used interchangeably. Precautions should be taken to wash all equipment utilized in the project activities before leaving the site. Arizona has noxious weed regulations (Arizona Revised Statutes, Rules R3-4-244 and R3-4-245). See Arizona Department of Agriculture website for restricted plants, https://agriculture.az.gov/. Additionally, the U.S. Department of Agriculture has information regarding pest and invasive plant control methods including: pesticide, herbicide, biological control agents, and mechanical control, http://www.usda.gov/wps/portal/usdahome. The Department regulates the importation, purchasing, and transportation of wildlife and fish (Restricted Live Wildlife), please refer to the hunting regulations for further information http://www.azgfd.gov/h_f/hunting_rules.shtml

Minimization and mitigation of impacts to wildlife and fish species due to changes in water quality, quantity, chemistry, temperature, and alteration to flow regimes (timing, magnitude, duration, and frequency of floods) should be evaluated. Minimize impacts to springs, in-stream flow, and consider irrigation improvements to decrease water use. If dredging is a project component, consider timing of the project in order to minimize impacts to spawning fish and other aquatic species (include spawning seasons), and to reduce spread of exotic invasive species. We recommend early direct coordination with Project Evaluation Program for projects that could impact water resources, wetlands, streams, springs, and/or riparian habitats.

The Department recommends that wildlife surveys are conducted to determine if noise-sensitive species occur within the project area. Avoidance or minimization measures could include conducting project activities outside of breeding seasons.

Based on the project type entered, coordination with the Office of Surface Mining may be required (http://www.osmre.gov/index.shtm).

Based on the project type entered, coordination with the Environmental Protection Agency may be required (http://www.epa.gov/).

Based on the project type entered, coordination with State Historic Preservation Office may be required (http://azstateparks.com/SHPO/index.html).

Pre- and post-survey/monitoring should be conducted to determine alternative access/exits to mines and to identify and/or minimize potential impacts to bat species. For further information when developing alternatives to mine closures, contact the Arizona Game and Fish Department Bat Coordinator at the Main Office in Nongame Branch, http://www.azgfd.gov/inside_azgfd/agency_directory.shtml .

Based on the project type entered, coordination with Arizona Department of Environmental Quality may be required (http://www.azdeq.gov/).

Based on the project type entered, coordination with Arizona Department of Water Resources may be required (http://www.azwater.gov/azdwr/default.aspx).

Vegetation restoration projects (including treatments of invasive or exotic species) should have a completed site-evaluation plan (identifying environmental conditions necessary to re-establish native vegetation), a revegetation plan (species, density, method of establishment), a short and long-term monitoring plan, including adaptive management guidelines to address needs for replacement vegetation.

Avoid/minimize wildlife impacts related to contacting hazardous and other human-made substances in facility water collection/storage basins, evaporation or settling ponds and/or facility storage yards. Design slopes to discourage wading birds and use fencing, netting, hazing or other measures to exclude wildlife.

Project Location and/or Species Recommendations:

HDMS records indicate that one or more listed, proposed, or candidate species or Critical Habitat (Designated or Proposed) have been documented in the vicinity of your project. The Endangered Species Act (ESA) gives the US Fish and Wildlife Service (USFWS) regulatory authority over all federally listed species. Please contact USFWS Ecological Services Offices at http://www.fws.gov/southwest/es/arizona/ or:

Phoenix Main Office
2321 W. Royal Palm Rd, Suite 103
Phoenix, AZ 85021
Phone: 602-242-0210
Fax: 602-242-2513

Tucson Sub-Office
201 N. Bonita Suite 141
Tucson, AZ 85745
Phone: 520-670-6144
Fax: 520-670-6155

Flagstaff Sub-Office
SW Forest Science Complex
2500 S. Pine Knoll Dr.
Flagstaff, AZ 86001
Phone: 928-556-2157
Fax: 928-556-2121

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Arizona Ecological Services Field Office
2321 WEST ROYAL PALM ROAD, SUITE 103
PHOENIX, AZ 85021
PHONE: (602)242-0210 FAX: (602)242-2513
URL: www.fws.gov/southwest/es/arizona/;
www.fws.gov/southwest/es/EndangeredSpecies/lists/

Consultation Code: 02EAAZ00-2015-SLI-0341 March 05, 2015
Event Code: 02EAAZ00-2015-E-00346
Project Name: Land Exchange - East Clear Creek

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The Fish and Wildlife Service (Service) is providing this list under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). The list you have generated identifies threatened, endangered, proposed, and candidate species, and designated and proposed critical habitat, that *may* occur within one or more delineated United States Geological Survey 7.5 minute quadrangles with which your project polygon intersects. Each quadrangle covers, at minimum, 49 square miles. Please refer to the species information links found at http://www.fws.gov/southwest/es/arizona/Docs_Species.htm or http://www.fws.gov/southwest/es/arizona/Documents/MiscDocs/AZSpeciesReference.pdf for a quick reference, to determine if suitable habitat for the species on your list occurs in your project area.

The purpose of the Act is to provide a means whereby threatened and endangered species and the habitats upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of Federal trust resources and to determine whether projects may affect federally listed species and/or designated critical habitat. A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If the Federal action agency determines that listed species or critical habitat *may be affected* by a federally funded, permitted or authorized activity, the agency must consult with us pursuant to 50 CFR 402. Note that a "may affect" determination includes effects that may not be adverse and that may be beneficial, insignificant, or discountable. An effect exists even if only one individual or habitat segment may be affected. The effects analysis should include the entire action area, which often extends well outside the project boundary or "footprint" (e.g., downstream). If the Federal action agency determines that the action may jeopardize a *proposed* species or adversely modify *proposed* critical habitat, the agency must enter into a section 7 conference. The agency may choose to confer with us on an action that may affect proposed species or critical habitat.

Candidate species are those for which there is sufficient information to support a proposal for listing. Although candidate species have no legal protection under the Act, we recommend that they be considered in the planning process in the event they become proposed or listed prior to project completion. More information on the regulations (50 CFR 402) and procedures for section 7 consultation, including the role of permit or license applicants, can be found in our Endangered Species Consultation Handbook at: http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF.

In addition to species listed under the Act, we advise you to consider species protected under the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703-712) and the Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. 668 *et seq.*). Both laws prohibit the take of covered species. The list of MBTA-protected birds is in 50 CFR 10.13 (for an alphabetical list see http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/MBTANDX.HTML). The Service's Division of Migratory Birds is the lead for consultations under these laws (Southwest Regional Office phone number: 505/248-7882). For more information regarding the MBTA, BGEPA, and permitting processes, please visit the following web site: http://www.fws.gov/migratorybirds/mbpermits.html. Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g. cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/southwest/es/arizona/CellTower.htm

Although bald eagles (*Haliaeetus leucocephalus*) are no longer listed under the Act, they are protected under both the BGEPA and the MBTA. If a bald eagle nest occurs in or near the proposed project area, our office should be contacted. An evaluation must be performed to determine whether the project is likely to disturb nesting bald eagles (see http://www.fws.gov/southeast/es/baldeagle/) and the Division of Migratory Birds consulted if necessary. The National Bald Eagle Management Guidelines provide recommendations to minimize potential project impacts to bald eagles (see http://www.fws.gov/midwest/eagle/pdf/NationalBaldEagleManagementGuidelines.pdf).

Activities that involve streams and/or wetlands are regulated by the U.S. Army Corps of Engineers (Corps). We recommend that you contact the Corps to determine their interest in proposed projects in these areas. For activities within a National Wildlife Refuge, we recommend that you contact refuge staff for specific information about refuge resources.

If your action is on Indian land or has implications for off-reservation tribal interests, we encourage you to contact the tribe(s) and the Bureau of Indian Affairs (BIA) to discuss potential

tribal concerns, and to invite any affected tribe and the BIA to participate in the section 7 consultation. In keeping with our tribal trust responsibility, we will notify tribes that may be affected by proposed actions when section 7 consultation is initiated. For more information, please contact our tribal coordinator, John Nystedt, at (928) 556-2160 or John_Nystedt@fws.gov.

The State of Arizona protects some species not protected by Federal law. We recommend you contact the Arizona Game and Fish Department (AGFD) for animals and Arizona Department of Agriculture for plants to determine if species protected by or of concern to the State may occur in your action area. The AGFD has an Environmental Review On-Line Tool that can be accessed at http://www.azgfd.gov/hgis/. We also recommend that you coordinate with the AGFD regarding your project.

For additional communications regarding this project, please refer to the consultation Tracking Number in the header of this letter. We appreciate your concern for threatened and endangered species. If we may be of further assistance, please contact Brenda Smith at 928/556-2157 for projects in Northern Arizona, our general Phoenix number (602/242-0210) for central Arizona, or Jean Calhoun at 520/670-6150 (x223) for projects in southern Arizona.

Sincerely,

/s/

Steven L. Spangle

Field Supervisor

Attachment

United States Department of Interior
Fish and Wildlife Service

Project name: Land Exchange - East Clear Creek

Official Species List

Provided by:

Arizona Ecological Services Field Office
2321 WEST ROYAL PALM ROAD, SUITE 103
PHOENIX, AZ 85021
(602) 242-0210
http://www.fws.gov/southwest/es/arizona/
http://www.fws.gov/southwest/es/EndangeredSpecies/lists/

Consultation Code: 02EAAZ00-2015-SLI-0341
Event Code: 02EAAZ00-2015-E-00346

Project Type: Mining

Project Name: Land Exchange - East Clear Creek
Project Description: Land Exchange

Please Note: The FWS office may have modified the Project Name and/or Project Description, so it may be different from what was submitted in your previous request. If the Consultation Code matches, the FWS considers this to be the same project. Contact the office in the 'Provided by' section of your previous Official Species list if you have any questions or concerns.

Project Location Map:

Project Coordinates: MULTIPOLYGON (((-111.0900511 34.6239238, -111.0726443 34.6239171, -111.0725797 34.6094422, -111.0900914 34.6094929, -111.0900511 34.6239238)))

Project Counties: Coconino, AZ

Endangered Species Act Species List

There are a total of 8 threatened, endangered, or candidate species on your species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Critical habitats listed under the **Has Critical Habitat** column may or may not lie within your project area. See the **Critical habitats within your project area** section further below for critical habitat that lies within your project. Please contact the designated FWS office if you have questions.

Amphibians	**Status**	**Has Critical Habitat**	**Condition(s)**
Chiricahua leopard frog *(Lithobates chiricahuensis)* Population: Entire	Threatened	Final designated	
Birds			
Mexican Spotted owl *(Strix occidentalis lucida)* Population: Entire	Threatened	Final designated	
Southwestern Willow flycatcher *(Empidonax traillii extimus)* Population: Entire	Endangered	Final designated	
Yellow-Billed Cuckoo *(Coccyzus americanus)* Population: Western U.S. DPS	Threatened	Proposed	
Fishes			
Little Colorado spinedace *(Lepidomeda vittata)* Population: Entire	Threatened	Final designated	
Roundtail chub *(Gila robusta)*	Candidate		

Population: Lower Colorado River Basin DPS			
Mammals			
Black-Footed ferret *(Mustela nigripes)* Population: U.S.A. (specific portions of AZ, CO, MT, SD, UT, and WY)	Experimental Population, Non-Essential		
Reptiles			
Northern Mexican gartersnake *(Thamnophis eques megalops)*	Threatened	Proposed	

Critical habitats that lie within your project area

The following critical habitats lie fully or partially within your project area.

Birds	Critical Habitat Type
Mexican Spotted owl *(Strix occidentalis lucida)* Population: Entire	Final designated
Fishes	
Little Colorado spinedace *(Lepidomeda vittata)* Population: Entire	Final designated

APPENDIX B

East Clear Creek Representative Photographs

Photograph 1. East Clear Creek parcel overview.

Photograph 3. Game trail within the East Clear Creek parcel on a terrace in the canyon.

Photograph 2. Informal two-track trail on a terrace within the East Clear Creek parcel.

Photograph 4. Off-site USFS water quality station near northwest corner of the East Clear Creek parcel.

Photograph 5. East Clear Creek through the Property. Note relative height of canyon walls in background.

Photograph 7. Floodplains and terraces are present on both sides of the stream in wider sections of the East Clear Creek canyon.

Photograph 6. Canyon form of East Clear Creek within the Property. Note near-vertical bedrock exposure on right and alluvial deposit (terrace) in foreground and left.

Photograph 8. Steep East Clear Creek canyon wall (south face).

Photograph 9. Alluvial deposit of sand, gravel, and small boulders forming terrace along East Clear Creek channel, with riparian vegetation.

Photograph 11. Exposed Coconino sandstone bedrock on East Clear Creek canyon floor, eroded by water.

Photograph 10. Talus (boulders) and alluvium on terrace above East Clear Creek channel, with small stature riparian vegetation.

Photograph 12. East Clear Creek canyon south wall. Note vertical cliff form of uppermost section, the Kaibab limestone. Coconino sandstone lies beneath the Kaibab formation.

Photograph 13. Kaibab limestone sample with calcite cavity.

Photograph 15. Petran Montane Conifer Forest vegetation on north-facing slope within the East Clear Creek parcel.

Photograph 14. Coconino sandstone exposure along south wall of East Clear Creek canyon.

Photograph 16. New Mexico locust, a species common to the Petran Montane Conifer Forest biotic community, was observed within the Property.

Photograph 17. Overview of south-facing slope within the East Clear Creek parcel.

Photograph 19. Rocky mountain juniper.

Photograph 18. Vegetation on south-facing slope characteristic of a transitional zone between Petran Montane Conifer Forest and Great Basin Conifer Woodland.

Photograph 20. Riparian vegetation along the East Clear Creek channel.

Photograph 21. Arizona alder.

Photograph 23. Patchy, open-canopied riparian vegetation found along East Clear Creek.

Photograph 22. Short-statured riparian vegetation and steep canyon walls along East Clear Creek within the Property.

Photograph 24. A tailless plateau lizard observed basking in the sun.

Photograph 25. Elk tracks observed within the Property.

Photograph 26. Virile crayfish claw in the East Clear Creek channel.