

Upper Gila River Ecological Conditions Analysis

Prepared for

New Mexico Interstate Stream Commission

Prepared by

SWCA Environmental Consultants

June 2006



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SWCA Project No. 10525-091

June 30, 2006

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1.0 INTRODUCTION

1.1 BACKGROUND

In 2004 the President of the United States signed into law the 2004 Arizona Water Settlements Act (AWSA). The Consumptive Use and Forbearance Agreement (CUFA) section of the settlement provides water and funding to the State of New Mexico to develop water resources in the Gila River Basin within New Mexico. The amount of water available for New Mexico's use is approximately 14,000 acre-feet per year over a ten-year period, and is administered by the New Mexico Interstate Stream Commission (NMISC).

In recognition of its mission and commitment to public involvement needed to move this process forward the NMISC adopted a policy to guide funding and uses of water resources in the Gila Basin. This policy states:

"The Interstate Stream Commission recognizes the unique and valuable ecology of the Gila Basin. In considering any proposal for water utilization under Section 212 of the Arizona Water Settlements Act, the Commission will apply the best available science to fully assess and mitigate the ecological impacts on southwest New Mexico, the Gila River, its tributaries and associated riparian corridors, while also considering the historic uses of and future demands for water in the Basin and the traditions, cultures and customs affecting those uses."

Following this directive the NMISC has tasked SWCA Environmental Consultants to complete an ecological conditions status report for those federally listed and special status plant and animal species in the Gila River Basin project area.

1.2 GENERAL PROJECT DESCRIPTION

The New Mexico Interstate Stream Commission is currently undertaking a collaborative planning process to evaluate potential water development scenarios under the CUFA and the 2004 AWSA. The planning process is inclusive of all stakeholders in the Upper Gila River Basin and heavily relies on the people of southwest New Mexico to consult with the ISC on this process.

This process will incorporate the best available science to comply with state and federal regulations that include, but are not limited to, the Endangered Species Act and the National Environmental Policy Act. The planning process will incorporate scientific investigations along with objectives developed by stakeholders in the region. The project description will be determined by utilizing this extensive planning process and incorporating sound science, federal compliance, guidance from the CUFA, and stakeholder objectives to manager the water resources of the Upper Gila River Basin.

1.3 PURPOSE OF THE STUDY

The purpose of this report is to provide technical information to the NMISC for meeting their goals and objectives for planning and development of Gila River Basin water resources. Baseline biological evaluations using existing information, models of the Upper Gila River geomorphology, and available aquatic habitat will provide the data needed to begin evaluations of potential impacts of the proposed development of Gila River water. These geomorphology and aquatic habitat reports will be submitted separately as standalone documents. Future synthesis of biological and physical resources will be conducted during additional phases of this project. An ecosystem approach using both biological and physical interactions will provide the technical support necessary to achieve the ISC's objectives of

reaching long-term solutions for the development of Gila River water resources in a scientifically defensible and cost-effective manner. Knowledge of baseline data on Gila River Basin threatened and endangered species, riverine habitat, instream flows, geomorphology, and potential impacts to these resources will allow the ISC to develop proactive and sound solutions that protect existing and future water uses.

The scope of this study included collating accessible, existing ecological data on U.S. Fish and Wildlife Service (FWS), U.S. Forest Service (FS), Bureau of Land Management (BLM), and State of New Mexico (State) threatened and endangered species, species of concern, the native and non-native fish community, and other relevant riparian and terrestrial ecological issues in the Gila River in New Mexico and in Greenlee County, Arizona. This includes confirmation of current species distribution and status, identification of significant information gaps, and potential impacts and threats assessment.

1.4 NEED FOR THE ANALYSIS

1.4.1 ENDANGERED SPECIES ACT

THREATENED AND ENDANGERED SPECIES AND CRITICAL HABITAT

Several threatened and endangered species were evaluated to determine their occurrence within the project area and to identify the presence of critical habitat. The purpose of critical habitat designation is to assist in achieving long-term protection and recovery of a species and the ecosystems upon which it depends. Areas designated as critical habitat are subjected to section 7(a)(2) of the ESA, thereby requiring consultation for federal actions that may affect these areas in order to avoid destruction or adverse modification of this habitat.

Section 7(a)(2) of the ESA requires federal agencies to consult with the USFWS to “insure that any action authorized, funded, or carried out by such agency . . . is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined . . . to be critical.” Each agency is required to use the best scientific and commercial data available. This consultation process is typically referred to as a section 7 consultation. Section 7 of the ESA does not apply to state, local, or private land unless there is a federal nexus (i.e., federal funding, authorization, permitting, land ownership).

SECTION 7 CONSULTATION PROCESS

Formal consultation will be initiated if it is determined that a proposed action is likely to (1) adversely affect a listed species or critical habitat through direct take, or (2) otherwise jeopardize the continued existence of that species by destruction or adverse modification of critical habitat. The section 7 consultation process begins with a determination of effects on listed species and designated critical habitat by the federal action agency. If the federal action agency determines that there will be no effect on listed species or designated critical habitat, the proposed action is not altered or impacted by ESA considerations. If the federal action agency determines that listed species or designated critical habitat may be affected, then consultation with the Service is initiated. Once it is determined that the proposed federal action may affect a listed species or critical habitat, the federal action agency and the Service typically enter into informal section 7 consultation. Informal consultation is an optional process for identifying affected species and critical habitat, determining potential effects, and exploring ways to modify the action to remove or reduce adverse effects to listed species or critical habitat (40 CFR 402.13). The informal section 7 consultation process concludes in one of two ways: 1) the Service concurs in writing that the proposed action is not likely to adversely affect listed species or critical habitat; or 2) adverse impacts are likely to occur and formal consultation is initiated. Formal consultation is initiated

when it is determined that the proposed federal action is likely to adversely affect a listed species or critical habitat (40 CFR §402.14). Formal consultation concludes with a biological opinion issued by the Service regarding whether the proposed federal action is likely to jeopardize the continued existence of a listed species or result in destruction or adverse modification of critical habitat. Independent analyses are made under both the jeopardy and the adverse modification standards.

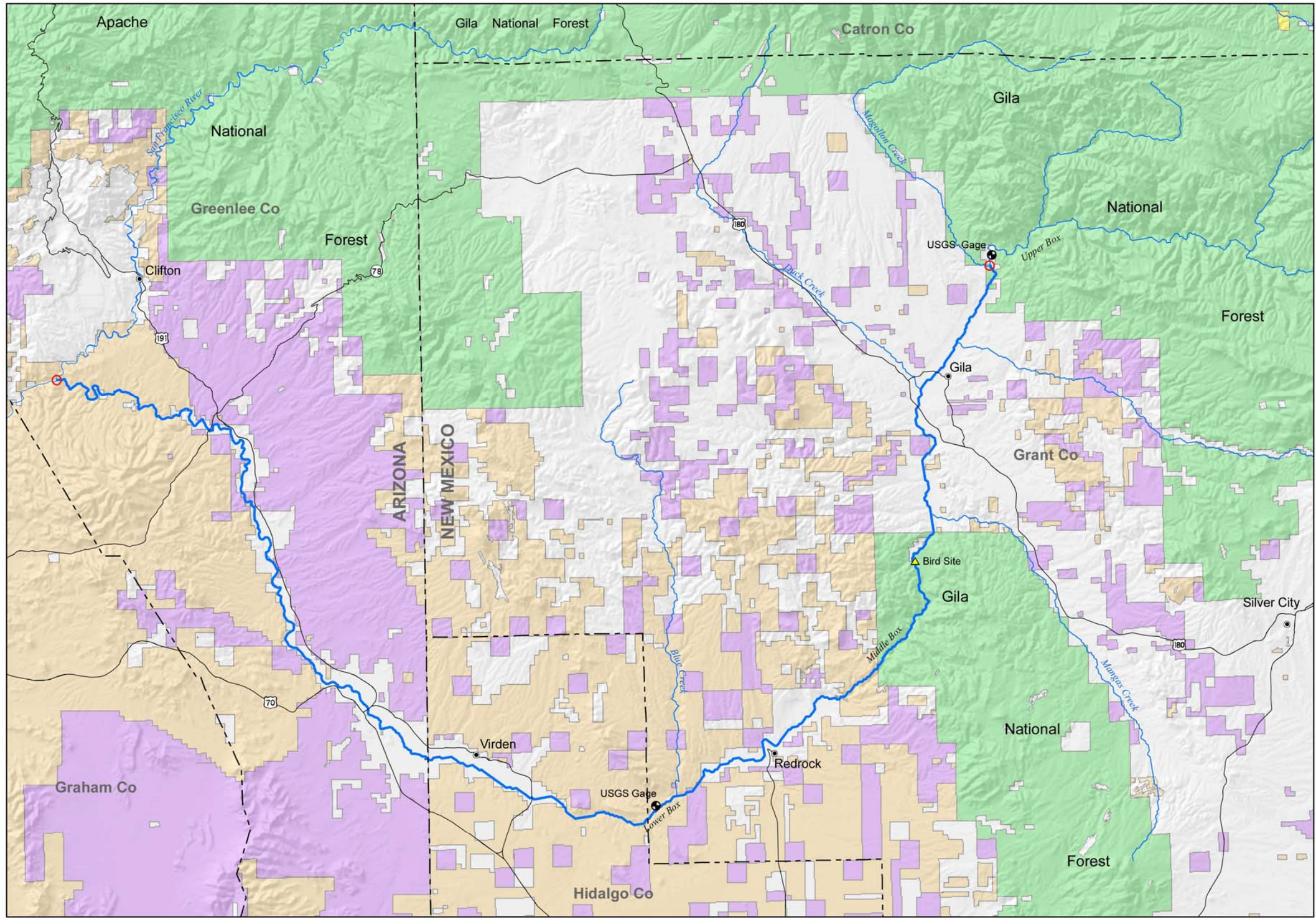
A "non-jeopardy" opinion concludes consultation, and the proposed action may proceed under the ESA. The Service may prepare an incidental take statement that includes reasonable and prudent measures to minimize take, along with associated, mandatory terms and conditions. Discretionary conservation recommendations may also be included in a biological opinion based on effects to species. Conservation recommendations, whether they relate to the jeopardy or adverse modification standard, are discretionary actions recommended by the Service. These recommendations may address minimizing adverse effects on listed species or critical habitat, identify studies or monitoring, or suggest how action agencies can assist species under their own authorities and section 7(a)(1) of the ESA. There are no ESA section 9 prohibitions for critical habitat. Therefore, a non-jeopardy biological opinion may contain conservation recommendations but would not include an incidental take statement, reasonable and prudent measures, or terms and conditions.

In a biological opinion that results in a jeopardy or adverse modification conclusion, the Service develops mandatory reasonable and prudent alternatives to the proposed action. Reasonable and prudent alternatives are actions that the federal agency can take to avoid jeopardizing the continued existence of the species or adversely modifying critical habitat. The Service may develop reasonable and prudent alternatives that vary from slight project modifications to extensive redesign or relocation of the project, depending on the situations involved. Reasonable and prudent alternatives must be consistent with the intended purpose of the proposed action, and they must be consistent with the scope of the federal agency's legal authority. Furthermore, the reasonable and prudent alternatives must be economically and technically feasible.

A biological opinion that results in a jeopardy finding, based on effects to the species, may also include an incidental take statement, reasonable and prudent measures, terms and conditions, and conservation recommendations. A biological opinion that results in an adverse modification finding may include reasonable and prudent alternatives and conservation recommendations, but no incidental take statement or associated reasonable and prudent measures and terms and conditions.

1.5 GENERAL PROJECT AREA

This project area is defined as the reach of the Gila River in New Mexico from Mogollon Creek to the Arizona state line, and in Arizona to the confluence of the San Francisco River in Greenlee County (Figure 1). The counties of Catron, Grant, and Hidalgo in New Mexico and Greenlee County in Arizona are part of the proposed project area. The region within the project area that may potentially be affected includes the mainstem and riparian areas of the Gila River and its tributaries in New Mexico, and the mainstem Gila River to its confluence with the San Francisco River in Greenlee County, Arizona. Additional terrestrial areas around the Cliff-Gila Valley may also be affected by an off-channel storage reservoir.



Gila River Inventory

Figure 1

Notes:

- Town
- Project Area
- Stream
- Highway
- BLM
- State
- Private
- USFS

0 2.5 5 Miles

0 2.5 5 Kilometers

1" = 25,000 ft

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Figure 1. Project location map.

1.5.1 BIOTIC COMMUNITY DESCRIPTION

ELEVATION

The project area encompasses approximately 156.8 kilometers (km) (98 mi) of the riparian corridor of the Gila River from the confluence of Mogollon Creek in New Mexico downstream to the confluence with the San Francisco River in Arizona (Figure 1). The river elevation is 1,410 meters (m) (4,625 ft) in the uppermost end and descends to 1,051 m (3,450 ft) in the lowermost end. The maximum elevations of the landscape adjacent to the river corridor in the reach upstream of Silver City range from approximately 1,860 m (6,100 ft) to 1,645 m (5,400 ft).

ECOREGIONS

Within the project area, the main Gila River corridor consists mostly of interior riparian deciduous forest as classified by Brown (1994). The typical forest gallery consists almost entirely of native trees, such as sycamore (*Platanus wrightii*), alder (*Alnus ablongifolia*), willows (*Salix gooddingii*, *S. bonplandiana*), walnut (*Juglans major*), ash (*Fraxinus pennsylvanica* var. *velutina*), and cottonwood (*Populus fremontii*). Very few patches of non-native trees, such as tamarisk (*Tamarix ramosissima*), can be found in the upper reaches of the corridor; however, patches become more abundant in the middle and lower reaches of the project area.

The river corridor within the project area flows through three different biomes. Upstream of Cliff, New Mexico, the river flows through Great Basin conifer woodlands, which are characterized by piñon pine (*Pinus monophylla*) and one-seed juniper (*Juniperus monosperma*) (Brown 1994). Downstream of Cliff to near the Arizona state border, the river corridor flows through Chihuahuan semidesert grasslands that are characterized by tobosa (*Hilaria mutica*), black grama grass (*Bouteloua eriopoda*), scrub species such as mesquite (*Prosopis glandulosa*, *P. juliflora*) and Mormon tea (*Ephedra trifurca*), and several yucca (*Yucca* sp.) and agave species (*Agave* sp.). Downstream of the border to the San Francisco River confluence, the Gila River flows through Chihuahuan desert scrub dominated by creosotebush (*Larrea tridentata*), tarbush (*Flourensia cernua*), and whitethorn acacia (*Acacia neovernicosa*).

1.5.2 HYDROLOGICAL CONDITIONS

FLOOD DYNAMICS

The Upper Gila River contains no significant impoundments or flood control structures within the channel. The absence of these structures results in mostly natural flooding dynamics within this system. The Upper Gila River experiences frequent flooding of varying magnitudes, caused primarily by rains from fall and winter storm systems. Extreme flood-producing storms are widespread and generally cover the majority of the Upper Gila River Basin. Instantaneous peak discharge data confirm that the largest-magnitude floods occur in the fall and winter and are predominately from rainfall. The largest floods (>12,000 cfs) have occurred in water years 1891, 1907, 1941, 1949, 1972, 1978, 1983, 1984, 1988, 1993, 1994, and 1997 (USGS 2006).

AGRICULTURE AND WATER WITHDRAWALS

Water withdrawals for irrigating fields occur throughout the Cliff-Gila Valley, and downstream of the Middle Box to the confluence with the San Francisco River above the Safford Valley. Water is withdrawn throughout the year to irrigate fields, except during severely cold winter months. Current water withdrawals often result in channel drying in several segments of the Cliff-Gila Valley, within the Middle Box, and downstream of the Middle Box to the confluence with the San Francisco River, especially

during the summer months and during drought conditions. When available river water is fully allocated, ground water is pumped from local and private wells to meet irrigation needs (Woodrow pers. comm. 2006).

CHANNEL DYNAMICS

The Gila River channel widens and constricts in response to flooding and vegetation, like most southwestern streams. Near the Safford Valley in Arizona, the channel has varied dramatically, from less than 46 m (150 ft) wide in 1846, to 610 m (2,000 ft) wide in 1905, and back to approximately 61m (200 ft) by 1968. (Burkham 1972). Encroachment into the active channel by agriculture and non-native riparian vegetation accelerates channel narrowing, while widening appears to occur in response to increases in frequency and magnitude of annual peak flows (Julien et al. 2005).

1.5.3 RIPARIAN CONDITIONS

HISTORIC

The historical riparian communities of the Upper Gila River are difficult to describe because of varying accounts of the actual conditions (Leopold 1951, University of Arizona 2002). By the early 1900s, much of the Gila River corridor had been developed into pastures and agriculture fields. Though severely reduced in area, multi-aged riparian forests persisted, especially in the upper reaches of the river where major impoundment structures or significant alteration of the natural hydrograph had not occurred. In contrast, Plastrine wetlands and cienega habitats (marshes), which had been common in the 1880s near confluences with tributaries and side channels, disappeared (McNamee 1994).

Montgomery et al. (1985) found that the habitat along the Gila River corridor was 13% riparian forests and 87% strands (narrow strips of riparian trees edging agricultural fields) and abandoned agricultural fields. Generally, the river corridor riparian forests contained cottonwoods (*Populus spp.*), willows (*Salix spp.*), sycamore (*Platanus spp.*), boxelder (*Acer spp.*), walnut (*Juglans major*), hackberry (*Celtis spp.*) and mesquite (*Prosopis spp.*) (Rixon 1905, McNamee 1994). Of the riparian forests, 71% were cottonwood-willow dominated forests, 14% were boxelder-dominated forests along the river channel, 10% were walnut dominated forests at the edges of the floodplain, and 5% were sycamore-dominated forests restricted to the area near Mogollon Creek. The species composition of the riparian areas changed little during most of the 1900s. Agricultural lands were most abundant along the river, though most fields were abandoned and grew Russian thistle (*Salosola kali*) and sunflower (*Helianthus spp.*). Strands of riparian trees were devoid of other vegetation except for a few isolated patches of trees along river bends (Montgomery et al. 1985).

PRESENT

The riparian communities in the Upper Gila River have remained unchanged since the early 1900s, although introduced salt cedar is now locally abundant (Whiteman 2006). These riparian forests are important to terrestrial and aquatic species, evidenced by the fact that this habitat supports the highest diversity and abundance of wildlife in the area (Montgomery et al. 1985). This disproportional value of riparian habitats relative to their geographical limitation is relatively common (Brown 1994). Many of the species that occur in riparian forests are listed as threatened or endangered by state or federal entities, and they depend on riparian habitats for survival.

INFLUENCING FACTORS

Impoundment and Withdrawals

The upper reach of the Gila River corridor is currently not impounded. As a result of this natural hydrograph, the riparian communities in this area have remained relatively unchanged since the early 1900s, although introduced salt cedar is now locally abundant (Whiteman 2006). The maintenance of riparian habitats can be attributed to the importance of natural flooding regimes in seed dispersal, germination, and recruitment of many riparian tree species (Brown 1994). Often, successions of multi-aged riparian trees relate to the occurrence of flood events (Brown 1994). Reduced flooding magnitude and frequency, along with river disconnection from the floodplain, hinder the establishment of mature, native vegetation, like cottonwoods and willows (Stromberg 1998). Furthermore, regulation of river flow has led to an increase in non-native plant and aquatic species in several southwestern streams (Stromberg 2001, Whiteman 2006). Return flows from irrigation water contain high level of dissolved salts that can favor tamarisk, which is more tolerant of high salt levels than most native species (Kerpez and Smith 1987, 60 FR 10693).

Ground Water Pumping

Reduced groundwater levels, due to groundwater pumping, also have a detrimental effect on cottonwoods and willows (Montgomery et al. 1985, Stromberg 1998), which have fairly shallow roots and need access to groundwater to survive during dry periods. Salt cedar has much deeper roots and can out-compete the native plants during dry conditions if the groundwater is lower.

Grazing

Grazing in riparian areas can reduce native species diversity and aid in recruitment of exotics. Cattle find non-native tamarisk unpalatable. However, they eat the shoots and seedlings of cottonwood and willow, acting as a selective agent in shifting the relative abundance of these species (Kerpez and Smith 1987). Following the removal of livestock along the San Pedro River, herbaceous and native vegetation abundance and diversity greatly increased. This can also lead to an increase in bird species that use the riparian area (Krueper et al. 2003).

2.0 METHODS

2.1 LITERATURE RESEARCH AND SPECIES OCCURRENCE DETERMINATION

The information presented in this document was obtained from agency-sensitive species lists, agency-maintained internet databases, agency reports, peer-reviewed manuscripts, and other pertinent documents. The preliminary investigation into species status and likelihood of occurrence within the project area was derived from USFWS species lists searched by county and general species habitat descriptions. Special status species were investigated in Hidalgo, Catron, and Grant Counties, New Mexico, and Greenlee County, Arizona. For those species that had habitat similar to or range descriptions overlapping or closely overlapping those of the project area, further research was conducted into habitat preferences, historic and present documented occurrences, and other information to determine the most current distribution of that species. From this information, the likelihood of the species occurring in the project area was determined. Species that did not have range overlap with the project area due to clear elevational or habitat differences were excluded from further analysis. Species determined to likely occur in the project area were further investigated as to determine the significance of hydrologic factors on various life history stages of the species where applicable (i.e. limited to riparian or aquatic species).

2.1.1 SPECIES TABLES

Tables 1 and 2 list species of concern, their state and federal status, habitat conditions, and the likelihood of their occurrence within the project area. General habitat descriptions and ranges are given for each species. Based on this information, species listed in Table 1 that had ranges that overlapped or closely overlapped those of the project were further investigated. A final list of species that are likely to occur in the project area or species that have uncertain distributions are presented in Table 3. All the tables are located in Section 5.0 of this report.

3.0 SPECIES OCCURRENCE DETERMINATIONS

3.1 NATIVE FISH FAUNA POTENTIALLY OCCURRING IN THE PROJECT AREA

3.1.1 GILA CHUB (*Gila intermedia*)

STATUS

The Gila chub is federally listed by the USFWS, effective December 2nd 2005, as an endangered species with critical habitat (70 FR 66663); as endangered by the New Mexico Wildlife Conservation Act (NMDGF 2003); as a species of special concern in Arizona (AGFD 2006); and as a sensitive species by the USFS Region 3 (Southwest Region: Arizona and New Mexico) and USBLM New Mexico State Office (NMDGF 2003). Within the Upper Gila River Basin, USFWS critical habitat is listed within Turkey Creek (New Mexico), Harden Cienega Creek (Arizona and New Mexico), Eagle Creek (Arizona), and the Right and Left Forks of Dix Creek (Arizona). Mineral Creek, located in the middle Gila River Basin in Arizona, is also listed as critical habitat (70 FR 66663).

DESCRIPTION

The Gila chub has a robust body with large, thick scales that are broadly imbricate (regularly overlapped). Its overall color is dark, sometimes becoming lighter towards the abdomen. Diffuse lateral bands are rarely present. Adult Gila chub typically grow to total lengths of 200 mm or more, and they mature at approximately 120 to 200 mm in length. Males often develop red or orange areas on the lower cheek, posterior part of the lips, paired fin bases, and lower surfaces during spawning season. The length of the head divided by the depth of the caudal peduncle is usually 3 or less, distinguishing the Gila chub from other southwestern chubs. (Minckley 1973 as cited in USFWS 2004)

The Gila chub can be found in many habitats in New Mexico and can live in waters that exhibit a variety of chemical and physical parameters and various habitat types. The species can also be found in habitats such as small segments of streams, isolated springs and associated cienegas, and artificial impoundments. Gila chub usually prefer to remain in deeper water or near cover (USFWS 2004). In larger stream systems they utilize heavily vegetated backwaters for cover and feeding (AGFD 2002). Minckley (1973) noted that Gila chub are generally found in pool habitats of small streams or springs in Arizona, but it may have formerly occupied larger, more complex habitats as well. The NMDGF (2000) noted that Gila chub have an affinity for deeper pools in slow velocity water and are almost always associated with cover such as undercut banks, rootwads, large woody riparian vegetation, and instream debris piles. The NMDGF (2000) noted that several of the small streams that Gila chub were known to occur in were associated with cienegas (e.g., San Simon Creek, Tularosa River, and Duck Creek). A cienega is a perennially wet area usually supported by a spring or other source and typically associated with the desert southwest.

The diet of the Gila chub consists primarily of insects (aquatic and terrestrial) and algae, but the species is also known to be piscivorous (NMDGF 1988).

LIFE HISTORY

Gila chub probably mature in their second or third year of life, and spawning occurs from late winter into the summer months, depending on water flows and temperature (USFWS 2004, BISON 2004). Pond breeding activities include large females being followed and closely attended by a large number of smaller males, over beds of aquatic plants. Minckley (1973) noted that spawning occurs over beds of submerged aquatic vegetation. Adult chubs are generally more active than younger chubs, and feed in evening and early morning. Very young Gila chub occur among plants and debris in shallows and currents, and then move to pools as they reach maturity. Juveniles are active throughout the day (USFWS 2004).

DISTRIBUTION AND ABUNDANCE

Historic

The Gila chub is endemic to the Gila River Basin of Arizona (Minckley 1973), New Mexico, and Sonora, Mexico (USFWS 2004, 70 FR 66663). In New Mexico, Gila chub likely inhabited numerous tributaries of the Gila River Basin, historically. These include Apache Creek, Catron County; Duck Creek, Grant County; San Francisco River, Catron County; San Simon Cienega, Hidalgo County; and Turkey Creek, Grant County (Rinne 1976, Bestgen and Propst 1989, Sublette et al. 1990, Propst 1999, 70 FR 66663). Propst (1999) and anecdotal reports suggest that a population may have existed in Mule Creek, a tributary of the San Francisco River that meets the San Francisco near the Arizona border. All of these populations within New Mexico are extirpated (Bestgen and Propst 1989), with the exception of Turkey Creek (Propst 1999).

The NMDGF (2000) noted that several small streams where Gila chub were known to occur were associated with cienegas (e.g., San Simon Creek, Tularosa River, and Duck Creek).

Present

Within the Gila Basin in New Mexico, populations exist in Turkey Creek (Propst 1999) and possibly in Mule Creek (Propst 1999). Propst (1999) first indicated that a population exists in Turkey Creek. After this discovery, a debate occurred as to whether this population was *Gila intermedia* or *Gila robusta*. According to Minckley and DeMarais (2000), the Turkey Creek population is in fact of *Gila intermedia*. Turkey Creek lies almost entirely within the Gila Wilderness.

Propst (2005) indicated that Gila chub are not present in any of the NMDGF standard sampling sites within the Gila or San Francisco River Basins, which have been sampled since 1988. The two sampling sites within the San Francisco River drainage are located on the lower Tularosa River off Highway 12 northeast of Reserve, and near the Glenwood Ranger Station on the San Francisco River. Survey sites in the Gila River drainage include one each on the East, Middle, and West Forks of the Gila River, one on the mainstem Gila River close to the town of Riverside, one on the mainstem near the town of Redrock, and one downstream of Redrock on the mainstem east of Virden.

Desert Fishes Team (2003) noted that Gila chub persist within fewer than 30 small or isolated waters within the Gila River Basin, including Bonita Creek, Eagle/East Eagle Creek, Mineral Creek/Devil's Canyon, and Turkey Creek (all tributaries to the mainstem Gila River).

Given the present information on distribution of the Gila chub, the species will likely not be found within the project area.

INFLUENCES OF HYDROLOGY

Hendrickson and Minckley (1984) noted that loss of habitat has been the major problem for the Gila chub, especially as a result of extreme modification of spring habitats by arroyo cutting and subsequent dewatering.

INFORMATION GAPS

Not applicable. This species is not likely to occur in the project area.

3.1.2 GILA TROUT (*Oncorhynchus gilae*)

STATUS

The Gila trout is listed by the USFWS as an endangered species, effective in 1967 (70 FR 24750), with an interagency recovery plan (USFWS 2003). In May of 2005, the USFWS proposed that the Gila trout be downlisted from endangered to threatened (70 FR 24750). The species is further listed as threatened by the New Mexico Wildlife Conservation Act (NMDGF 2003), as a species of special concern in Arizona (AGFD 2006), and as a sensitive species by the USFS Region 3 (Southwest Region: Arizona and New Mexico) (NMDGF 2003). No critical habitat is currently listed for the Gila trout.

DESCRIPTION

The Gila trout is a deep-bodied salmonid readily identified by its iridescent gold sides, which blend to a darker shade of copper on the operculums. The species has fine, profuse spotting on the body, dorsal, and adipose fins (USFWS 2004). Sublette et al. (1990 as cited in AGFD 2002) noted “spots larger dorsally, diminishing in size toward lateral line; a pinkish band present; lower sides deep yellow; abdomen grayish white to pinkish orange.” The dorsal, pelvic, and anal fins all have white to yellowish tips (USFWS 2004). Sublette et al. (1990 as cited in AGFD 2002) further stated, “Fins: Dorsal yellow, first three or four rays yellowish orange to white, round or oval spots fine and dense; adipose deep yellow marked with large spots; caudal yellow, spotting dense; anal yellow with first five or six rays tipped with white, lower rays becoming reddish; pectoral and pelvic fins yellowish orange edged with white.” A yellow slash, similar to that typical of a cutthroat trout, is present on most mature specimens. Parr marks are commonly retained by adults, although they may be faint or absent on some specimens (USFWS 2004). The flesh of the posterior end of the upper lip extends back beyond the eye (Sublette 1990 as cited in AGFD 2002).

Although the species is reported to have once occurred in a variety of stream habitats, the Gila trout now lives exclusively in pristine cold-water streams, where it feeds primarily on aquatic insects. In the Gila National Forest in New Mexico, the species is found at elevations of 1,660 m to 2,810 m (5,446 ft to 9,220 ft) (AGFD 2002). The stream gradient is high in inhabited stream reaches, ranging from 2.3% in South Diamond Creek to 13.5% in Big Dry Creek (USFWS 2004). Streams are generally narrow and shallow and rarely exceed 21°C (AGFD 2002). The flows in Main Diamond, South Diamond, and McKnight Creeks range from 0.5 to 5.8 l/sec, with flows increasing 30 to 50 fold during flood events. In such streams, pool habitat seems to be critical to abundance. Floods in the area are generally of high magnitude and short duration (USFWS 2004). Siltation is usually low, and cobble is the predominant substrate. During drought years, Gila trout tend to be confined to pools with sufficient depth and cover. Cover types used extensively include stream improvement structures, branches, logs, and undercut banks. Tolerances to water chemical parameters (pH, conductivity, dissolved oxygen, temperature, etc) are

similar to those of other salmonids. Critical thermal maxima range from 25.57°C to 28.25°C (AGFD 2002). USFWS (2004) further noted that Gila trout have been known to tolerate 27°C for two hours.

The most important Gila trout food sources include adult true flies, caddis fly larvae, mayfly nymphs, and aquatic beetles. These food sources were found in all sizes of fish examined in the Gila River drainage. Large Gila trout are known to occasionally consume speckled dace. Food habits of the Gila trout vary seasonally depending on prey species availability. Gila trout are known to establish a feeding hierarchy in pools during low flow periods in which larger fish aggressively guard their feeding territory by chasing away smaller fish (USFWS 2004).

LIFE HISTORY

Gila trout spawn from early April through June when water temperatures reach approximately 8°C. The females, which usually mature at age three, construct redds in fine gravel and sand substrates. The spawning behavior is typical of a stream trout. The female deposits 96 to 196 eggs; the fry emerge from the redds in 56 to 70 days and inhabit the riffle areas. By the end of the first summer, the fry typically grow to 40 mm to 90 mm in total length. (USFWS 2004) The Gila trout can hybridize with the non-native rainbow trout (*Oncorhynchus mykiss*)(AGFD 2002).

DISTRIBUTION AND ABUNDANCE

Historic

The Gila trout once occurred throughout the Upper Gila River drainage and in the Agua Fria and Verde drainages of Arizona (Minckley 1973, AGFD 2002, BISON 2004). Its purported occurrence in Eagle Creek, Arizona, and the unique characteristics of individuals taken from Spruce Creek (a tributary to the San Francisco River) further suggest that it may also have been indigenous to the San Francisco drainage (BISON 2004, AGFD 2002, 70 FR 24750).

In 1896, according to anecdotal reports, Gila trout were found in the Gila River drainage, New Mexico, from the headwaters downstream to a box canyon about 11 km (7 mi) northeast of Cliff, New Mexico. At the time, it was reported that the trout could be caught at a rate of about 1 per minute. By 1915, the downstream distribution of the species had receded up to Sapillo Creek, a distance of approximately 24 km. By 1950, water temperatures in the Gila River at Sapillo Creek were considered too warm to support any trout species (Miller 1950, 70 FR 24750, BISON 2004). Miller (1950) further noted that the first documented collections of Gila trout within the drainage was in 1939 from Main Diamond Creek (BISON 2004).

Present

In 1975, the known distribution of the species consisted of only five populations restricted to headwater stream habitats in the Upper Gila River drainage within the Gila National Forest, New Mexico. These populations inhabited Main Diamond Creek (a tributary to the Middle Fork Gila River), South Diamond Creek, McKenna Creek (a tributary to Turkey Creek), Spruce Creek, and Iron Creek (a tributary to the Middle Fork Gila River)(AGFD 2002, USFWS 2003, BISON 2004). At the time of listing in 1967, no detailed genetic investigations of these populations had been conducted, and thus, each of the five known populations was considered pure and essential to recovery of the species. In 1992, a sixth population was discovered in Whiskey Creek (a tributary to the West Fork Gila River); (70 FR 24750). In 1989, the Main Diamond Creek population was severely diminished by a forest fire (USFWS 2004). In 1996 and 1997, it was discovered that the McKenna Creek and Iron Creek populations had hybridized with non-native rainbow trout (70 FR 24750). Consequently, there are now four confirmed original, pure populations (70 FR 24750).

As a result of transplants, five additional populations of Gila trout exist in the Gila and San Francisco River drainages within New Mexico. These include populations in Black Canyon, a tributary to the East Fork Gila River; Lower Little Creek, a tributary to the West Fork Gila River; Upper White Creek, a tributary to the West Fork Gila River; Mogollon Creek (including many of its tributaries), a tributary to the mainstem Gila River; and Big Dry Creek, a tributary to the San Francisco River (70 FR 24750). Currently, there are 14 populations of Gila trout in the wild (USFWS 2003), with the total population size estimated to be approximately 37,000 in 1998. (USFWS 2003, 70 FR 24750)

Propst (2005) indicates that no Gila trout have been captured within the mainstem Gila River at the Riverside, Middle Box, and Lower Box sites sampled since 1988, 1997, and 1997 respectively. Surveys were not conducted at each of these sites in 2000 due to high water flows.

Given the present information on distribution of the Gila trout, the species will likely not be found within the project area.

INFLUENCES OF HYDROLOGY

Declines in abundance of Gila trout in New Mexico streams have been caused by hybridization with non-native. Declines have also been partially attributed to destruction of riparian vegetation and general habitat degradation resulting in erosion, sedimentation, and lowering of water tables (USFWS 2004).

INFORMATION GAPS

Not applicable. This species is not likely to occur in project area.

3.1.3 SPIKEDACE (*Meda fulgida*)

STATUS

The spikedace is currently listed by the USFWS as threatened (effective in 1986) with proposed critical habitat (70 FR 75545); listed as threatened by the New Mexico Wildlife Conservation Act (NMDGF 2003); listed as a species of special concern in Arizona (AGFD 2006), and listed as a sensitive species by the USFS Region 3 (Southwest Region: Arizona and New Mexico) (NMDGF 2003). Critical habitat is currently proposed for 42.0 km (26.1 mi) of the East Fork Gila River, 12.3 km (7.7 mi) of the Middle Fork Gila River, 12.4 km (7.7 mi) of the West Fork Gila River, and 164.3 km (102 mi) of the upper mainstem Gila River. Critical habitat is also proposed for 62.8 km (39.0 mi) of the Gila River between the Ashurst-Hayden dam and the San Pedro River in Arizona (70 FR 75545).

DESCRIPTION

The spikedace, the only member of the genus *Meda*, is a small (less than 80 mm), slim fish characterized by silvery sides and spines within the dorsal and pelvic fins. The common name refers to the well-developed spine located in the dorsal fin. Coloration on the back is olive to brown, often with dark blotches. The abdomen is usually a yellowish white. Breeding males develop a brassy golden color, which intensifies on the head and fin bases (USFWS 2004). The body is somewhat compressed at the front and strongly compressed at the caudal peduncle. The snout is fairly pointed with a slightly subterminal mouth. The eye is relatively large in size. Scales are present only as small deeply embedded plates (Minckley 1973 as cited in AGFD 2002).

Spikedace are associated with clear, narrow (3 to 5 m), low- to moderate-gradient riffles in perennial streams within the Gila River drainage (USFWS 2004). The current elevational range of capture points of the spikedace as noted by AGFD (2002) is 494 to 1,373 m (1,620 to 4,500 ft). Rinne (1991) noted that

spikedace occur in slow-moving waters (25.0 cm/sec) in streams across its range in the southwest. USFWS (2004) further noted that in Aravaipa Creek, Arizona, the species is often found in eddying currents and “shear zones” between confluent riffles. Propst et al. (1986) reported that the preferred habitat of the spikedace varies, shifting both seasonally and with maturation. In the Gila River, juvenile spikedace (26 mm to 35 mm) have been found to occupy areas with velocities near 16.8 cm/sec (6.6 in/sec), while larval spikedace (<25mm) were found in velocities near 8.4 cm/sec (3.3 in/sec). Adults occupied areas with velocities near 49.1 cm/sec (19.3 in/sec) (Propst et al. 1986). Propst et al. (1986) further reported that larval and juvenile spikedace are most common in water depths of 32.0 cm or less, with juveniles found most commonly over sand (45% of fish documented) and/or gravel (46%) substrates, and larvae being found most commonly over sand (60%) substrates. Both juvenile and larval fish can be found in peripheral portions of the stream. Geographical differences in utilized microhabitat in Gila River populations were also reported by Propst et al. (1986), with populations in the ‘forks area’ (near and above the confluences of the Middle, East, and West Forks) of the Gila River drainage occupying deeper, slower velocities than more downstream populations in the Cliff-Gila Valley. Similarly, seasonal shifts in utilized microhabitat have been noted in the Upper Gila River drainage, with populations seeking slightly shallower habitats (17.3 cm in the ‘forks’ area and 18.2 cm in the Cliff-Gila Valley) in the winter, and deeper water (23.1 cm the ‘forks’ area and 19.3 cm in the Cliff-Gila area) during warmer months (Propst et al. 1986). Seasonal differences in velocities of occupied habitats were not detected. In the winter, the species generally congregates in shallow stream margins with cobble substrates, presumed by Propst et al. (1986) to be a result of the species searching for protection during periods of lower metabolic rates.

Spikedace are generally drift feeders that consume primarily aquatic insects, with mayflies, caddisflies, and true flies comprising a large proportion of its diet (Propst et al. 1986). AGFD (2002) noted that spikedace have been known to feed on fry of other fish during certain seasons. Propst et al. (1986) further reported that the general lack of terrestrial insects in the stomachs of examined specimens indicates the species is dependent on aquatic insects for sustenance; therefore, maintenance of pristine riffle habitats that provide aquatic insect drift is essential to the survival of the species.

LIFE HISTORY

Spikedace typically live one to two years, although they can live as long as three to four years (AGFD 2002). Spawning occurs from mid-March into June, typically in shallow (less than 15 cm deep) riffles over gravel and sand substrates in moderate flow. By mid-May, most spawning discontinues, although in high water flow years, spawning may continue into late May or early June (Propst et al. 1986). Spawning appears to be initiated by decreasing stream flows and an increase in water temperature (USFWS 2004).

Spikedace mature at age 1 and are known to be polyandrous, in which a female will mate with more than one male in a breeding season. Males move about spawning riffles exhibiting no aggression towards other males, awaiting ready females to enter the spawning area. Females then enter the spawning sites from adjacent pools and runs, or from downstream, and are met by two or more males who herd the female toward the bottom where spawning occurs. After spawning, the males return to patrol the area while females migrate downstream (Minckley 1973). Gametes are presumably expelled into the water column. The eggs are adhesive and demersal and likely cling to the substrate. Younger females typically spawn once a year, and older females typically spawn twice a year. The number of eggs produced varies from 100 to over 300, depending on the size of the individual. (USFWS 2004, Minckley 1973 as cited in AGFD 2002)

DISTRIBUTION AND ABUNDANCE

Historic

Historically, the spikedace was common and very abundant in places throughout the Upper Gila River Basin of Arizona and New Mexico (Minckley 1973 as cited in Propst 1986). The spikedace probably

occurred in the San Francisco River from the Arizona-New Mexico border upstream to the vicinity of the town of Reserve, and in the Tularosa River several kilometers upstream of the mouth (Propst et al. 1986).

Propst et al. (1986) stated that the distribution of the spikedace in the New Mexico portion of the mainstem Gila River probably was never continuous from the Arizona-New Mexico border upstream to the confluence of the West and East Forks. Within, the mainstem, suitable spikedace habitat was generally lacking in an approximately 10-kilometer stretch in the lowermost section of the Middle Box, and in the reach of the mainstem from the confluence of the West and East Forks downstream to the mouth of Turkey Creek. The spikedace may very well have been present sporadically in short stretches of both of these reaches where suitable habitat occurred. Furthermore, lower stretches of Sapillo, Duck, and Mangas creeks may contain habitats suitable for spikedace (Propst et al. 1986).

From the juncture of the East and West Forks of the Gila River, the spikedace extended upstream in each of the major tributaries. Spikedace probably occurred in the East Fork from its mouth upstream to the Taylor and Beaver Creeks area. In the West Fork, the species probably occurred 3 km or less upstream of the Gila Cliff Dwellings. In the Middle Fork Gila River, the species probably ranged as far upstream as Little Bear Canyon. Few, if any, of the tributaries to the East, West, and Middle Forks of the Gila River contain suitable habitat for spikedace, and, thus, spikedace probably only occupied the lowest sections of these tributaries (Propst et al. 1986).

Present

Currently in New Mexico, the spikedace is found in the lower ends of the West, East, and Middle Forks of the Gila River and throughout the upper reaches of the mainstem Gila River in the Cliff-Gila Valley. (AGFD 2002, USFWS 2004, Propst 2005). However, the species is generally lacking within the Gila River from the confluence of the West and the East Forks downstream to the mouth of Turkey Creek (Propst et al. 1986). The spikedace also commonly occurs in low densities in the mainstem of the Gila River near the mouth of the Middle Box close to the town of Redrock (USFWS 2004, Propst 2005). Downstream from the town of Redrock, where the river occasionally goes dry, the species only occurs sporadically and generally during periods of runoff (Propst et al. 1986, USFWS 2004). The Desert Fishes Team (2003) places the species as occurring in middle reaches of the mainstem Gila River within Arizona.

The NMDGF (2000), Propst et al. (1986), and Propst (2005) noted that the spikedace has most likely been extirpated from the San Francisco River drainage in New Mexico. Propst (1986) attributed reasons for the decline of the spikedace as being associated with land and water use practices (overgrazing, water diversion, timber cutting, ground-water pumping, stream channelizing, etc), as well as competition and predation from non-native fish populations.

Desert Fishes Team (2003) noted that populations also exist in Eagle Creek, Mangus Creek (a tributary to the Gila River), Aravaipa Creek, and Verde River, Arizona.

According to current information on distribution of the spikedace, the species likely occurs in the project area.

INFLUENCES OF HYDROLOGY

Spawning for the spikedace typically occurs from mid-March to June in shallow (less than 15 cm deep) riffles over gravel and sand substrates in moderate flow. In average flow years, most spawning discontinues by mid-May. However, in high water flow years, spawning may continue into late May or early June (Propst et al. 1986), and it appears to be initiated by decreasing stream flows and an increase in water temperature (USFWS 2004).

The flow patterns of southwestern streams that include periodic spates and recurrent flooding are essential to the feeding and reproduction of the spinedace (Propst et al. 1986). The hydrograph on the Gila River in New Mexico is bimodal, with snowmelt causing spring pulses and occasional floods, and late-summer monsoon rains producing pulses and occasional flooding. Mueller (1984 as cited in 70 FR 75545) noted that floods likely benefit native fish by breaking up embedded substrate. Recurrent flooding and a natural hydrograph are very important in maintaining the species' habitat and in helping it sustain a competitive edge over invading, non-native aquatic species (Propst et al. 1986).

Minckley and Meffe (1987) summarized a study on the differential responses to flooding of native and non-native fishes in seven unregulated streams and three regulated streams or stream reaches. They reported that flooding, as part of a natural hydrograph, may help improve native fish populations that persist after a flow by reducing competition pressure from non-native species that are not adapted to flooding. Each of the streams was sampled before and after major flooding events. They noted that fish faunas of canyon-bound reaches of the unregulated streams shifted from a mixture of native and non-native species to predominantly, and in some cases exclusively, native forms after flood events. Samples from regulated systems indicated relatively few or no changes in species composition due to releases from upstream dams at low, controlled volumes. However, during emergency releases, effects to non-native fish species were similar to those seen with flooding on unregulated systems.

Rinne and Stefferud (1997) summarized a study of the Verde River analyzing the effects of flooding in 1993 and 1995. The study found that floods had a notable effect on both native and non-native fish species, either stimulating spawning or increasing recruitment among the three native species, while possibly eliminating one of the non-native species within the study area. Peak floods can modify channel morphology and sort and rearrange streambed materials (Stefferud and Rinne 1995).

Threats to spinedace habitat include damming, stream channel morphology and flow alteration, riparian zone destruction, water diversion, groundwater pumping, dewatering of riverine habitats, and modification of existing habitats by channelization and removal of riparian vegetation (USFWS 2004, AGFD 2002, NMDGF 2000). Propst et al. (1986) noted that maintenance of suitable habitat in the Gila River, especially between Mogollon Creek and the Middle Box, is essential to the survival of the spinedace.

Rinne (1991) noted that habitat partitioning may occur when spinedace and red shiner co-exist in a stream. Douglas et al. (1994) further documented displacement of spinedace by red shiner. They noted that habitat utilization of both species is very similar when each occurs in isolation of the other, but in environments where both species co-occur, the spinedace is found in significantly swifter currents than when found in isolation. Two hypotheses have been offered as to the mechanism by which red shiner specifically impacts spinedace: first, displacement of the spinedace through competitive interaction with the red shiner; and second, replacement of the spinedace by the red shiner as a result of environmental perturbation (Douglas et al. 1994).

INFORMATION GAPS

Data on microhabitat use and flooding are needed to determine impacts from water withdrawals.

3.1.4 LOACH MINNOW (*Tiaroga cobitis*)

STATUS

The Loach minnow is currently listed by the USFWS as threatened, effective in 1986, with proposed critical habitat (70 FR 75545); as threatened by the New Mexico Wildlife Conservation Act (NMDGF 2003); as a species of special concern in Arizona (AGFD 2006) and as a sensitive species by the USFS

Region 3 (Southwest Region: Arizona and New Mexico). Critical habitat is proposed for the loach minnow in 42.0 km (26.1 mi) of the East Fork Gila River, 12.4 km (7.7 mi) of the West Fork Gila River, 19.1 km (11.9 mi) of the Middle Fork Gila River, and 164.3 km (102.1 mi) of the upper mainstem Gila River. Further critical habitat is proposed for lower in the Gila River Basin in Aravaipa Creek and in Deer Creek and Turkey Creek (both tributaries of Aravaipa Creek) in Arizona (70 FR 75545).

DESCRIPTION

The loach minnow is a stream dwelling fish of the family Cyprinidae that rarely exceeds 65 mm in total length. The body is slender, elongate, and ventrally flattened. Eyes are upward directed and mouth is small, terminal, and highly oblique with no barbels present. Loach minnow generally have an olivaceous coloration that is highly pocked with darker pigments. Whitish spots can be found at the origin and insertion of the dorsal fin and in the dorsal and ventral portions of the caudal fin base. A black basicaudal spot is usually present. Along the lateral line, there are typically 65 scales. The anal fin contains 7 fin rays, and the dorsal fin contains 8 fin rays. Breeding males develop bright, red-orange coloration at the bases of paired fins, on adjacent fins, on the base of the caudal opening, and often on the abdomen. Breeding females become yellowish in color on the lower body and in the fins. (USFWS 2004; Minckley 1973, as cited in AGFD 2002).

The loach minnow is a generally a bottom-dwelling fish that typically utilizes spaces between and in the lee of larger substrate and is absent where fine sediments fill the interstitial spaces in the substrate (Propst and Bestgen 1991). Consequently, loach minnow are generally associated with cobble riffle habitats where water is shallow and turbulent (Propst and Bestgen 1991, 70 FR 75545). Elevational distribution records place the loach minnow as occurring in rivers up to 2,200 m (7,218 ft) in elevation (AGFD 2002). Propst et al. (1988) documented water velocity, water depth, and substrate utilization at different life stages of loach minnow. Adults (>36 mm TL) occupied a broader range of water velocities than juveniles and larvae, but average water velocities were still higher at 52.6 cm/sec. Adults were found at an average depth of 18.3 cm and were most commonly associated with gravel to cobble substrates (Propst and Bestgen 1991). Juvenile (26–35 mm TL) loach minnow occupied water that averaged 35.1 cm/sec in velocity and 16.8 cm in depth, and they generally occupied areas with larger substrate particle sizes than those utilized by larvae. Larvae (5–25 mm TL) were found in water velocities significantly slower than those utilized by juveniles and adults. On average, larvae used flows of 7.9 cm/sec and depths of 10.6 cm, and were generally found where substrate particles were smaller than those occupied by embryos. Embryos occurred primarily on large gravel to rubble. Clean interstitial spaces are critical to their habitat at all life stages (Propst and Bestgen 1991).

Loach minnow are opportunistic, benthic insectivores that feed primarily on larval insects inhabiting riffles (70 FR 75545). In the Gila, Tularosa, and San Francisco drainages, loach minnow primarily consume true flies and mayflies (Propst et al. 1988, Propst and Bestgen 1991). Seasonally, pupae or emerging adults may also be eaten. (Propst et al. 1988, as cited in USFWS 2004).

LIFE HISTORY

The lifespan of the loach minnow is typically 15 months to two years, although they have been known to live as long as three years. The species spawn between mid-March and early June, and the first spawn typically occurs at age 1 (USFWS 2004). Reports indicate that this species may also spawn in the autumn (Vives and Minckley 1990, as cited in USFWS 2004). Spawning occurs in habitats similar to those occupied by the adults during the non-breeding season. Adhesive eggs are deposited on the underside of flattened rock that forms the roof of a small cavity in the substrate on the downstream side. Female fecundity ranges from 150 to 250 mature ova, with an average of 52 to 63 eggs per rock. After emergence, larval loach minnow move from spawning areas to slower velocity nursery areas, and they

typically inhabit areas with significantly slower velocities than those utilized by juveniles and adults (Propst et al. 1988, Propst and Bestgen 1991, as cited in 70 FR 75545).

DISTRIBUTION AND ABUNDANCE

Historic

The loach minnow was historically found throughout warm water reaches and many tributaries of the San Francisco and Gila River drainages within Arizona, New Mexico, and extreme northern Sonora, Mexico (Propst et al. 1988). Propst et al. (1988) more specifically indicated that the species remained in limited portions of the Upper Gila, San Francisco, Blue, Black, Tularosa, and White Rivers.

Present

In New Mexico, the range of the loach minnow in the Gila and San Francisco drainages is fragmented (Propst et al. 1988). Currently, it is moderately common only in short reaches of less than 10 km in the Tularosa and San Francisco Rivers. A small population persists in the lower reaches of the West Fork Gila River. The population in the Cliff-Gila Valley has declined considerably in the past 10 years. Elsewhere in the Gila-San Francisco drainage, it occurs irregularly or is absent (NMDGF 2000).

Propst (2005) documented that the loach minnow has been found in sample sites in the Tularosa, San Francisco, East, West, and Middle Forks of the Gila River, and in the mainstem Gila River in samples taken between 1988 and 2004. In a permanent survey site located in the upper mainstem Gila River near the town of Riverside, loach minnow were found in surveys conducted between 1988 and 2004, except in 1996 and in 2000. Surveys near the Middle Box between 1997 and 2004 found loach minnow in all years except 2004. At a permanent survey site located downstream of Redrock, loach minnow were documented in 1998 and 2003. Surveys began at this site in 1997 and continued through 2004. Surveys could not be conducted at each of the three survey sites located in the mainstem Gila River in 2000 due to high water flows. Desert Fishes Team (2003) noted that the loach minnow occurs elsewhere in the Gila River Basin

According to present information on distribution of the loach minnow, the species likely occurs in the project area.

INFLUENCES OF HYDROLOGY

Natural flows and flooding seem to play a major role in maintaining loach minnow habitat and have a positive affect on loach minnow population dynamics. During periods of low flow, excessive sediment is typically deposited at the downstream side of gravel, cobble, and boulder substrates (Rinne 2001). Periodic flooding rearranges these substrates and cleans interstitial spaces that are crucial to loach minnow habitat. Flooding also helps to maintain riffle habitats that are crucial loach minnow habitat (Propst et al. 1988; Britt 1982, as cited in 70 FR 75545). Furthermore, flooding seems to play a major role in keeping non-native predators and competitors from invading native loach minnow habitat (Britt 1982; Minckley and Meffe 1987 as cited in 70 FR 75545).

In areas where streams have been impounded, dewatered, or have had alterations in stream morphology, loach minnow are less likely to occur. This is partially due to the reduction of beneficial effects that result from flooding on loach minnow habitats. The construction of water diversions and impoundments has reduced or eliminated riffle habitats upon which loach minnow depend. Although the specific factor responsible for this phenomenon is not known, it has been attributed to modification of thermal regimes, habitat, foodbase, predation, or discharge patterns. (Propst et al. 1988, 70 FR 75545)

Studies conducted in the Gila, Tularosa, and San Francisco Rivers found that flooding is primarily a positive influence on native fish, including the loach minnow, and apparently had a positive influence on the relative abundance of loach minnow in stream reaches studied. Rather than following a typical pattern of winter mortality and population decline, high levels of recruitment occurred throughout the winter after flood events, and loach minnow relative abundance remained high through the next spring. Winter flooding has maintained, enhanced, or even enlarged loach minnow habitat in times when mortality is typically high, resulting in a greater survivorship of individuals through winter and into spring (Propst et al. 1988). Britt (1982) noted that similar results were observed in the Gila and San Francisco Rivers following flooding in 1978.

Natural flooding may also reduce the negative impacts of non-native fish species on loach minnow. During significant floods, non-native species were typically displaced or destroyed, while native species were able to persist in micro-refuges or quickly recolonize after flood events (Britt 1982, Minckley and Meffe 1987).

Habitat destruction of the loach minnow has been attributed to damming, stream channel morphology and flow alteration, riparian zone destruction, channel downcutting, water diversion, groundwater pumping, dewatering of riverine habitats, modification of existing habitats by channelization and removal of riparian vegetation, agrarian practices, and logging. Impoundment results in creation of lentic habitats, which negatively impacts the swift-water loach minnow by reducing riffle habitats and increasing sediment loads. Impoundments of stream habitats can also alter natural flow regimes, ameliorate flooding, change thermal and chemical characteristics of streams, and eliminate or reduce drift of food items. (USFWS 2004)

INFORMATION GAPS

Data on microhabitat use and flooding are needed to determine impacts from water withdrawals.

3.1.5 HEADWATER CHUB (*Gila nigra*)

STATUS

The headwater chub is currently being reviewed by the USFWS as a candidate species for listing (71 FR 26007). The species is not listed as a species of concern or a sensitive species by any other federal or state agencies.

DESCRIPTION

The headwater chub has a thick body, chunky to streamlined, but not markedly attenuate. Maximum size is approximately 50 cm (19.7 in). Females are typically 100 mm to 180 mm in length. The species grows relatively rapidly, but growth is dependent on water temperature. Coloration is dark olive-gray or brown above, with silver sides and white below. The fish often have diffuse longitudinal stripes, rarely with dark dorsolateral blotches. The head length to least depth of caudal peduncle ratio of the species is less than 3.2 cm. The caudal peduncle is not pencil-like, with its length less than head length. Fins are small to moderate in size, sometimes convex, and rarely falcate. Inter-radial membranes of fins are variously pigmented. The scales are developed and imbricate over the entire body and generally 73 to 83 cm along the lateral line. There are usually 8 dorsal and 8 anal fin rays. The headwater chub is similar in appearance to the humpback chub (*Gila cypha*) and bonytail chub (*Gila elegans*), but it lacks the hump on the nape and depressed head common to adults of the two species. Furthermore, the headwater chub generally has a thicker caudal peduncle and larger eyes than the other two species. (AGFD 2003)

Adult headwater chub occupy cool to warm water in middle to headwater stretches of mid-sized streams in the Gila River Basin. They are typically associated with deep, near-shore pools adjacent to swift riffles and runs, and near cover (AGFD 2003). Cover consists of root wads, boulders, undercut banks, submerged organic debris, and deep water. Barret and Maughan (1995) found adults in water greater than 1.8 m deep with velocities less than 0.10 m/sec. They are associated with gravel, small boulder, and large instream substrates. Preferred water temperatures were 20°C to 27°C, with minimum temperatures around 7°C. Juveniles are associated with shallow, low-velocity habitat with overhead cover. Voeltz (2002) noted that juveniles seem to select depths between 0.9 m and 1.5 m and velocities near 0.15 m/sec over sand substrates.

Juvenile headwater chub feed primarily on algae and diatoms. After reaching approximately 100 mm to 150 mm in length, adult headwater chub begin to feed on mayflies, caddisflies, and other aquatic insects, in addition to algae and diatoms. Larger adults (>150 mm) begin to add fish and crayfish to their diets. Adult headwater chub show seasonal variations in their diet, with the greatest diversity occurring in spring and summer. In spring, food sources include various aquatic invertebrates, macrophytes, and algae, with diatoms being added in the summer. (AGFD 2003)

LIFE HISTORY

The headwater chub life span is 8 to 10 years. Sexual maturity is reached at 2 to 5 years of age. Both males and females produce spawning tubercles. In males, tubercles are usually uniformly distributed from the head to the base of the dorsal fin and rarely to the base of the tail. Females display tubercles only on the head, operculum, pectoral, and caudal fins. Spawning individuals may develop red/orange coloration on the operculums, posterior parts of the lips, and fin bases. Spawning occurs in spring and early summer at the end of spring runoff. Suitable spawning temperatures are 14°C to 24°C. Each female is escorted by several males and spawning is performed in pool, run, and riffle habitats. Eggs hatch in 4 to 7 days at a water temperature of 19°C to 20°C. The larval stage may last up to 53 days, depending on water temperatures. (AGFD 2003)

DISTRIBUTION AND ABUNDANCE

Historic

Headwater chubs are endemic to the Gila River Basin of Arizona and New Mexico, where they occupy the middle and headwater reaches of mid-sized streams. Populations have been recognized from the mainstem Gila River (above confluence with Mangus Creek) in New Mexico. This includes the West, Middle and East Forks of the Gila River, along with the San Carlos River (a tributary to the Gila River). They have also been identified from Ash Creek (tributary to San Carlos River), Tonto Creek (tributary to the Salt River), and Spring Creek, (tributary of Tonto Creek) (AGFD 2003).

Present

The present distribution of the headwater chub does not include the mainstem of the Gila River (Propst 2005). However, Propst (2005) documented that the headwater chub has been collected within the West Fork Gila River at the Gila Cliff Dwellings site in 1991, 1992, 1993, 1995, 1999, 2001, 2003, and 2004; within the Middle Fork Gila River in 1988 through 1999, and again in 2001 and 2002; within the East Fork Gila River in 1988 through 1995 at a site located approximately 2.0 km downstream from the confluences of Beaver and Taylor Creeks; and in 1997 through 2001 and 2004 at the Fall Springs site. No survey was conducted in the East Fork Gila River in 1996. Bestgen and Propst (1989) reported headwater chub in the Gila River Basin of New Mexico at elevations between 1,325 m and 2,000 m (4,347 ft and 6,562 ft). Given current information on the distribution of the species, the headwater chub will likely not be found within the project area.

INFLUENCES OF HYDROLOGY

AGFD (2003) noted that potential threats to the headwater chub include aquifer pumping, stream diversion and impoundment, reduction in stream flows, and predation by and competition with non-native fishes.

INFORMATION GAPS

Not applicable. The species does not occur in the project area.

3.1.6 ROUNDTAIL CHUB (*Gila robusta*)

STATUS

The roundtail chub is listed by the USFWS as a species of concern (71 FR 26007), as endangered by the New Mexico Wildlife Conservation Act (NMDGF 2003), as a species of special concern in Arizona (AGFD 2006), and as a sensitive species by the USFS Region 3 (Southwest Region: Arizona and New Mexico) and the USBLM New Mexico State Office (NMDGF 2003). The species was petitioned for listing as threatened, but the USFWS determined that listing was not warranted (71 FR 26007).

DESCRIPTION

The roundtail chub has a deeply compressed body with a flat head. The caudal peduncle is slender, and the caudal fin is deeply forked. The angle along the anal fin base continues into the middle of the caudal fin. The terminal mouth extends to the front of the eye. The species is dark olive-gray above with silver sides. Breeding males often develop red-orange areas on the lower half of the cheek and paired fin bases. The species has 80 to 99 lateral line scales, 9 anal fin rays, and usually 9 dorsal fin rays. (AGFD 2002, USFWS 2004). USFWS (2004) further noted that average adults are approximately 250 mm to 300 mm in length.

Roundtail chub occupy cool to warm water in mid-elevation streams and rivers, where adult microhabitat consists of pools up to 2 m deep adjacent to swifter riffles and runs. Cover is usually present and consists of large boulders, tree rootwads, submerged large trees and branches, undercut cliff walls, or deep water (AGFD 2002). Smaller chubs generally occupy shallower, low-velocity water adjacent to overhead bank cover (AGFD 2002, USFWS 2004). Roundtail chub may also inhabit large reservoirs (Sublette et al. 1990, as cited in AGFD 2002). NMDGF (2000) noted that in inhabited streams, roundtail chub was most common in moderate-velocity areas near vegetated shorelines and debris piles.

AGFD (2002) noted that the current range includes areas varying in elevation from approximately 369 m to 2,200 m (1,210 ft to 7,220 ft), with occurrence more common at elevations between 610 m to 1524 m (2,000 ft and 5,000 ft).

LIFE HISTORY

Roundtail chub spawn in spring and early summer (Minckley 1973; Sublette et al. 1990 as cited in AGFD 2002) as spring runoff is subsiding. Spawning is often in association with submerged cover, such as fallen trees and brush. Fertilized eggs are randomly scattered over gravel substrates with no parental care involved (AGFD 2002).

DISTRIBUTION AND ABUNDANCE

Historic

Roundtail chub inhabit larger tributaries of the Colorado Basin from Wyoming south to Arizona and New Mexico, as well as the Rio Yaqui south to Rio Piaxtla in northwestern Mexico (Sublette et al. 1990 as cited in AGFD 2002). In New Mexico, roundtail chub occurred in the San Francisco and Gila River drainages (Bestgen and Propst 1989 as cited in NMDGF 2000).

Within the Gila River drainage, records indicate that roundtail chub historically occupied much of the mainstem Gila River (Bestgen and Propst 1989) and numerous tributaries. These included the San Francisco (Bestgen and Propst 1989), San Carlos, San Pedro; Ash Creek (tributary to San Carlos River); Beaver Creek (tributary to the East Fork Gila River); Eagle Creek; Taylor Creek (tributary to East Fork Gila River); Aravaipa Creek; Turkey Creek (tributary to Aravaipa Creek); and Babocomari Creek (tributary to the San Pedro River, Voeltz 2002).

Of 328 collections made within the Gila and San Francisco River drainages, summarized in Bestgen and Propst (1989), roundtail chub were found only in the mainstem Gila River; the West, East, and Middle Forks of the Gila River; Turkey Creek; and lowermost Black Canyon. Of 83,000 specimens collected during these surveys, 858 were roundtail chub. Of the 858 roundtail chub collected, 590 of those (69%) were taken from Turkey Creek. Bestgen and Propst (1989) further noted that roundtail chub were historically collected in the Gila River portion of the basin, from the Arizona-New Mexico border throughout much of the mainstem and varying distances upstream into each of the three forks.

Present

Populations of roundtail chub have declined considerably throughout the lower Colorado River drainage. Populations in the San Francisco River drainage have been extirpated (Bestgen and Propst 1989, Propst 1999, Voeltz 2002), and populations have been limited to several isolated segments in the Gila River drainage (Bestgen and Propst 1989). Furthermore, based on Minckley and DeMarais' (2000) reclassification of Gila River drainage *Gila* species, roundtail chub are restricted to the mainstem Gila River downstream of Cliff.

Samples conducted within the Gila River drainage by Propst (2005) between 1988 and 2004 have revealed only one occurrence of roundtail chub in a survey conducted in 1991 near the town of Riverside. Propst (1999) reported that roundtail chub are incidental or absent in the Upper Gila River near the Cliff-Gila Valley. Voeltz (2002) classified the roundtail chub populations within the New Mexico stretch of the Gila River as unstable and threatened. Voeltz (2002) further noted that roundtail chub were likely extirpated from the Arizona portion of the Upper Gila River. The Desert Fishes Team (2003) also noted that roundtail chub exist in the Upper Gila River. According to present information on distribution of the roundtail chub, the species likely occurs in the project area.

INFLUENCES OF HYDROLOGY

AGFD (2002), USFWS (2004), and NMDGF (2000) noted that threats to the roundtail chub include aquifer pumping, stream diversion and impoundment, reduction in stream flows, and predation by and competition with non-native fishes. Minckley and Meffe (1987) noted that in Aravaipa Creek in Arizona, the roundtail chub is resilient to the flash flooding that commonly occurs in southwestern streams.

INFORMATION GAPS

Data on microhabitat use and flooding are needed to determine impacts from water withdrawals.

3.1.7 DESERT SUCKER (*Catostomus clarki*)

STATUS

The desert sucker is currently listed by the USFWS as a species of concern (NMDGF 2003, 59 FR 58982), informally listed as a sensitive species in the state of New Mexico by the New Mexico Department of Game and Fish (NMDGF 2003), and listed as a sensitive species by the USBLM New Mexico State Office (NMDGF 2003) and USBLM Arizona State Office (AGFD 2006).

DESCRIPTION

The desert sucker is a medium-sized catostomid attaining an adult size of 100 mm to 250 mm in standard length. Lips are large with small papillae evenly dispersed over the lower lip (Minckley 1973, as cited in AGFD 2002). Number of scales in the lateral line range from 61 to 104, with 65 to 80 being the norm in the Gila River drainage. Number of dorsal fin rays and pelvic fin rays both range from 8 to 12, with 9 or 10 being the norm (Minckley 1973 as cited in AGFD 2002). Typically, a small flap of skin is present at the base of each pelvic fin. Coloration is silvery-tan to dark greenish above and silvery to yellowish coloring below (AGFD 2002). It is similar in appearance to other catostomids inhabiting the same waters, except that the desert sucker has cartilaginous edges on the inside of the mouth (AGFD 2002, Sublette et al. 1990).

The desert sucker occupies small- to medium-sized streams and creeks in the Gila River Basin, and is found at its greatest abundance in hard-bottomed streams of intermediate elevation (Desert Fishes Team 2004). Some studies indicate that desert suckers exhibit little seasonal movement and are resistant to downstream displacement, despite floods. Preferred temperature is believed to be 17.5°C within modal bounds ranging from 10.0-21.0°C, although the species has been known to survive temperatures exceeding 32.0°C. Experimental studies on oxygen deprivation suggest that it has a lower tolerance to reduced oxygen than do other native stream fishes. The desert sucker is found in rapids and flowing pools of streams and rivers, primarily over bottoms of gravel-rubble with sandy silt in the interstices. It occurs at elevations between 146 m and 2,694 m (480 ft and 8,840 ft) (AGFD 2002).

As adults, desert suckers are primarily herbivorous, scraping diatoms and algae from stones and ingesting plant detritus using their cartilage-sheathed jaws. Chironomid larvae are the primary food source of juveniles. Adults live in pools, moving at night to swift riffles and runs to feed. Young inhabit riffles throughout the day, feeding on midge larvae (AGFD 2002).

LIFE HISTORY

The desert sucker generally spawns in late winter and early spring when adults congregate in large numbers in riffles. The act of spawning generally involves one large female and several smaller males. The adhesive eggs are deposited in a shallow redd, with eggs hatching in only a few days. After emerging, young tend to congregate in large numbers along the banks in quiet water, and then progressively move into the mainstream as they increase in size. Maturity occurs by age 2 and at a length of approximately 100 mm to 130 mm. (AGFD 2002)

DISTRIBUTION AND ABUNDANCE

Historic

Within New Mexico, the desert sucker is endemic to the Gila and San Francisco River drainages (AGFD 2002).

Present

The Desert Fishes Team (2004) noted that the desert sucker can be found in 137 of the 186 Gila River Basin locations in which it has been recorded. Sublette et al. (1990 as cited in AGFD 2002) noted that it occurs in “the Gila River Basin and San Francisco drainage in extreme headwater situations.” However, Propst (2005) documented the desert sucker as occurring in the mainstem Gila River close to the town of Riverside during all years in surveys conducted between 1988 and 2004. Surveys could not be conducted in 2000 due to high flows. The species was also found in all surveys conducted between 1997 and 2004 in the Middle Box site near the town of Redrock. Again, sampling could not be conducted in 2000 due to high flows. Lower in the drainage, in the Lower Box site, surveys have confirmed the species’ presence in 1997, 1998, 2001, and 2002. Surveys conducted by the NMDGF have also shown it as being common and present in the San Francisco drainage and in the West, East, and Middle Forks of the Gila River. According to current information on distribution of the desert sucker, the species likely occurs in the project area.

INFLUENCES OF HYDROLOGY

Alteration of historic flow regimes through water use practices and construction of reservoirs has diminished available habitat for the desert sucker (AGFD 2002). In a study done on Aravaipa Creek in Arizona, Minckley and Meffe (1987) noted that the desert sucker is resilient to the flash flooding that commonly occurs in southwestern streams.

INFORMATION GAPS

Data on microhabitat use and flooding are needed to determine impacts from water withdrawals.

3.1.8 SONORA SUCKER (*Catostomus insignis*)

STATUS

The Sonora sucker is currently listed by the USFWS as a species of concern (NMDGF 2003, 59 FR 58982), informally listed as a sensitive species in the state of New Mexico by the New Mexico Department of Game and Fish (NMDGF 2003), and listed as a sensitive species by the USBLM New Mexico State Office (NMDGF 2003).

DESCRIPTION

The Sonora sucker is a medium-sized catostomid, although adults can attain sizes of 800 mm (AGFD 2002) and weigh as much as 2.0 kg (Minckley 1973 as cited in AGFD 2002). The body is fusiform and generally chubby. The head is large. The number of dorsal fin rays is almost always 11. The scales are relatively large, with typically fewer than 60 on the lateral line, and crowded anteriorly. The body is sharply bi-colored, being brownish dorsally and yellow beneath. The dorso-lateral scales are sharply outlined with melanophores overall, each scale with a discrete broadening of the outline to form a variable distinct spot. The “spots” are aligned to provide the visual effect of longitudinal, punctuate lines on upper sides of darkly colored individuals (AGFD 2002). The interradials of fins are variably darkened, with lower fins generally yellow to white (Minckley 1973 as cited in AGFD 2002).

The Sonora sucker exists in small- to moderate-sized streams and small rivers at elevations between 369 m and 2,661 m (1,210 ft and 8,730 ft) (AGFD 2002), but generally below 1,981 m (6,500 ft) in elevation. It is a riverine species that does not persist in impoundments (Desert Fishes Team 2004). AGFD (2002) further explained that the Sonora sucker can be found in a wide variety of habitats, ranging from lower warm-water rivers to “trout” streams. The species seems to have an affinity for relatively deep, quiet

waters and gravelly or rocky pools (Minckley 1973 as cited in AGFD 2002). Adults generally remain near cover in daylight hours but move into runs and deeper riffles at night and during feeding. Young typically utilize runs and quiet eddies (AGFD 2002).

Juvenile Sonora sucker feed along the margins of streams and rivers, often in extremely large groups, on food sources such as tiny crustaceans and protozoans (Minckley 1973 as cited in AGFD 2002). Adults are omnivorous, feeding on aufwuchs (diatoms and algae) in shallow pools. Macroinvertebrates also contribute significantly to the diet of the species. Feeding is often done in the early morning and late evening (Sublette et al. 1990 as cited in AGFD 2002).

LIFE HISTORY

Spawning of the Sonora sucker begins in late winter and can continue through midsummer. Like the desert sucker, two or more males usually attend the female Sonora sucker during spawning. Eggs are deposited in riffle habitats, where they fall into interstitial spaces within the substrate to incubate. Minckley (1973 as cited in AGFD 2002) stated, “they tend to move to smaller streams or into riffles in larger streams, but a few populations are known to spawn in lakes.” Spawning does not appear to be correlated with any specific stream flow or temperature patterns (AGFD 2002).

DISTRIBUTION AND ABUNDANCE

Historic

The Sonora sucker is endemic to the Gila and Bill Williams systems of New Mexico, Arizona, and northern Sonora, Mexico (AGFD 2002).

Present

“The status of the species is stable in the San Francisco and Gila River drainages, New Mexico” (Sublette et al. 1990 as cited in AGFD 2002). Propst (2005) further confirmed that the Sonora sucker is common and present in the mainstem Gila River and elsewhere in the Gila and San Francisco River drainages. The species persists in 93 of the 127 Gila River Basin locations in which it has been recorded (Desert Fishes Team 2004).

According to present information on distribution of the Sonora sucker, the species likely occurs in the project area.

INFLUENCE OF HYDROLOGY

Alteration of flow regimes and construction of reservoirs have reduced suitable habitat for the Sonora sucker (AGFD 2002). Declines in populations and fragmentation of the historic range are attributed to dewatering and alteration of habitats (Desert Fishes Team 2004). Minckley and Meffe (1987) noted that in Aravaipa Creek, Arizona, the Sonora sucker is resilient to flash flooding common to southwestern streams.

INFORMATION GAPS

Data on microhabitat use and flooding are needed to determine impacts from water withdrawals.

3.1.9 LONGFIN DACE (*Agosia chrysogaster*)

STATUS

The species is listed as a species of concern by the USFWS (59 FR 58982, AGFD 2006) and is listed by the USBLM New Mexico State Office (NMDGF 2003) and by the USBLM Arizona State Office (AGFD 2006) as a sensitive species.

DESCRIPTION

The longfin dace is a small member of the family Cyprinidae that rarely exceeds 65 mm in standard adult length. The body is fusiform with small scales that are 70 to 90 at the lateral line. The head is thick and blunt. The mouth is small, subterminal, oblique, and overhung by a bluntly rounded snout. The mouth terminates posteriorly at a point below the nares. Back and upper sides are silvery-gray to olive in coloration, sometimes with golden flecks. The lower sides and abdomen are whitish in color. The diffuse dusky lateral strip originates at the upper corner of the opercula and terminates in a black spot at the base of the caudal fin (Sublette et al. 1990, AGFD 2002).

Although longfin dace tend to occupy relatively small streams with sandy or gravelly bottoms, the species can occur in a variety of habitats ranging from intermittent hot, low-desert streams to clear and cooler brooks at higher elevations. Usually found in water less than 0.2 m (0.6 ft) deep, with velocities around 0.3 m/sec (1.1 ft/sec) and temperatures below 24°C (75°F), the longfin dace is rarely abundant in large streams or above 1,500 m (5,000 ft) in elevation (AGFD 2002). Rinne and Minckley (1991) noted, "It has a remarkable capability to disperse into new habitats, appearing a few hours or days after flow reestablishes in formerly dry stream channels. Longfin dace were once recorded to survive in tiny volumes of water beneath mats of filamentous algae, then reproduce a few days after when summer rains rejuvenated the stream." In response to the onset of flooding, fish will move into the margins of the current and move back into the channel as the discharge declines (AGFD 2002).

The species is classified as omnivorous and opportunistic, feeding primarily on detritus (Minckley 1973; Sublette et al. 1990 as cited in AGFD 2002). Other prey items include aquatic invertebrates, zooplankton, and algae. Because of feeding habits, diet can be highly variable among populations in different areas. Preferred feeding time for the species is during daylight hours when resources are abundant (AGFD 2002).

LIFE HISTORY

Although longfin dace may spawn throughout the year, spawning occurs primarily in the spring. Most individuals become sexually mature in the first year. The Colorado River populations of longfin dace create saucer-shaped depressions, where eggs are deposited and newly hatched young remain for a brief time before dispersing to shoreline areas (Rinne and Minckley 1991 as cited in AGFD 2002). Nests are usually created in shallow water 5 cm to 20 cm (2 in to 4 in) deep and over a sandy substrate. Hatching occurs within four days (AGFD 2002).

DISTRIBUTION AND ABUNDANCE

Historic

Longfin dace historically occupied the Gila, Bill Williams, Yaqui, Magdalena, and Sonoyta drainages (Minckley 1973 as cited in AGFD 2002). The species is endemic to the Upper Gila River drainage.

Present

Despite substantial declines in populations of other native fish species in the drainage, longfin appear to be present throughout much of their historic range. Propst (2005) showed that longfin dace are found in the Gila and San Francisco River drainages. At the San Francisco River survey site near the Glenwood Ranger Station, longfin dace were found in all years except 2001 and 2004. A survey was not conducted in 2000 due to high flows. Longfin dace were found in all annual surveys conducted at the Tularosa River Eagle Peak Road site (1988–2004). Within the mainstem Gila River, fish were found in all years surveyed except 1997 at the Gila River site near the town of Riverside. Longfin dace were found in all annual surveys conducted at the Middle Box site (1997–2004). In the Lower Box site on the mainstem Gila River, longfin dace were collected in 1997–2002 (sampling began in 1997). Longfin were not collected at this site in 2003 or 2004. In 1988 to 1995, longfin dace were collected in the East Fork Gila River at a site located approximately 2.0 km downstream of the Beaver and Taylor Creeks confluence. In 1997 to 2000 (except 1996), the species was collected in the East Fork Gila River at the Fall Springs site. The longfin dace was absent from surveys in the East Fork Gila River from 2001 to 2004. Longfin dace were collected from 1988 through 1995 and again in 1997 in the Middle Fork Gila River Trailhead site (sampling began in 1988), but were not collected there in 1998 to 2004. Longfin dace have been collected at the West Fork Gila River Cliff Dwellings site in all years surveyed (1989–2004) except 2003. Furthermore, the Desert Fishes Team (2004) noted that of the 257 Gila River Basin locations in which longfin dace were collected between 1840 and 2003, 213 still retain the species. According to current information on distribution of the longfin dace, the species likely occurs in the project area.

INFLUENCES OF HYDROLOGY

Individual populations of longfin dace may be moved by changes in water flows (i.e. flooding or droughts), but the species has the ability to recover numbers very rapidly when flows return to normal levels (AGFD 2002). In a study done on Aravaipa Creek, Arizona, Minckley and Meffe (1987) noted that the longfin dace is resilient to flash flooding that commonly occurs in southwestern streams

INFORMATION GAPS

Data on microhabitat use and flooding are needed to determine impacts from water withdrawals.

3.1.10 SPECKLED DACE (*Rhinichthys osculus*)

STATUS

The Gila basin population of speckled dace is listed as a USFWS species of concern (59 FR 58982) and is listed by the USBLM New Mexico State Office as a species of concern (NMDGF 2003).

DESCRIPTION

The speckled dace is a small minnow that rarely exceeds 7.6 cm (3.0 in) in length. The body is chunky, rounded, and somewhat flattened ventrally. The body depth is usually approximately equal to the length of the head. Barbels are usually present at the sides of the upper lips. Fins are generally rounded, with the dorsal fin origin above or just behind the pelvic fin insertion. Scales are moderately small, with 60 to 90 along the lateral line. Coloration is highly variable, typically being drab olivaceous with patterns ranging from large blotches throughout the body, to a single or double lateral band, to unicolored throughout the body. In the Gila River system, the speckled dace is typically highly speckled or blotched and chubby-bodied. Breeding males may develop vivid red at the base of paired fins and on the body near those fins. (AGFD 2002; Minckley 1973 as cited in AGFD 2002). Species forms in the Colorado River Basin are

generally more streamlined, with enlarged falcate fins and a more slender caudal peduncle (Page and Burr 1991).

The species is typically a bottom dweller than can be found in rocky riffle, run, and pool habitats in headwaters, creeks, and small to medium rivers. They typically reside in water less than 0.5 m (1.6 ft) deep, with water velocities near 0.4 m/sec (1.3 ft/sec), and they often congregate below riffles and eddies (AGFD 2002). The speckled dace is omnivorous and somewhat opportunistic. Food sources include algae and other plant material, aquatic insects, and small crustaceans (AGFD 2002).

LIFE HISTORY

The speckled dace has two breeding periods: one in the spring and the other in late summer. They typically spawn over a coarse substrate using a broadcast spawning method and congregate in large groups to release eggs. Breeding adults prefer swift water. John (1964 as cited in Mueller 1984) noted that during years of unusually low spring runoff, spawning efforts may be weak and scattered.

DISTRIBUTION AND ABUNDANCE

Historic

The speckled dace is native to western drainages from the Columbia River Basin in Canada south to the Colorado River Basin in Mexico. It is the most ubiquitous fish species in the western United States (Page and Burr 1991).

Present

Propst (2005) documented that no collections of the species have been made within the mainstem Gila River. However, other collections show the species to be a common resident of the West Fork Gila River, and a periodic resident of the East and Middle Forks of the Gila River. Speckled dace have been collected in all surveys conducted in the West Fork Gila River at the Cliff Dwellings site between 1989 and 2004. The species was collected within the East Fork Gila River in 1988 at a site approximately 2.0 km downstream of the Beaver and Taylor Creeks confluence, and in 2001 and 2002 at the Fall Springs site. Speckled dace were collected in the Middle Fork Gila River at the Trailhead site in 1988 through 1995 and again in 1998. The species has also been collected frequently in surveys conducted in the San Francisco-Tularosa drainage (Propst 2005). The Desert Fishes Team (2004) further noted that within the Gila River Basin, the speckled dace is still found in 153 of its 215 historical locations. However, they do not place it as occurring in the mainstem Gila River in New Mexico. Given current information on the distribution of the speckled dace, the species is not likely to be found within the project area.

INFLUENCES OF HYDROLOGY

Speckled dace can persist for long periods of time in intermittent pools, even when crowded, diseased, and starving. Conversely, the species has a relatively low tolerance for high water temperatures and low oxygen content (AGFD 2002). Furthermore, Mueller (1984) noted that during years of unusually low spring runoff, spawning effort by the speckled dace may be weak and scattered.

Minckley and Meffe (1987) noted that in Aravaipa Creek, Arizona, the speckled dace is resilient to flash flooding that is common to southwestern streams.

INFORMATION GAPS

Habitat requirements related to water withdrawals are in need of further study.

3.2 POTENTIALLY OCCURRING NON-NATIVE FISH FAUNA

3.2.1 CHIHUAHUA CATFISH (*Ictalurus* sp.)

STATUS

The Chihuahua catfish is an unrecognized species native to the Rio Grande Basin. It is currently listed by the USFWS as a species of concern (NMDGF 2003, 59 FR 58982) and is informally listed as a sensitive species by the New Mexico Department of Game and Fish (NMDGF 2003).

DESCRIPTION

The Chihuahua catfish closely resembles the headwater catfish (*Ictalurus lupus*); however, it differs from the headwater catfish in that it possesses a heavy-set body, deeper caudal peduncle, broader head, and shorter dorsal and pectoral spines (BISON 2004). Using the New Mexico Department of Game and Fish taxonomic key, this species would likely be identified as *I. lupus* (BISON 2004).

Both the Chihuahua catfish and the headwater catfish resemble the channel catfish (*Ictalurus punctatus*) in appearance, but they both lack the spots present on the channel catfish.

No information was found regarding habitats utilized by the Chihuahua catfish. Its close relative, the headwater catfish, occupies clear, temperate creeks and rivers, including associated spring runs, generally with a moderate gradient. The headwater catfish typically occupies sandy and rocky substrates (BISON 2004).

LIFE HISTORY

No information was found concerning the life history of the Chihuahua catfish or the headwater catfish.

DISTRIBUTION AND ABUNDANCE

Historic

The species was found in the Rio Grande and Rio Conchos drainages of Texas and Mexico. Although no specimens have been located to date in the Rio Grande of New Mexico, species records as far upriver as El Paso, Texas indicate that it formerly occurred in New Mexico. Archaeological evidence of the species suggests the species formerly occurred in the Pecos drainage (BISON 2004).

Present

The Chihuahua catfish occurs as a sporadic resident of the East Fork Gila River. Propst (2005) documented the Chihuahua catfish as being collected in surveys conducted in the East Fork Gila River approximately 2.0 km downstream of the Beaver and Taylor Creeks confluence in 1990 through 1995, and at the Fall Springs site in 2000 and 2004. The East Fork Gila River was not surveyed in 1996. The species was not found elsewhere in the Upper Gila River drainage (Propst 2005). Given current information on the distribution of the Chihuahua catfish, the species is not likely to be found within the project area

3.2.2 CHANNEL CATFISH (*Ictalurus punctatus*)

DESCRIPTION

Channel catfish, unlike other catfish now found in the Gila River Basin, are characterized by their deeply forked caudal fin. The upper jaw projects beyond the lower jaw. Coloration is olive-brown to slate-blue on the back and sides, shading to silvery-white on the belly. Typically, numerous small, black spots are present, but these may be obscured in larger adults (TPWD 2005).

Although found in a variety of habitats, channel catfish prefer large streams with a low to moderate current (TPWD 2005). Optimal lotic environments for the channel catfish are characterized by warm temperatures and a variety of velocities, depths, and structural features for cover and feeding. Adults are largely omnivorous, feeding on insects, mollusks, crustaceans, fish, and plant material (TPWD 2005).

LIFE HISTORY

Channel catfish spawn in late spring or early summer when water temperatures reach 23.9°C. Males select dark, secluded areas (such as cavities in drift piles, logs, undercut banks, rocks, etc.) as nest sites. A golden-yellow, gelatinous egg mass is deposited in the bottom of the nest. Males guard the nest and may actually eat some of the eggs if disturbed. The eggs, if not devoured, typically hatch in about a week. Fry remain in the nest under guardianship of the male for about another week. In clear water, young fish appear to be much more susceptible to predation, and, thus, survival rates during the first year are low. Sexual maturity is typically reached in three to six years and usually by the time they reach 305 mm in length (TPWD 2005).

DISTRIBUTION AND ABUNDANCE

Historic

The channel catfish is endemic to St. Lawrence-Great Lakes, Hudson Bay, and the Missouri-Mississippi River Basins. It is possibly also native to Atlantic and Gulf Slope drainages. (Page and Burr 1991)

Present

The channel catfish now occurs within the Colorado River drainage as a non-native species. Propst (2005) documented that the channel catfish is a common and relatively abundant resident of the Middle Box and Lower Box sites, located in the mainstem Gila River. At the NMDGF Middle Box site, surveyed from 1997 to 2004 (except in 2000 due to high flows), channel catfish were collected in 1998, 2001, 2002, 2003, and 2004. The species represented 28% of the fish collected in 2004 at this site. At the NMDGF Lower Box site, surveyed from 1997 to 2004 (except in 2000 due to high flows), channel catfish were collected in 1997, 1998, 1999, 2001, 2003, and 2004. In 2004, the only other species collected was the red shiner. The channel catfish has only been collected from the Gila River Riverside permanent site in 1988, and from the East Fork Gila River, approximately 2.0 km below the Beaver and Taylor Creeks confluence, in 1988 and 1989. The species has never been collected from the West or Middle Forks during NMDGF surveys. Given current information on the distribution of the channel catfish, the species will likely be found within the project area.

INFLUENCES OF HYDROLOGY

Lentsch et al. (1996) noted that flash floods, which raise turbidity levels and provide input of silt, may cause detrimental impacts to channel catfish populations. Channel catfish generally prefer low to moderate turbidity levels.

INFORMATION GAPS

Habitat requirements related to water withdrawals are in need of further study.

3.2.3 FLATHEAD CATFISH (*Pylodictis olivaris*)

DESCRIPTION

The flathead catfish is characterized and often distinguished from other catfish by its flat head and protruding lower jaw. It has smooth, scaleless skin and long barbels around the mouth. The dorsal fin and pectoral fins all contain a large, sharp spine. Coloration is light brown on the back and sides, with black or brown mottling often occurring throughout the body. The belly is a pale yellow or cream color. The tail fin is only slightly notched. Young flathead catfish are typically very dark in appearance (TPWD 2005).

Although found in a wide variety of habitats, flathead catfish prefer deep pools of streams, rivers, canals, lakes, and reservoirs. Inhabited waters are typically turbid with slow currents. Adult flathead are usually solitary and spend days hiding in deep water under cover. At night, they move into shallow areas to feed (TPWD 2005).

Adult flatheads are almost exclusively piscivorous, feeding on a wide variety of prey species, including other flathead catfish. The diet of young primarily consists of invertebrates such as worms, insects, and crayfish (TPWD 2005).

LIFE HISTORY

The average lifespan of the species is 12 to 14 years, and sexual maturity is reached between the third and sixth year. Spawning season typically occurs from late May through August when water temperatures are near 24°C to 27°C. Males select the nest site, usually in hollow logs, caves, or undercut banks, and they may even improve sites by creating shallow depressions for the female to lay her eggs. Fecundity in females varies greatly but is estimated to be about 1,200 eggs for every pound of weight. Males aggressively defend the eggs and nest, and they have been known to fan the eggs to provide oxygenated water. After an incubation period of four to six days, emerged fry will remain together near the nest for several days before seeking shelter beneath rocks, roots, and other cover. Spawning success is often affected by environmental conditions such as drought or flood. (TPWD 2005)

DISTRIBUTION AND ABUNDANCE

Historic

Flathead catfish are endemic to the lower Great Lakes, Mississippi River Basins, and Gulf Slope drainages (Page and Burr 1991).

Present

Flathead catfish are found in the Colorado River drainage as a non-native species. Within the mainstem Gila River, Propst (2005) documented that the species has been found in surveys conducted at the Riverside, Middle Box, and Lower Box site locations. It was collected at the NMDGF Riverside site, which was surveyed from 1988 to 2004, in 1988, 1991, and 1998. At the Middle Box site, surveyed from 1997 to 2004, the flathead catfish was documented in 2001, 2002, and 2003. At the Lower Box site, surveyed from 1997 to 2004, the flathead catfish was documented in 1997, 1998, 1999, 2001, and 2003. None of these three sites were surveyed in 2000 due to high flows. The flathead catfish has not been collected in any NMDGF surveys conducted in the East, West, and Middle Forks of the Gila River, which

began in 1988. Given current information on the distribution of the flathead catfish, the species will likely be found within the project area.

INFLUENCES OF HYDROLOGY

Hydrological influences are in need of additional study.

INFORMATION GAPS

Habitat requirements related to water withdrawals are in need of further study.

3.2.4 YELLOW BULLHEAD (*Ameiurus natalis*)

DESCRIPTION

Yellow bullheads are typically light yellow to olive-green on the back and often somewhat mottled, with yellowish to white underneath. The tail is not notched and may be slightly rounded. Chin barbels are white. The anal fin contains 23 to 27 rays (TPWD 2005).

The species may inhabit both lentic and lotic environments. In creeks and small to large rivers, the species occupies pools, backwaters, and sluggish currents over soft substrates. The yellow bullhead may also be common in oxbows, ponds, and impoundments (Page and Burr 1991).

The species is omnivorous, feeding on a variety of plant and animal material, both live and dead. Immature insects and crustaceans often comprise a considerable proportion of the diet. (TPWD 2005)

LIFE HISTORY

During late spring or summer, yellow bullheads excavate nests in mud bottoms and spawn. Both parents guard the nest, which may contain 2,000 to 12,000 eggs. In four to six days, eggs hatch and fry begin to school in compact balls, which are guarded by adults until individuals reach about one inch in length. (TPWD 2005)

DISTRIBUTION AND ABUNDANCE

Historic

The yellow bullhead is endemic to Atlantic, Gulf Slope, St. Lawrence-Great Lakes, and Mississippi River drainages (Page and Burr 1991).

Present

The yellow bullhead has been widely introduced outside its native range, and it can be found as a non-native species in the Colorado River drainage. Propst (2005) documented that the species is a common resident of the Middle Fork Gila River, having been found in relatively high densities in recent surveys conducted at the NMDGF Trailhead permanent site on the Middle Fork. Yellow bullheads were collected in surveys conducted at this site from 1988 to 2004, and they were also found in the West Fork Gila River at the Cliff Dwellings site in 1990, 1995, 1996, and 1997 in surveys conducted between 1989 and 2004. The species was found in the East Fork Gila River at the Fall Spring site in 1999, 2003, and 2004. The East Fork Gila River site was not sampled in 1996. Within the mainstem Gila River, yellow bullheads were only found at the NMDGF Riverside site in 1999 and at the Lower Box site in 1997. Given current

information on the distribution of the yellow bullhead, the species will likely be found within the project area.

INFLUENCES OF HYDROLOGY

Hydrological influences are in need of additional study.

INFORMATION GAPS

Habitat requirements related to water withdrawals are in need of further study.

3.2.5 BLACK BULLHEAD (*Ameiurus melas*)

DESCRIPTION

Black bullheads are greenish-black on the back and gray to white on the belly. In turbid environments, they may develop a yellowish-brown coloration on the back. The caudal fin contains a slight notch. Chin barbels are dark or black (TPWD 2005).

The black bullhead is typically associated with sluggish, turbid waters. In lentic environments, the species prefers vegetated backwaters, impoundments, ponds, and lakes. In lotic environments, they prefer low-gradient waters with muddy bottoms (BISON 2004).

Black bullheads are opportunistic scavengers, primarily feeding from the bottom on a wide variety of live and dead plant and animal material. Fingerling feed primarily on crustaceans, and adults feed largely on aquatic insects and crustaceans. (TPWD 2005)

LIFE HISTORY

Black bullheads spawn during late spring and early summer and typically build their nests in muddy substrates. Nest sites are typically associated with some sort of cover. Eggs are golden-yellow and laid in gelatinous masses. The nest is usually guarded by both parents, but often only one is present at a time. Eggs hatch within four to six days, after which emerged fry school near the nest. Adults continue to guard the fry until they reach approximately one inch in length. The average adult life span is less than five years. (TPWD 2005)

DISTRIBUTION AND ABUNDANCE

Historic

The black bullhead is endemic to the Great Lakes, Hudson Bay, Mississippi River Basins, and Gulf Slope drainages (Page and Burr 1991).

Present

Black bullhead are found in the Colorado River drainage as a non-native species. Propst (2005) documented the species as only occurring in 1999 at the East Fork Gila River Fall Spring site, and in 1999 at the mainstem Gila River Riverside site. Given current information on the distribution of the black bullhead, the species will likely be found within the project area.

INFLUENCES OF HYDROLOGY

The black bullhead is intolerant of clear, cool, high-velocity streams (Lentsch et al. 1996).

INFORMATION GAPS

Habitat requirements related to water withdrawals are in need of further study.

3.2.6 SMALLMOUTH BASS (*Micropterus dolomieu*)

DESCRIPTION

Smallmouth bass are generally green with dark green vertical bands. The dorsal fin contains 13 to 15 soft rays. The upper jaw never extends beyond the eye (TPWD 2005).

Although found in a variety of habitats, smallmouth bass prefer large, clear-water lakes (greater than 100 acres and more than 9 m deep) and clear, cooler streams with rocky to sandy substrates (TPWD 2005).

Smallmouth bass are generally known as sight feeders. Fry feed on zooplankton, switching to insect larvae as juveniles. As the juveniles grow, they add fish and crayfish to their diets (TPWD 2005).

LIFE HISTORY

Smallmouth bass spawn in the spring. Males move into spawning areas when water temperatures rise in the spring. Nests are typically located near shores in lentic systems, downstream of boulders or other protection from strong currents in lotic systems. Males may spawn with several females on a single nest. Mature females may contain as many as 2,000 to 15,000 golden-yellow eggs. On average, though, each nest contains approximately 2,500. Eggs hatch in approximately 10 days when water temperatures are near 10°C, and in 2 or 3 days when temperatures rise above 20°C. Males will guard the nest for up to a month when the fry begin to disperse (TPWD 2005). Bestgen and Propst (1989) noted that smallmouth bass have apparently displaced roundtail chub in sections of the Gila River drainage.

DISTRIBUTION AND ABUNDANCE

Historic

Smallmouth bass are endemic to the St. Lawrence-Great Lakes, Hudson Bay, and Mississippi River Basins. They have now been widely introduced throughout the United States (Page and Burr 1991).

Present

Smallmouth bass are now found within the Colorado River Basin as a non-native species. Propst (2005) documented that the species is a periodic resident of the West Fork Gila River and mainstem Gila River and a relatively common resident of the Middle and East Forks of the Gila River. Within the West Fork Gila River at the Cliff Dwellings permanent site, the species was collected in 1989, 1991, 1992, 1993, 1997, and 2004. Only one specimen was collected in the 2004 survey. At the Middle Fork Trailhead site, the smallmouth bass was collected in all years surveyed (1988–2004), and, along with the yellow bullhead, it has been identified as the reason for elimination of most native species and for the relatively low abundance of all fishes within the Middle Fork Gila River. In 2004, the smallmouth was found at a density of approximately 0.075 fish/m² at this site. Within the East Fork Gila River, the species was collected in 1991 through 1995 at the site located about 2.0 km below the Beaver and Taylor Creeks confluence, and in 1997 and 2004 at the Fall Springs site. It was also collected at the Riverside site on the

mainstem Gila River in 1989, 1991, 1992, and 2004. Only once specimen was collected in the 2004 survey. No documentations of the species have occurred at the Middle Box and Lower Box sites. Given current information on the distribution of the smallmouth bass, the species will likely be found within the project area.

INFLUENCES OF HYDROLOGY

Bestgen and Propst (1989) noted that natural conditions in southwestern streams with variable flows and temperatures and high turbidity would discourage movement of smallmouth bass into habitats of endangered fishes in the Gila River drainage. Reportedly, floods in 1983 and 1984 within the drainage severely reduced smallmouth bass abundances (Bestgen and Propst 1989).

INFORMATION GAPS

Habitat requirements related to water withdrawals are in need of further study.

3.2.7 LARGEMOUTH BASS (*Micropterus salmoides*)

DESCRIPTION

The largemouth bass has an overall green coloration, usually with dark blotches that form a horizontal stripe along the middle of the fish on either side. Its underside ranges from light green to almost white. The dorsal fin is divided, with 9 spines in the anterior portion and 12 to 13 soft rays in the posterior portion. The upper jaw reaches far beyond the rear margin of the eye (TPWD 2005).

Found in a wide variety of habitats, largemouth bass prefer clear and quiet waters of lentic and lotic systems. They generally seek protective cover such as logs, rock ledges, vegetation, and man-made structures (TPWD 2005).

The species is generally classified as a sight feeder (Lentsch et al. 1996). Fry feed primarily on zooplankton and insect larvae. At approximately two inches in length, they become active predators. As adults, they feed primarily on other fish and large invertebrates. The species is sometimes cannibalistic and is typically a stalking predator, hiding among cover before striking prey (TPWD 2005). Feeding habits and tolerance to low-velocity environments have caused concern over the impacts of the largemouth bass to young native fishes in other basins (Lentsch et al. 1996).

LIFE HISTORY

Spawning typically occurs in the spring when water temperatures begin to rise. Males typically build nests in quiet, vegetated water that is approximately two to eight feet deep. Nests are built in a wide variety of substrates except soft mud. After the female lays 2,000 to 43,000 eggs in the nest, she is chased away by the male who then guards the eggs. Fry hatch in five to ten days and remain near the nest in a school under guard of the male before dispersing after several days (TPWD 2005).

DISTRIBUTION AND ABUNDANCE

Historic

The largemouth bass is endemic to the St. Lawrence-Great Lakes, Hudson Bay, Mississippi River Basins, and the Atlantic and Gulf Slopes. It has been introduced throughout the United States (Page and Burr 1991).

Present

Found in the Colorado River drainage as an introduced species. Propst (2005) documented that the largemouth bass is an infrequent resident of the Upper Gila River basin, with no collections being made of the species in the area since 1997. The last collection of the species within the mainstem Gila River was in 1992 at the Riverside site. Given current information on the distribution of the largemouth bass, the species will potentially be found within the project area.

INFLUENCES OF HYDROLOGY

The species is intolerant to low dissolved oxygen and high turbidity levels (Lentsch et al. 1996). Thus, high turbidity and variable flows are generally detrimental to largemouth bass abundances.

INFORMATION GAPS

Habitat requirements related to water withdrawals are in need of further study.

3.2.8 GREEN SUNFISH (*Lepomis cyanellus*)

DESCRIPTION

Green sunfish are dark green or blue in dorsal coloration, fading to a lighter green on the sides and to a yellowish-white ventrally. Its sides are marked by faint vertical bars, and some scales have turquoise spots. The body is very deep and laterally flattened, which is characteristic of fish within the family Centrarchidae (TPWD 2005).

Green sunfish are known to be a versatile species able to tolerate a wide range of environmental conditions. They tend to thrive when competition with other sunfish is minimal. Its ability to survive in environmental extremes allows the species to populate in conditions that are not stable, such as in prairie and desert streams. Because of its reproductive potential, it is often the first sunfish species to repopulate depleted areas.

The diet of adult green sunfish consists primarily of insects and small fish (TPWD 2005). Young-of-year typically feed on zooplankton (Lentsch et al. 1996).

LIFE HISTORY

Green sunfish spawn in shallow water colonies where nests are typically excavated in gravel or rocky substrates. Spawning begins in late spring when water temperatures rise above 21°C and may continue throughout the summer. Males aggressively defend the nests for six to seven days after the female deposits the eggs. By this time, fry have typically emerged and are free-swimming (TPWD 2005).

DISTRIBUTION AND ABUNDANCE

Historic

The green sunfish is endemic to the Great Lakes, Hudson Bay, Mississippi River Basins, and Gulf Slope drainages, including the Rio Grande (Page and Burr 1991).

Present

The species is now found in the Colorado River drainage as a non-native species. Propst (2005) documented that the green sunfish is a sporadic resident of the Upper Gila River drainage. The species was documented as occurring at the Middle Fork Gila River Trailhead site in 1992, 1997, and 2004; at the East Fork Gila River Fall Spring site in 2004; and at the mainstem Gila River Riverside site in 1989 and 1991. Given current information on the distribution of the green sunfish, the species will potentially be found within the project area.

INFLUENCES OF HYDROLOGY

The green sunfish is intolerant of high-velocity, shallow habitats (Lentsch et al. 1996).

Because of their dietary habits and tolerance of a wide variety of habitats, green sunfish populations may be detrimental to native fish populations (Lentsch et al. 1996).

INFORMATION GAPS

Habitat requirements related to water withdrawals are in need of further study.

3.2.9 RAINBOW TROUT (*Oncorhynchus mykiss*)

DESCRIPTION

Rainbow trout are usually dark olive on the back and fade to silvery white on the sides and underside. The body is heavily spotted, usually with a pink to red stripe running along the fish's side. The anal fin contains 10 to 12 rays, and dark spots are clearly visible on the dorsal and caudal fins. The caudal fin is slightly forked (TPWD 2005).

Rainbow trout are found in cool- to cold-water stream and lake environments. They thrive in waters that remain below 21°C but have been known to tolerate higher temperatures (TPWD 2005).

Rainbow trout are carnivorous, but not exclusively piscivorous. Prey items include insects, crustaceans, mollusks, and fish (TPWD 2005).

LIFE HISTORY

Rainbow trout spawn in the late winter and into spring. Eggs are laid in a shallow nest dug out by the females in gravel riffles. Eggs require continuous oxygenation (TPWD 2005).

DISTRIBUTION AND ABUNDANCE

Historic

Rainbow trout are endemic to North America west of the Rockies, north to Alaska, and south to Baja California in Mexico. They have been introduced throughout the United States (TPWD 2005, Page and Burr 1991).

Present

Rainbow trout occur as a non-native species in the Colorado River Basin. Propst (2005) documented that rainbow trout were collected in 1989–1999, 2001, and 2004 in the West Fork Gila River Cliff Dwellings site, and in 1989, 1993, and 1998–2000 in the Middle Fork Gila River Trailhead site. Only one specimen

was collected in the 2004 survey in the West Fork. Rainbow trout also occur in the San Francisco-Tularosa River drainage. No collections have been made of rainbow trout in the mainstem Gila River, as documented by Propst (2005). Given current information on the distribution of the rainbow trout, the species is not likely to be found within the project area.

3.2.10 BROWN TROUT (*Salmo trutta*)

DESCRIPTION

Brown trout are olive to dark brown above, yellow-brown on the sides, and white to yellow below. Red and black spots are found on the head and body, with many spots on gill covers. Bold black spots appear on the head and back, and on the dorsal and adipose fins. Spots are typically surrounded by pale halos. The caudal fin is nearly straight-edged. Lateral scales 120 to 130. Usually 10 brachiostegal rays and 9 dorsal rays. Young typically have 9 to 14 short, narrow parr marks with a few red spots along the lateral line (Page and Burr 1991).

Brown trout are carnivorous and are voracious piscivores, especially older fish. They feed on drifting aquatic insects and other fishes.

LIFE HISTORY

Brown trout spawn in the fall and winter. Eggs are laid in shallow nests dug out by the females in gravel riffles and require continuous oxygenation.

DISTRIBUTION AND ABUNDANCE

Historic

The brown trout is endemic to Europe. It has been introduced and is now common throughout the United States and Canada (Page and Burr 1991).

Present

Brown trout exist in the Colorado River Basin as a non-native species. Propst (2005) documented that the brown trout is a sporadic resident of the Upper Gila River Basin, with no collections being made of the species since 2002. Brown trout were collected in the West Fork Gila River at the Cliff Dwelling site in 1992 through 2002, and in the Middle Fork Gila River at the Trailhead site in 1988 and 1989. Given current information on the distribution of the brown trout, the species is not likely to be found within the project area.

3.2.11 COMMON CARP (*Cyprinus carpio carpio*)

DESCRIPTION

The common carp is a heavy-bodied member of the family Cyprinidae that varies in color from brassy green or yellow to a golden-brown or silver. The mouth has barbels on either side of the upper jaw. Scales are large and distinct. The dorsal fin contains 17 to 21 fin rays. The dorsal and anal fins are both characterized by a heavy-toothed spine. Individuals 305 to 635 mm in length and 3.6 to 4.5 kg in weight are common, although the species can grow much larger. (TPWD 2005)

The common carp is a hardy and tolerant species that can persist in a wide variety of conditions. The species generally prefers large bodies of water with slow-flowing or standing water and a soft substrate. They are known to thrive in large, turbid rivers and can tolerate a temperature range of 3°C to 35°C.

Common carp are omnivorous and very opportunistic feeders. Food sources include aquatic insects, crustaceans, annelids, mollusks, terrestrial plant seeds, aquatic plants, and algae.

LIFE HISTORY

The common carp is generally a long-lived species, sometimes surviving to 20 years of age or more. They spawn in spring and summer, with females laying the adhesive eggs in shallow vegetation. The species is known to be detrimental to native fish assemblages, as it feeds on eggs of native fish and alters habitat, primarily through uprooting macrophyte communities and, as a result, increasing turbidity (Lentsch et al. 1996).

DISTRIBUTION AND ABUNDANCE

Historic

Common carp are native to Europe and Asia. They were first introduced in North America in 1877. Countless introductions (intentional and unintentional) have allowed the common carp to become one of the most widely distributed fish species in North America (TPWD 2005).

Present

Propst (2005) reported that the common carp was found in the mainstem Gila River during NMDGF surveys conducted in 1990 and 1994 near the town of Riverside. It was also found in 1998 in the mainstem Gila River downstream of Redrock. Given current information on the distribution of the common carp, the species will likely be found within the project area.

INFLUENCES OF HYDROLOGY

The effects of hydrology on common carp are not well understood.

INFORMATION GAPS

Habitat requirements related to water withdrawals are in need of further study.

3.2.12 RED SHINER (*Cyprinella lutrensis*)

DESCRIPTION

Red shiners are olive green above and silver on the sides. Spawning males become bluish on the sides and red at the fins. There are 7 to 8 fin rays in the dorsal fin and 8 to 10 rays in the anal fin. Maximum size is approximately 90 mm (TPWD 2005).

The red shiner is an aggressive and mobile generalist species that occurs primarily in riverine environments. The species may inhabit a variety of streams, but it is most often found in moderate- to large-sized creeks and rivers with low gradients and low to moderate water velocities. Furthermore, the species is able to survive in a wide variety of ephemeral and perennial riverine habitats with varied substrate types. The red shiner is very adaptable and tolerant of unstable environments, but it is usually

uncommon or absent in clear and cool high-gradient streams. It may also be found in impoundments (Lentsch et al. 1996).

The species is thought to feed primarily on small invertebrates (TPWD 2005), but is also known to feed on larval fish (Lentsch et al. 1996).

LIFE HISTORY

Red shiners spawn over an extended period from spring into fall months, with a peak occurring in early to mid-summer. Spawning may occur on riffles, on or near submerged objects, over vegetation beds, or in association with sunfish nests. Adults typically school in midwater or near the surface (TPWD 2005).

DISTRIBUTION AND ABUNDANCE

Historic

The red shiner is native to central North America west of the Mississippi River drainage, with New Mexico being the westernmost point of its range. Latitudinally, the species ranges from central Mexico north to South Dakota. It is classified as a plains species (TPWD 2005). In the Gila River drainage the red shiner is a non-native species.

Present

Propst (2005) documented that the red shiner was found in most years surveyed at all three NMDGF survey sites located on the mainstem Gila River (one in proximity to the town of Riverside, one in proximity to the town of Redrock, and one located lower on the mainstem downstream from Redrock). The species has not shown up in surveys documented in Propst (2005) in the San Francisco drainage and in the East, West, and Middle Forks of the Gila River. Given current information on the distribution of the red shiner, the species will likely be found within the project area.

INFLUENCES OF HYDROLOGY

Within the native range of the red shiner, the species rarely becomes abundant in clear streams with a constant flow and a substantial population of other minnows. Conversely, during dry years when flows decrease, red shiner abundance may increase while other fish populations decline; therefore, the species may begin to dominate (Minckley 1973 as cited in Lentsch et al. 1996). Furthermore, in areas of streams that become rewetted after a dry period, the red shiner is often the pioneer species, utilizing its generalist behavior and large reproductive potential (Lentsch et al. 1996). Minckley and Meffe (1987) noted that flooding in unregulated rivers of Arizona and New Mexico depleted or even removed red shiner from certain stream reaches, but the species was able to rapidly reestablish itself through survivors, reinvaders, and strong reproductive potential. Rinne (1991) noted that habitat partitioning may occur when spikedace and red shiner co-exist in a stream.

INFORMATION GAPS

Habitat requirements related to water withdrawals are in need of further study.

3.2.13 FATHEAD MINNOW (*Pimephales promelas*)

DESCRIPTION

The fathead minnow has a rounded snout and short, rounded fins. A dark spot appears at the base of the tail fin, and sometimes a blotch on the anterior portion of the dorsal fin. There is a darkening along the midline of the back. The anal fin contains 7 rays (TPWD 2005).

The fathead minnow is a stream fish, able to tolerate a wide range of environmental conditions, including high temperatures, low oxygen levels, and high turbidities. The species seems to be most abundant in small streams where competition with other species is limited. Fatheads school either in midwater or near the bottom (TPWD 2005).

Fathead minnows feed primarily on plant material, although invertebrates are sometimes consumed (TPWD 2005)

LIFE HISTORY

Spawning occurs from late spring through midsummer. Eggs are deposited over submerged objects and then guarded by males. The nests may contain as many as 12,000 eggs. Females may spawn up to 12 times in a single summer. Some individuals may mature and spawn during their first summer of life, but spawning is usually delayed until the second summer (TPWD 2005).

DISTRIBUTION AND ABUNDANCE

Historic

The fathead minnow is found throughout much of North America east of the Rocky Mountains.

Present

Propst (2005) documented the fathead minnow as occurring in the mainstem Gila River as a non-native species. The species was collected in the mainstem Gila River at the Riverside site in 1998 and 1999; at the Middle Box site in 1998, 2001, 2003, and 2004; and at the Lower Box site in 1998, 2001, 2002, and 2003. The fathead minnow is also a sporadic to rare resident of the East, West, and Middle Forks of the Gila River. Propst (2005) also reported that the fathead minnow is a sporadic resident of the San Francisco-Tularosa drainage. Given current information on the distribution of the fathead minnow, it will likely be found within the project area.

INFLUENCES OF HYDROLOGY

The effects of hydrology on the fathead minnow are not well understood.

INFORMATION GAPS

Habitat requirements related to water withdrawals are in need of further study.

3.2.14 WESTERN MOSQUITOFISH (*Gambusia affinis*)

DESCRIPTION

The species is light olive-gray to yellow-brown, with a dark stripe that runs along the back to the dorsal fin. The sides are yellow and iridescent blue on transparent silver-gray. Pregnant females have a black anal spot. The dorsal fin contains 6 to 7 rays. The species grows to 65 mm in size (Page and Burr 1991).

Habitat of the western mosquitofish consists of standing to slow-flowing water. It is most commonly found in vegetated ponds and lakes, backwaters and quiet pools of streams, and in brackish water (Page and Burr 1991).

The western mosquitofish primarily feeds on mosquito larvae and pupae. Zooplankton, diatoms, algae, fish fry, and other aquatic insects are other food sources (Sublette et al. 1990 as cited in Lentsch et al. 1996).

LIFE HISTORY

Western mosquitofish are livebearers that can reproduce throughout the year in warm water, but they generally breed between March and September. Females can carry 1 to 315 embryos during a gestation period of 21 to 28 days. One to five broods may be produced per year (Sublette et al. 1990, Lentsch et al. 1996). A positive correlation exists between sexual activity in males and increased water temperatures. Introductions of the species into western drainages have been detrimental to the survival of certain rare fishes (Page and Burr 1991).

DISTRIBUTION AND ABUNDANCE

Historic

The western mosquitofish is endemic to Atlantic and Gulf Slope drainages and the Mississippi River Basin (Page and Burr 1991).

Present

The species has been transplanted into many western U.S. drainages, including the Gila River. Propst (2005) documented that the fish occurs sporadically throughout the Upper Gila River drainage, including the East, Middle, and West Forks and in the San Francisco-Tularosa drainage. Within the 'forks area', the western mosquitofish was collected in the West Fork Cliff Dwellings site in 1991, 1992, and 2000; in the Middle Fork Trailhead site in 1989, 1990, 1992, 1994, 1996, and 1998–2002; in the East Fork approximately 2.0 km downstream from the Beaver and Taylor Creek confluences in 1988–1995, and at the Fall Springs site in 1998, 1999, and 2001 through 2004. The species was collected in the mainstem Gila River at the Middle Box site in 2001–2003, and at the Lower Box site in 1997–1999 and 2001–2003. Surveys at each of these sites began in 1997 and have continued through 2004. The western mosquitofish is the most commonly collected non-native species at the Riverside site located on the mainstem Gila River, occurring at a density of approximately 0.08 fish/m² in 2004 and reaching its highest density in 1999 at approximately 0.5 fish/m². The species was collected at this site in 1988–1995, 1998, 1999, and 2001–2004. Given current information on the distribution of the western mosquitofish, the species will likely be found within the project area.

INFLUENCES OF HYDROLOGY

The effects of hydrology on the western mosquitofish are not well understood.

INFORMATION GAPS

Habitat requirements related to water withdrawals are in need of further study.

3.2.15 BROOK STICKLEBACK (*Culaea inconstans*)

DESCRIPTION

This species has a deep, compressed body that is olive with pale green flecks and dark green mottling. It often has a pale stripe along the side and is silver-white to light green below. Breeding males are typically dark green to black, sometimes with red on the pelvic fins. They grow to 89 mm in length and have 4 to 6 short dorsal spines. Their pelvic fins have one spine and one ray (Page and Burr 1991).

The species usually occupies vegetated, mud-bottomed lakes and ponds. These lentic environments include quiet to flowing pools and backwaters of headwaters, creeks, and small rivers, usually over sand or mud. They are rarely found in brackish water (Page and Burr 1991).

The brook stickleback primarily feeds on aquatic insects (Page and Burr 1991).

LIFE HISTORY

Sticklebacks are well known for their complex mating behaviors. The male builds a nest, usually on the stem of an aquatic plant, using plant materials and a sticky kidney secretion. He then entices a female to enter the nest and lay the eggs. After the female leaves, the male enters and fertilizes the eggs, then remains near the nest to guard the eggs (Page and Burr 1991).

DISTRIBUTION AND ABUNDANCE

Historic

The brook stickleback is endemic to Atlantic, Arctic, Mississippi, and Great Lakes drainages (Page and Burr 1991).

Present

The species occurs as a non-native species in the Colorado River drainage. The only documentation of the brook stickleback in the Upper Gila River Basin occurred in the Tularosa River in 2002 (Propst 2005).

Given current information on the distribution of the brook stickleback, the species is not likely to be found within the project area.

3.3 AFFECTED AVIAN FAUNA

3.3.1 SOUTHWESTERN WILLOW FLYCATCHER (*Empidonax traillii extimus*)

STATUS

The southwestern willow flycatcher (*Empidonax traillii extimus*) is federally listed as endangered (60 FR 10693), with designated critical habitat (70 FR 60886). It is further listed as endangered under the New Mexico Wildlife Conservation Act (NMDGF 2003), as a species of special concern in Arizona (AGFD

2002), and as a sensitive species by the USFS Region 3 (Southwest Region: Arizona and New Mexico) (NMDGF 2003).

DESCRIPTION

A flycatcher with brownish-olive upper parts, a whitish throat that contrasts with the pale olive breast, a pale yellow belly, and two light wing bars; generally lacks a conspicuous eye ring. As in other flycatchers, the bill is depressed and wide at the base (NGS 1983). The palest subspecies of *E. traillii*, *extimus* adults most closely resemble the subspecies *E. t. adastus* but are even paler above, especially on the head, and *E. t. extimus* has a less pronounced chest band and the belly and crissum are paler yellow (Phillips 1948). The song differs from that of other subspecies by being a more protracted, slurred "fit-a-bew" with a burry "bew" syllable rather than a crisp, sneezy "fitz-bew" (60 FR 10693).

Willow flycatchers inhabit riparian woodlands at lower elevations of 853 to 1,676 m (2,800 to 5,500 ft) in the south and higher elevations of 2,133 to 3,962 m (7,000 to 13,000 ft) in the north. They migrate at lower and middle elevations of 1,524 to 2,286 m (5,000 to 7,500 ft) in shrublands and woodlands (Hubbard 1978). They are found in thickets, scrubby and brushy areas, open second growth, swamps, and open woodland (AOU 1983). *E. t. extimus* is restricted to riparian habitat in Arizona (Brown 1988).

This flycatcher eats mainly insects caught in flight, but sometimes gleans insects from foliage and occasionally eats berries. In its breeding range, *E. t. extimus* forages within and occasionally above dense riparian vegetation (NatureServe 2006).

LIFE HISTORY

Willow flycatcher nesting occurs usually from early June through the end of July and peaks in mid-June (Unitt 1987). Sometimes eggs can be laid as early as late May. In Grand Canyon, Arizona, flycatchers breed from early June to mid-July or perhaps early August (Brown 1988). Clutch size is usually 3 to 4 eggs (2 to 3 along Colorado River). Incubation lasts 12 to 15 days, and is done by the female. Both parents tend young and the young leave the nest at 12 to 15 days, usually in early to mid-July. Flycatchers typically raise one brood per year. Flycatcher nests may incur a high rate of cowbird parasitism, especially in low elevation populations (Harris 1991, Brown 1988). Breeding territories are about 1.5 acres. Densities may be on the order of 9–14 pairs/100 acres.

E. t. extimus nests primarily in swampy thickets, especially of willow, sometimes buttonbush (Phillips et al. 1964, AOU 1983), tamarisk (Brown 1988), vines, or other plants, where vegetation is 4 to 7 m or more in height. Habitat patches as small as 0.5 ha can support one or two nesting pairs (60 FR 10693). Nests are constructed in forks or on a horizontal limb of small trees, shrubs, or vines, at a height of 0.6 to 6.4 m (mean usually about 2–3 m) (Harris 1991), with dense vegetation above and around the nest.

DISTRIBUTION AND ABUNDANCE

Historic

In 1948, Phillips reported that *E. t. extimus* was "now greatly reduced in numbers...colonies few and far between...total population relatively small." *E. t. extimus* has declined precipitously and is now absent from many areas where once it was common (Unitt 1987, 60 FR 10693, 58 FR 39495). In New Mexico in the mid-1980s, the overall range was not significantly reduced but populations were smaller than historic levels (58 FR 39495). Breeding populations of willow flycatchers are greatly reduced in California and Arizona (Unitt 1987, 60 FR 10693, 58 FR 39495).

Present

In New Mexico, *E. t. extimus* populations occur in the Cliff/Gila Valley. In this region occurs the largest known nesting concentration of the southwestern willow flycatcher (Boucher et al., 1997). The species occurs statewide in spring and autumn migration, while birds presumably of the subspecies *E. t. extimus* breed in the Chama, Rio Grande, Zuni, San Francisco, Gila, and probably the Hondo (Lincoln Co.) basins and in the San Juan and western Sangre de Cristo mountains; reports of breeding elsewhere are unverified, dubious, or incorrect (Hubbard 1987). Areas of key habitat include breeding areas in the vicinities of Zuni (McKinley Co.), Corrales (Sandoval Co.) to upper Elephant Butte L. (Sierra Co.), Glenwood-Pleasanton (Catron Co.), and Cliff-Redrock (Grant Co.) (NMDGF 1988).

In Arizona, *E. t. extimus* breeds locally along Colorado River in Grand Canyon near the mouth of Little Colorado River, and south of Yuma; at Little Colorado River headwaters near Greer and Eagar; very locally along the middle Gila, Salt, and Verde rivers; middle to lower San Pedro River; and upper San Francisco River near Alpine.

INFLUENCES OF HYDROLOGY

This species could occur in areas with surface water (main river channel and all associated side channels, backwaters, pools, and marshes), and areas within 100 m (328 ft) of the edge of surface water, throughout the May to September breeding season. Areas where surface water no longer exists but where habitat may be recovered also are considered potentially suitable. This includes areas with existing thickets of riparian shrubs and trees, and areas where such riparian vegetation does not currently exist but may become established with natural regeneration or habitat rehabilitation (58 FR 39495).

Degradation and, in some cases, loss of native riparian vegetation has lowered the water table and resulted in the loss of perennial flows in some streams. Owing to its deep root system and adaptive reproductive strategy, tamarisk often thrives or persists where surface flow has been reduced or lost. *E. t. extimus* is generally absent where the exotic tamarisk has replaced native riparian vegetation (58 FR 39495).

Some authors believe tamarisk may not provide the thermal protection that native broadleaf species do (Hunter et al. 1987, Hunter et al. 1988). This could be important at lower elevations in the Southwest, where extremely high temperatures are common during the bird's midsummer breeding season (58 FR 39495).

INFORMATION GAPS

Factors that maintain riparian habitat structure for nesting and surface water are in need of investigation.

3.3.2 BROWN PELICAN (*Pelecanus occidentalis carolinensis*)

STATUS

The brown pelican (*Pelecanus occidentalis*) is federally listed as endangered (35 FR 16047) except along the U.S. Atlantic coast and in Florida and Alabama where it has been delisted (50 FR 4938). In 1983, New Mexico listed the brown pelican as endangered under the New Mexico Wildlife Conservation Act (NMDGF 2004). The species is also listed as sensitive by the USFS Region 3 (Southwest Region: Arizona and New Mexico) (NMDGF 2003). The brown pelican is not listed as a species of special concern in Arizona (AGFD 2006).

DESCRIPTION

The brown pelican is a large water bird with a massive bill and huge throat pouch; its wings and body are mostly grayish-brown. Non-breeding adults have a whitish head and neck, often washed with yellow; breeding adults have a dark chestnut hindneck; and juveniles have a grayish-brown head and neck. Brown pelicans vary greatly in size depending on location, with the smallest individuals occurring in the West Indies; medium birds on the coasts of the United States (Atlantic and Gulf), Central America, and Colombia and Ecuador; and large birds on the coasts of California, Mexico, the Galapagos Islands, Peru, and Chile (NGS 1983, Palmer 1962).

Brown pelicans are mainly coastal, rarely being seen inland or far out at sea. *P. o. carolinensis* feeds mostly in shallow estuarine waters, less often up to 64 km (40 mi) from shore. Non-breeders especially make extensive use of sand spits, offshore sand bars, and islets for nocturnal roosting and daily loafing. Dry roosting sites are essential. Some roosting sites eventually may become nesting areas (NatureServe 2006).

LIFE HISTORY

Brown pelicans eat mainly fish, especially menhaden, mullet, sardines, pinfish, and anchovies (sometimes euphausiids) in U.S. waters (USFWS 1980), foraging in shallow estuarine and inshore waters mostly within 10 km (6 mi) of the coast (Johnsgard 1993). It sometimes feeds in cooperative groups (Hilty and Brown 1986). Rarely reported scavenging or preying on eggs or young of water birds. The prey base (e.g., fish) can be affected by overexploitation and habitat degradation (NatureServe 2006).

Nests of this species are usually found on the ground or in small bushes and trees on coastal islands (Palmer 1962). Brown pelican nests on middle or upper parts of steep rocky slopes of small islands in California and Baja California, and usually in mangroves, sometimes in Australian "pines," red-cedars, live oaks, redbays, or sea grapes on low-lying islands landward of barrier islands or reefs on Atlantic and Gulf coasts. In the subtropics and tropics, mangrove vegetation constitutes an important roosting and nesting substrate (NatureServe 2006). May shift between different breeding sites, apparently in response to changing food supply (Anderson and Gress 1983) and/or to erosion/flooding of nesting sites.

Along the west coast of North America, egg laying may occur from late winter to early spring (peak usually in March or April but may vary among colonies and from year to year). Clutch size averages between two and three. Incubation, by both sexes, lasts about 28 to 30 days. Young leave ground nests at about 35 days and first fly at 71 to 88 days. Pelicans may first breed at two years in some colonies (e.g., newly formed ones), but sometimes not until about four to seven years in stable populations (Johnsgard 1993). Reproductive success varies with level of disturbance by humans, abundance of food, and/or flooding of nests, but typically the number of young fledged per nest averages one or less.

DISTRIBUTION AND ABUNDANCE

This species breeds from California and the Mid-Atlantic States southward to South America (AOU 1998). In New Mexico and Arizona, the brown pelican is a rare visitor, although through 2003 there were some 50 reports, involving more than 60 individual birds, observed in 15 of New Mexico's 33 counties. Most reports were from large lakes or along major rivers, including the San Juan, Gila, Rio Grande, and Pecos drainages. Most brown pelicans that occur in New Mexico are the Pacific subspecies *P. o. californicus*, although the eastern *P. o. carolinensis* is also likely to occur (NMDGF 2004).

INFLUENCES OF HYDROLOGY

Hydrological threats to brown pelicans include declining fish (food) populations, increased turbidity (e.g., from dredging, resulting in reduced visibility of prey), and oil and other chemical spills. Human disturbance (e.g., recreational boating, poaching) not only disrupts reproductive success, but may also affect distribution patterns and age structure of pelicans using roosting sites during the non-breeding season (NatureServe 2006).

INFORMATION GAPS

An evaluation of potential use by the species of proposed off channel storage lake is needed.

3.3.3 BALD EAGLE (*Haliaeetus leucocephalus*)

STATUS

The bald eagle was reclassified in 1995 from endangered to threatened (60 FR 35999), and was recently proposed for federal delisting (64 FR 36453). The species is further listed as threatened under the New Mexico Wildlife Conservation Act (NMDGF 2004), as a species of special concern in Arizona (AGFD 2006), and as a sensitive species by the USFS Region 3 (Southwest Region: Arizona and New Mexico) (NMDGF 2003).

DESCRIPTION

Adult bald eagles have a white head, white tail, and a large bright yellow bill. Immature bald eagles are dark with variable amounts of light splotching on the body, underwing coverts, flight feathers, and tail base. It averages 79 to 94 cm (31 to 37 in) long with a 178 to 229 cm (70 to 90 in) wingspan (NGS 1983). Bald eagle has a proportionately larger head and bill than does the golden eagle. Compared with immature bald eagles, the white in immature golden eagles is confined to the base of the primaries and the base of the tail.

The majority of bald eagle populations in New Mexico are found near streams and lakes (NMDGF 1988). It prefers to roost in conifers or other sheltered sites in winter in some areas, typically selecting the larger, more accessible trees (Buehler et al. 1991). Perching in deciduous and coniferous trees is equally common in other areas (Bowerman et al. 1993). Communal roost sites used by two or more eagles are common, and during periods of high use some sites may be used by 100 or more eagles. Winter roost sites vary in their proximity to food resources (up to 33 km) and may be determined to some extent by a preference for a warmer microclimate at these sites.

In winter, bald eagles may associate with waterfowl concentrations or congregate in areas with abundant dead fish (Griffin et al. 1982). They often roost communally at night in trees that are used in successive years. Wintering areas are commonly associated with open water though in some areas eagles use habitats with little or no open water if other food resources (e.g. rabbit or deer carrion) are readily available. Bald Eagles avoid areas with nearby human activity (boat traffic, pedestrians) and development (Buehler et al. 1991).

Bald eagles also feed opportunistically on various mammals and on carrion (Terres 1980).

LIFE HISTORY

Breeding habitat most commonly within 4 km (2.5 mi) of coastal areas, bays, rivers, lakes, or other bodies of water that provide the primary food sources including fish, waterfowl, and seabirds (Andrew and

Mosher 1982, Campbell et al. 1990). Clutch size of bald eagles is 1 to 3 (usually 2). Incubation, which is performed by both sexes, lasts about 5 weeks. The second hatched young often dies. Young first fly at 10 to 12.5 weeks and may remain around the nest for several weeks after fledging. Bald Eagles generally breed for the first time at 5 to 6 years of age. Adults may not lay eggs every year (NatureServe 2006).

DISTRIBUTION AND ABUNDANCE

Historic

The species was on the brink of extinction late in the 20th century but most populations are now stable. As of the early 1990s, populations in many areas had rebounded from the low levels that occurred before DDT use was banned in the U.S. The population increase in recent years has been accomplished through protection and active management, as well as through enhanced reproduction after the DDT ban. Populations have been increasing in the contiguous 48 states, with the number of nesting territories nearly tripling between 1980 and 1990 (Kjos 1992).

Present

Most eagles that breed in Canada and the northern U.S. move south for the winter. Eagles migrate widely over most of North America (AOU 1983). Gerrard (1983) estimated that there are approximately 48,000 bald eagles in Alaska and British Columbia. Blood and Anweiler (1991) gave North American estimates of 70,000, with 21,000 in British Columbia and 30,000 in Alaska.

In New Mexico, key habitat areas include winter roost and concentration sites at Navajo Lake, the Chama Valley (Rio Arriba Co.), Cochiti Lake (Sandoval Co.), the northeastern lakes (Raton to Las Vegas), the lower Canadian Valley, Sumner Lake, Elephant Butte Lake, Caballo Lake, and the upper Gila Basin. They also are winter residents at Gray Ranch (Hidalgo County). Nesting and summering areas also are classified as key habitats for the species (NMDGF 1988). Bald eagles are rare summer residents in the Gila National Forest (Zimmerman 1995).

In Arizona, bald eagle territories and nesting localities have been documented in the Bill Williams River Drainage, upper and lower Verde and Salt Rivers (including winter and non-breeding sightings on the Black River, and on Cherry Creek), Roosevelt Lake, Gila River (only when favorable conditions are available), Colorado River (sporadically observed wintering individuals), and the Mogollon Rim and White Mountain lakes (Tibbits et al. 1990).

INFLUENCES OF HYDROLOGY

The principal threats to bald eagles in New Mexico are loss or degradation of wintering habitat (including declines in prey and in roost-site availability), disturbance (particularly of nesting pairs), environmental contamination, and illegal killing (NMDGF 1994, 1996). Since these habitats and roost sites are primarily in riparian areas in the state, any dramatic changes to riparian areas will most likely affect the bald eagle.

INFORMATION GAPS

There is a need for identifying factors that maintain winter habitat and riverine environments for foraging.

3.3.4 YELLOW-BILLED CUCKOO (*Coccyzus americanus*)

STATUS

The western yellow-billed cuckoo (subspecies *occidentalis*) was federally designated a candidate for listing in the Western U.S. in 1982 (47 FR 58454). However, the listing of western yellow-billed cuckoo as a Distinct Population Segment (DPS), though considered warranted by USFWS, was precluded by higher priority listing actions (65 FR 8104). The species is informally listed by the NMDGF as a sensitive species (NMDGF 2003), is listed as a species of special concern in Arizona (AGFD 2006), and is listed as a sensitive species by the USFS Region 3 (Southwest Region: Arizona and New Mexico) (NMDGF 2003, AGFD 2006).

DESCRIPTION

Yellow-billed cuckoos are slender, long-tailed birds with white underparts and dark upperparts. They have unstreaked, grayish-brown backs and rufous wings. Their tails have black-and-white bars when seen from below, but from above they show brown with white spots at the edges. Their bills are mostly yellow and curved downward (BirdWeb 2006).

Yellow-billed cuckoos breed in riparian woodlands and similar habitats at lower elevations of 853 to 1,676 m (2,800 to 5,500 ft) to middle elevations of 1,524 to 2,286 m (5,000 to 7,500 ft) (Hubbard 1978). They nest in a tree or shrub, usually up to 1 to 4 m (2 to 12 ft) above the ground, often in areas with dense understory foliage. The nest is a flimsy platform of short twigs placed on a horizontal branch. The 3 to 4 eggs are incubated for 14 days or less. The chicks are able to climb about with agility at 7 to 9 days of age. The entire time from egg-laying to fledging may be as little as 17 days.

Yellow-billed cuckoos are insectivorous, gleaning insects from leaves or catching them in the air. Hairy caterpillars are a favorite food item, and the nesting cycle of the yellow-billed cuckoo often coincides with outbreaks of tent caterpillars, katydids, or cicadas. Yellow-billed cuckoos may also feed on bird eggs, frogs, lizards, and berries (Ehrlich et al. 1988).

LIFE HISTORY

Home ranges often include at least 25 acres of riparian habitat. West of the continental divide, cuckoos nest almost exclusively close to open water, and humidity may be required for successful hatching and rearing of young (66 FR 38611). Western yellow-billed cuckoos arrive on their breeding grounds starting in mid to late May, which is later than most co-occurring bird species and 4 to 8 weeks later than yellow-billed cuckoos east of the crest of the Rockies (Franzreb and Laymon 1993 as cited in Hughes 1999).

DISTRIBUTION AND ABUNDANCE

Historic

Historically, the yellow-billed cuckoo occurred throughout the United States, ranging from southern Canada to northern Mexico (AOU 1998). In the western United States, yellow-billed cuckoos were historically locally common in Arizona, California, New Mexico, Oregon, and Washington; and local and uncommon in western Colorado, western Wyoming, Idaho, Nevada, Utah, and British Columbia (66 FR 38611).

Present

Range-wide estimates of yellow-billed cuckoo abundance are unavailable, but the population must be considerably more than 10,000 pairs. It reaches its greatest abundance in southeastern and south-central North America, as indicated by BBS data (states with highest BBS relative abundance are Arkansas, Mississippi, and Oklahoma; Sauer et al. 1997, Price et al. 1995).

The yellow-billed cuckoo has declined precipitously throughout its range in southern Canada, the United States, and northern Mexico. It is nearly extinct west of the Continental Divide, having disappeared from British Columbia in the 1920's, from Washington in the 1930's, from Oregon in the 1940's, and from northern-most California in the 1950's. It is extremely rare and local in the interior West, where its only remaining western "strongholds" are three small populations in California, scattered populations in Arizona (Gila, Bill Williams, and Colorado rivers; Groschupf 1987) and New Mexico (San Juan, Rio Grande, Pecos, Canadian, San Francisco, and Gila rivers; Howe 1986), and an unknown number of birds in northern Mexico (Center for Biological Diversity 2000).

INFLUENCES OF HYDROLOGY

Biologists estimate that more than 90 percent of the bird's riparian (streamside) habitat in the West has been lost or degraded due to conversion to agriculture; grazing; competition from nonnative plants, such as tamarisk; river management, including altered flow and sediment regime; and flood control practices, such as channelization and bank protection (70 FR 24869).

INFORMATION GAPS

There is a need for identifying factors that maintain trees for nesting and riverine environments for foraging and surface water.

3.3.5 BELL'S VIREO (*Vireo bellii*)

STATUS

The Bell's vireo is listed as a species of concern by the USFWS (NMDGF 2003), is considered threatened by the New Mexico Wildlife Conservation Act (NMDGF 2003), and is listed as a sensitive species by the USFS Region 3 (Southwest Region: Arizona and New Mexico) (NMDGF 2003, AGFD 2006). The subspecies recognized in New Mexico are *V. b. arizonae* and *V. b. medius* (BISON 2004). The species is not listed as a species of special concern in Arizona (AGFD 2006).

DESCRIPTION

The Bell's vireo (*Vireo bellii*) is a small North American songbird. It is 12 to 13 cm (4 3/4 to 5 in) in length, dull olive-gray above and whitish below. It has a faint white eye ring and faint wing bars. Color ranges from olive in the central U.S. to grayish in the Southwest. It differs from the warbling vireo (*Vireo gilvus*) by having wing bars and a pale eye ring (NGS 1983, Peterson 1990, AGFD 2001).

In New Mexico this species characteristically occurs in dense shrubland or woodland along lowland stream courses, with willows (*Salix* spp.), mesquite (*Prosopis* spp.), and seepwillows (*Baccharis glutinosa*) being characteristic plant species (Hubbard 1985). It is generally the only vireo breeding along lowland stream sides, although other species occur there in migration, and gray vireos (*V. vicinior*) may breed on nearby slopes (NMDGF 1988).

Bell's vireo eat primarily insects and small spiders (99.3 percent), rarely fruits (0.7 percent) (Chapin 1925). It forages in dense brush, occasionally in treetops (Terres 1980, NGS 1983). In California, 69 percent of foraging observations were within 4 meters of ground, but rarely on the ground. It gleans prey from leaf and bark substrates, but also obtains some prey by hovering and occasionally by hawking (Salata 1983). No observations of drinking have been recoded; they may obtain adequate water from their food (Brown 1993).

LIFE HISTORY

Clutch size is three to five (commonly four) eggs and incubation lasts 14 days. Young are tended by both parents, leave the nest at 10 to 12 days, and remain with the adults for 25 to 30 days after leaving the nest. The breeding season begins in early April in the southern part of the range to late May in the northern part. Both parents incubate eggs and tend young (Harrison 1978). Most pairs double-brooded in the Lower Colorado River Valley and Grand Canyon, Arizona (Brown 1993, Franzreb 1989). Nests are constructed with grasses, bark, and other plant parts, along with spider webs and hair. Most nests are located 0.5 to 1.5 m (1.6 to 4.9 ft) above ground, with nest height ranging from 0.2 to 8.0 m (0.7 to 26.2 ft) (Thelander and Crabtree 1994).

Bell's vireo usually return to the same nesting territory in successive years (Franzreb 1989). More than 60 percent of returning males and 30 percent of returning females utilize the previous year's territory (Greaves 1989). Most fledglings that survive to breeding age return to their natal area (Greaves and Gray 1991). Nest sites are occasionally found in the same shrub as in previous years (Greaves 1987).

Observed nesting densities range from 0.5 breeding pairs per 40 hectares of mesquite bosque habitat in the lower Colorado River Valley, where nearly extirpated, to 26 pairs per 40 hectares in willow-tamarisk habitat elsewhere in Arizona (Meents et al. 1984, Szaro and Jakle 1985). Extrapolated densities of up to 200 pairs per 40 hectares have been calculated from small, extremely productive riparian study areas (The Nature Conservancy 2000).

DISTRIBUTION AND ABUNDANCE

Historic

This species has declined in parts of its range, including Arizona (Phillips et al. 1964) and New Mexico. In New Mexico, the species almost certainly has declined given the amount of habitat destruction that has occurred (Hubbard 1985). There also is evidence that the species may have been negatively impacted as the result of increased nest-parasitism by the brown-headed cowbird (*Molothrus ater*) (e.g., Phillips et al. 1964). Recent New Mexico surveys and reports indicate that numbers and range may fluctuate locally from year to year, but that overall numbers remain low and may number fewer than 100 breeding pairs (NMDGF 1996). The number of territories detected on a transect in Guadalupe Canyon, for example, declined from an annual average 4.8 in 1987–1992 to 4 in 1993–1997 and to 1.3 in 1998–2001 (NMDGF 2002).

Present

Bell's vireo breeds in southern California, southern Nevada, southwestern Utah, Arizona, southern New Mexico, northeastern Colorado, Nebraska, South Dakota, western North Dakota, southeastern Minnesota, southern Wisconsin, northeastern Illinois, northwestern Indiana, and southwestern Michigan south to northern Baja California, southern Sonora, southern Durango, Zacatecas, southern Tamaulipas, southern Texas, north-central Louisiana, Arkansas, and southwestern Tennessee, southwestern Kentucky, southern Indiana, and western Ohio (Brown 1993, AOU 1998). In New Mexico, the subspecies *V. b. arizonae* summers locally in the lower Gila Valley and in Guadalupe Canyon (Hidalgo Co.), with occasional birds

in the lower San Francisco Valley and at San Simon Cienaga in Hidalgo Co. (Hubbard 1985). In Arizona, this species is found predominantly along the Colorado River corridor as well as central and southern Arizona (AGFD 2002).

INFLUENCES OF HYDROLOGY

Population declines in Bell's vireo may be related to loss of riparian habitat (NatureServe 2006), particularly in the western portions of its range. Loss of riparian habitat has resulted from urban development, water diversion, flood control projects, grazing, and the spread of agriculture. No special management attention is needed for the apparently stable populations in the eastern half of the breeding range (Brown 1993), but those in the central and western portion of the range would likely benefit from conservation of breeding habitat.

INFORMATION GAPS

It is not known what constitutes a viable genetic pool among least Bell's vireos (*V. b. pusillus*), one of four subspecies of Bell's Vireo recognized by the American Ornithologist's Union (AOU 1957). Additional research is needed to understand what role genetic factors, such as inbreeding depression, may affect the conservation of isolated populations (Greaves 1989, Robinson et al. 1995). Furthermore, there is a need for identifying factors that maintain riparian habitat structure for nesting.

3.3.6 AMERICAN PEREGRINE FALCON (*Falco peregrinus anatum*)

STATUS

On August 25, 1999, the American peregrine falcon (*Falco peregrinus anatum*) was delisted throughout its entire range (64 FR 46542). Currently, the American peregrine falcon is listed as threatened by the New Mexico Wildlife Conservation Act (NMDGF 2003), as a species of special concern in Arizona (AGFD 2006), and as a sensitive species by the USFS Region 3 (Southwest Region: Arizona and New Mexico) (NMDGF 2003, AGFD 2006).

DESCRIPTION

F. p. anatum is a medium to large falcon. The total length of the male is 36 to 49 cm (14 to 19 in), and the female is 45 to 58 cm (17 to 23 in). Adults have bluish-gray upperparts (becoming more blackish on the head), a blackish facial stripe extending down from the eye, pale auriculars, whitish underparts with variable amounts of blackish spotting and barring, and under wing and under tail surfaces barred pale gray and black. Immatures are similar but the upperparts vary from pale to slate or chocolate brown and the underparts are buff colored with blackish streaks (vs. bars). The sexes are best distinguished by size, with the female being 15 to 20% larger and 40 to 50% heavier than the male; there normally is no size overlap between the sexes within a given subspecies. On average, females also are more heavily marked below (e.g., broader and fewer bars) than males.

Although most North American peregrines formerly nested on cliffs, some now nest on buildings where they have become established in urban areas over the past 2 decades (Frank 1994, Cade et al. 1996). Increasingly, they are also using other unconventional nest sites such as old common raven (*Corvus corax*) nests on electric pylons, osprey (*Pandion haliaetus*) and cormorant (*Phalacrocorax* spp.) nests on channel buoys, abandoned bald eagle (*Haliaeetus leucocephalus*) nests along the Pacific Coast, a dead tree snag in California, and specially erected towers in salt marshes. Peregrines most commonly occupy habitats containing cliffs generally near open landscapes for foraging (Enderson and Craig 1979, Ellis 1982, Willey 1986, Grebence and White 1989).

Optimum peregrine falcon habitat is steep, sheer cliffs overlooking woodlands, riparian areas or other habitats supporting abundant avian prey. The presence of an open expanse is critical. In Arizona, this species can be found from around 121 m (400 ft) elevation in areas of Sonoran, Mohave, and Great Basin desert scrub to 2,743 m (9,000 ft) elevation in areas of Rocky Mountain and Madrean Montane Conifer Forest (AGFD 2002).

Peregrines feed almost exclusively on other birds, including waterfowl, gamebirds, shorebirds, doves, pigeons, and various passerines. Most prey is captured in the air, but prey may be captured from the water's surface or on the ground; peregrines also may walk on ground in search of nestling birds and rodents (Harris and Clement 1975; Dekker 1980, 1995, 1999; Rosenfield et al. 1995). Peregrines regularly hunt Mexican free-tailed bats (*Tadarida brasiliensis*) at dawn and dusk at mouths of roosting caves on the Edwards Plateau, Texas (Stager 1941, Skutch 1951, Lee and Kuo 2001).

LIFE HISTORY

Nest sites are often near open water, and the same nest site may be used for many years. Females typically lay three or four eggs. Both adults share in the incubation duties, although females do the majority of the incubation. Chicks hatch after approximately 30 days, and young fledge from the nest 35 to 42 days after hatching (Ehrlich et al. 1988). Because of wide geographic distribution, there is a large range in the onset of egg laying, with laying being latest in Arctic and earliest at southern latitudes; laying may vary at the same latitude depending on conditions (i.e., maritime vs. inland) (BNOA 2006).

DISTRIBUTION AND ABUNDANCE

F. peregrinus is virtually cosmopolitan and is found on every continent except Antarctica. The subspecies *F. p. anatum* nests from central Alaska, central Yukon Territory, and northern Alberta and Saskatchewan, east to the Maritimes and south (excluding coastal areas north of the Columbia River in Washington and British Columbia) throughout western Canada and the United States to Baja California, Sonora, and the highlands of Central Mexico (48 FR 8796). The wintering range of *F. p. anatum* includes North America to Central and South America, as far south as Chile (Brown and Amadon 1968).

In New Mexico, American peregrine falcons are rare to uncommon summer or year-round residents in montane areas (Hubbard 1978). This species is known to breed in the Gila National Forest (Zimmerman 1995). In Arizona, peregrine falcons breed where cliff habitat and sufficient prey are available. This includes the Mogollon Rim, the Grand Canyon, and the Colorado Plateau (AGFD 2002).

INFLUENCES OF HYDROLOGY

Riparian areas are important peregrine foraging habitats, especially in nesting areas. A reduction of prey species that depend on riparian or aquatic habitats will negatively impact the peregrine.

INFORMATION GAPS

There is a need for identifying factors that maintain riparian and riverine environments for foraging and surface water.

3.3.7 COMMON BLACK-HAWK (*Buteogallus anthracinus anthracinus*)

STATUS

The common black-hawk is listed federally as a species of concern in New Mexico according to USFWS Region 2 (USFWS 2006), as threatened under the New Mexico Wildlife Conservation Act, as a species of

special concern in Arizona (AGFD 2006), and as a sensitive species by the USFS Region 3 (Southwest Region: Arizona and New Mexico) (AGFD 2006, NMDGF 2003).

DESCRIPTION

Adult common black-hawks average 43 to 53 cm (17 to 21 in) long and weigh approximately 930 g. Black-hawks have very broad wings, and a short black tail with a single broad white band and a white tip. The bill is black and the legs and cere are yellow. Sexes are similar, but immature birds are dark brown above with spotting and streaks, and the tail has a number of black and white bars (NatureServe 2006).

In the Southwest, common black-hawks are found in cottonwood (*Populus* spp.) and other woodlands along permanent lowland streams (Hubbard and Eley 1985). In New Mexico, they choose mature, well-developed riparian forest stands located near permanent streams where their principal prey species are available (NMDGF 1996). In other areas they utilize lowland forests, swamps and mangroves, in both moist and arid habitats near water (along rivers and streams), foraging often on tidal flats or in open woodland (Tropical and lower Subtropical zones) (AOU 1983).

The hawk feeds primarily on frogs, fish, crabs, and reptiles and also eats small mammals and insects. It hunts primarily from a perch often near the ground close to the stream or impoundment, also walks on sandbars and mud flats in search of crabs and stranded fish (Palmer 1988, Terres 1980).

LIFE HISTORY

The common black-hawk breeding season is from late February to late May. The nests of this species are usually built within 120 m (480 ft) of permanent flowing water and are typically constructed 15 to 30 m (60 to 120 ft) above the ground. Occasionally nests have been found in rocky recesses. The clutch size is relatively small in this species, ranging from 1 to 3. Incubation lasts for 38 to 39 days. The fledging period is between 43 to 50 days, and post-fledging dependence of the juvenile on the adult lasts for 6 to 8 weeks (ADW 2006).

DISTRIBUTION AND ABUNDANCE

Historic

Range wide trends for this species are largely unknown. The breeding population along the Rio Grande River in south Texas declined in early 1900s, probably because of habitat alteration (timber cutting), and that in adjacent Mexico (Tamaulipas) declined after 1958, possibly from DDT runoff (Oberholser 1974). Extensive riparian alteration and loss has probably resulted in a reduction of breeding black-hawks along other major southwestern water courses, e.g., the lower Colorado River in the late 1800s to the present along other Arizona watercourses (Carothers 1977, Ohmart et al. 1977).

There are, however, reports of range extensions in New Mexico (Hundertmark 1974, Hubbard 1978, Williams 1993) and Utah (Wauer and Russell 1967) and vagrants in Colorado, Nevada, Arizona, Texas, and California.

Present

During the breeding season, this hawk is a resident from central (rarely northwestern) Arizona, southwestern Utah (rarely), southern (rarely central) New Mexico, and western and (formerly) southern Texas, south through Mexico and Central America to northern Colombia, and east through coastal Venezuela and Trinidad to Guyana, French Guiana, and in the Lesser Antilles on St. Vincent. The Cuban race (sometimes considered a separate species) is resident on Cuba and the Isle of Pines.

The northernmost breeding populations in the southwestern U.S. migrate southward after the breeding season (AOU 1998). Common black-hawks arrive in the southern U.S. as early as March-April; most are probably gone from the U.S. by mid-October (Palmer 1988, Schnell et al. 1988).

Common black-hawks are casual or accidental in southern Nevada, north-central Texas, southern and western Texas away from breeding areas, and the Lesser Antilles; there are sight records from southern California and northern Baja California. Reports from Minnesota and southern Florida are probably based on escaped individuals, and may pertain in part to *B. urubitinga* (AOU 1998).

South of the United States, this species is locally common, and even north of the border it occurs in moderate numbers in some areas (Hubbard and Eley 1985). The common black-hawk reaches its northern limits in the southwest United States. In New Mexico, this species is an uncommon summer resident largely restricted to well-developed riparian habitats in the San Francisco, Gila, and Mimbres drainages (NMDGF 1994). Based on surveys conducted in 1994–95, the common black-hawk population in the San Francisco, Gila, and Mimbres drainages is estimated to be 60 to 80 pairs (NMDGF 1996). In Arizona, breeding individuals may arrive as early as March to drainages of the Mogollon Rim, the Big Sandy and Virgin rivers and the Upper portions of the Gila Drainage (AGFD 2005).

INFLUENCES OF HYDROLOGY

This hawk is threatened in the United States by the alteration or elimination of riparian habitat through clearing, water diversion, diking and damming, and lowering of the water table by underground pumping (Schnell et al. 1988, Schnell 1994). At least 95% of the riparian habitat in the southwestern United States has been lost, altered, or degraded (Ohmart 1994). Loss of southwestern riparian habitat, particularly cottonwood bosque, is the principal threat to the common black-hawk (NMDGF 1994). Protection and enhancement of frog and fish populations near nest sites and regeneration of gallery forest trees by periodic suppression or elimination of livestock grazing has been suggested (Palmer 1988, Schnell et al. 1988).

INFORMATION GAPS

There is a need for identifying factors that maintain trees for nesting and riverine environments for foraging and surface water.

3.3.8 MOUNTAIN PLOVER (*Charadrius montanus*)

STATUS

The mountain plover (*Charadrius montanus*) was proposed for listing by USFWS in 1999; however, in 2003, USFWS withdrew the proposed listing (68 FR 53083). The species is also listed as sensitive by the USFS Region 3 (Southwest Region: Arizona and New Mexico) (NMDGF 2003) and is informally listed as a sensitive species by the New Mexico Department of Game and Fish (NMDGF 2003). The mountain plover is not listed as a species of concern in Arizona (AGFD 2006).

DESCRIPTION

The mountain plover is a small bird approximately 18 cm (7 in) in length. Like many plover species, mountain plovers are cryptically colored (Sibley 2003). The upper body is brown, the undersides are white, and the legs are pale. Mountain plovers have a white forehead and a dark line between the beak and eye (AGFD 2001).

The mountain plover is a species of short-grass prairies and shrub-steppe landscapes. In both the breeding and wintering seasons, mountain plovers are found in xeric or disturbed uplands characterized by short vegetation, bare ground, and flat topography (Ehrlich et al. 1988). Nest sites are depressions scraped in the ground by the male and are often located near prominent objects such as woody plants, cow manure, rocks, fence posts, or power poles (Graul 1975).

Mountain plovers are insectivorous and both the male and female feed young.

LIFE HISTORY

Females lay one to four eggs, which incubate in 28 to 31 days. The chicks are precocial, and they fledge in approximately 35 to 45 days.

DISTRIBUTION AND ABUNDANCE

Historic

Historically, the breeding range of the mountain plover included Colorado, Wyoming, Montana, western South Dakota, North Dakota, Kansas, and Nebraska. Historic reports from New Mexico indicate that mountain plovers numbered from several individuals to 150 in a single flock. As recently as 1995, biologists found 152 breeding adults and 26 juveniles at 35 sites in 11 counties north of 34 degrees latitude.

Present

Mountain plovers are moderately widespread but patchily distributed (AGFD 2001). Nesting birds are reported in parts of the Rocky Mountain and Great Plains states from Canada south to Texas, and possibly in Mexico. Most breed in Colorado and Montana; however, breeding also occurs in Wyoming, New Mexico, Arizona, Nebraska, Utah, Kansas, Oklahoma, and Texas.

In New Mexico, this species is an uncommon to rare breeder mostly in open shortgrass prairie habitats on the eastern plains west to the central west portion of the state (BISON 2004). The most extensive breeding grounds are located in Lea, Union, Roosevelt, and Harding counties. Sightings of migrating mountain plovers have been made in Valencia, Colfax, Union, and Torraine counties in New Mexico. In Arizona, this species breeds irregularly at man-made and alkali ponds near Wilcox in Cochise County and Painted Rock Reservoir in Maricopa County (AGFD 2001). The species does not occur within Greenlee County, AZ (AGFD 2001). During the winter, it is found along the lower Colorado and Gila Rivers and as far north as Phoenix and Prescott.

INFLUENCES OF HYDROLOGY

Mountain plovers are rarely found near water (AGFD 2001). Therefore, changes in hydrology have little affect on this species, unless water is introduced into an arid landscape where this species is found.

INFORMATION GAPS

None were determined during this evaluation.

3.3.9 CACTUS FERRUGINOUS PYGMY-OWL (*Glaucidium brasilianum cactorum*)

STATUS

The USWFS listed the Arizona population of the cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*) as endangered in 1997 (62 FR 10730); however, the species was removed from the list in 2006. In Arizona, the cactus ferruginous pygmy-owl is listed as a species of special concern (AGFD 2006).

DESCRIPTION

The cactus ferruginous pygmy-owl is one of four currently recognized subspecies of the ferruginous pygmy-owl. It is a small owl weighing approximately two to three ounces and measuring approximately six to seven inches in length. Like many raptors, the females are slightly larger than the males. The plumage is the same for males and females, adults and juveniles. Overall, the cactus ferruginous pygmy-owl is reddish-brown with a cream-colored belly streaked with reddish-brown. The eyes are yellow, the crown is lightly streaked, ear tufts are absent, and there are paired black and white spots on the nape. The call is a monotonous series of short notes (Center for Biological Diversity 2000).

In Arizona, the cactus ferruginous pygmy-owl is reported to occur in association with riparian habitats (71 FR 19452). In addition, this species can be found in a variety of other vegetation communities such as mesquite bosques, Sonoran desertscrub, semidesert grassland, and Sonoran savanna grassland.

LIFE HISTORY

The cactus ferruginous pygmy-owl begins nesting activities in late winter to early spring. Nests are located in woodpecker or natural cavities in broadleaf riparian trees or saguaros. Nest cavities are usually 10 to 20 feet above ground and may be as high as 12 m (40 ft). It lays three to six eggs, which are incubated for approximately 28 days. The young are altricial and fledge approximately 28 days after hatching. The cactus ferruginous pygmy owl diet includes lizards, large insects, scorpions, small birds and mammals, and other small animals (Terres 1980).

DISTRIBUTION AND ABUNDANCE

Historic

The subspecies is geographically isolated into eastern and western populations. The western population extends from lowland central Arizona south through western Mexico, to the States of Colima and Michoacan, Mexico. The eastern population is distributed from southern Texas south through the States of Tamaulipas and Nuevo Leon, Mexico. Before 1950, this species was a fairly common to common resident in low elevation riparian mesquite woodlands ranging north to Phoenix, northwest to the confluence of the Salt and Gila Rivers, west to Cabeza Prieta Tanks, and east to the upper Gila River near Safford. Arizona makes up approximately 12 percent of the historical range for the cactus ferruginous pygmy owl.

Present

AGFD (2001) reported drastic declines in both the range and abundance of cactus ferruginous pygmy-owl. Current management needs include refining survey protocols, determining habitat needs, and managing land uses to maintain and enhance important occupied or potentially occupied habitats.

INFLUENCES OF HYDROLOGY

The cactus ferruginous pygmy-owl is associated with desert riparian systems. Any alterations in the hydrology of these systems may reduce habitat for this species.

INFORMATION GAPS

Further information is needed concerning habitat needs and for identifying factors that maintain riparian habitat structure for nesting, foraging, and surface water for the cactus ferruginous pygmy-owl.

3.3.10 COMMON GROUND-DOVE (*Columbina passerina pallescens*)

STATUS

The common ground-dove is listed as endangered under the New Mexico Wildlife Conservation Act (NMDGF 2003) and is considered a sensitive species by the USFS Region 3 (Southwest Region: Arizona and New Mexico) (NMDGF 2003).

DESCRIPTION

The common ground-dove is a small, chunky dove about 14 cm (5.5 in) in total length. The back and upperwings of the species are grayish-brown, with the breast and head being scaly in appearance. The wing coverts show black spotting and the inner webs of primaries and wing linings are cinnamon in coloration. The tail is mostly black in coloration with black edges and white corners. The bright chestnut coloration on the primaries and wing lining are flashed in flight. The male of the species shows a pinkish-buff colored head, neck and breast and a blue hindneck and nape. The belly of the male is pinkish and unscaled. Females of the species have a pale gray head, neck, nape, and breast and have an unscaled belly. Juveniles are similar to the females in appearance, but have a longer tail, lack the cinnamon primaries, and tend to be scaly in appearance (NatureServe 2006).

In New Mexico, the common ground-dove is found at elevations up to 1,524 m (5,000 ft) in shrubby riparian habitat often at the edges of riparian woodlands and in desert shrub dominated by mesquite or prickly pear (NMDGF 1994 as cited in NatureServe 2006).

The species feeds primarily on small seeds, but will also take berries and some insects. Birds are often seen feeding on the ground in small clearings with sparse herbaceous cover. This species must drink frequently and is often found in association with a water source (NatureServe 2006).

LIFE HISTORY

Typical nesting season for the species in Arizona and presumably New Mexico is mid-March to late October, probably peaking sometime in April (Bowman and Woolfenden 1997, Oberholser 1974 as cited in NatureServe 2006). Pairs nest solitarily or in small groups. The female typically lays 2 eggs, with two to four broods being raised in a year. The incubation period is 12 to 14 days. Nestling care is generally 12 days, with both parents incubating the eggs. The young are altricial, cared for by both parents, fledging at 11 days. It takes roughly a month to complete a successful nesting cycle (Bowman and Woolfenden 1997 as cited in NatureServe 2006).

DISTRIBUTION AND ABUNDANCE

Historic

The common ground-dove is a resident of the southern United States from North Carolina and Florida west to California (NatureServe 2006). In New Mexico, the species has declined from being a sparse resident near the border to only a few birds recorded in Hidalgo County (NMDGF 1994).

Present

At the Gila-Cliff birding area along the Gila River in New Mexico, 2 to 5 individuals were documented as breeding individuals in Christmas bird counts between 1997 and 2000 (National Audubon Society 2005). BISON (2004) notes that the species is a resident of the Gila National Forest. Given current distributional information for this species, the common ground-dove will likely be found within the project area.

INFLUENCES OF HYDROLOGY

NMDGF (1996) attributes declines in common ground-dove populations to loss of riparian habitat in western portions of the species' range. In New Mexico, loss of native shrublands, weedy area, and riparian areas that the species prefers apparently limits populations. Some of this is attributed to flood control projects, water diversion, urban development, and grazing. Loss and degradation of desert riparian habitats in New Mexico is often attributed to livestock operations and improper water management.

INFORMATION GAPS

There is a need for current distributional data for this species.

3.3.11 NEOTROPIC CORMORANT (*Phalacrocorax brasilianus*)

STATUS

The neotropic cormorant is listed as threatened under the New Mexico Wildlife Conservation Act (NMDGF 2003) and is listed as a sensitive species by the USFS Region 3 (Southwest Region: Arizona and New Mexico) (NMDGF 2003). The neotropic cormorant is not listed as a species of concern in Arizona (AGFD 2006).

DESCRIPTION

The neotropic cormorant, which is approximately 63.5 cm (25 in) in length and has a wingspan of 102 cm (40 in), is smaller than other common North American cormorants.

The neotropic cormorant nests on coastal islands, and around inland lakes, reservoirs, and ponds where it builds stick nests near or over water in dead snags or living trees (NMDGF 1988). Where vegetation is absent, neotropic cormorants will nest on rocks or bare ground.

The neotropic cormorant preys on fish, and also on amphibians and dragonfly nymphs.

LIFE HISTORY

The average clutch size is between two and four eggs, incubation lasts approximately 24 to 25 days, and fledging occurs within 12 weeks of hatching. Pairs are monogamous and both sexes tend the young.

DISTRIBUTION AND ABUNDANCE

Historic

The neotropic cormorant is widespread in Central and South America and reaches its northernmost breeding limits in New Mexico (NMDGF 2004). Here, it nests only in the middle Rio Grande Valley. Non-breeders wander north to Bernalillo, west to the Gila Valley and Hidalgo County, east to the Tularosa Basin and middle and lower Pecos Valley, and rarely to Colfax County. The neotropic cormorant is a rare but regular visitor to Arizona.

Present

In New Mexico, the neotropic cormorant occurs in varying but typically small numbers primarily in the Elephant Butte Lake and Caballo Lake areas. In 1994, numbers increased north to Bosque del Apache National Wildlife Refuge, and a few pairs were observed nesting there. However, there has been no documentation of neotropic cormorants nesting in New Mexico since 1998. Since 2000, the number of individuals reported in many key areas has been lower than historic records.

INFLUENCES OF HYDROLOGY

Neotropic cormorants are associated with streams, canals, lakes, and reservoirs; therefore, changes in hydrology will affect nesting and foraging habitat for this species.

INFORMATION GAPS

An evaluation of potential use by the species of proposed off channel storage lake is needed.

3.3.12 GILA WOODPECKER (*Melanerpes uropygialis*)

STATUS

The Gila woodpecker (*Melanerpes uropygialis*) is listed as threatened under the New Mexico Wildlife Conservation Act (NMDGF 2003), and is listed as a sensitive species by the USFS Region 3 (Southwest Region: Arizona and New Mexico) (NMDGF 2003). The species is not listed as a species of concern in Arizona (AGFD 2006).

DESCRIPTION

The Gila woodpecker is a medium-sized bird approximately 20 to 25 cm (8 to 10 in) in length. Both sexes have a black and white, zebra-patterned back; gray-brown head and underparts; and white wing patches in flight (Peterson 1990). The male sports a round red cap.

In New Mexico, the Gila woodpecker is found in lower elevation woodlands, especially those dominated by cottonwood trees, and along stream courses (Hubbard 1985). Other habitat characteristics associated with this species include well-developed broadleaf riparian woodlands characterized by mature cottonwoods and or sycamores (NMDGF 2004).

This species excavates nest holes in a living cactus or dead tree, although holes in living cacti can be used only after they have dried out (Winkler et al. 1995). Nests have been found in saguaro cacti, cottonwoods, willows, and mesquites, and pairs may occupy the same nesting hole for more than one season. In southern Arizona, Kerpez and Smith (1990a) report the greatest number of nests found in saguaro cacti in arroyos, where Gila woodpeckers forage. The diet of the Gila woodpecker consists of ants, beetles,

grasshoppers, fruits from saguaro cactus, and mistletoe berries (Bent 1939). In addition, this woodpecker has been reported to remove eggs from the nests of various songbirds.

LIFE HISTORY

The Gila woodpeckers breeding season is from April through August. This species will nest more than once during the breeding season if food is abundant (Baicich and Harrison 1997). The average clutch size is between three and five eggs (Short 1982), with fewer eggs in a second clutch (Bent 1939). Incubation is reported to take between 13 and 14 days, and young fledge at approximately 28 days.

DISTRIBUTION AND ABUNDANCE

Historic

Gila woodpeckers range through southeastern California, southern Nevada, Arizona, and New Mexico. The Gila woodpecker was not recorded in New Mexico until the beginning of the 20th century (Phillips 1968). The species attained its present range in southwestern New Mexico by the early 1900's and was considered common in the lower Gila Valley and southern Hidalgo County.

Present

In New Mexico, the Gila woodpecker is classified as a year-round resident in Grant and Hidalgo counties and a breeding species in Hidalgo County. At present, the bird is regarded as uncommon to fairly common; however, it is considered rare at its northernmost limit (NMDGF 1988). Surveys conducted in 2001 suggest that numbers are improving in the Gila Valley. In addition, sightings from the Animas Mountains between 1996 and 2002 are the first records for this species east of the Continental Divide (NMDGF 2004). National Audubon Society (2005) Christmas bird counts show that the species has been documented numerous in previous years on the upper Gila River within Arizona.

INFLUENCES OF HYDROLOGY

Gila woodpeckers are found in lower elevation woodlands, especially those dominated by cottonwood trees and along stream courses; therefore, changes to stream courses may impact nesting and foraging habitat used by this species.

INFORMATION GAPS

There is a need for identifying factors that maintain riparian and riverine environments for foraging, nesting, and surface water.

3.3.13 GRAY VIREO (*Vireo vicinior*)

STATUS

The gray vireo is listed as threatened under the New Mexico Wildlife Conservation Act (NMDGF 2003), and is listed as a sensitive species by the USFS Region 3 (Southwest Region: Arizona and New Mexico) (NMDGF 2003). The gray vireo is not listed as a species of concern in Arizona (AGFD 2006).

DESCRIPTION

The gray vireo (*Vireo vicinior*) is a plain, gray-backed bird with a narrow white eye-ring. It is distinguished from other vireos by having no wing bars or only one faint bar (Peterson 1990). The bird averages 14 cm (5.5 in) in length.

Gray vireos generally are found nest building and breeding in open woodlands and shrublands dominated by junipers (*Juniperus* spp). Although junipers are the dominant element in most areas of occurrence in New Mexico, oaks (*Quercus* spp) are also frequent habitat components in the southern part of the range (Hubbard 1985).

This vireo, like other members of the family, is an insectivore.

LIFE HISTORY

The species nests between April and June and will incubate more than one clutch in favorable conditions. The nest is semi-pensile and comprised of vegetal matter, including grass and bark strips. Generally, the clutch size is between 3 and 5; incubation takes approximately 13 to 14 days; and young fledge in 13 to 14 days (Ehrlich et al. 1988).

DISTRIBUTION AND ABUNDANCE

Historic

Gray vireos have been recorded breeding from the southwestern United States and Baja California to western Texas. This neotropical migrant is found in New Mexico from April to September where it inhabits evergreen shrubland-oak woodland and piñon-juniper woodland in the summer. In northwestern New Mexico, gray vireos are found at elevations from 1,768 to 2,195 m (5,800 to 7,200 ft) in flat or gently sloping valleys below or near ridge-tops or in gently sloping basins in piñon-juniper woodland (Reeves 1998). The gray vireo is known to summer very locally west of the eastern plains and at least formerly near Montoya, southward to the southern New Mexico border (Hubbard 1985).

Present

Recent surveys conducted in New Mexico found the species in new areas and in unexpected numbers. For example, in 1996 surveyors found 25 territories in the Manzano Mountains, 2 in the Sandia Mountains, and up to 6 in the San Andres Mountains (NMDGF 1996). In Arizona, this species is widely distributed throughout most of the southern part of the state (BISON 2004).

INFLUENCES OF HYDROLOGY

Gray vireos are not known to nest or forage in association with water sources; therefore, changes in hydrology are unlikely to directly affect this species.

INFORMATION GAPS

Due in part to its preference for inhospitable habitats, relatively little is known about population trends, susceptibility to cowbird parasitism, and other aspects of gray vireo biology (Audubon 2002).

3.3.14 ABERT'S TOWHEE (*Pipilo aberti*)

STATUS

The Abert's towhee is listed as threatened under the New Mexico Wildlife Conservation Act (NMDGF 2003), and is listed as a sensitive species by the USFS Region 3 (Southwest Region: Arizona and New Mexico) (NMDGF 2003). The species is not listed as a species of concern in Arizona (AGFD 2006).

DESCRIPTION

The Abert's towhee is a pale brown bird with buffy brown underparts and a black patch at the base of the bill (Peterson 1990). This medium sized bird is generally 20 to 23 cm (8 to 9 in) in length and has a long tail.

Abert's towhees inhabit dense, shrubby streamside vegetation, preferring brushy habitats in cottonwood-willow forests or mesquite bosques and adjacent shrublands (Hubbard 1978). This species is non-migratory, and is resident throughout its range. Nests are constructed in shrubs and are often placed close to the ground (Audubon 2002).

The diet of this species consists of various insects and other invertebrates, as well as seeds and other vegetal matter.

LIFE HISTORY

There are typically 2 to 4 eggs per clutch. Abert's towhees forage on the ground by scratching in leaves and brush (NatureServe 2006).

DISTRIBUTION AND ABUNDANCE

Historic

The range of Abert's towhees include southeastern California, extreme southeastern Nevada, southwestern Utah, central and southeastern Arizona, southwestern New Mexico, south to northeastern Baja California, and the northwestern mainland of Mexico (AOU 1983). The species is found where desert streams provide sufficient moisture to support a narrow band of deciduous trees and shrubs (USFS 2001).

Present

In Arizona, Abert's towhees are found primarily in the Colorado and Gila River Valleys (BISON 2004). Populations increased dramatically over five years along the San Pedro River in southeast Arizona following the removal of cows from the San Pedro Riparian National Conservation Area. In New Mexico, this species is known to occur only in the Gila Valley and at San Simon Cienega, Grant and Hidalgo counties, where it inhabits riparian thickets and similar habitats (NMDGF 1996). Abert's towhees also can be observed in urban environments (Audubon 2002).

INFLUENCES OF HYDROLOGY

Abert's towhees are associated strongly with water dependent, riparian habitats. Hydrological changes can affect this species' nesting and foraging habitat. Protection and restoration of native riparian habitats in the Gila Valley are the prime measures needed for conserving this species in New Mexico (NMDGF 1988).

INFORMATION GAPS

Research to determine relative population numbers in native versus human created habitats is warranted (NatureServe 2006). Furthermore, there is a need for identifying factors that maintain riparian and riverine environments for foraging, nesting, and surface water.

3.3.15 NORTHERN GOSHAWK (*Accipiter gentilis*)

STATUS

The northern goshawk is listed as a species of concern by the USFWS (NMDGF 2003) and the Arizona Game and Fish Department (AGFD 2006). The species is listed as sensitive by the USBLM New Mexico State Office, the USFS Region 3 (Southwest Region: Arizona and New Mexico), and the New Mexico Department of Game and Fish.

DESCRIPTION

The northern goshawk is most likely the largest accipiter in Arizona (AGFD 2003), and possibly the largest accipiter found near the project area. Females of the species weigh approximately 1080 grams (2.4 lbs), being slightly larger than males of the species at approximately 860 grams (1.9 lbs) in weight. Adults range from 45.7-65.0 cm (18.0-26.0 in) in length and 96.5-117.0 cm (38.0-46.0 in) in wingspan. The species has a relatively short wingspan and long tail, which aids in maneuverability. The species has a prominent light eyebrow which flares behind the eye and separates the black crown from the variably gray back. The underside of the bird is generally white with fine gray barring which may give the underside a light gray appearance from a distance. The tail is gray with black transverse bars and bears evident fluffy undertail coverts. The legs and feet of the species are yellow (AGFD 2003).

Preferred habitat of the species is highly variably and includes a variety of deciduous, coniferous, and mixed type forests. Nesting typically occurs in mature or old-growth forest, with a preference towards larger tracts of forest. In Arizona, the species most commonly nests within ponderosa pine forests. Seldomly, the species may breed in relatively lower elevations within oak forests. Throughout the west, the species characteristically nests in coniferous forests dominated by lodgepole or ponderosa pine, or in mixed forests dominated by Douglas fir, cedar, hemlock, or spruce. Rarely, nesting occurs in deciduous forests with aspen, birch, or willow. According to unpublished records in the Arizona HDMS, the species has been located at elevations of 1,448-2,780 m (4,750-9,120 ft). The wintering habitat requirements of the species are poorly understood (AGFD 2003).

The species forages during alternately during flight and during brief prey searches from perches. The species may take prey from the ground, from vegetation, or in the air. While foraging in flight, the species may hunt across openings or through dense forest. Mammalian prey of the species includes cottontails, tree squirrels, and rock squirrels. Within Arizona, avian prey of the species may include mourning doves, Stellar's jays, northern flickers, band-tailed pigeons, and Montezuma quail (AGFD 2003).

LIFE HISTORY

Individuals become sexually mature typically at two years of age, upon which lifelong pair bonds are formed. Pairs have very strong site fidelity and will typically return to the same tract of woods for nesting year after year. If nesting territories are logged or disturbed, pairs may attempt nesting for 1 to 5 years after disturbance even with low reproductive success (AGFD 2003).

In March, nest building begins, with breeding activity beginning around mid-April. Eggs are typically laid by late April. Typically 2 to 4 eggs are laid. Within a nest area, a breeding pair may maintain 1 to 8 nests. Home ranges during nesting periods vary from 94 to 3500 hectares, depending upon sex and habitat characteristics (AGFD 2003).

DISTRIBUTION AND ABUNDANCE

Historic

The total breeding range of the species ranges from timberline in Alaska and Canada, south to Mexico, and northwestern to Connecticut. The species also occurs elsewhere in the eastern hemisphere.

Present

According to Arizona HDMS unpublished records, the northern goshawk has been located within Greenlee County, among other counties within Arizona (AGFD 2003). The National Audubon Society (2005) notes that the species has been documented during Christmas counts on the Gila River near the Gila-Cliff birding area. Given current information on the distribution of the species, the northern goshawk may be found within the project area.

INFLUENCES OF HYDROLOGY

This species is not associated with riparian areas. Therefore, changes in hydrology will likely have little affect on the northern goshawk.

INFORMATION GAPS

There is a need for current distributional data for this species within the project area.

3.3.16 WESTERN BURROWING OWL (*Athene cunicularia hypugea*)

STATUS

The western burrowing owl (*Athene cunicularia hypugea*) is currently not listed by the USFWS or the states of Arizona and New Mexico. However, the species is listed as a sensitive species by the USBLM New Mexico State Office (NMDGF 2003). The burrowing owl is not listed as a species of special concern in Arizona (AGFD 2006).

DESCRIPTION

There are two North American subspecies of burrowing owl: *A. c. hypugea* of southern Canada, western USA, and Mexico; and *A. c. floridana* of Florida and some Caribbean islands. The western burrowing owl is a small bird between 23 to 28 cm (9 and 11 in) in length with relatively long, rounded wings and a short tail. It has long slender tarsi covered with short brown hair-like feathers that terminate in sparse bristles on the feet. The head is rounded, lacks ear tufts, and is chocolate in color. The eyes are lemon yellow and the beak is pale horn-colored.

Burrowing owls inhabit grasslands and open shrubland and woodland at lower elevations of 853 to 1,676 m (2,800 to 5,500 ft) and middle elevations of 1,524 to 2,286 m (5000 to 7500 ft) elevations (Hubbard 1978). Burrowing owls often are associated with prairie dog towns (Clark et al. 1982). They use burrows excavated by other mammals, including primarily prairie dogs in Colorado. Another species that provides nest burrows is the coyote (*Canis latrans*) (Bailey 1965, Bent 1938). The nest chamber is lined with cow chips, horse dung, food debris, dry grass, weeds, pellets, feathers, but it is occasionally unlined (Williams 1988). Home range size is approximately 2.0 acres (ranges 0.1 to 4.0 acres)(Smith et al. 1973).

Weather plays a major role in abundance and availability of small mammal prey, which in turn can limit reproductive success (Wellicome 1997).

LIFE HISTORY

Clutch size averages six to seven and brood size averages three to five. Burrowing owls generally breed at one year of age and there is generally one brood per year. Incubation, by the female, lasts 27 to 30 days. The male provides food during incubation and the early nestling stages. The young run and forage at four weeks, and achieve sustained flight at six weeks (Wellicome 1997).

DISTRIBUTION AND ABUNDANCE

Historic

The historic range of the western burrowing owl includes Arizona, California, Colorado, Idaho, Iowa, Kansas, Louisiana, Minnesota, Montana, North Dakota, Nebraska, New Mexico, Nevada, Oklahoma, Oregon, South Dakota, Texas, Washington, Wyoming, Canada, and Mexico (59 FR 58982).

Present

California, New Mexico, and Arizona are considered important wintering areas in the U.S. for this species (James and Ethier 1989). In New Mexico, western burrowing owls are considered rare to common, and are known to breed in the Gila National Forest (Zimmerman 1995). In Arizona, this species is widely distributed throughout the southern and southeastern portions of the state (AGFD 2001). This species is a year-round resident in the southern part of its range, while individuals that breed farther north usually migrate south to Mexico and the southern U.S. for winter. Range wide population estimates are not available; however, habitat loss due to habitat changes and loss of prairie dog towns has been considerable.

INFLUENCES OF HYDROLOGY

Burrowing owls are associated with open landscapes and disturbed sites. Water is not a significant component of their habitat needs. Therefore, changes to hydrology are likely to have little affect on western burrowing owls.

INFORMATION GAPS

None were determined during this evaluation.

3.4 AFFECTED MAMMALIAN FAUNA

3.4.1 MEXICAN GRAY WOLF (*Canis lupus baileyi*)

STATUS

The Mexican gray wolf is federally listed as endangered by the USFWS (43 FR 9607) without critical habitat. The species is further listed as endangered (effective in 1975) by the State of New Mexico under the New Mexico Wildlife Conservation Act (NMDGF 2003), as a species of special concern in Arizona (AGFD 2006), and as a sensitive species by the USFS Region 3 (Southwest Region: Arizona and New Mexico) and the USBLM New Mexico State Office (NMDGF 2003). The USFWS recovery goal for Mexican gray wolves is to re-establish at least 100 wolves in 5,000 mi² of the subspecies historic range (USFWS 1982). In March 1997, the Secretary of the Interior authorized the reintroduction of Mexican wolves to the Southwest. This decision included selection of the preferred alternative as described in the Final Environmental Impact Statement (USFWS 1996). Beginning in March 1998, captive-reared

Mexican wolves were released into the Blue Range Wolf Recovery Area in the Apache National Forest in eastern Arizona as a nonessential experimental population. The Final Rule for the experimental population of Mexican wolves allowed for the translocation of wolves within the recovery zone, and for wolves from these releases to naturally disperse onto public lands in Arizona and adjacent New Mexico on the Gila National Forest.

DESCRIPTION

The Mexican gray wolf is the smallest of the North American gray wolves. Adults typically weigh 22.7 to 40.8 kg (50 to 90 lbs), average 137 to 168 cm (54 to 66 in) in total length, and reach 66 to 81 cm (26 to 32 in) in height at the shoulder. The coat is a mix of brown, rust, black, gray and white (USFWS 2004).

Most Mexican gray wolves are found in pine-oak woodlands, piñon-juniper woodlands, and grasslands interspersed between these areas, generally above 1,372 m elevation (4,500 ft.) (Brown 1983). The combination of prey availability, cover, and water found in montane woodlands appear to have been preferred by Mexican wolves.

Mexican gray wolves feed primarily on large mammals including elk, deer, javelina, occasionally pronghorn, and bighorn sheep. They also may take, to a lesser degree, rabbits, hares, wild turkeys, and small rodents (Groebner 1995). They have been known to occasionally take cattle.

LIFE HISTORY

The life history of the Mexican wolf is based largely on anecdotal observations of northern wolf populations. Mexican wolves were virtually eliminated before in-depth studies of their biology could be undertaken. Family groups (packs) form the basic social unit that typically consists of a breeding pair and yearling offspring (Mech 1970). The alpha pair is believed to be monogamous and these wolves are normally the only breeding animals in the pack. Although highly variable, a typical Mexican wolf pack might consist of approximately four to eight animals, with a territory encompassing up to several hundred square miles. Generally, they breed in February and give birth in April or early May to four to six pups after a 63-day gestation period. Like other wolves, Mexican gray wolves have a complex social structure and an intricate communication system that includes scent marking, body postures, and numerous vocalizations such as howling, barking, whining, and growling.

DISTRIBUTION AND ABUNDANCE

Historic

The Mexican wolf's historic range extended from Arizona, New Mexico, Texas, south into Mexico. Historic reports refer to the Mexican wolf as primarily associated with forested mountainous terrain within its range (Bednarz 1988). Nowak (1995) suggested that the original core geographic range of the Mexican wolf extended just north of the Gila River.

Present

Currently, there are approximately 50 to 60 free-ranging Mexican wolves within the Blue Range Wolf Recovery Area, which includes all of the Apache and Gila National Forest in east-central Arizona and west-central New Mexico. This includes three small groups in New Mexico. Mexican gray wolves have been present continuously in New Mexico since about 2000, when wolves dispersed to New Mexico naturally after being released in Arizona, and other wolves were translocated to remote sites in the Gila Wilderness (USFWS 2004).

Given current information on the distribution of the Mexican gray wolf, the species could occur within the project area.

INFLUENCES OF HYDROLOGY

Wolves prefer habitats containing water and corresponding riparian areas.

INFORMATION GAPS

None were determined during this evaluation.

3.4.2 ARIZONA MONTANE VOLE (*Microtus montanus arizonensis*)

STATUS

The Arizona montane vole is not listed by the USFWS, however, the species was listed as endangered in 1979 by the State of New Mexico under the New Mexico Wildlife Conservation Act (Jones and Schmitt 1997, NMDGF 2003), and is listed as a sensitive species by the USFS Region 3 (Southwest Region: Arizona and New Mexico) (NMDGF 2003). The Arizona montane vole is not listed as a species of special concern in Arizona (AGFD 2006).

DESCRIPTION

The species is a medium-sized vole with four pairs of mammae. The tail is approximately 24 to 64 mm (1-2.5 in) in length, which is less than 1/3 of the head and body length. Total length is 140 to 220 mm (5.5-8.6 in) and total weight is 18 to 90 g (1-5.5 oz) in adults. The color is grizzled brown to blackish above, often with a buff tint. The black hairs of the venter are tipped with white. Coloration below is white to gray overall. Most adult males have oily skin glands on their hips (AGFD 2004).

Arizona montane vole habitat in New Mexico consists of mesic sedge and grass meadows bordering small creeks and marshes at elevations around 6,800 feet. Voles construct networks of tunnels through the thick and often matted cover in which they live. Sleeping areas are lined with vegetation--especially grasses and sedges (NMDGF 1988).

Voles, unlike most rodents, are active both day and night. During times of abundance, voles become more readily discernable—both as they rustle through the vegetation and by virtue of their squeaky vocalizations. Individuals of the montane vole are not known to hibernate in New Mexico, but their activity is greatly diminished during winter months (NMDGF 1988).

LIFE HISTORY

Reproduction occurs throughout the year, with litters averaging four to six young. Their nests are placed in holes or under objects (NMDGF 1988).

DISTRIBUTION AND ABUNDANCE

Historic

The Montane vole (*Microtus montanus*) occurred from British Columbia south to east-central California, Arizona, and New Mexico (Hall 1981). The known distribution of the Arizona subspecies, *Microtus montanus arizonensis*, was restricted to the White Mountains of eastern Arizona (Hoffmeister 1986) and adjacent portions of the Gila National Forest in New Mexico (Hubbard et al. 1983).

Present

The Arizona montane vole is locally numerous in Arizona and is known to occur in the White Mountains and the Blue Range within Apache and Greenlee Counties at elevations near 2,285 m (7,500 ft)(AGFD 2004). However, the New Mexico population of this subspecies is limited to a very restricted area, in the vicinity of Jenkins Creek and Centerfire Bog (directly north of the San Francisco River) in Catron County, New Mexico, and therefore it is vulnerable to adverse habitat alteration (NMDGF 1988). Although current information suggests that the New Mexico populations are small and isolated, microtine populations are known to fluctuate dramatically in response to habitat changes (Findley et al. 1975). Given current distribution information on the Arizona montane vole, the species will likely not be found within the project area.

INFLUENCES OF HYDROLOGY

Alteration of watercourses and grazing can have negative effects on vole populations (AGFD 2004).

INFORMATION GAPS

Surveys need to be performed to determine the status of this subspecies as well as its life history (AGFD 2004). Additional distributional information is needed for this species.

3.4.3 SPOTTED BAT (*Euderma maculatum*)

STATUS

The spotted bat was listed as threatened in 1988 by the State of New Mexico under the New Mexico Wildlife Conservation Act in 1988 (Jones and Schmitt 1997, NMDGF 2003). The species is further listed as a species of special concern in Arizona (AGFD 2006), and is currently listed as a sensitive species by the USBLM New Mexico State Office and the USFS Region 3 (Southwest Region: Arizona and New Mexico) (NMDGF 2003).

DESCRIPTION

The spotted bat is a moderately large bat with extremely large ears and a conspicuous dorsal color pattern of three large white spots (one on each shoulder and one on the rump) on a black background. The species is also marked by a small white patch at the base of each ear and hairs on the underparts with white tips and blackish bases (Davis and Schmidly 1997).

The species frequents a wide variety of habitat types. In the summer, it is a resident of ponderosa pine forests, but in fall and winter it tends to wander to lower elevations. It is commonly found in riparian areas near perennial or ephemeral streams, and adjacent to cliffs or steep slopes with loose rocks. Roosts of the species often occur in horizontal rock crevices. It is believed that the spotted bat will roost in cliffs and rocky crevices and move to open areas to forage (BISON 2004).

Moths appear to be the principal food of the spotted bat, and the bat's low-frequency echolocation call has apparently evolved to minimize its being detected by moths (NMDGF 1988).

LIFE HISTORY

Pregnant females have been trapped in June and July. It is thought that spotted bats breed in late February to early April, and give birth to a litter of one offspring from late May to early July (NMDGF 1988).

DISTRIBUTION AND ABUNDANCE

Historic

Presumed to be similar to the present distribution.

Present

The spotted bat is widely distributed across western North America, occurring locally from central California and southern British Columbia, and southward through the Big Bend region of Texas to central Mexico (Hall 1981, Fenton et al. 1987). Nowhere within this range is the species considered to be abundant. In Arizona, this species is widely distributed throughout the state and aural records exist for the eastern portion of the state (AGFD 2003). In New Mexico, spotted bats have been found in 11 localities including Albuquerque (Bernalillo Co.), the Jemez Mountains (Sandoval Co.), the Mogollon Mountains (Catron Co.), the San Mateo Mountains (Socorro Co.), the Sacramento Mountains (Otero Co.), Mesilla Park (Doña Ana Co.), Lake Roberts (Grant Co.), Ghost Ranch (Rio Arriba Co.), and Aztec (San Juan Co.). All of these areas are located west of the Rio Grande River (BISON 2004).

Given current information on the distribution of the spotted bat, the species could occur within the project area.

INFLUENCES OF HYDROLOGY

Water is very important to insectivorous bats because of the high proportion of protein in their diets, and because of their high rates of evaporative water loss. Another extremely important factor in successful bat reproduction is the availability of suitable maternity roost sites. For bats in the southwestern U.S., accessible surface water, suitable roost sites, and food are necessary components of viable habitat (BISON 2004).

INFORMATION GAPS

More information is needed on life history, ecology, reproduction, habitat use, movement patterns, and distribution and abundance.

3.4.4 ALLEN'S BIG-EARED BAT (*Idionycteris phyllotis*)

STATUS

Allen's big-eared bat is federally listed as a species of concern by the USFWS (59 FR 58982) and as a sensitive species by the USBLM New Mexico State Office (NMDGF 2003). It is informally listed as a sensitive species by the New Mexico Department of Game and Fish (NMDGF 2003). This species is not listed as a species of special concern in Arizona (AGFD 2006).

DESCRIPTION

The species is tawny above with hairs dark brown at the base; underparts are slightly lighter. There is no fur on wings or membranes. The ears are large (approximately 40 mm in length) and there are two flaps (lappets) projecting forward from the base of each ear. The ears are often protected by folding and coiling them into hornlike projections, which lay along the sides of the neck. This species has no glandular enlargements on the muzzle and has a spur on each of the wings (AGFD 2001).

In Arizona, Allen's big-eared bats are most often found in ponderosa pine, piñon-juniper, Mexican woodland and riparian areas of sycamores, cottonwoods and willows. It has also been collected in other areas in white fir and in Mohave desertscrub. Of 54 specimens from New Mexico sampled by Findley et al. (1975), 41 were from ponderosa pine forest, 10 were from oak-piñon-juniper-pine transition, and three were from riparian cottonwood-sycamore forests. AGFD (2001) further notes that the species is also associated with boulder piles, cliffs, rocky outcrops, and lava flows, and is often netted along streams or over ponds where they may be seeking insects, water, or both. They have been found roosting in caves and abandoned mineshafts (AGFD 2001).

The fragile skull and jaw of the Allen's big-eared bat suggests that this species feeds primarily on soft-bodied insects. This is supported by diet studies, which have found that the main food items of this species are small moths (Microlepidoptera, 6-12 mm in size). There are also records of *I. phyllotis* feeding on soldier beetles (Cantharidae), dung beetles (Scarabeidae), leaf beetles (Chrysomelidae), roaches (Blattidae), and flying ants (Formicidae). Food is gleaned from surfaces or pursued and taken in flight (AGFD 2001, WBWG 2005).

LIFE HISTORY

Reproduction in this species is very poorly known. Females form maternity colonies in the early summer, while males roost alone during this time. The young are born in mid to late June in Arizona, and begin to fledge by late July (AGFD 2001).

DISTRIBUTION AND ABUNDANCE

Historic

The historic distribution of Allen's big-eared bat is relatively unknown, but is presumed to be similar to the present distribution.

Present

Allen's big-eared bat is one of the rarest bats in North America, occurring from central Mexico north through the southwestern United States, including Arizona, New Mexico, southern Nevada, and southern Utah (WBWG 2005). The Forest Service (1995) notes that the Allen's big-eared bat is a fairly common resident of the Gila National Forest. In Arizona, specimen locations range across the entire state (AGFD 2001). Given current information on the distribution of the Allen's big-eared bat, the species could occur in the project area.

INFLUENCES OF HYDROLOGY

None determined at this time.

INFORMATION GAPS

Relatively little is known of maternity roost requirements or the range of roost types used, especially during the winter. Foraging behavior and seasonal requirements in different habitats need further research. Reproductive biology and population dynamics are poorly understood. It will be necessary to gather these data to properly evaluate potential threats and provide adequate management protocols. The current lack of knowledge of Allen's big-eared bat suggests the need for focused surveys throughout its geographic range (WBWG 2005).

Additional distributional information is needed for this species.

3.4.5 WESTERN RED BAT (*Lasiurus blossevillii*)

STATUS

The western red bat is listed as a species of special concern in Arizona (AGFD 2006), as a species of concern by the USFWS (NMDGF 2003), and as a sensitive species by the New Mexico Department of Game and Fish and the USFS Region 3 (Southwest Region: Arizona and New Mexico) (NMDGF 2003).

DESCRIPTION

Western red bat is a medium-sized bat similar in appearance to the eastern red bat (*Lasiurus borealis*). Pelage coloration is rusty red to brownish, but the white-tipped hairs that give the frosted appearance so characteristic of the eastern variety are absent (Davis and Schmidly 1997). The species weighs 10 to 15 grams and has a wingspan ranging from 28 to 32 cm (Harvey et al. 1999).

Western red bats appear to prefer riparian areas. In New Mexico and Arizona, this bat is occasionally captured in riparian habitats dominated by cottonwoods, oaks, sycamores, and walnuts; it is rarely found in desert habitats (Davis and Schmidly 1997). Western red bats are typically solitary, roosting primarily in the foliage of trees or shrubs. Day roosts are commonly in edge habitats adjacent to streams or open fields, in orchards, and sometimes in urban areas. Roost sites may be associated mostly with intact riparian habitat, particularly areas with willows, cottonwoods, and sycamores. Such sites are generally hidden from view except from below, where they are unobstructed, allowing bats to drop downward to attain flight. They also are characterized by an absence of lower perches that would allow visibility by predators; presence of dark ground cover to minimize solar reflection; presence of nearby vegetation to reduce wind and dust; and are generally located on the south or southwest side of a tree. This species may also occasionally use caves, as both dead and live red bats, including a pregnant female, have been collected from Carlsbad Caverns in New Mexico (Bolster 1998).

LIFE HISTORY

No information was found on the life history of the western red bat.

DISTRIBUTION AND ABUNDANCE

Historic

The historical distribution of the western red bat is presumed to be similar to the present distribution.

Present

The western red bat has a broad distribution reaching from southern British Columbia in Canada, through much of the western United States, through Mexico and Central America, to Argentina and Chile in South America (Davis and Schmidly 1997). In Arizona, records of this species are scattered throughout most of the state, especially in riparian woodlands (AGFD 2003). Given current information on the distribution of the western red bat, the species could occur within the project area.

INFLUENCES OF HYDROLOGY

Loss of riparian zones, primarily due to agricultural conversion and creation of water storage reservoirs, has reduced both roosting and foraging habitat of red bats (Bolster 1998).

INFORMATION GAPS

Bolster (1998) notes that habitat requirements, altitudinal distribution, migration patterns, effects of controlled burns, and effects of pesticide use in orchards need to be further investigated to accurately determine the status of and conserve the red bat in the western United States.

Additional distributional information is needed for this species.

3.4.6 TOWNSEND'S BIG-EARED BAT (*Corynorhinus townsendii*)

STATUS

Townsend's big-eared bat is listed as a species of concern by the USFWS (NMDGF 2003) and as a sensitive species by the state of Arizona Game and Fish Department (AGFD 2003), the New Mexico Department of Game and Fish (NMDGF 2003), USFS Region 3 (Southwest Region: Arizona and New Mexico) (NMDGF 2003), and the USBLM New Mexico State Office (NMDGF 2003).

DESCRIPTION

This is a medium-sized bat with a wingspan of 30 to 34 cm, a forearm length of 3.9 to 4.7 cm, and a weight of 8 to 14 g. The dorsal hairs are slate or gray with pale cinnamon brown to blackish brown tips that contrast little with the base. The ventral hairs are slate, gray or brownish with brownish or buff tips. The ears are large, at 30.0 to 39.0 mm in length, hairless, and are joined across the forehead. They have a large glandular lump on either side of the nose. The toe hairs do not project beyond the toenails (AGFD 2003).

The distribution of this bat is correlated largely with rocky areas where caves or abandoned mine tunnels are available. They do not seem to utilize crevices in such sites, and may occasionally inhabit old buildings. It is reported at elevations ranging from sea level to 3,300 meters. Habitat associations of the species include coniferous forests, mixed meso-phytic forests, deserts, native prairies, riparian communities, active agricultural areas, and coastal habitat types (AGFD 2003).

Townsend's big-eared bat hibernates throughout its range during winter months, when temperatures are between 0°C and 11.5°C, in cold caves, lava tubes and mines mostly in uplands and mountains. Bats hibernate in tight clusters, which may help stabilize body temperature against external changes in temperature. While torpid, the large ears are "rolled up" and laid back against the neck. Males may select warmer hibernacula than females and are more easily aroused into activity in winter than females. Winter sleep is interrupted by frequent periods of wakefulness during which they move about in the cave or from one cave to another. Townsend's big-eared bats put on fat before hibernation, which allows them to maintain a lowered metabolism during the winter months when they do not eat. Males and females occupy separate roosting sites during summer. During this season, males appear to lead a solitary lifestyle while females and young form maternity colonies that may number from 12 to 200, although in the eastern United States colonies of 1,000 or more are known. The largest colony disappeared in the 1970s shortly after the roost site was gated to protect archeological and paleontological remains. After the gate was modified in the mid 1980s, several bat species (but not *C. townsendii*) were observed flying inside the site (AGFD 2003, Davis and Schmidly 1997).

Townsend's big-eared bats emerge late in the evening to forage and are swift, highly maneuverable fliers. Prey items include small moths, flies, lacewings, dung beetles, and sawflies. Following a late night peak of activity they usually go to a night roost. They may forage again in the early morning since they are reported not to return to their daytime roosts until shortly before sunrise. They may forage several miles (4-5 miles) from the roost site (AGFD 2003).

LIFE HISTORY

Dates of birth for this species range from late April to mid July and vary considerably throughout the range. Young are weaned at about 6 to 8 weeks. Nursery colonies begin to disperse during August. Following mating in fall and winter (which sometimes takes place while the female is torpid), the sperm is stored in the female's reproductive tract until spring. Fertilization occurs when ovulation takes place. Gestation varies from 56 to 100 days after fertilization depending on climatic conditions and the metabolic rate of the female (i.e. development is slowed when the female goes into daily torpor). Band recoveries in California suggest a maximum longevity of 16+ years (AGFD 2003).

DISTRIBUTION AND ABUNDANCE

Historic

Presumed to be similar to the present distribution.

Present

The Townsend's big-eared bat occurs throughout the west and is distributed from the southern portion of British Columbia south along the Pacific coast to central Mexico and east into the Great Plains, with isolated populations occurring in the central and eastern United States (WBWG 2005). Given current information on the distribution of the Townsend's big-eared bat, the species could occur within the project area.

INFLUENCES OF HYDROLOGY

In general, the long-term persistence of North American bat species is threatened by the loss of clean, open water; modification or destruction of roosting and foraging habitat; and, for hibernating species, disturbance or destruction of hibernacula.

INFORMATION GAPS

The daily and seasonal degree of movement of these bats and colonies of these bats is not understood and the belief that these bats are sedentary, have high roost fidelity, and small home ranges may not be accurate. The identification of critical roosts and limiting factors in roost requirements is incomplete, especially for hibernacula. Identification and protection of significant roost sites is still needed in most areas. Significant populations need to be monitored over time. More information is needed on foraging requirements, seasonal movement patterns, and population genetics (i.e., the degree of relatedness within and between different maternity roosts) (WBWG 2005).

Additional distributional information is needed for this species.

3.4.7 YELLOW-NOSED COTTON RAT (*Sigmodon ochrognathus*)

STATUS

The yellow-nosed cotton rat is listed as a species of concern by the USFWS (NMDGF 2003, 59 FR 58982) and as a sensitive species by the USBLM New Mexico State Office (NMDGF 2003). This species is not listed as a species of special concern in Arizona (AGFD 2006).

DESCRIPTION

This species is small, with a total length of 132 to 264 mm, a tail length of 30 to 114 mm, and a weight of approximately 51 to 106 grams. The fur of the yellow-nosed cotton rat is coarse and grayish-brown to blackish-brown in coloration with a heavily mixed pale buff. The fur of the belly is typically silvery or whitish and the nose and eye rings are typically orangish or yellowish. The bicolored tail is finely haired, being blackish above and pale below, and shorter than the combined length of the head and body. The ears are relatively short, barely projecting above the fur. The feet are gray, and the hind foot length is generally 30 mm or less (AGFD 2003).

The habitat of the yellow-nosed cotton rat consists of grassy, dry, rocky slopes in or near the oak woodland belt, and montane meadows with adjacent to ponderosa pine and Douglas fir forests. Habitat conditions preferred by this species are typically more xeric (dry) than those of other species within the genus. Grasses within their preferred habitats are often sparse and scattered in clumps amidst patches of beargrass, agave, and yuccas. They inhabit slopes often up to 40 degrees (AGFD 2003).

The diet of the species primarily consists of grasses, especially *Bouteloua gracilis*. However, prickly pear fruit is reported to be a primary food item at some locations. Succulent plants probably provide moisture needed by the species, since they apparently do not require free water (AGFD 2003).

LIFE HISTORY

Reproduction may occur throughout most of the year, except possibly during the hottest and driest periods. Females as young as 45 days of age may breed. The gestation period is approximately 34 days, with a litter size of 2 to 6. The young, which are blind and helpless at birth, are very precocial and within a few hours of birth behave like young adults. Weaning occurs by 15 days, and young may begin eating vegetation at eight days.

DISTRIBUTION AND ABUNDANCE

Historic

The yellow-nosed cotton rat is endemic to southeastern Arizona, southwestern New Mexico, southwestern Texas, and south into central Durango, Mexico (AGFD 2003, 59 FR 58982). In Arizona, this species is known to occur in Cochise, Graham, Santa Cruz and Pima Counties (AGFD 2003).

Present

This species only occurs in southern Hidalgo County in the Animas Mountains and Guadalupe Canyon (BISON 2004). However, Montgomery et al. (1985) trapped a specimen thought to be a yellow-nosed cotton rat within Rough Canyon in the Middle Box area. The yellow-nosed cotton rat has expanded its range northward in the past 100 years (AGFD 2003). This expansion has sometimes occurred across gaps with habitat that seems unsuitable for the species.

Given current information on the distribution of the yellow-nosed cotton rat, it is uncertain whether this species occurs within the project area. If the specimen captured by Montgomery et al. (1985) was indeed a yellow-nosed cotton rat, then further surveys need to be conducted to better determine the current distribution of the species.

INFLUENCES OF HYDROLOGY

Because the yellow-nosed cotton rat is generally known from xeric habitats, the effects of changes in hydrology are uncertain.

INFORMATION GAPS

Studies of the distribution, habitat requirements, population sizes, and effects of habitat modification are needed for the yellow-nosed cotton rat (AGFD 2003).

3.5 AFFECTED REPTILE AND AMPHIBIAN FAUNA

3.5.1 CHIRICAHUA LEOPARD FROG (*Rana chiricahuensis*)

STATUS

The Chiricahua leopard frog is currently listed as threatened, without critical habitat, by the USFWS and as a sensitive species by the USFS Region 3 (Southwest Region: Arizona and New Mexico) (61 FR 7595, NMDGF 2003). It is considered a species of special concern in New Mexico and was assigned a State Rank of S2 (Imperiled) in 1991 and G3 (Vulnerable) in 2001 by the New Mexico Natural Heritage Program (NMDGF 2004, BISON 2004, NMNHP 2006). The Chiricahua leopard frog has been assigned a federal recovery priority of 2C, which indicates a high degree of threat, a high potential for recovery, and taxonomic distinction as a species. A special rule exempts operation and maintenance of livestock tanks on non-federal lands from the Section 9 “take” prohibitions of the ESA. The species is also considered a species of special concern in the state of Arizona (AGFD 2006).

DESCRIPTION

The Chiricahua leopard frog, which measures up to 4.3 inches in length from snout to urostyle, is distinguished from other members of the *Rana pipiens* complex by a combination of characters, including a distinctive pattern on the rear of the thighs consisting of small, raised, cream-colored spots or tubercles on a dark background; dorsolateral folds that are interrupted and deflected medially; stocky body proportions; and relatively rough skin on the back and sides. This species also has a distinctive call consisting of a relatively long snore of one to two seconds in duration (Stebbins 2003).

LIFE HISTORY

This frog requires permanent water for reproduction, and uses a variety of habitats including springs, streams, man-made and natural ponds, and lakes. Those found above 1,800 m breed during June to August and those found above 1,800 m breed from spring to late summer (but mostly prior to June). Egg masses are usually suspended within 5 cm of the surface on vegetation growing in water 15-35 cm deep near the shore of ponds and streams. In the Chiricahua Mountains of southeastern Arizona, near the type locality, eggs of *R. chiricahuensis* have been found from early February through early September (Degenhardt et al. 1996). Time of metamorphosis varies depending on temperature. The time from hatching to metamorphosis is 2-3 months at Alamosa Warm Springs while it may be 8-9 months at sites that experience marked drops in temperature over the winter (BISON 2004). Tadpoles are dark colored and reproductive maturity usually requires 2-3 years. In New Mexico, populations occurring in thermally stable habitats may be reproductively active throughout the year, with tadpoles growing continuously during the winter months. The time required to pass through the larval stage may be much more rapid at sites with relatively warm temperatures than at sites where water temperature is strongly affected by ambient air temperature. Life span is up to 14 years in the wild (Stebbins 2003, USFWS 2005).

DISTRIBUTION AND ABUNDANCE

Historic

Historic records of this species exist for Pima, Santa Cruz, Cochise, Graham, Apache, Greenlee, Gila, Coconino, Navajo, and Yavapai Counties, Arizona; and Catron, Grant, Hidalgo, Luna, Socorro, and Sierra Counties, New Mexico (Degenhardt et al. 1996).

Present

The species occurs at elevations of 1,000 – 2,710 m (3,281 to 8,890 ft) in central and southeastern Arizona, west-central and southwestern New Mexico, and in the Sierra Madre Occidental of northeastern Sonora and western Chihuahua, Mexico. The range of the species is disjunct, with northern populations found along the Mogollon Rim in Arizona east into the mountains of west-central New Mexico, and southern populations occurring in southeastern Arizona, southwestern New Mexico, and Mexico. Genetic analysis suggests that the northern populations may represent an undescribed, distinct species (USFWS 2005).

In New Mexico, there is currently at least one extant population of *Rana chiricahuensis* in each of the major drainages within its range. Within the San Francisco drainage, populations persist in the Upper Tularosa River from near its downstream to its confluence with Apache Creek. Private lands along Apache Creek preclude efforts to determine whether populations persist there. Small populations in the Upper San Francisco River near the Box and in Cave Creek (northwest of Reserve) may have gone extinct since their presence was documented in 2001 and 2002. Only a single individual was observed during surveys in 2002 along Negrito Creek, where this species was once common. A presumed metapopulation in the Deep Creek Divide area, which once consisted of nine local populations inhabiting earthen stock tanks, has been reduced to four populations as recently as the summer of 2002. These four remaining populations (all of which formerly consisted of >500 individuals) began experiencing severe die-offs in September 2002 and have been reduced to populations of a few tadpoles and post-metamorphic individuals. *Chytridiomycosis* has been documented in the Deep Creek Divide area and appears responsible for the die-offs. Small populations likely persist in Deep Creek and Devil's Creek. Populations in Pueblo Creek and its tributary Chimney Rock Canyon have not been observed since the early 1990s. The status of small populations along Blue Creek and its tributaries in New Mexico, documented in the late 1990s and early 2000s, have not been recently assessed. Moderate numbers of frogs can be found near Beaver Spring along the main stem of the San Francisco River, but American bullfrogs, which prey on native leopard frogs, also inhabit these areas (USFWS 2005).

Chiricahua leopard frogs may persist in each of the forks of the Upper Gila River. Along the West Fork of the Gila River, small populations have been documented near the mouth of Turkeyfeather Canyon and upstream from the mouth of White Creek, but their status has not been evaluated since 2001. Egg masses and calls were reported in the Meadows along the Middle Fork of the Gila River, but these reports need corroboration. No frogs are currently known from the East Fork of the Gila River, but populations persist along Main Diamond Creek, Black Canyon near its confluence with the East fork, and in Black Canyon near its confluence with Aspen Creek. Along the lower main stem of the Gila River in New Mexico, frogs are known only from the upper reaches of Blue Creek (USFWS 2005).

INFLUENCES OF HYDROLOGY

Predation by non-native predators, including crayfish and non-native fishes, are likely the biggest threats to Chiricahua leopard frogs. However, poor water use practices likely result in continued habitat loss and degradation.

INFORMATION GAPS

Additional distributional information is needed for this species.

3.5.2 LOWLAND LEOPARD FROG (*Rana yavapaiensis*)

STATUS

The lowland leopard frog is currently listed as a species of special concern by USFWS, USBLM New Mexico State Office, Arizona Game and Fish and the USFS Region 3 (Southwest Region: Arizona and New Mexico)(NMDGF 2003). It is listed as endangered by NMDGF under the New Mexico Wildlife Conservation Act (NMDGF 2003, BISON 2004) and was assigned a State Rank of S1 (Critically Imperiled) in 1991 and G3 (Vulnerable) in 1998 by the New Mexico Natural Heritage Program (NMNHP 2006).

DESCRIPTION

The dorsal color of the lowland leopard frog is light gray-green, green, tan, or gray-brown, spotted with dark brown. The venter is cream and generally lacks gray pigment except in the region bordering the lower jaw. A yellow wash is often present on the groin and posterior venter. The supralabial stripe is incomplete and does not extend anterior to the eye (Stebbins 1985, 2003). The dorsal surface of the thigh and the area immediately surrounding the cloaca are tuberculate. It differs from other sympatric ranids in having the dorsolateral folds interrupted posteriorly and inset medially, the posterior surface of the thigh smooth and dark with narrower reticulations of lighter color, no spots on the snout, and a sharply triangular head when viewed dorsally. Males lack vestigial oviducts (Stebbins 2003). During the breeding season the males have enlarged thumb pads. Snout to vent length may reach 80 mm in this species.

The mating call of *R. yavapaiensis* can be distinguished from that of *R. chiricahuensis* by its lower dominant call frequency and pulse rate; it also differs from that of *R. pipiens* by its lower pulse rate. Although the mating call is similar to that of *R. blairi* in dominant call frequency and pulse rate, differences between the two species in length of notes and duration are easily detected by ear (NMDGF 2006).

LIFE HISTORY

The breeding chronology of this species is poorly known in New Mexico, although in Arizona egg masses and newly hatched tadpoles have been found in late February to late April and during October (NMDGF 2006).

DISTRIBUTION AND ABUNDANCE

In New Mexico, *R. yavapaiensis* is known to occur between 1,128 and 1,700 m elevation in western Catron, Hidalgo, and Grant counties. Lowland leopard frogs are aquatic and normally are found in small to medium-sized streams and occasionally in small ponds in desert scrub localities (NMDGF 2006). It reaches the extreme eastern edge of its range in southwest New Mexico (Degenhardt et al. 1996). Lowland leopard frogs often concentrate near deep pools in association with root masses of large riparian trees. In New Mexico, this species inhabits riparian areas in grasslands, chaparral, and evergreen woodlands (NMDGF 2006).

Historic

In New Mexico, lowland leopard frog is known from 14 historical locations distributed discontinuously from extreme west New Mexico, north to Clark County, Nevada and Utah, south to Sonora, Mexico, and west to Imperial County, California. The lowland leopard frog has occurred from sea level to 1700 m elevation (5,577 ft.).

Present

This species may have been extirpated from peripheral areas of the range in New Mexico, and remaining populations may be small (NMDGF 2004). *R. yavapaiensis* is currently considered to be very rare in New Mexico. A 1995 survey of 72 potential locations in New Mexico, including six historical sites that had not been surveyed in the past 10 years, resulted in no observations. Localities where this species may persist are in the San Francisco and Gila River drainages between Redrock (Grant Co.) and Virden (Hidalgo Co.), but the last known specimen observed was at Guadalupe Canyon in Hidalgo County in 1995 (Degenhardt et al. 1996, NMDGF 2004). The Guadalupe Canyon specimen is the first and only specimen of this species reported from New Mexico since April 1985 (Degenhardt et al. 1996). No reproduction, i.e., egg masses or tadpoles, has been reported from New Mexico in recent years. In Arizona, this species occurs throughout the western, central, and southeastern portions of the state (AGFD 2001).

INFLUENCES OF HYDROLOGY

This species relies heavily on the presence of water in the San Francisco and Gila River drainages, where it is already threatened by the presence of introduced predators (i.e., bullfrogs, crawfish, and game fish). Populations of *R. yavapaiensis* may be especially susceptible to catastrophic events such as floods and droughts. All of the historical collection sites visited experience seasonal and annual variation in water flow that could alter microhabitats used by frogs (NMDGF 2006).

INFORMATION GAPS

Additional surveys are needed to determine the current distribution of this species, and there is a need for identifying factors that maintain breeding habitats.

3.5.3 MEXICAN GARTER SNAKE (*Thamnophis eques megalops*)

STATUS

The Mexican garter snake is currently listed as a species of concern by USFWS, USBLM New Mexico State Office, the Arizona Game and Fish Department (AGFD 2006), and the USFS Region 3 (Southwest Region: Arizona and New Mexico) (NMDGF 2003). It is considered endangered under the New Mexico Wildlife Conservation Act (NMDGF 2003, 2006) and was assigned a State Rank of S1 (Critically Imperiled) in 1991 and G3 (Vulnerable) in 1998 by the New Mexico Natural Heritage Program (NMNHP 2006). In 2003, the subspecies *T. e. megalops* was petitioned for federal listing by the Center for Biological Diversity. The basis of this petition was cited as documented population declines, decreased range, and local extinction (Center for Biological Diversity 2003).

DESCRIPTION

The Mexican garter snake, a medium-sized snake with a maximum total length of 112 cm. It is one of ten currently recognized subspecies of *T. eques*, has the largest historical distribution of any of the subspecies, and is the only subspecies known to occur in the United States. The background color of this snake ranges from olive to olive-brown to olive-gray. Three stripes run the length of the body, with the

yellow stripe down the dorsum darkening toward the tail. Mexican garter snake is distinguished from other garter snake species by the extension of the lateral stripe onto the fourth scale row. Paired black spots extend along the dorsolateral fields. A light-colored crescent extends behind the corners of the mouth.

This species is strongly associated with permanent water, and is found in stock tanks, ponds, lakes, cienegas, cienega streams, and riparian woods (Degenhardt et al. 1996, Rossman et al. 1996). In the northern part of the range, the species is usually found in or near water in highland canyons with pine-oak forest and piñon-juniper woodland, but it also enters mesquite grassland and desert areas, especially along valleys and stream courses (Stebbins 2003). Mexican garter snakes forage in or near streams, lakes, and irrigation ditches, feeding primarily upon native fish [e.g., Gila topminnow (*Poeciliopsis occidentalis occidentalis*), desert pupfish (*Cyrpinodon macularius*), Gila chub (*Gila intermedia*), and roundtail chub (*Gila robusta*)] and adult and larval native ranid frogs [e.g., lowland leopard frog (*Rana yavapaiensis*) and Chiricahua leopard frog (*Rana chiricahuensis*)], but may also supplement their diet with earthworms and vertebrates such as lizards, small rodents, salamanders, and hylid frogs (tree frogs).

LIFE HISTORY

Like all garter snakes, *T. eques* is viviparous, giving birth to live young instead of laying eggs. Males breed in fall and early spring, and females store the sperm until ovulation in late March or early April. Young are born in early June to early July. On average, about half of the females in a population will give birth each year to 10-20 young. Males mature in two years while females, which grow to a larger size than males, reach maturity in 2 to 3 years (Rosen and Schwalbe 1988)

DISTRIBUTION AND ABUNDANCE

Historic

In New Mexico, the Mexican garter snake was once extant in the Upper Gila River watershed in Grant and Hidalgo counties. In April of 1977, Roger Conant, James S. Jacob, and a group of students counted approximately 100 northern Mexican garter snakes in and around three small ponds on private land southwest of Mule Creek Village (Degenhardt et al. 1996). This population was considered a stronghold for the species in New Mexico (Degenhardt et al. 1996). However, it has been suggested that this population has since declined and is possibly extirpated from New Mexico (BISON 2004) based on several factors including limited historical distribution in New Mexico, modification and loss of suitable habitat, introduction of non-native species, and the lack of protection offered to unlisted but declining native species on private land.

Present

The Mexican garter snake has been extirpated from most of its U.S. range, including the Colorado River, Gila River, and much of the Santa Cruz and San Pedro rivers. Remaining populations are severely fragmented and isolated due to loss and destruction of suitable habitat, which consists of riparian areas with permanent water, streamside vegetation for cover, and native prey species.

In New Mexico, this snake is currently known from the lower Gila River Basin, along Duck and Mule creeks in Grant County and near Virden in Hidalgo County (Degenhardt et al. 1996, BISON 2004). A single record from a locality along Mule Creek is the only recent record, but it is questionable if the species is still extant at this locality (Center for Biological Diversity 2003). Any populations of *T. eques* that may have survived in the stock tanks at Mule Creek would be prone to extirpation as these habitats are susceptible to draining, siltation, desiccation, flooding, and anthropogenic disturbance including maintenance, dredging, and the introduction of non-native predators (e.g., bullfrogs, domestic geese, and

predatory fishes) (Degenhardt et al. 1996). In Arizona, the species is known to occur in the southeast corner of the state in Santa Cruz valley but generally south of the Gila River (AGFD 2001).

INFLUENCES OF HYDROLOGY

Important components of suitable northern Mexican garter snake habitat are perennial streams and an intact native prey base that is not significantly affected by non-native, invasive species. The effect of recent droughts may have had a significant negative impact on the Mexican garter snake.

INFORMATION GAPS

There is a need to determine factors that maintain riparian and riverine environments for foraging.

3.5.4 RETICULATE GILA MONSTER (*Heloderma suspectum suspectum*)

STATUS

In the United States, the Gila monster was listed in the 1970's as a threatened species under the ESA, but was later removed from the federal list of threatened and endangered species when it was determined that populations were not at risk. However, rapid urban development and encroachment in the southwestern United States has prompted the USFWS to view the Gila monster as a high-priority species whose listing as a threatened or endangered species may be warranted in the future (Beck 2005). In Mexico and Guatemala, Gila monsters are listed as threatened. Gila monsters do receive protection under the U.S. Lacey Act, which controls illegal commerce in fish and wildlife. It has been listed since 1975, however, by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) as an Appendix II species, a species protected from overexploitation. In New Mexico, the Gila monster received endangered status in 1975 by NMDGF under the New Mexico Wildlife Conservation Act (NMDGF 2003). The species is also listed as a sensitive species by the USFS Region 3 (Southwest Region: Arizona and New Mexico) (NMDGF 2003). This species is not listed as a species of special concern in Arizona (AGFD 2006).

DESCRIPTION

The Gila monster was first described in 1869 from specimens collected in northern Mexico in 1855, but it was not until the early 1950's that the Gila monster was documented in New Mexico (Degenhardt et al 1996). The Gila monster is the largest lizard native to United States and is also one of only two venomous lizards in the world (the beaded lizard being the other). The Gila monster can be readily distinguished from any other lizard in New Mexico by its stout build, pinkish-and-blackish coloration, and large size (total length up to 610 mm) (Stebbins 1985, 2003). The coloration of the young is similar to that of adults, but the body and tail of the young is irregularly ringed. The poison glands are located in the lower jaw, and grooved teeth in both jaws inject the venom, which is primarily neurotoxic.

Gila monsters occur between 1,180 and 1,950 m elevation in New Mexico (Degenhardt et al 1996), where it typically inhabits the lower slopes of mountains and nearby outwash plains, especially in canyons and arroyos where water is at least periodically present. In some areas, Gila monsters also frequent irrigated farmlands that adjoin these habitat types. Some of the best habitat for this species is found along the Gila River in southwestern New Mexico and southeastern Arizona where Gila monsters frequent bluffs, rocky slopes and small, dry canyons. In the mountain foothills and canyons on both sides of the New Mexico/Arizona border, Gila monsters frequently inhabit areas along the Gila River where desert grasslands and Chihuahuan desert scrub occur together (Beck 2005). Habitat selection in Gila monsters is especially influenced by the availability of suitable refugia (Beck and Jennings 2003).

The diet of this species includes small mammals, snakes, lizards, the eggs of birds and reptiles, and invertebrates. A primary portion of the diet of Gila monsters in the Redrock area consists of juvenile cottontails (Beck 2005).

LIFE HISTORY

Gila monsters are secretive, diurnal predators that dig burrows for shelter, or use natural burrows or those made by other animals. Burrows are occupied both as winter hibernacula and as warm-season retreats. The seasonal activity period of *Heloderma suspectum* extends from March through November, although it spends over 96% of its time in sub-surface refugia (NMDGF 2004). Mating occurs at night during the spring, and clutches of eggs, which are laid in July-August, range from 2-12, averaging 5 (Lowe et al. 1986). Hatching occurs the following May.

DISTRIBUTION AND ABUNDANCE

Historic

Little is known about the historic distribution of the Gila monster.

Present

In New Mexico, the current distribution of the Gila monster is restricted to the southwest corner of the state in Grant, Hidalgo, Luna and perhaps Dona Ana counties. It is found most commonly at Redrock Wildlife Area in Grant County and at Granite Gap in Hidalgo County (NMDGF 2004, Degenhardt et al 1996, Beck 2005). This species is known to occur throughout southern Arizona (BISON 2004).

INFLUENCES OF HYDROLOGY

None were determined for this species.

INFORMATION GAPS

Additional information is needed on riparian habitat needs of the species and factors that may maintain those habitat.

3.5.5 NARROWHEAD GARTER SNAKE (*Thamnophis rufipunctatus rufipunctatus*)

STATUS

The narrowhead garter snake is currently listed as a species of special concern by the USFWS, the USBLM New Mexico State Office, the USFS Region 3 (Southwest Region: Arizona and New Mexico), and the Arizona Game and Fish Department (NMDGF 2003). It is considered threatened by NMDGF under the New Mexico Wildlife Conservation Act (NMDGF 2003, 2006) and was assigned the State Rank of S2 (Imperiled) in 1991 and G3/G4 (Vulnerable but Apparently Secure) in 1998 by the New Mexico Natural Heritage Program (NMNHP 2006). The species is listed as a species of special concern in the state of Arizona (AGFD 2006).

DESCRIPTION

The narrowhead garter snake is one of about 21 species in this genus, which range in distribution from southern Canada to Costa Rica in Central America (Stebbins 1985, 2003). It is a small to medium-sized garter snake with a total length of 46-112 cm. The narrowhead garter snake is olive to brown in color with no dorsal or side stripes, but with distinct dark brown, dull brick red, or blackish spots on the back that

fade on the tail. It is brownish to gray below and on throat. The venter is usually brownish-gray, often with two rows of blackish wedges that fade posteriorly. The head is narrow and more elongated than most other *Thamnophis*. The scales, which are keeled, usually number 21 rows at mid-body. The young have a dull yellowish belly, and often a cream-colored throat (Degenhardt et al. 1996).

Narrowhead garter snake is found in or near well-lit sections of clear, cool, permanently flowing rocky streams in areas of piñon-juniper, oak-pine, or ponderosa pine, commonly sheltered by cottonwood and/or willow trees. It seeks cover under rocks in water when disturbed (Stebbins 1985, 2003). It is usually inactive in cold temperatures or extreme heat and is almost strictly aquatic, seldom seen more than a meter from water.

This species feeds primarily on fish, although other aquatic prey (frogs, toads, tadpoles and larval tiger salamanders) may be taken. This species has a small home range of no more than one km during the summer. Narrowhead garter snakes tend to use overhanging vegetation that provides hiding places from predators, including hawks, wading birds, ravens and crows, raccoons, crayfish, predatory fish, and other snake species.

LIFE HISTORY

Male narrowhead garter snakes are mature at approximately 2.5 years of age and females at two years of age. Females usually reproduce every year and are viviparous/ovoviviparous, having 8–18 young during July-August (Degenhardt et al. 1996). Young snakes usually average 175–225 mm total length. Although neonate mortality is high (Rossman et al, 1996), survivorship is also usually high for snakes that reach two years of age; some individuals may live up to 10 years or more.

DISTRIBUTION AND ABUNDANCE

Historic

Little is known about the historic distribution of the narrowhead garter snake.

Present

The narrowhead garter snake occurs in upland drainages in the mountains of Arizona and New Mexico. In Arizona, this species occurs throughout central and eastern Arizona including Apache, Coconino, Gila, Graham, Greenlee, Navajo, and Yavapai Counties (AGFD 2002). In New Mexico, it is found in Catron, Grant, and Hidalgo counties.

INFLUENCES OF HYDROLOGY

This species relies heavily on the presence of water. It is already threatened by the negative effects of non-native crayfish on their prey base. Habitat alteration can negatively affect high elevation populations in particular, because optimal basking sites such as shrubs and snags are essential for thermoregulation. Under such circumstances, channelization or other activities that remove or disrupt bank vegetation may lead to extirpation

INFORMATION GAPS

There is a need for identifying factors that maintain riparian and riverine environments needed by this species.

3.6 AFFECTED INVERTEBRATE SPECIES

3.6.1 GILA SPRING SNAIL (*Pyrgulopsis gilae*)

STATUS

The Gila springsnail, also referred to as the Gila pyrg, is a federal candidate species (70 FR 24869), is listed as threatened under the New Mexico Wildlife Conservation Act (NMDGF 2003), and is listed as a sensitive by the USFS Region 3 (Southwest Region: Arizona and New Mexico) (NMDGF 2003).

DESCRIPTION

The Gila springsnail is a small (2 to 4 mm long) snail of the family Hydrobiidae. The elongate-ovoid shell, which is tan in coloration, has up to four and three-quarter whorls. The whorls are usually convex to slightly shouldered, and are separated by a distinct incised suture. The body is gray, becoming darker on the dorsal and lateral aspects of the rostrum and head (USFWS 2004).

P. gilae is a gilled aquatic species typically associated with spring habitats. These habitats provide perennial, oxygenated flowing water within the Gila springsnail's thermal range of approximately 15°C – 22°C (BISON 2004, USFWS 2004). Populations found at thermal springs in association with the New Mexico hot springsnail *Pyrgulopsis thermalis*, occur at lower densities than those at cooler springs (NMDGF 1988, Taylor 1987). The Gila springsnail occurs in mud, debris, and vegetation (BISON 2004, USFWS 2004) and probably feeds on algae and other organic material (NMDGF 1988). Historical data shows that Gila springsnail and other associated gastropods drastically decline in number at elevations above 3,048 m and below 2,286 m (Hoff 1962).

LIFE HISTORY

Female springsnails are oviparous and probably lay their eggs in spring and summer (USFWS 2004).

DISTRIBUTION AND ABUNDANCE

Historic

The historic range of the Gila springsnail is limited to areas in New Mexico; it has not been found beyond the state's borders (59 FR 58982). This species may have once occurred at Gila Hot Springs upstream from the confluence of the West and East Forks, and in springs on private land downstream from existing habitat on the East Fork. The springs on private land have been developed however, and any populations associated with these locations may have been extirpated (USFWS 2004).

Present

P. gilae is currently known from 13 populations (70 FR 24869) associated with a series of spring systems in the East and Middle forks of the Gila River and in the Gila River mainstem in Grant County (Taylor 1983, 1987). Mehlhop (1993) reported new Gila springsnail populations along Beaver and Taylor creeks, and at Fall Spring, Catron County. Populations also are found in five thermal springs in Grant County; four along three miles of the lower East Fork of the Gila River and one on the mainstem of the Gila River about a mile and a half downstream from the confluence of the East and West forks.

The presence of Gila springsnail in the project area is considered unlikely, considering that it is only found in reaches of the Gila River within the Gila Wilderness, upstream from the project area. Also, the elevational range of this species is above that of the project area.

INFLUENCES OF HYDROLOGY

The species is limited to spring-brooks and thermal springs.

INFORMATION GAPS

None were determined during this evaluation.

3.6.2 NEW MEXICO HOT SPRINGSNAIL (*Pyrgulopsis thermalis*)

STATUS

The New Mexico hot springsnail, also referred to as the New Mexico hot spring pyrg snail or New Mexico springsnail, is a federal candidate species (70 FR 24869), is listed as threatened under the New Mexico Wildlife Conservation Act (NMDGF 2003), and is listed as a sensitive species by the USFS Region 3 (Southwest Region: Arizona and New Mexico) (NMDGF 2003).

DESCRIPTION

The New Mexico hot springsnail is an aquatic, gilled species generally tan in coloration. The species typically grows to 2 mm in length, but can grow up to 4 mm in length. The broadly conical shell has up to three and a half smoothly rounded whorls. The New Mexico hot springsnail can be distinguished from the Gila springsnail (*P. gilae*) by its broadly conical or globose shell; the shell of the Gila springsnail is rather narrow and elongate (USFWS 2004).

The New Mexico hot springsnail is unique in its genus for its occurrence in thermal springs. Waters inhabited by the snail are typically 33°C to 35°C, but can be as warm as 38°C. Taylor (1987) notes that although the species occupies waters within the 33°C to 38°C range it generally is found within the lower limits of this range. Inhabited springs typically have a moderate outflow. A major substrate occupied by *P. thermalis* is steep or vertical rock covered with thin sheets of water. It can also be found in smaller spring flows with an algal film and crusts of lime-depositing algae. The species possibly also occurs in the dense grasses and sedges bordering thermal springs (USFWS 2004). The comparatively large foot and compact shell of this snail are sometimes interpreted as adaptations to its unique thermal habitat (NMDGF 1988, BISON 2004).

These snails are herbivorous and feed primarily on algae and other organic matter associated with these habitats (USFWS 2004).

LIFE HISTORY

Female springsnails are oviparous and probably lay their eggs in spring and summer (USFWS 2004).

DISTRIBUTION AND ABUNDANCE

Historic

Lack of distribution information on *P. thermalis* prior to 1977 precludes precise knowledge of historic range. Experts on this species believe that it likely once occupied thermal springs at the village of Gila Hot Springs on the Gila River and at a lodge on the lower East Fork of the Gila River. These springs have since been modified and the snail likely extirpated (USFWS 2004).

Present

Populations of this species are currently restricted to a series of thermal springs along the Gila River within the Gila Wilderness in Grant County (USFWS 2004). Four populations are found along a 4.8 km stretch of the lower East Fork Gila River and a fifth on the mainstem Gila River about 2.4 km below the confluence of the East and West forks (Taylor 1983, 1987).

The presence of New Mexico hot springsnail in the project area is considered unlikely, considering that it is only found in reaches of the Gila River within the Gila Wilderness, upstream from the project area.

INFLUENCES OF HYDROLOGY

This species is limited to thermal springs.

INFORMATION GAPS

None were determined during this evaluation.

3.6.3 DESERT VICEROY BUTTERFLY (*Basilarchia archippus obsoleta*)

STATUS

The desert viceroy butterfly, also commonly known as the obsolete viceroy butterfly, is listed as a species of concern by the USFWS (NMDGF 2003) and as a sensitive species by the USFS Region 3 (Southwest Region: Arizona and New Mexico) (NMDGF 2003).

DESCRIPTION

The desert viceroy butterfly has a wingspan of 58 to 76 mm. Sexes are similar in appearance, but females generally are larger. The upperside of the wings are a brownish-orange with black fringes often enclosing a single row of large white dots and punctuated by white markings along the edge. The forewing has a median row of four white dots extending down from the top. The hindwing has a black median line edged inwardly with white. The undersides of the wings are tan and lighter than the upperside.

This subspecies is strongly associated with willows (*Salix* sp.), especially in riparian habitats, where it perches, mates, and deposits its eggs (AGFD 2001). Adults rarely visit flowers, preferring to feed on tree sap and dung.

LIFE HISTORY

The eggs of this species are pale green or yellow, and are laid on the upperside of leaves. The mature larvae display a pair of plume-like horns near the head and numerous bumps dorsally. The color may be dark brown to yellow-green with a cream or pinkish patch on the saddle in the middle of the abdomen. The head is red-brown. The larvae feed on *Salix* catkins or leaves (AGFD 2001). Larvae of the fall brood hibernate partially grown by rolling a leaf of the host into a tube and attaching the leaf petiole to the stem using silk. The pupa is shiny brown with a white abdomen and a saddle-horn like appendage on the back (Brock and Prchal 2001).

DISTRIBUTION AND ABUNDANCE

Historic

No information is available on the historic range of the desert viceroy butterfly.

Present

This butterfly is presently known from southeastern Nevada, extreme southwestern Utah, Arizona, and southward into Sonora, Mexico. It also is found throughout most of southern New Mexico and western Texas (AGFD 2001). In New Mexico, the species is described as a resident of Gray Ranch, Hidalgo County, and as occurring in the Gila National Forest (BISON 2004). Bailowitz and Brock (1991) places the subspecies as occurring within Greenlee County, Arizona. Records from the Arizona Heritage Data Management System (HDMS) indicated that the species occurs at elevations ranging from 2,040 to 4,100 ft (AGFD 2001).

INFLUENCES OF HYDROLOGY

None determined for this species at this time.

INFORMATION GAPS

No information was found pertaining to the species' distribution in the Gila River drainage. Information is needed on factors that maintain riparian habitats, especially pertaining to willows, needed by the species.

3.7 AFFECTED NATIVE PLANT SPECIES

3.7.1 PARISH'S ALKALI GRASS (*Puccinellia parishii* A.S. Hitchcock)

STATUS

Parish's alkali grass is listed as a species of concern by the USFWS, endangered by the State of New Mexico, and is listed as a sensitive species by the USFS Region 3 (Southwest Region: Arizona and New Mexico) and the USBLM New Mexico State Office (NMRPTC 1999).

DESCRIPTION

Parish's alkali grass is in the family Poaceae. It is a low-growing (7.5-20.0 cm [3.0-8.0 in.]) bluish-green annual. Culms (hollow stems) are 2.0-20.0 cm (1.0-8.0 in.) long. The ligules are 1.0 to 3.0 mm long, membranous, acute, and entire. Leaf blades are 1.0-3.0 cm (0.5-1.75 in.) long, contracted, and located on appressed branches (AGFD 2004). The inflorescence is a narrow, few-flowered panicle. Spikelets are 4-6 mm long and 2-6 flowered (AGFD 2004, NMRPTC 1999). The florets disarticulate above the glumes, which are much shorter than the lemmas and sharply acute. The lemmas are 1.5-2.0 mm long, rounded across the back, and finely pubescent on the nerves. The flowers are perfect with anthers ranging from 0.25-0.75 mm long (Soreng 1986 in AGFD 2004).

This plant grows in salty alkaline springs, seeps, and seasonally wet areas that occur at the heads of drainages or on gentle slopes at 800-2,200 m (2,600-7,200 ft). The species requires continuously damp soils during its late winter to spring growing period. It frequently grows in association with *Distichlis stricta* (salt grass), *Sporobolus airoides* (alkali sacaton), *Carex* spp. (sedges), *Scirpus* spp. (bulrushes),

Juncus spp. (rushes), *Eleocharis* spp. (spike rushes), and *Anemopsis californica* (yerba mansa) (NMRPTC 1999). Sites where this grass grows lack dense vegetative cover (AGFD 2004).

LIFE HISTORY

Parish's alkali grass is a short-lived winter or spring annual, flowering from April–May, quickly setting seed and drying up with the late spring drought. Reproduction and dispersal is abiotic; wind and water facilitated (AGFD 2004).

DISTRIBUTION AND ABUNDANCE

Parish's alkali grass is known from 30 sites range-wide, 17 of which are in New Mexico (NMRPTC 1999). It has been documented from Catron, Cibola, Grant, Hidalgo, McKinley, Sandoval, and San Juan counties in New Mexico, and Coconino, Yavapai, and Apache counties in Arizona (ADA 1994, AGFD 2004). It also is found in California and Colorado (NMRPTC 1999). Historically it was known from five small, widely disjunct sites in California, Nevada, Arizona and New Mexico (AGFD 2004).

INFLUENCES OF HYDROLOGY

Parish's alkali grass requires moist soil and is an opportunistic species capable of invading newly created habitats such as plowed fields and leaking burms (ARPC 2001).

INFORMATION GAPS

None were determined during this evaluation.

3.7.2 GILA BRICKELLBUSH (*Brickellia chenopodina* [Greene] B.L. Robinson)

STATUS

Gila brickellbush is listed as a species of concern by both USFWS and the State of New Mexico (NMRPTC 1999).

DESCRIPTION

Gila brickellbush is a much-branched shrub with stout branches and exfoliating bark. The leaves, which average 35 mm (1.5 in.) long, are alternate, simple, petiolate, ovate to lanceolate, somewhat thick and succulent, glabrous or nearly so, acute at the apex, rounded to cuneate (wedge-shaped) at the base, and serrate at the margins. The flower heads are approximately 12 mm in height with about 28 flowers in a panicle. The flowers are white to pinkish in color, perfect and tubular, and located on slender, leafy stalks 2–4 cm (0.75 –1.5 in.) long (NMNPPAC 1984). The pappus is composed of minutely barbed capillary bristles.

LIFE HISTORY

Gila brickellbush flowers from June to September (NMNPPAC 1984).

DISTRIBUTION AND ABUNDANCE

Historic

This species is known from only one site along the Gila River Valley in Grant County, New Mexico. It was collected in alluvial soils along the Gila River at an elevation of 1,370 m (4,500 ft). The specimen is likely an atypical growth form of *Brickellia floribunda* that from burial in sediment following a flood (NMRPTC 1999). It may also be an anomalous form of *B. floribunda* that grew in shade and rich soil (NMNPPAC 1984).

Present

Gila brickellbush may occur in the project area at elevations at or near 1,370 m (4,500 ft).

INFLUENCES OF HYDROLOGY

None determined for this species.

INFORMATION GAPS

None were determined during this evaluation.

3.7.3 METCALFE'S TICKTREFOIL (*Desmodium metcalfei* [Rose & Painter] Kearney & Peebles)

STATUS

Metcalfé's ticktrefoil is listed as a species of concern by both the USFWS and the State of New Mexico. It is listed as a sensitive species by the USFS Region 3 (Southwest Region: Arizona and New Mexico) (NMRPTC 1999).

DESCRIPTION

This genus is often considered to be difficult to identify because collected specimens often lack fruit and intermediate leaf shapes and sizes are common (NMRPTC 1999). Metcalfé's ticktrefoil is also known by the synonym *Meibomia metcalfi* Rose & Painter. This member of the family Fabaceae has upright stems that are 30-90 cm (1.25-3.5 in.) long. The stem may be smooth or have a coating of fine hairs. The leaves are trifoliate; leaflets are oblong with the central leaflet longer than the others. Inflorescences are axillary and terminal, elongating to 5-30 cm (2-12 in.) in fruit. The flowers are purple, and the fruits are pods that are constricted between each seed. Each pod has 2-5 segments, with each segment from 5-6 mm (0.25 in.) long. The surface of the pod has fine, stiff, hooked hairs (NMRPTC 1999).

Metcalfé's ticktrefoil occurs on rocky slopes, canyons, and ditches in grasslands and oak/piñon-juniper woodlands at elevations of 1,310-2,000 m (4,000-6,500 ft).

LIFE HISTORY

Metcalfé's ticktrefoil flowers from August to October.

DISTRIBUTION AND ABUNDANCE

Historic

This species occurs in Grant and Sierra counties in New Mexico, and in Cochise, Gila, Pinal, and Santa Cruz counties in Arizona. It is probably found in adjacent Mexico (NMRPTC 1999).

Present

There are few recent collections of this plant.

INFLUENCES OF HYDROLOGY

None determined for this species.

INFORMATION GAPS

None were determined during this evaluation.

3.7.4 MOGOLLON WHITLOWGRASS (*Draba mogollonica* Greene)

STATUS

Mogollon whitlowgrass is listed as a species of concern by both the USFWS and the State of New Mexico (NMRPTC 1999).

DESCRIPTION

Mogollon whitlowgrass is a member of the family Brassicaceae. Plants grow from taproots that are enlarged near the top. Mogollon whitlowgrass has one or more stems, each with several branches between 15-25 cm (6-10 in.) long (NMRPTC 1999). The leaves, which form a flat basal rosette, are 2-9 cm (0.75 – 3.5 in.) long and 1-2.5 cm (0.5-1 in.) wide. The flowers, which have bright yellow petals, grow in clusters of 20-50. The fruits are 7-18 mm (0.25-0.75 in.) long, oblong, flat, twisted pods that may or may not be hairy (NMNPPAC 1984). The reduced or absent stem leaves and large basal leaves are characters that separate this species of *Draba* from others in New Mexico (NMNPPAC 1984).

Mogollon whitlowgrass grows in cool, moist northern slopes of mountains, ravines and canyons on volcanic rocks and soil in montane forests from 1,500-2,900 m (5,000-9,000 ft).

LIFE HISTORY

Mogollon whitlowgrass can be a winter annual, biennial or perennial. It flowers from April to May.

DISTRIBUTION AND ABUNDANCE

This species occurs, sometimes as large populations, in Catron, Grant, Sierra, and Socorro counties in New Mexico. It may be more abundant than is now known because of the relative inaccessibility of its habitat (NMRPTC 1999).

INFLUENCES OF HYDROLOGY

None determined for this species.

INFORMATION GAPS

None were determined during this evaluation.

3.7.5 ROCK FLEABANE (*Erigeron scopulinus*)

STATUS

Rock fleabane is listed as a species of concern by the USFWS and the State of New Mexico. It is listed as a sensitive species by the USBLM New Mexico State Office (NMRPTC 1999).

DESCRIPTION

Rock fleabane is in the family Asteraceae. It is a low-growing, mat-forming herb with a fibrous root system and slender rhizomes up to 15 cm (6 in.) long (NMRPTC 1999, NMNPPAC 1984). The leaves, which are clustered at the tips of the rhizomes, are 5-12 mm (0.2-0.5 in.) long, 1.0-3.5 mm (0.04-0.1 in.) wide, spatula shaped, broadest above the middle, tapering toward the petiole, and entire at the margins (NMNPPAC 1984). Flower heads, which are solitary on bare stems, are 6-33 mm (0.25-1.25 in.) tall with 12-20 white ray flowers that dry to light violet. This species flowers during May and June (NMRPTC 1999, NMNPPAC 1984). The rhizomatous mat-forming habit, low stature, and cliff habitats distinguish this species from other *Erigeron* species in southwestern New Mexico (NMNPPAC 1984). Populations of this species are widely spaced and disjunct, but can be locally very abundant (NMRPTC 1999).

LIFE HISTORY

Rock fleabane is a perennial plant that grows in crevices in cliff faces of rhyolitic rock in lower montane coniferous forest at elevations of 1,800-2,800 m (6,000-9,000 ft).

DISTRIBUTION AND ABUNDANCE

In New Mexico, rock fleabane is found in southern Catron, northwestern Sierra, and western Socorro counties, including the Black Range and the Mogollon and San Mateo mountains. In Arizona, it is found in the Chiricahua Mountains.

INFLUENCES OF HYDROLOGY

None were determined for this species.

INFORMATION GAPS

None were determined during this evaluation.

3.7.6 MAGUIRE'S BEARDTONGUE (*Penstemon linarioides* A. Gray ssp. *maguirei* Keck)

STATUS

Maguire's beardtongue is listed as a species of concern by the USFWS and the State of New Mexico. It is listed as a sensitive species by the USFS Region 3 (Southwest Region: Arizona and New Mexico) (NMRPTC 1999).

DESCRIPTION

Maguire's beardtongue is a mat-forming shrub or sub-shrub in the family Scrophulariaceae. The stems are 1-5 dm (4-20 in.) tall, tufted, leafy, and pubescent. The leaves are oblanceolate, 2-4 mm (0.10-0.20 in.) wide; possibly with flattened, scale-like, and appressed hairs (AGFD 2004, NMRPTC 1999). The inflorescence is glandular; the corolla is pale lavender to blue lavender with purple-red stripes down throat, the inside of which is white with purple anthers (AGFD 2004). The corolla is 16-20 mm (0.5-0.75 in.) long, floor 2-ridged, abruptly expanded, and with the base of the lower lobes strongly bearded (NMRPTC 1999).

This subspecies differs from ssp. *linarioides* by having oblanceolate rather than more or less linear leaves. The otherwise similar species *Penstemon crandallii* does not occur in southern New Mexico and its leaf surface has fine erect or retrorse hairs.

Maguire's beardtongue occurs on limestone cliffs of piñon-juniper woodlands at 1,830-1,980 m (6,000-6,500 ft) elevation (AGFD 2004, NMRPTC 1999).

LIFE HISTORY

Maguire's beardtongue flowers from June to October and is a perennial.

DISTRIBUTION AND ABUNDANCE

Maguire's beardtongue occurs in or near the Gila River valley in Grant County, New Mexico and Greenlee County, Arizona. It apparently is very rare. This taxon has been collected only five times, once in Grant County, New Mexico, and four times in Greenlee County, Arizona. The first four collections were all made prior to 1935. The most recent collection was in 1994 in an area proposed for mining. The plant has not been seen in New Mexico for over 100 years, but it may still exist in the canyons of the Gila River (AGFD 2004).

INFLUENCES OF HYDROLOGY

Unknown for this species.

INFORMATION GAPS

More research is needed to determine the distribution, abundance, and habitat needs of this taxon (NMRPTC 1999).

3.7.7 PIÑOS ALTOS FLAME FLOWER (*Talinum humile* Greene)

STATUS

The Piños Altos flame flower is listed as a species of concern by the USFWS and the State of New Mexico. It is also listed as a sensitive species by the USFS Region 3 (Southwest Region: Arizona and New Mexico) and the USBLM New Mexico State Office (NMRPTC 1999).

DESCRIPTION

Piños Altos flame flower, has the synonym *Talinum greenmanii* Harshb, is in the family Portulacaceae. The main roots are fleshy, turbinate, near the soil surface, and sometimes bifurcated and occasionally forked (AGFD 2004). The main stems rarely exceed 10 cm (4 in.) in height, and are usually simple, erect,

and rarely branched. Occasionally the stems may be elongated when the soil surface is raised by erosion deposition. This plant has round succulent leaves that are sessile, glabrous, and terete, give the appearance of a tuft or rosette, and are without obvious petioles (AGFD 2004). The leaves are light glaucous-green to yellowish green, 1-5 mm in diameter, and up to 10 cm (4in.) in length. The inflorescence is cymose, with 5-10 flowers in terminal clusters, and shorter than the height of the leaves (AGFD 2004). The flowers have 5 yellow petals about 5 mm (0.25 in.) long, and are elliptic to obovate. The yellow flowers of *Talinum humile* distinguish it from all other members of the genus in the area except *T. marginatum* and *T. aurantiacum*. *T. marginatum* is very similar in flower color, morphology, and general appearance except that it has distinctly long petiolate leaves while *T. humile* has no apparent petiole. The inflorescence of *T. humile* does not generally overtop or exceed the length of the leaves. The inflorescence of *T. marginatum* in contrast is usually longer than the leaves and stands above the level of the leaves. *T. aurantiacum* may also have yellow flowers, but they are inserted singly or occasionally in 2- or 3- flowered cymules rather than in pedunculate cymes as in *T. humile* (Neal 1987 as cited in AGFD 2004).

Piños Altos flame flower grows in dry, shallow, gravelly, well-drained, rhyolitic soil terraces, often overlying bedrock. It is found at elevations from 1,219 to 1,524 m (4,000 - 5,000 feet) (ARPC 2001).

LIFE HISTORY

Piños Altos flame flower is a small perennial herb that flowers from mid-July to mid-August (ARPC 2001).

DISTRIBUTION AND ABUNDANCE

Two populations are known from Grant County, New Mexico, and from the Canelo Hills, Santa Cruz County, Arizona (AGFD 2004). It is also known from several localities in Durango and western Chihuahua, Mexico (ARPC 2001, AGFD 2004). Known populations occur in semi-desert grassland/Madrean evergreen woodland transition communities in Arizona. In New Mexico and Mexico, this species occurs in pine-oak woodland habitat. In New Mexico, it is known to occur in shallow pockets of soil associated with rhyolite outcrops (AGFD 2004).

INFLUENCES OF HYDROLOGY

Hydrology is not an important factor for this species.

INFORMATION GAPS

None were determined during this evaluation.

3.7.8 GOODDING'S BLADDERPOD (*Physaria gooddingii* Rollins & Shaw)

STATUS

Goodding's bladderpod is listed as a species of concern by the USFWS and the State of New Mexico (NMRPTC 1999).

DESCRIPTION

Goodding's bladderpod is also known by the synonym *Lesquerella gooddingii* Rollins & Shaw. It is a member of the family Brassicaceae. This densely hairy and stout plant grows to 40 cm (16 in.) tall. Several stems arise from a basal rosette of obovate or elliptical, sinuate or shallowly dentate leaves

(NMNPPAC 1984). The basal leaves are up to 3 cm (1.25 in.) long on a short petiole, while the stem leaves are sessile (NMRPTC 1999). The inflorescence is densely compact, and each flower has four yellow petals between 6.5-8 mm (0.23-0.45 in.) long (NMNPPAC 1984). The fruit is a hairy silicle (pod), roughly oblong and broadly elliptical, 5-8 mm (0.20-0.45 in.) long, and flattened parallel to the plane of the septum (NMRPTC 1999). The pod is S-shaped at maturity. This is the only yellow-flowered species of *Physaria* in New Mexico with flattened pods (NMNPPAC 1984).

Goodding's bladderpod grows in open areas in piñon-juniper woodlands and ponderosa pine forests from 1,800-2,300 m (6,000-7,500 ft) elevation (NMRPTC 1999).

LIFE HISTORY

Goodding's bladderpod is an annual or biennial that flowers from June to September (NMRPTC 1999).

DISTRIBUTION AND ABUNDANCE

Goodding's bladderpod is found in Catron and Sierra counties, New Mexico and Greenlee County in adjacent Arizona (NMRPTC 1999). This plant is found in several of the mountain ranges that compose the Gila massif (NMRPTC 1999).

INFLUENCES OF HYDROLOGY

Hydrology is not an important factor for this species.

INFORMATION GAPS

None were determined during this evaluation.

3.7.9 DAVIDSON'S CLIFF CARROT (*Pteryxia davidsonii* (Coulter & Rose) Mathias & Constance)

STATUS

Davidson's cliff carrot is listed as a species of concern by the USFWS and the State of New Mexico. It is listed by the USFS Region 3 (Southwest Region: Arizona and New Mexico) as a sensitive species (NMRPTC 1999).

DESCRIPTION

Synonyms for this plant include *Aletes davidsonii* Coulter & Rose; *Pseudocymopterus davidsonii* (Coulter & Rose) Mathias; and *Pseudocymopterus filicinus* Wooton & Standley. Davidson's cliff carrot is in the family Apiaceae. Plants are 15-40 cm (6-16 in.) tall, with multiple branches that have several leaves (NMRPTC 1999, NMNPPAC 1984). The leaves are oblong to somewhat oblong-oval in outline, with the blade 1.5-14 cm long, 1-9 cm wide, and 2- to 3-times pinnately parted. The inflorescence is a compound umbel with 5-9 primary branches (rays); the rays are 5-30 mm long, the primary bracts are either absent or broad and partially enclosing the primary branches; and the secondary bracts are filamentous and subtending the terminal flower clusters, which are yellow or purple (NMRPTC 1999). The fruits are oblong, 3-4 mm long, 1-2 mm wide, with narrow lateral wings. The differences between this species and *Cymopterus lemmonii* are slight. In general, *C. lemmonii* has fewer stem leaves and somewhat larger fruits with broader wings (NMRPTC 1999).

Davidson's cliff carrot grows on sheer, north-facing cool, moist, rocky cliffs in piñon-juniper woodland and lower montane coniferous forest at 1,980-2,440 m (6,500-8,000 ft) elevation (AGFD 2004, NMRPTC 1999).

LIFE HISTORY

This plant flowers in August (NMRPTC 1999).

DISTRIBUTION AND ABUNDANCE

The range of Davidson's cliff carrot includes the Mogollon Mountains and Piños Altos Range in Catron and Grant counties, New Mexico, and near Clifton in Greenlee County, Arizona (AGFD 2004, NMNPPAC 1984). It is found in a relatively small geographical area, and has been reported or collected infrequently since it was first found in 1900 (NMNPPAC 1984).

INFLUENCES OF HYDROLOGY

This species grows in moist areas and thus any land use practice that results in soil drying may be a threat. The documented decline in wetlands within its range may have contributed to its infrequent collection (NatureServe 2006)

INFORMATION GAPS

None were determined during this evaluation.

3.7.10 GRAYISH-WHITE GIANT HYSSOP (*Agastache cana* (W.J. Hooker) Wooton & Standley)

STATUS

Grayish-white giant hyssop is listed as a species of concern by both the USFWS and the State of New Mexico (NMRPTC 1999).

DESCRIPTION

This plant is a member of the family Lamiaceae. It is also known by the synonym *Brittonastrum canum* (NMRPTC 1999). Grayish-white giant hyssop is a semi-woody, upright, perennial herb that grows to a height of 30-50 cm (12-20 in.) (NMNPPAC 1984). The numerous stems are finely hairy, appearing grayish-green in color (NMNPPAC 1984). The leaves are triangular, about 15mm (0.6 in.) wide, with leaf margins that can be entire or with rounded or sharply pointed teeth (NMNPPAC 1984). Attractive red to rose-pink flowers appear in whorls of loose clusters. The five petals are fused into a tube, the two small upper petals extending forward like the visor of a cap, and the three larger lower petals forming a reflexed lip (NMRPTC 1999). The fruit is divided into four small, dark nutlets, each about 2 mm long (NMRPTC 1999).

The habitat of this species is low mountains at middle elevations in crevices, at the bases of granite cliffs, or in canyons with small-leaved oaks at the upper edge of the desert and lower edge of the piñon-juniper zone at 1,400-1,800 m (4,600-5,900 ft) elevation.

LIFE HISTORY

Grayish-white giant hyssop flowers from June to September (NMRPTC 1999).

DISTRIBUTION AND ABUNDANCE

The range of this species includes Doña Ana, Grant, Luna, and Sierra counties in New Mexico and El Paso and Hudspeth counties in Texas (NMRPTC 1999). This plant is a regional endemic with a restricted range. It is found in areas that are hard to access. There are no apparent threats to the species under current land uses (NMRPTC 1999). Grayish-white giant hyssop may be present within the project area at elevations from 4,600-5,900 feet.

INFLUENCES OF HYDROLOGY

Because this plant grows in rock crevices and cliff bases in inaccessible areas, it is not likely to be subjected to the influences of hydrology.

INFORMATION GAPS

The species needs additional distribution surveys.

4.0 CONCLUSIONS

Based on the current available information reviewed for this analysis, 52 federally or State of New Mexico listed species were identified as having the potential to occur within the proposed project area in Catron, Grant, and Hidalgo counties in New Mexico and in Greenlee County, Arizona (Table 1). Using accessible and available information to determine what species currently inhabit the proposed project area, the number of species was reduced to 24 (Table 3). Of these remaining species some will require additional studies to determine if they are susceptible to potential project impacts. This may require studies on distribution, life history requirements, and seasonal movements.

Due to the nature of the proposed project, only a limited number of species have the potential to be directly impacted. These will include primarily aquatic species and possibly some select terrestrial species and riparian species. Indirect impacts to some birds, mammals, reptiles, and amphibians may also occur.

Federally listed species known to occur in the project area with certainty include spikedace, loach minnow, southwestern willow flycatcher, bald eagle, and possibly the Chiricahua leopard frog. Critical habitat is proposed for the Gila River within the project area for spikedace, loach minnow, and the southwestern willow flycatcher. Future assessments will require affects determinations for the species and their habitats.

Species listed as threatened and endangered by the State of New Mexico that may potentially be impacted include the spikedace, loach minnow, roundtail chub, southwestern willow flycatcher, bald eagle, Bell's vireo, peregrine falcon, common black-hawk, common ground-dove, cactus ferruginous pygmy owl, neotropical cormorant, Gila woodpecker, gray vireo, Abert's towhee, Arizona mountain vole, spotted bat, lowland leopard frog, Mexican garter snake, reticulate Gila monster, and the narrowhead garter snake.

Important physical factors that may affect listed species are related to potential changes in hydrological conditions due to project implementation. These may include alterations of instream habitats available for fishes, overbank flooding for riparian areas and avian species, and creation of reservoirs and associated conveyance infrastructure.

Floods are an important abiotic factor regulating stream fish assemblages. Alterations to the natural hydrograph (e.g., water storage and diversion dams) that have reduced or eliminated flooding have been blamed, in part, for the decline of many native fishes in the southwest United States. A reduction in flood

frequency likely would be detrimental to native fishes (Brouder 2001). Flood flows also aid in maintenance of instream habitats, such as pool-riffle-run ratios, gravel and cobble bar formation, and they also remove fine sediment from gravel and cobbles that are important for Gila River fishes.

In streams in Arizona and New Mexico, Minckley and Meffe (1987) showed that native and non-native fishes were differentially influenced by flooding events common to those streams. Their studies showed that non-native fishes introduced into unregulated streams of arid, mountainous regions of Arizona and New Mexico are relatively unable to resist flooding and are significantly reduced in numbers or eliminated. Conversely, native fishes show little or no response to such flooding events; they exhibit similar species composition and population sizes before and following such events. This phenomenon may reflect differences in evolutionary histories. In the Verde River, Arizona, Rinne (2005) noted that during floods, native fish species dominate fish assemblages. In contrast, during droughts and sustained base flows, non-native fish abundances increased.

In the Gila River the relationships between river flows, instream habitats, and riparian habitats are in need of quantification. Current studies such as this, along with ongoing geomorphic and aquatic mesohabitat evaluations, will provide the baseline data to determine the relationship between Gila River flows and aquatic habitats for species of concern. Quantification of habitat needs of aquatic species relative to geomorphic processes in the Gila River project area will be required to determine future potential impacts.

5.0 TABLES

Table 1. Special Status Species that Potentially Occur in the Project Area Based on Preliminary Literature Review

Common Name (<i>Scientific name</i>)	Status		General Habitat	Likelihood of Occurrence in Project Area
	FED	STATE		
Fish				
Gila Chub (<i>Gila intermedia</i>)	E	E	Generally occurs in pool habitats of small streams or springs. (BISON 2004) Critical habitat for this species is proposed throughout the Gila Basin. (70 FR 66663)	Potentially: Gila chub was historically present in smaller streams and cienegas of the Gila River drainage of southwestern New Mexico (Sublette et al. 1990), southeastern Arizona (Minckley 1973, Rinne 1976), and northern Sonora (Varela-Romero et al. 1992). The species may persist in canyon-bound portions of Turkey Creek in the Upper Gila River and in several tributaries within the San Francisco Drainage. Critical habitat was designated throughout the Gila basin in November 2005. (70 FR 66663)
Gila Trout (<i>Oncorhynchus gilae</i>)	E	T	Inhabits small, cool, clear mountain streams and headwaters, along which riparian vegetation provides a fairly complete canopy. Uses deep pools to survive drought conditions (BISON 2004).	Potentially: In New Mexico, it is found in the Iron, Main Diamond, South Diamond, McKenna, and Spruce Creeks of the Gila National Forest. In the early 1900's, this species was found in the Upper Gila River upstream of Mogollon Creek. In the Gila National Forest, it has been reintroduced into McKnight, Little, Trail Canyon, Big and Sheep Corral creeks (BISON 2004). In Arizona, this species occurred in the Verde, Agua Fria and San Francisco drainages (AGFD 2002).
Spikedace (<i>Meda fulgida</i>)	T	T	Habitat varies, shifting both seasonally and as the fish matures. The young typically occupy stream-margin habitats, where the water velocity is less than 5 cm/sec (2 in/sec) and the depth is less than 5 cm (2 in). Adults are most commonly found in main channel areas, where Velocities are 2-20 cm/sec (0.8-7.9 in/sec) and depths 4-12 cm (1.6-4.7 in); substrates in these areas are sand and gravel. In winter months, the species tends to congregate along cobble-bottomed stream margins if the habitat is available (Propst et al. 1986). USFWS has proposed Critical Habitat for this species throughout the Gila Basin (70 FR 75545).	Likely: The range of the species in the Gila River drainage in New Mexico is fragmented; it is currently found mainly in the lower reaches of the West Fork Gila River and the Cliff-Gila Valley reach of the Gila River. It is frequently found near the mouth of the Middle Box upstream of Redrock and is irregularly found in portions of the East Fork Gila River (Propst et al. 1986). USFWS has proposed Critical Habitat for this species throughout the Gila Basin (70 FR 75545). This species can be found in Eagle Creek, Greenlee County, AZ (AGFD 2002).
Loach Minnow (<i>Tiaroga cobitis</i>)	T	T	Inhabits riffle areas with moderate to rapid water velocities and moderate to high gradients. The species is most common in a substrate of elevated cobble and rubble—particularly where sediments have not filled-in crevices (BISON 2004). USFWS has proposed Critical Habitat for this species throughout the Gila Basin (70 FR 75545).	Likely: In New Mexico, its range in the Gila and San Francisco drainages is fragmented (Propst et al. 1988). Currently, it is moderately common only in a short reaches (<10 km) of the Tularosa and San Francisco rivers. A small population persists in the lower reaches of the West Fork Gila River and the population in the Cliff-Gila Valley has declined in the past 10 years (Propst 2005). It has apparently been eliminated from Middle Fork Gila River and occurs irregularly in portions of East Fork Gila River. Elsewhere in the Gila-San Francisco drainage, it occurs irregularly or is absent (Propst 1999). In Greenlee Co., AZ this species occurs in the San Francisco, Blue, and Campbell Blue rivers as well as Eagle Creek (AGFD 2002).

Table 1. Special Status Species that Potentially Occur in the Project Area Based on Preliminary Literature Review, continued

Common Name (Scientific name)	Status		General Habitat	Likelihood of Occurrence in Project Area
	FED	STATE		
Headwater Chub (<i>Gila nigra</i>)	C	-	Adult headwater chub occupy cool to warm water in mid to headwater stretches of mid-sized streams in the Gila River basin. They are typically associated with deep, near shore pools adjacent to swift riffles and runs, and near cover (AGFD 2003, Voeltz 2002).	Potentially: Headwater chub have been collected in the 'forks area' during NMDGF surveys (Propst 2005). No collections have been made in Greenlee Co, AZ (AGFD 2003)
Roundtail Chub (<i>Gila robusta</i>)	S	E	Occurs in mid-elevation streams and rivers with cool to warm water. Typical adult microhabitat consists of pools up to 2.0 m (6.6 ft) deep adjacent to swifter riffles and runs. Cover consists of large boulders, tree roots, submerged large trees and branches, undercut cliff walls, or deep water. Smaller chubs generally occupy shallower, low velocity water adjacent to overhead bank cover (BISON 2004).	Potentially: Historically the roundtail chub occurred in the San Juan, Zuni (a Little Colorado River tributary), San Francisco, and Gila River drainages in New Mexico and Arizona (Baird and Girard 1853, Koster 1957, Bestgen and Propst 1989, Platania 1990, AGFD 2002). In New Mexico, the species is rare in the San Juan River (Ryden and Pfeifer 1996), extirpated from the Zuni River drainage (Propst et al. 2001), and extirpated from the San Francisco River drainage (Bestgen and Propst 1989). The roundtail chub was believed to have been extirpated from the Gila River by the late 1960s, but has subsequently been confirmed to persist in several localities in the drainage. In the Gila River drainage in New Mexico it is limited mainly to the upper East Fork, lower Middle Fork and lowermost West Fork; elsewhere in the drainage it is incidental or absent. Although surviving populations are small, recruitment by each has been documented in most years since 1988 (BISON 2004).
Desert sucker (<i>Catostomus clarki</i>)	S	S	Associated with flowing pools and rapids of streams and rivers. Substrate typically consists of gravel- to rubble-sized stones with interstitial spaces filled with sandy silt (BISON 2004).	Likely: Native to the Lower Colorado River Basin including the Gila and San Francisco River basins except for extreme headwater situations. Fairly common in Gila National Forest (BISON 2004) and throughout the Gila River drainage in AZ (AGFD 2002). Listed as a species of concern for consideration for threatened or endangered status due to range-wide population declines (59 FR 58982)
Sonora sucker (<i>Catostomus insignis</i>)	S	S	Found in a variety of habitats from warm-water rivers to headwater streams with a general affinity for relatively deep quiet pools. Move to runs and deeper riffles at night to feed (BISON 2004).	Likely: The Sonora sucker is native to the Lower Colorado River Basin including the Gila and San Francisco River basins in AZ and NM (AGFD 2002, BISON 2004). Populations were considered stable in these areas (Sublette et al. 1990). Listed as a species of concern for consideration for threatened or endangered status due to range wide population declines (59 FR 58982)
Longfin Dace (<i>Agosia chrysogaster</i>)	S	-	Although longfin dace tend to occupy relatively small streams with sandy or gravelly bottoms, the species can occur in a variety of habitats ranging from intermittent hot low-desert streams to clear and cooler brooks of higher elevations (AGFD 2002).	Likely: Longfin dace have been collected by the NMDGF in the mainstem Gila River (Propst 2005). Longfin are known to occur in the Gila River in Greenlee County, AZ (AGFD 2002).
Speckled Dace (<i>Rhinichthys osculus</i>)	S	-	The species is typically a bottom dweller than can be found in rocky riffle, run, and pool habitats in headwaters, creeks, and small to medium rivers (AGFD 2002).	Likely: Speckled dace have been collected in the 'forks area' in NMDGF surveys (Propst 2005) and is known to occur within the Gila and San Francisco drainages in Greenlee Co., AZ (AGFD 2002).
Chihuahua catfish (<i>Ictalurus sp.</i>)	S	S	An unrecognized species resembling <i>I. Lupus</i> . Considered an exclusively warmwater species (BISON 2004).	Potentially: Native to the Rio Grande drainage. An introduced population is believed to be in the East Fork of the Gila River (BISON 2004).

Table 1. Special Status Species that Potentially Occur in the Project Area Based on Preliminary Literature Review, continued

Common Name (<i>Scientific name</i>)	Status		General Habitat	Likelihood of Occurrence in Project Area
	FED	STATE		
Birds				
Southwestern Willow Flycatcher (<i>Empidonax traillii extimus</i>)	E	E	Found in close association with dense groves of willows, arrowweed, buttonbush, tamarisk, Russian olive, and some other riparian vegetation, often with a scattered overstory of cottonwood. The Southwestern willow flycatcher breeds in riparian habitats along rivers, streams, and other wetlands. The willow flycatcher builds its nest in shrubs and small trees in willow thickets, shrubby mountain meadows, and deciduous woodlands. Although occurring widely in New Mexico during migration, willow flycatchers are confined to riparian woodlands in the breeding season (BISON 2004). USFWS critical habitat has been designated (62 FR 39129).	Likely: The southwestern subspecies <i>extimus</i> (Phillips 1948) breeds primarily in New Mexico, Arizona, and southern California, where it is restricted to remnants of dense streamside vegetation and where breeding populations have suffered declines (Phillips et al. 1964, Unitt 1987, Hubbard 1987, Rosenberg et al. 1991, 60 FR 10693). Populations occur in the Cliff/Gila Valley, New Mexico. In this region occurs the largest known nesting concentration of the Southwestern willow flycatcher (Boucher et al. 1997). In Greenlee Co., AZ, this species breeds along the middle Gila River and upper San Francisco River drainages (AGFD 2002).
Brown Pelican (<i>Pelecanus occidentalis carolinensis</i>)	E	E	The brown pelican is usually found in marine habitats in warmer waters in North America, but is occasionally noted occurring in the lower Colorado Basin. Inland, always associated with larger bodies of water (i.e. larger lakes and reservoirs)(BISON 2004).	Potentially: A rare visitor, although through 2003, there have been some 50 reports involving more than 60 individual birds, these from 15 of New Mexico's 33 counties, with most from large lakes or along major rivers, including the San Juan, Gila, Rio Grande, and Pecos drainages (NMDGF 2004).
Bald Eagle (<i>Haliaeetus leucocephalus</i>)	T	T	The species is primarily water-oriented, and the majority of the populations occurring in New Mexico are found near streams and lakes. There are also some "dry land" areas where these eagles occur regularly, most notably in the region between the Pecos Valley and the Sandia, Manzano, Capitan, and Sacramento mountains, plus on the Mogollon Plateau (BISON 2004).	Likely: Resident eagles occur in Arizona and there are wintering populations in both New Mexico and Arizona. Presently, wintering eagles are found along rivers and major reservoirs in both states (BISON 2004, AGFD 2002). Beginning in the late 1980s, bald eagles have nested at 4 sites in 2 counties: 3 in Colfax and 1 in Sierra (NMDGF 2000).
Yellow-billed cuckoo (<i>Coccyzus americanus</i>)	C	S	Breed in large blocks of riparian habitat usually of 25 acres or more (i.e. lowland deciduous woodlands, willow and alder thickets, and second growth forests). Nests are usually placed in dense understory foliage and typically near open water (66 FR 38611).	Likely: Winter in South America, Central America, and Mexico. Breeding grounds historically found throughout the southwestern United States, but have become more scattered in recent decades. Undocumented breeding pairs were noted in Gila National Forest as recent as 1995 (BISON 2004). Known to occur in Greenlee Co. AZ (AGFD 2002)
Bell's Vireo (<i>Vireo bellii</i>)	S	T	In New Mexico, this species characteristically occurs in dense shrubland or woodland along lowland stream courses, with willows (<i>Salix</i> spp), mesquite (<i>Prosopis</i> spp.), and seepwillows (<i>Baccharis glutinosa</i>) being characteristic plant species (Hubbard 1985).	Likely: In New Mexico, it occurs in the southernmost portion of the state, where small numbers summer primarily in the Gila Valley, Guadalupe Canyon, and the lower Rio Grande and Pecos valleys and associated drainages (Hubbard 1978). A subspecies <i>V. b. arizonae</i> occurs throughout southern Arizona (AGFD 2002).
American Peregrine Falcon (<i>Falco peregrinus anatum</i>)	D, S	T	Breeding territories in New Mexico are restricted to cliffs near forested or wooded habitats that support updrafts or 'gulfs' of air that are suitable for foraging (BISON 2004).	Likely: In New Mexico, the American subspecies <i>F. p. anatum</i> breeds locally in mountains and river canyons and migrates essentially statewide. (Skaggs et al. 1988). In Arizona, this species breed where sufficient prey is available near cliffs (AGFD 2002).

Table 1. Special Status Species that Potentially Occur in the Project Area Based on Preliminary Literature Review, continued

Common Name (<i>Scientific name</i>)	Status		General Habitat	Likelihood of Occurrence in Project Area
	FED	STATE		
Common Black-Hawk (<i>Buteogallus anthracinus anthracinus</i>)	S	T	Characteristically found in the Southwest in cottonwood (<i>Populus spp.</i>) and other woodlands along permanent lowland streams. Breeding hawks require mature, well-developed riparian forest stands (e.g., cottonwood bosques) that are located near permanent streams where principal prey species are available (BISON 2004).	Likely: This neotropical raptor reaches its northern limits in the southwestern United States, where in New Mexico it is an uncommon but regular summer resident that is largely restricted to the San Francisco, Gila, and Mimbres drainages (NMDGF 2000). Breeds in the Upper Gila River in AZ (AGFD 2005). Listed by the National Audubon Society (2005) as occurring in the Gila-Cliff birding area.
Mountain Plover (<i>Charadrius montanus</i>)	S	S	This is a lowland grassland species and is not found in the mountains, in spite of its common name. Currently, the mountain plover is also attracted to man-made landscapes (e.g., sod farm, cultivated fields) that mimic the natural habitat associations, or sites with grassland characteristics (alkali flats, other agricultural lands). Nesting sites are dominated by short vegetation and bare ground, often with manure piles or rocks nearby (AGFD 2001, BISON 2004).	Likely: Migrates locally almost statewide. Summers in the eastern plains westward to the San Augustin Plains and Animas Mountains area, and southward to the Tularosa Basin. Current documented breeding: Cibola, Colfax, Harding, Lincoln, McKinley, Mora, Sandoval, San Juan, San Miguel, Socorro, Taos, and Union Counties; but breeding may occur statewide within appropriate habitat. Also known from Bernalillo, Catron, Chaves, De Baca, Guadalupe, Hidalgo, Luna, Otero, Quay, Santa Fe, Tarrant, and Valencia Counties (USFWS 2004).
Cactus Ferruginous Pygmy-Owl (<i>Glaucidium brasilianum cactorum</i>)	D	E	Sonoran riparian deciduous woodland within Arizona upland subdivision and Sonoran desertscrub (AGFD 2001).	Likely: Formerly fairly common in mesquite bosques throughout central southern Arizona. Have been found south of Tortolita Mts., west of Tortilla Mts., Rincon Mts., Pajarito Mts., Puerto Blanco Mts., Ajo Mts., Santa Catalina Mts., Santa Rita Mts., Tucson area, Gila River near Bonita Creek and San Francisco River, San Pedro River near Dudleyville, and Sonoyta Creek. The only recent records are from Organ Pipe Cactus National Monument, near Ajo, and suburban Tucson (AGFD 2001).
Common Ground-dove (<i>Columbina passerina pallescens</i>)	-	E	Typically found in agricultural and undeveloped areas at elevations below 1650 m (5410 ft), and occurring as individuals, pairs, or family groups. Nests are typically in a shrub or low tree, often within six feet of the ground (BISON 2004).	Likely: This dove is a very local, mainly warm-season (April-September) visitor to the southernmost part of the state, including presently at San Simon Cienega (Hidalgo Co.) and sparingly in the lowermost Rio Grande and Pecos valleys; it has also occurred irregularly northward to the lower Gila Valley and the Socorro area, and as a straggler elsewhere, e.g., Silver City, Belen, and Elk (Chaves Co.) (Hubbard 1985). New Mexico reports for the 10-year period 1990-1999 averaged less than 4-5 birds per year, and with no documentation of nesting (NMDGF 2000). Listed by National Audubon Society as breeding in Cliff-Gila Birding Area (2005). Listed as secure in AZ (NatureServe 2006).
Neotropic Cormorant (<i>Phalacrocorax brasilianus</i>)	S	T	In New Mexico, cormorants are generally found on larger bodies of water such as reservoirs, where they prey on fish (BISON 2004).	Potentially: It nests only in the middle Rio Grande Valley. Non-breeders wander north to Bernalillo, west to the Gila Valley and Hidalgo County, east to the Tularosa Basin and middle and lower Pecos Valley (NMDGF 2000), and, rarely, northeast to Colfax County.
Gila Woodpecker (<i>Melanerpes uropygialis uropygialis</i>)	S	T	Within New Mexico, Gila woodpeckers require well-developed broadleaf riparian woodlands characterized by mature cottonwoods (<i>Populus sp.</i>) and/or sycamores (<i>Platanus sp.</i>) (NMDGF 2000).	Likely: In New Mexico, Gila woodpeckers are resident only in the Gila Valley and in Guadalupe Canyon (NMDGF 2000). National Audubon Society (2005) shows that the species has been recorded numerously on Christas bird counts on the Gila River in Arizona.
Gray Vireo (<i>Vireo vicinior</i>)	S	T	In New Mexico, it is most often found in arid juniper (<i>Juniperus spp.</i>) woodlands on foothills and mesas, these sometimes associated with oaks (<i>Quercus sp.</i>) or piñons (<i>Pinus edulis</i>) and usually in habitat with a well-developed grass component (NMDGF 2000).	Likely: The gray vireo is a widespread species of the Four Corners states, southern California, and west Texas. It winters in Latin America (NMDGF 1994).

Table 1. Special Status Species that Potentially Occur in the Project Area Based on Preliminary Literature Review, continued

Common Name (<i>Scientific name</i>)	Status		General Habitat	Likelihood of Occurrence in Project Area
	FED	STATE		
Abert's Towhee (<i>Pipilo aberti aberti</i>)	S	T	Primarily inhabits riparian thickets and similar native habitats (NMDGF 2000). Can also be found in Sonoran Desert scrub; Chihuahuan Desert scrub; desert riparian deciduous woodlands, and marshes.	Likely: This is primarily a species of the lowlands of central and southwest Arizona and adjacent areas where it is a permanent resident along desert rivers and streams (Tweit and Finch 1994). It is found in New Mexico only in the Gila Valley and at San Simon Cienega, Grant and Hidalgo counties (NMDGF 2000).
Northern goshawk (<i>Accipiter gentilis</i>)	S	S	The northern goshawk nests in a variety of forested habitats including deciduous, coniferous, and mixed forests (AGFD 2003). In New Mexico, the small populations occur locally in the mountains and high mesas in generally mature, closed-canopy coniferous forests (BISON 2004).	Potentially: New Mexico and Arizona populations of the northern goshawk are typically associated with high montane areas above 1825 m (6000 ft; AGFD 2003). BISON (2004) and Zimmerman (1995) places the species in the Gila National Forest. Unpublished records from the Arizona HDMS (2003) locates the species as occurring in Greenlee county. The National Audubon Society (2005) places the species at the Gila-Cliff birding area.
Western burrowing owl (<i>Athene cunicularia hypugea</i>)	S	-	Generally inhabits open areas such as well-drained grasslands, deserts, prairies, steppes and agricultural lands. Often utilize abandoned burrows and thus associated with burrowing mammals (AGFD 2001).	Likely: Burrowing owls are found year round in New Mexico and breed at many various sites throughout the state. Populations exist in Grant, Catron, and Hidalgo counties (BISON 2004) and known to occur in southeastern AZ (AGFD 2001).
Mammals				
Mexican Gray Wolf (<i>Canis lupus baileyi</i>)	E	E	Mexican gray wolves were once found in shortgrass plains, sactan grassland, sycamore, cottonwood, rabbitbrush, chapparal, and oak savanna (Cook 1986).	Potentially: Currently there are approximately 50-60 free-ranging Mexican wolves within the recovery area. Three small groups of these wolves are in New Mexico. Mexican gray wolves have been present continuously in New Mexico since about 2000, when wolves dispersed to New Mexico naturally after being released in Arizona, and other wolves were translocated to remote sites in the Gila Wilderness (USFWS 2004). May occur in Greenlee Co., AZ (AGFD 2001).
Arizona Montane Vole (<i>Microtus montanus arizonensis</i>)	S	E	In New Mexico, this subspecies of the montane vole occurs in wet sedge and grass meadows bordering marshes and open water at elevations around 2100 m (6900 ft) (NMDGF 2000).	Likely: The known distribution of the Arizona subspecies, <i>Microtus montanus arizonensis</i> , is restricted to the White Mountains of eastern Arizona (Hoffmeister 1986, AGFD 2004) and adjacent portions of the Gila national Forest in New Mexico (Hubbard et al. 1983; Frey et al. 1995).
Spotted Bat (<i>Euderma maculatum</i>)	S	T	Frequently reported near cliffs over perennial water, but individuals range from low deserts to evergreen forests. These bats have been recorded in a wide variety of habitats, from riparian and piñon-juniper woodlands to ponderosa pine and spruce-fir forests May summer in forested areas and migrate through lower elevations at other seasons (BISON 2004).	Likely: The spotted bat is widely distributed across western North America, occurring locally from central California and southern British Columbia, and southward through the Big Bend region of Texas to central Mexico (Hall 1981, Fenton et al. 1987). Aural records exist for this species in eastern Arizona (AGFD 2003).
Allen's big-eared bat (<i>Idionycteris phyllotis</i>)	S	S	Primarily found in forested zones. Found at various elevations from the yellow pine zone down to riparian communities, but mostly associated with ponderosa pine forests and oak-piñon-juniper-pine transitional forests (Findley et al. 1975, BISON 2004). Generally netted feeding over streams and small ponds (Hoffmeister 1986).	Likely: Allen's big-eared bat is believed to be a common summer resident of Gila National Forest (BISON 2004). Known to occur throughout Arizona with the exception of extreme Southwest deserts (AGFD 2001).

Table 1. Special Status Species that Potentially Occur in the Project Area Based on Preliminary Literature Review, continued

Common Name (<i>Scientific name</i>)	Status		General Habitat	Likelihood of Occurrence in Project Area
	FED	STATE		
Western red bat (<i>Lasiurus blossevillii</i>)	S	S	Primarily associated with riparian habitats containing sycamore, cottonwood, and rabbitbrush (Cook 1986).	Likely: Western red bats are a rare summer resident of Gila National Forest. Various recordings of the species are found throughout New Mexico, but are very sporadic (BISON 2004). Found in riparian and wooded areas throughout Arizona (AGFD 2003).
Townsend's big-eared bat (<i>Corynorhinus townsendii</i>)	S	S	Townsend's big-eared bat occurs in a variety of xeric to mesic communities, but is typically associated with semidesert shrublands, piñon-juniper woodlands, and open montane forests, especially ones with rock outcropping or caves suitable for refuge (BISON 2004).	Likely: Townsend's big-eared bat is believed to be a common permanent resident in Gila National Forest (BISON 2004). Known to occur throughout Arizona in a variety of habitats ranging from desert scrublands to coniferous forests (AGFD 2003).
Yellow-nosed cotton rat (<i>Sigmodon ochrognathus</i>)	S	-	In New Mexico, occurs from upper grasslands to pine-oak forest. Sometimes associated with piñon-juniper communities. <i>Sigmodon ochrognathus</i> seems most common in hillside stands of bunch grass, Yucca, Agave, prickly pear cactus, Dasylirion, oaks, leguminous shrubs, and the like. Soil is often very rocky in places of noted populations (BISON 2004).	Potentially: Has been noted in New Mexico as occurring in the Animas Range and in Guadalupe Canyon in Hidalgo county. (BISON 2004) Montgomery et al. (1985) trapped an individual in the vicinity of Rough Canyon in the Middle Box area. Known to occur in southeastern Arizona in semidesert grasslands and oak woodlands (AGFD 2003).
Reptiles & Amphibians				
Chiricahua Leopard Frog (<i>Rana chiricahuensis</i>)	T	S	Known as existing in cienegas (mid-elevation wetland communities surrounded by arid environments), pools, livestock tanks, lakes reservoirs and lotic environments at elevations of 1000 to 2710 m (3280 to 8890 ft) (67 FR 40789).	Likely: They are found in the Gila, San Francisco, Tularosa, and Blue Rivers; the Gila National Forest, Patterson Lake and the Guadalupe and Animas mountains. They are also found on the Apache Reservation, and in the Black Range in Sierra County (Fritts et al. 1984, AGFD 2001).
Lowland Leopard Frog (<i>Rana Yavapaiensis</i>)	S	E	A frog of permanent to semi-permanent streams and ponds; most populations inhabit small streams and rivers, springs, and associated pools in low desert scrub localities (NMDGF 2000).	Likely: This frog is restricted to the extreme southwest, where it is known from 14 localities in Catron, Grant, and Hidalgo counties – including the vicinity of Frisco Hot Springs (Catron Co.), the Gila River between Redrock (Grant Co.) and Virden (Hidalgo Co.), and in the Peloncillo Mountains in Pine and Guadalupe canyons (Hidalgo Co.), which are presumed key habitat for this species in New Mexico (NMDGF 1988). This species occurs in southeastern Arizona (AGFD 2001).
Mexican Garter Snake (<i>Thamnophis eques megalops</i>)	S	E	Varied Habitats including woodlands of pines (<i>Pinus</i> spp.) and oaks (<i>Quercus</i> spp.), grasslands with mesquites (<i>Prosopis</i> spp.), and low to mid (1300-1800m; 4265-5905 ft) elevational watercourses in which cottonwoods (<i>Populus</i> spp.), willows (<i>Salix</i> spp.), and other riparian plants are found. Whatever the terrestrial habitats may be in an area of occurrence, the Mexican garter snake is typically an aquatic species frequenting streams generally characterized by shallow, slow-moving, and at least partially vegetated bodies of water (BISON 2004).	Likely: This species is known only from the lower Gila basin, with occurrences documented along Duck and Mule creeks in Grant Co. and near Virden in Hidalgo Co. (Hubbard and Eley 1985). Known to occur in southeastern Arizona in riparian areas (AGFD 2001).

Table 1. Special Status Species that Potentially Occur in the Project Area Based on Preliminary Literature Review, continued

Common Name (<i>Scientific name</i>)	Status		General Habitat	Likelihood of Occurrence in Project Area
	FED	STATE		
Reticulate Gila Monster (<i>Heloderma suspectum suspectum</i>)	-	E	Widely distributed in desert and mesquite-grassland, but also occurs in pine-oak forest, tropical deciduous forest, and thorn forest. It is usually found in rocky foothill regions. It is peripheral in New Mexico, reaching the eastern edge of its range in the southwest part of the state (BISON 2004).	Likely: The Reticulate Gila Monster is common only at Redrock Wildlife Area in Grant County (Beck 1994) and at Granite Gap in Hidalgo County in New Mexico.
Narrowhead Garter Snake (<i>Thamnophis rufipunctatus rufipunctatus</i>)	S	T	A rather habitat specific species, the narrowhead garter snake is generally found only near the shallow, swift-flowing, rocky streams and rivers of the Gila and San Francisco river drainages (NMDGF 2000). Known as a highly aquatic species often associated with montane regions (BISON 2004).	Likely: In New Mexico, <i>Thamnophis rufipunctatus</i> is confined to Catron, Grant, and Hidalgo counties where it reaches the eastern edge of its distribution. It is a habitat specialist, occurring only in shallow, swift-flowing, rocky rivers and streams of the San Francisco and Gila River drainages (Fitzgerald 1986, Degenhardt et al. 1996). In Arizona, this species occurs throughout the central and eastern portions of the state (AGFD 2002).
Invertebrates				
Gila springsnail (<i>Pyrgulopsis gilae</i>)	C	T	Major habitat is a cool spring and its brook, but a few of the animals have also been found in a nearby thermal spring, occurring in association with the New Mexico hot springsnail. The Gila springsnail occurs in mud, debris, and vegetation (BISON 2004).	Potentially: The Gila springsnail is endemic to the Gila River Basin, Gila Wilderness, Grant County. Thirteen populations are known. Ten disjunct populations are associated with a series of springs along the East Fork, Middle Fork, and mainstem of the Gila River in the Gila National Forest in Grant County, New Mexico (70 FR 24869; Taylor 1983, 1987).
New Mexico Hot Springsnail (<i>Pyrgulopsis thermalis</i>)	C	T	Warm springs with temperatures between 33-35 C (91.4-95 F), occasionally up to 38 C (100 F). Major substrate occupied are areas of steep or even vertical rock, covered with thin sheets of water. Also inhabited are minor spring flows on algal film and crusts of lime-depositing algae. The species possibly also occurs in dense grasses and sedges bordering the springs (BISON 2004).	Potentially: This endemic springsnail is restricted to a series of thermal springs along the East Fork Gila River, and an isolated thermal spring (Alum Hot Spring) on the mainstem below the confluence of the East and West forks, Gila River, Gila Wilderness, Grant County (Taylor 1983, 1987; NMDGF 1988; Mehlhop 1993).
Desert viceroy butterfly (<i>Basilarchia archippus obsoleta</i>)	S	-	Willow stands associated with riparian areas are thought to be key habitat. Also associated with desert grassland and scrub communities. Host is genus <i>Salix</i> (willow) (AGFD 2001).	Potentially: Thought to be present in most of southern New Mexico (AGFD 2001).
Plants				
Parish's alkali grass (<i>Puccinellia parishii</i>)	S	E	Alkaline springs, seeps, and seasonally wet areas that occur at the heads of drainages or on gentle slopes at 800-2200 m (2600-7200 ft) range-wide. The species requires continuously damp soils during its late winter to spring growing period. It frequently grows with <i>Distichlis stricta</i> (salt grass), <i>Sporobolus airoides</i> (alkali sacaton), <i>Carex</i> spp. (sedges), <i>Scirpus</i> spp. (bulrushes), <i>Juncus</i> spp. (rushes), <i>Eleocharis</i> spp. (spike rushes), and <i>Anemopsis californica</i> (yerba mansa) (NMRPTC 1999).	Likely: New Mexico, Catron, Cibola, Grant, Hidalgo, McKinley, Sandoval, and San Juan counties; California, Arizona, and Colorado (NMRPTC 1999).

Table 1. Special Status Species that Potentially Occur in the Project Area Based on Preliminary Literature Review, continued

Common Name (<i>Scientific name</i>)	Status		General Habitat	Likelihood of Occurrence in Project Area
	FED	STATE		
Gila brickellbush (<i>Brickellia chenopodina</i>)	S	S	Restricted to alluvial soils along the Gila River. Found near elevations of 1370 m (4500 ft). Although a questionable taxon, it should be retained until more information is available (NMRPTC 1999).	Likely: New Mexico, Grant County, Gila River Valley (NMRPTC 1999).
Metcalfe's ticktrefoil (<i>Desmodium metcalfei</i>)	S	S	Rocky slopes, canyons, and ditches in grasslands and oak/piñon-juniper woodlands. Elevations of 1310-2000 m (4000-6500 ft) (NMRPTC 1999).	Likely: New Mexico, Grant and Sierra counties; Arizona, Cochise, Gila, Pinal, and Santa Cruz counties; and probably adjacent Mexico (NMRPTC 1999).
Mogollon whitlowgrass (<i>Draba mogollonica</i>)	S	S	Cool, moist northern slopes of mountains, ravines and canyons on volcanic rocks and soil in montane forests; 1500-2900 m (5000-9000 ft) (NMRPTC 1999).	Likely: New Mexico, Catron, Grant, Sierra, and Socorro counties (NMRPTC 1999).
Rock fleabane (<i>Erigeron scopulinus</i>)	S	S	Crevices in cliff faces of rhyolitic rock in lower montane coniferous forest; 1800-2800 m (6000-9000 ft). Populations of this species are sporadic and disjunct, but can be locally very abundant (NMRPTC 1999).	Likely: New Mexico, southern Catron, northwestern Sierra, western Socorro counties, Black Range, Mogollon and San Mateo mountains; adjacent Arizona, Chiricahua Mountains (NMRPTC 1999).
Maguire's beardtongue (<i>Penstemon linarioides</i> ssp. <i>Maguirei</i>)	S	S	Limestone cliffs in piñon-juniper woodland; 1830-1980 m (6000-6500 ft). The plant has not been seen in New Mexico for over 100 years, but it may still exist in the canyons of the Gila River (NMRPTC 1999).	Likely: New Mexico, Grant County; Arizona, Greenlee County; in and near the Gila River valley in both states (NMRPTC 1999).
Piños Altos fame flower (<i>Talinum humile</i>)	S	S	Shallow, gravelly, usually clayey soils overlying rhyolite, usually on rock benches in sloping terrain, but also in soil pockets overlying rock in nearly level areas; Madrean grassland, oak woodland, or piñon-juniper woodland, often with <i>Nolina microcarpa</i> and <i>Agave parryii</i> (NMRPTC 1999).	Likely: New Mexico, Grant and Hidalgo counties; Arizona, Cochise County; Mexico, western Chihuahua and northeastern Sonora (NMRPTC 1999). A transplanted population occurs in Santa Cruz Co, AZ (AGFD 2004).
Goodding's bladderpod (<i>Physaria gooddingii</i>)	S	S	Open areas in piñon-juniper woodland and ponderosa pine forest; 1800-2300 m (6000-7500 ft) (NMRPTC 1999).	Likely: This plant is found in several of the mountain ranges that compose the Gila massif (NMRPTC 1999).
Davidson's cliff carrot (<i>Pteryxia davidsonii</i>)	S	S	Cool, rocky places in piñon-juniper woodland and lower montane coniferous forest; 1980-2440 m (6500-8000 ft) (NMRPTC 1999).	Likely: New Mexico, Catron and Grant counties, Mogollon Mountains and Piños Altos Range; adjacent eastern Arizona (NMRPTC 1999). Occurs near Clifton, AZ in Greenlee Co (AGFD 2004).
Grayish-white giant hyssop (<i>Agastache cana</i>)	S	S	Crevices and bases of granite cliffs or in canyons with small-leaved oaks at the upper edge of the desert and lower edge of the piñon-juniper zone, at 1400-1800 m (4600-5900 ft) (NMRPTC 1999).	Potentially: New Mexico, Doña Ana, Grant, Luna, and Sierra counties; Texas, El Paso and Hudspeth counties. Regional endemic (NMRPTC 1999). This plant grows in canyons and may be present in the project area.

Notes:

Threatened (T), Endangered (E), Species of Concern (fed) or Sensitive Species (state) (S), Candidate (C), Proposed (P) and (D) Delisted Plant and Wildlife Species Listed by any State or Federal Agency and Known to Occur in Hidalgo, Catron and Grant Counties, New Mexico and in the upper Gila-Mangas drainage in Arizona.

Table 2. Special Status Species Not Likely to Occur in the Project Area				
Common Name (Scientific name)	Status		General Habitat	Likelihood of Occurrence in Project Area
	FED	STATE		
Fish				
Gila Topminnow (<i>Poeciliopsis occidentalis occidentalis</i>)	E	T	Typically inhabits lower-elevation (below 1500 m; 4920 ft) springs, streams, and the margins of larger bodies of water. Prefers areas containing emergent or aquatic vegetation. Expatriated in NM except for re-introduced population in the Red Rock Wildlife Area (BISON 2004).	Not Likely: Topminnow were eliminated from the Gila River in New Mexico during the 1950s. In 1989, Gila topminnow was stocked in a pond on the New Mexico Department of Game and Fish Red Rock Wildlife Management Area (BISON 2004). Not found in Greenlee Co. in Gila River above confluence with San Francisco, AZ (NatureServe 2006).
Chihuahua Chub (<i>Gila nigriceps</i>)	T	E	Occurs in the U.S. only in the Mimbres basin of New Mexico, where it is reduced to fewer than 100 adult fish occupying a reach of about 7.5 km of the Mimbres River. Typically found in deep pools containing suitable cover (i.e. woody debris, undercut banks) (BISON 2004).	Not Likely: The Chihuahua chub is native to the Mimbres, Guzmán, and Bustillos basins of southwest New Mexico and northwest Chihuahua (Smith and Miller 1986). Not found in AZ (BISON 2004).
Apache Trout (<i>Oncorhynchus apache</i>)	T	T	Apache trout occur in small, cold, high-gradient streams flowing through conifer forests with substrates consisting of boulders, rocks, gravel, and sand (AGFD 2001, Behnke 1992).	Not Likely: AGFD (2001) does not place the Apache trout as occurring in the Gila River. However, the species historically may have occupied headwaters of the San Francisco River.
Beautiful shiner (<i>Cyprinella Formosa</i>)	T	S	Mainly occurs in pools of small to medium sized streams. Typically associated with sand, gravel, and rocky bottoms (AGFD 2001).	Not Likely: Historical range included the Rios Yaqui, Casas Grandes, Santa Maria and Santa Clara drainages in Sonora and Chihuahua, Mexico, the Rio Yaqui in Arizona, and the Mimbres River in New Mexico. Extirpated from the United States in 1968. Populations were reintroduced into San Bernardino National Wildlife Refuge in 1990 and still existed there in 1994. Critical habitat has been determined (49 FR 34490).
Birds				
Interior Least Tern (<i>Sterna antillarum athalassos</i>)	E	E	Least terns are colonial nesters that prefer a flat, sandy substrate essentially devoid of vegetation on which they place their nest scrapes. Sandbars are used in rivers, as are beaches and spits in coastal areas (BISON 2004).	Not Likely: In New Mexico, this summer resident nests only at or near Bitter Lake N.W.R. (Hubbard 1978); it occurs as a regular migrant in Eddy County and as an occasional visitor in other wetlands in at least 15 additional New Mexico counties (NMDGF 2000). Not found in AZ (NatureServe 2006).
Whooping Crane (<i>Grus Americana</i>)	E	E	Also known to inhabit marshes, river bottoms, potholes, prairies, and croplands. USFWS critical habitat has been designated (43 FR 20938), but does not exist in New Mexico (NMDGF 2000).	Not Likely: In New Mexico, whooping cranes winter in the same habitats as their foster-parent sandhill cranes (NMDGF 2000). Both species of cranes roost together, typically on sand bars in the Rio Grande (43 FR 20938). Not found in AZ (NatureServe 2006).
Aplomado Falcon (<i>Falco femoralis septentrionalis</i>)	E	E	Typically associated with open grasslands with interspersed yucca, cactus, and mesquite (BISON 2004).	Not Likely: This grassland raptor occurs from the southwestern United States south to southern South America (NMDGF 2000). The historic range in New Mexico included desert grasslands across the southern one-third of the state, and north in the central region to Socorro County (BISON 2004). Possibly extirpated in AZ (NatureServe 2006).

Common Name (<i>Scientific name</i>)	Status		General Habitat	Likelihood of Occurrence in Project Area
	FED	STATE		
Mexican Spotted Owl (<i>Strix occidentalis lucida</i>)	T	S	Habitat characteristics highly sought by Mexican spotted owls include high canopy closure, high stand density, a multi-layered canopy, uneven-aged stands, numerous snags, and downed woody matter. These are best expressed in old-growth mixed-conifer forests (usually more than 200 years old). These characteristics may also develop in younger stands that are unmanaged or minimally managed, especially when the stands contain remnant large trees or patches of large trees from earlier stands. USFWS critical habitat has been designated (69 FR 53181).	Not Likely: In New Mexico, the Mexican Spotted Owl has been recorded in all montane regions from the San Juan, Jemez, and Sangre de Cristo mountains in the north, to the Guadalupe and Animas mountains in the south. The largest concentration of Mexican Spotted Owls in New Mexico occurs in the Mogollon and Sacramento Mountain ranges. Records for lowland occurrences exist for: Navajo Lake, Mountainair, Lower San Francisco Valley, Estancia, Grants, Hurley, Burro Mts., Carlsbad Caverns National Park and San Andres NWR. These records probably represent dispersing individuals (69 FR 53181).
Baird's Sparrow (<i>Ammodramus bairdii</i>)	S	T	Shortgrass prairies with scattered low bushes and matted vegetation. In migration and winter, found in desert and open grasslands, and overgrown fields (AGFD 2001).	Not Likely: Baird's sparrows are migrants or vagrants. It is possible that they are winter residents in Gray Ranch, Hidalgo county, New Mexico. They occur in grasslands (expansive open areas mostly in the SW area) (Black 1997). Not found in Greenlee County, AZ (NatureServe 2006).
Arctic peregrine falcon (<i>Falco peregrinus tundrius</i>)	S	T	Associated with Douglas fir, Hemlock-Sitka spruce, redwood, ponderosa pine, larch/white pine, lodgepole pine, fir-spruce, aspen (hardwoods), chaparral, and piñon-juniper forest types. Winter at coastlines and in mountains (BISON 2004).	Not likely: The subspecies <i>F.p. tundrius</i> has only been noted in New Mexico at the White Sands Missile Range, Holloman Air Force Base, and in the Roswell area. (BISON 2004). Not found in Greenlee County, AZ (NatureServe 2006).
Gould's Wild Turkey (<i>Meleagris gallopavo mexicana</i>)	S	T	In New Mexico, this subspecies is known only from mountainous areas in which live-oaks (<i>Quercus spp.</i>) predominate, and acorns from these trees are consumed as food by the birds (BISON 2004).	Not Likely: The species occurs widely in North America; however, the subspecies <i>mexicana</i> , of Mexico's Sierra Madre, occurs naturally in the United States only in the Animas and Peloncillo ranges and the intervening Animas Valley of Hidalgo County, New Mexico (Ridgway and Friedmann 1946). Not found in Greenlee County, AZ (NatureServe 2006).
Whiskered Screech Owl (<i>Otus trichopsis asperus</i>)	S	T	Generally found in dense, montane woodlands. Prefers pine-oak woodlands where it forages among the branches and leaves of oaks (BISON 2004).	Not Likely: Beginning in 1990, a small population has been documented by NMDGF surveys in Hidalgo County, with up to eight pairs occupying four canyons in the Peloncillo Mountains (Williams 1996); more recently (1991, 1995), individuals have been reported from at least two sites in the Animas Mountains. (NMDGF 1996). Listed as secure in AZ (NatureServe 2006).
Northern gray hawk (<i>Buteo nitidus maximus</i>)	S	-	In New Mexico, associated with woodlands, especially of cottonwoods, and riparian areas where streams and rivers provide enough moisture for vegetative communities (BISON 2004).	Not Likely: Northern gray hawks occasionally breed/summer in southwestern United States, but are considered local and very rare. In New Mexico, breeding pairs are rarely found and are scattered in occurrence (BISON 2004). Not found in Greenlee County, AZ (NatureServe 2006).
Elegant Trogon (<i>Trogon elegans canescens</i>)	-	E	Typically inhabits riparian areas in montane canyons. (Hall and Karubian 1996, NMDGF 2000).	Not Likely: This primarily Mexican species reaches the northern limit of its range in southeastern Arizona and southwestern New Mexico (AOU 1998), where it is a rare summer resident of riparian habitats in montane canyons (Hall and Karubian 1996). Found in Grant, Hidalgo, and Catron Counties NM, and in the Upper Gila watershed within Santa Cruz County, AZ (NatureServe 2006).

Table 2. Special Status Species Not Likely to Occur in the Project Area, continued

Common Name (<i>Scientific name</i>)	Status		General Habitat	Likelihood of Occurrence in Project Area
	FED	STATE		
Northern Beardless Tyrannulet (<i>Camptostoma imberbe ridgwayi</i>)	-	E	Typically occurs at lower elevations in dense stands of mesquite (<i>Prosopis</i> spp.) and associated growth, typically along stream courses (Philips et al. 1964, NMDGF 2000).	Not Likely: This neotropical flycatcher occurs from Costa Rica north through Mexico; it reaches its northernmost limits in southeastern Arizona and southwestern New Mexico, where in New Mexico it summers regularly only in Guadalupe Canyon, Hidalgo County (AOU 1998). Not found in Greenlee County, AZ (NatureServe 2006).
Thick-billed Kingbird (<i>Tyrannus crassirostris</i>)	-	E	In New Mexico, the species requires broadleaf (cottonwood, <i>Populus</i> sp.; sycamore, <i>Platanus</i> sp.) riparian habitats (NMDGF 2000).	Not Likely: Migrant Thick-billed kingbirds summer in Guadalupe Valley, Hidalgo County, NM (Hubbard 1978). Not found in Greenlee County, AZ (NatureServe 2006).
Buff-collared Nightjar (<i>Caprimulgus ridgwayi ridgwayi</i>)	-	E	A primarily nocturnal species that has been reported only in areas that support rather arid shrublands and woodlands, generally in canyons and washes (BISON 2004).	Not Likely: The species was first discovered in the United States in Guadalupe Canyon, Hidalgo County (Johnston and Hardy 1959), but it has not been reported from there since 1985; surveys for listed species there 1987-2003 failed to detect this species. There has been but one report of the species in the state since 1985, an unconfirmed occurrence of one heard at Redrock, Grant County on May 30 th , 1999 (Williams 1999). Not found in Greenlee County, AZ (NatureServe 2006).
Arizona Grasshopper Sparrow (<i>Ammodramus savannarum ammolegus</i>)	-	T	In New Mexico, limited to grasslands generally lacking woody vegetation (Williams 1991).	Not Likely: The known range in New Mexico is limited to well-developed grasslands (generally lacking woody vegetation) in the southern Animas and western Playas valleys (Williams 1991). Found in Coronado and Apache-Sitgraves National Forests in AZ (BISON 2004).
Yellow-eyed Junco (<i>Junco phaeonotus palliates</i>)	-	T	Forests and adjacent pine-oak woodland. In winter some birds may move downslope or rarely to adjacent highlands (BISON 2004).	Not Likely: Historically known to be resident in New Mexico only in the Animas Mountains, Hidalgo County, where it is largely confined, at least in the nesting season, to the limited coniferous forest there. The species undertakes altitudinal migration in Arizona (Moore 1972) and presumably in New Mexico, which may explain the occasional winter sightings in the nearby Peloncillo and Big Hatchet mountains (NMDGF 2000). Largely confined to coniferous forests in the Chiricahua mountains of AZ (BISON 2004).
Varied Bunting (<i>Passerina versicolor</i>)	-	T	In New Mexico, this species seems to prefer dense stands of mesquite (<i>Prosopis</i> spp.) and associated growth in canyon bottoms (BISON 2004).	Not Likely: In New Mexico, it summers regularly in small numbers in Hidalgo and Eddy counties, where it prefers dense, shrubby vegetation associated with relatively arid canyons (NMDGF 2000). Not found in Greenlee County, AZ (NatureServe 2006).
Broad-billed Hummingbird (<i>Cynanthus latirostris magicus</i>)	-	T	In the United States this species is found primarily in riparian woodlands at low to moderate elevations. A regular summer resident in Guadalupe Canyon (AZ and NM) (NMDGF 2004).	Not Likely: In New Mexico, the species is a regular summer resident only in Guadalupe Canyon (NMDGF 1994). Rarely occurs in Greenlee County, AZ (NatureServe 2006).
White-eared Hummingbird (<i>Hylocharis leucotis borealis</i>)	-	T	White-eared hummingbirds are often found in the pine and pine-oak zones and also inhabit evergreens and riparian woodlands at middle elevations (1525-2290m; 5000-7510 ft). The white-eared hummingbird prefers generally moist montane canyons (NMDGF 2000).	Not Likely: This species has been found in Bear and Indian canyons in the Animas Mts. (Hidalgo Co.), which is presumably a key habitat area (Hubbard 1985). The regularity of occurrence in the state needs further study, as does the question as to whether the species breeds there. There are also unconfirmed reports to the west of the Animas Mts. In the Peloncillo Mts. (NMDGF 1988). Vagrant in AZ (NatureServe 2006).

Common Name (<i>Scientific name</i>)	Status		General Habitat	Likelihood of Occurrence in Project Area
	FED	STATE		
Violet-crowned Hummingbird (<i>Amazilia violiceps ellioti</i>)	-	T	In New Mexico, the violet-crowned hummingbird seeks only well-developed riparian areas of the Guadalupe Canyon in summer (NMDGF 2000).	Not Likely: It summers regularly only in mature, well-developed riparian areas of Guadalupe Canyon, where it nests exclusively in sycamores (Zimmerman and Levy 1960, Baltosser 1989, Williams 2002). Vagrant in AZ (NatureServe 2006).
Lucifer Hummingbird (<i>Calothorax lucifer</i>)	-	T	Habitat use by this species over much of its range seems to center on slopes and adjacent canyons in arid montane areas, especially where there are flowering species such as agaves (<i>Agave</i> spp.), ocotillo (<i>Fouquieria splendens</i>), and other chaparral-type plants. In New Mexico, habitat use is similar, except for occasional birds that occur in more desert-like areas of Guadalupe Canyon, where the species is rare. Nests are located in shrubs, including small cacti, typically near the ground (BISON 2004).	Not Likely: A migratory species, it prefers rugged canyons and slopes in dry mountain ranges, and New Mexico's Peloncillo Mountains appear to be one of its more important areas of occurrence. First detected in New Mexico in 1977 (Baltosser 1989), the species was found to be regular in Post Office Canyon near Rodeo during the 1980s and in Skeleton Canyon during the 1990s (NMDGF 2000). Breeds in Cochise Co. and vagrant further north in AZ (NatureServe 2006).
Costa's Hummingbird (<i>Calypte costae</i>)	-	T	Occurs in a variety of habitats during the non-breeding season; however, it usually breeds in arid habitats, plus occasionally in adjacent agricultural areas (BISON 2004).	Not Likely: They are most regular in Guadalupe Canyon and are considered rare and very local (Hubbard 1978). Secure in Arizona (NatureServe 2006).
Mammals				
Mexican Long-nosed Bat (<i>Leptonycteris nivalis</i>)	E	E	In New Mexico, Mexican long-nosed bats inhabit upper desert scrub – pine oak woodlands in or near mountainous areas. Characteristic vegetation in these areas includes agaves (<i>Agave</i> spp.), junipers (<i>Juniperus</i> spp.), oaks (<i>Quercus</i> spp.), and Mexican piñon (<i>Pinus cembroides</i>) (BISON 2004).	Not Likely: The only confirmed locations of this species are the Animas Mountains in southern Hidalgo County, NM (NMDGF 1996). Found in Pinal Co., AZ (NatureServe 2006).
Black-footed Ferret (<i>Mustela nigripes</i>)	E	E	Occurs mainly in mixed shrub habitat type (BISON 2004). Closely associated with the prairie dog whose burrows provide excellent retreats for ferrets. The dependency of the black-footed ferret on this food item is so great that reduction in numbers of ferrets is directly related to reduction in prairie dogs. This species is apparently extirpated in New Mexico, having been last confirmed there in 1934 (Hoffmeister 1986).	Not Likely: Historically, the mammal's range included all or portions of the States of Colorado, Arizona, Utah, New Mexico, Kansas, Montana, Nebraska, Oklahoma, Texas, Wyoming, North Dakota, South Dakota, and the Provinces of Alberta and Saskatchewan, Canada. Presently, New Mexico has had no verified sighting since around 1960. It may still exist in McKinley, Rio Arriba, and San Juan Counties, New Mexico. The best possibility in New Mexico appears to be in this "four-corners" area. (USFWS 2004). Arizona populations are limited to Coconino and Navajo Counties (NatureServe 2006).
Southern Long-nosed Bat (<i>Leptonycteris curasoae yerbabuena</i>)	E	T	They are found in shortgrass plains, sactan grassland, sycamore, cottonwood, rabbitbrush, and oak savanna. Long-nosed bats are well-known pollinators of agave, as well as saguaro, organpipe and cardon cacti. These bats are found primarily in desert scrub habitat in their range within the U.S (BISON 2004).	Not Likely: In New Mexico, this species has been found in the Animas Mountains and Peloncillo Mountains in Hidalgo County (Findley et al. 1975, Baltosser 1980, Hoyt et al. 1994). Not found in Greenlee Co, AZ (BISON 2004).
Jaguar (<i>Panthera onca arizonensis</i>)	E	S	Known from a variety of habitats. However, they show a high affinity to lowland wet habitats, typically swampy savannas or tropical rain forests. However, they also occur, or once did, in upland habitats in warmer regions of North and South America (62 FR 39147). Recent sightings of this species in the Peloncillo Mountains of New Mexico (BISON 2004).	Not Likely: In New Mexico, a recent sighting of a jaguar occurred in the Peloncillo Mountains on March 7, 1996 (BISON 2004). The Fish and Wildlife Service continues to recognize that the jaguar continues to occur in the American Southwest, at least as an occasional wanderer from Mexico (USFWS 2004). Confirmed reports not present in Greenlee Co. AZ (BISON 2004).

Common Name (<i>Scientific name</i>)	Status		General Habitat	Likelihood of Occurrence in Project Area
	FED	STATE		
Desert Bighorn Sheep (<i>Ovis canadensis mexicana</i>)	S	E	Desert bighorn sheep occur in arid, rocky mountains, mainly in open habitats. Their habitats include areas with high degrees of visibility and include steep, rocky, and broken terrain with large rock outcrops and escarpments variously dissected by drainages (NMDGF 2000).	Not Likely: Currently, free-ranging desert bighorn sheep are found in the following mountain ranges in New Mexico: Peloncillo, Hatchet (Big and Little Hatchet Mountains), San Andres, Fra Cristobal, and Ladron (NMDGF 2004). Populations in AZ are hunted (AGFD 2006).
Arizona Shrew (<i>Sorex arizonae</i>)	S	E	Known habitat for this species in New Mexico is relatively mesic, the most common trees being Douglas-fir (<i>Pseudotsuga menziesii</i>), quaking aspen (<i>Populus tremuloides</i>), and netleaf oak (<i>Quercus rugosa</i>)(NMDGF 2000).	Not Likely: In New Mexico, the species only occurs in the Animas Mountains (Conway and Schmitt 1978, Cook 1986). Limited to the Chiricahua Mountains in AZ (NatureServe 2006).
White-sided Jack Rabbit (<i>Lepus callotis gaillardi</i>)	S	T	Dependent on well-developed grasslands that have low shrub density and level terrain (BISON 2004).	Not Likely: This species is found only in the Animas Valley and very limited parts of the Playas Valley in southern Hidalgo County (Findley et al. 1975, Bednarz 1977, Bednarz and Cook 1984). Occurrence not confirmed in AZ (BISON 2004).
Black-tailed prairie dog (<i>Cynomys ludovicianus</i>)	S	S	Found in open plains and desert grasslands with little or no vegetation. Typically utilize fine to medium textured soils. Often associated with silty clay and sandy clay loams (AGFD 2004).	Not Likely: Species is associated with prairies and open grasslands. No noted occurrences in the Gila and San Francisco drainages. (BISON 2004). Presumed extirpated in AZ (NatureServe 2006; AGFD 2004).
Mexican long-tongued bat (<i>Choenycteris mexicana</i>)	S	S	Primarily found in areas of canyons and shallow caves suitable for refuge, but specimens are often found roosting in well-lighted areas. Specimens collected in Hidalgo County were associated with piñon, juniper, oak, manzanita, and in canyon bottoms with sycamore (Findley et al. 1975, BISON 2004).	Not Likely: Specimens have rarely been noted in New Mexico, but have been recorded in Coronado National Forest, Skeleton Canyon in the Peloncillo Mountains, and Guadalupe Mountains in Hidalgo County. (BISON 2004). Not found in Greenlee Co., AZ (AGFD 2003).
Western Yellow Bat (<i>Lasiurus xanthinus</i>)	-	T	They are found in sycamore, rabbitbrush, and cottonwood riparian habitats (BISON 2004).	Not Likely: In New Mexico, the Western yellow bat is known only from Guadalupe Canyon and the Animas Mountains in southern Hidalgo County (Mumford and Zimmerman 1963, Findley et al. 1975, Baltosser 1980, Cook 1981). In AZ, this species has not been documented in Greenlee County (AGFD 2003).
Southern Pocket Gopher (<i>Thomomys umbrinus emotus</i>)	-	T	Found in rabbitbrush riparian, oak savanna, oak woodland, piñon-juniper, chaparral, and coniferous forest (BISON 2004).	Not Likely: The distribution of the Southern pocket gopher is restricted to a few mountain ranges in southeast Arizona and in higher elevations within the Animas Mountains in New Mexico (Findley et al. 1975; Hinesley and Thaeler 1977, Cook 1982, Hoffmeister 1986).
Reptiles & Amphibians				
New Mexico Ridgenose Rattlesnake (<i>Crotalus willardi obscurus</i>)	T	E	Animas Mountains of New Mexico at elevations of 2025-2515 m. It occupies habitats dominated by oaks (<i>Quercus</i> spp.), extending up locally into ones featuring Douglas-fir (<i>Pseudotsuga menziesii</i>) and other forest (NMDGF 2000). It largely confines itself to canyon bottoms and other sites in which leaf and other litter accumulates, concealing its coloration and allowing it to blend in among the browns, buffs, and grays of the environment (BISON 2004). USFWS Critical Habitat has been designated (43 FR 34476).	Not Likely: Historically, it was limited to areas in northern Mexico and extreme southwestern New Mexico. Presently, in New Mexico, it is found in the Animas and Peloncillo mountains, Hidalgo County, New Mexico (NMDGF 2000). Only known from the Peloncillo Mtns in AZ (AGFD 2001).

Common Name (<i>Scientific name</i>)	Status		General Habitat	Likelihood of Occurrence in Project Area
	FED	STATE		
Gray-checked Whiptail (<i>Aspidoscelis dixonii</i>)	S	E	Found near an elevation of 1300m (4265 ft), the New Mexico populations are typically associated with desert grasslands and the like (BISON 2004).	Not Likely: Known from only two areas; a small area in Trans-Pecos Texas and in the vicinity of Antelope Pass in Hidalgo County, New Mexico (Scudday 1973). This species has no documented occurrence in AZ (BISON 2004).
Bunch Grass Lizard (<i>Sceloporus slevini</i>)	-	T	Occur in areas of dense bunch grass, usually on hillsides within the Ponderosa pine zone and usually in montane areas (BISON 2004).	Not Likely: It is known only from extreme southwest Hidalgo County in the grasslands and adjacent foothills in the southern end of the Animas Valley at elevations of 1555-1615m (5100-5300ft) (Degenhardt et al. 1996). This species is limited to mountainous regions in southeastern AZ (AGFD 2003).
Giant Spotted Whiptail (<i>Aspidoscelis burti</i>)	-	T	In New Mexico, associated with canyon and arroyo habitats, in and near mountains, mesas, and foothills to an elevation of 1370m (4495ft) where such plants as Arizona white oak (<i>Quercus arizonica</i>), netleaf hackberry (<i>Celtis reticulata</i>), Arizona sycamore (<i>Platanus wrightii</i>), and mesquite (<i>Prosopis glandulosa</i>) are present (BISON 2004).	Not Likely: In New Mexico, it occurs only in Guadalupe Canyon in southwest Hidalgo County where it is common in its limited habitat at 1320-1378m (4330-4520ft) (Degenhardt et al. 1996). This species is limited to mountainous areas in Cochise and Pinal Counties, AZ (AGFD 2001).
Mountain Skink (<i>Eumeces callicephalus</i>)	-	T	Occurs in riparian habitats in the southern Peloncillo Mountains of southwest Hidalgo County. It is known only from Geronimo Trail and Guadalupe Canyon, where it is most active during May and early June (BISON 2004).	Not Likely: In New Mexico, <i>Eumeces callicephalus</i> occurs only in the southern Peloncillo Mountains of southwest Hidalgo County (Degenhardt et al. 1996). This species is not known to occur in Greenlee Co. AZ (NatureServe 2006).
Green Rat Snake (<i>Senticolis triaspis intermedia</i>)	-	T	The species reaches the eastern edge of its range in New Mexico. Primarily a montane species, occurring at elevations from 1225m (4020ft) to over 2140m (7020ft) in association with rocky canyon bottoms near streams or in areas having intermittent water (BISON 2004).	Not likely: Photographs and unconfirmed sight records of <i>S. triaspis</i> exist for Post Office Canyon and the Animas Mountains. The species reaches the eastern edge of its range in New Mexico where it is very rare and seldom encountered (NMDGF 1994). This species is known only from the Baboquivari, Santa Rita, Pajarito, and Chiricahua mountains of Arizona (BISON 2004).
Mottled Rock Rattlesnake (<i>Crotalus lepidus lepidus</i>)	-	T	Montane species, rarely found away from rocky canyons or hillsides. Favors areas of boulders and rocks, including talus slopes (BISON 2004).	Not Likely: In New Mexico, this montane rattlesnake is known only from the Guadalupe Mountains in Eddy County and extreme eastern Otero County (Degenhardt et al. 1996). The mottled rock rattlesnake was seen only once, in dense leaf litter beneath an oak forest in middle Skull Canyon, Hidalgo Co. (Dixon 1978). Distribution of <i>C.l. lepidus</i> is unknown in AZ (BISON 2004).
Colorado River Toad (<i>Bufo alvarius</i>)	-	T	In New Mexico, most observations of the species have been in habitats associated with plants such as mesquite (<i>Prosopis glandulosa</i>), creosote bush (<i>Larrea tridentata</i>), and other shrubs, plus forbs and grasses—typically at elevations around 1500m (4920ft) (BISON 2004).	Not Likely: In New Mexico, <i>B. alvarius</i> is an uncommon species that occurs only in southwest Hidalgo County in the vicinity of Rodeo and in scattered localities in the adjacent Peloncillo Mountains at elevations of 1250-1510m (4100-4950ft) (Degenhardt et al. 1996). Populations considered secure in AZ (NatureServe 2006).
Invertebrates				
Shortneck Snaggletooth Snail (<i>Gastrocopta dalliana dalliana</i>)	S	E	Occupies an array of habitats ranging from Sonoran desert shrublands to montane forest (BISON 2004).	Not Likely: In New Mexico, the shortneck snaggletooth appears restricted to geographically disparate populations in the Upper Sonoran Life Zone (1800-1950m; 5900-6400ft elevation) of the Animas (Indian Creek Canyon), Big Hatchet, and San Luis (Lang Canyon) mountains of Hidalgo County (Metcalf and Smartt 1997, Lang 2000). Not considered a species of concern in AZ (BISON 2004).

Common Name (<i>Scientific name</i>)	Status		General Habitat	Likelihood of Occurrence in Project Area
	FED	STATE		
Hacheta Grande Woodlandsnail (<i>Ashmunella hebardii</i>)	S	T	Endemic to the Big Hatchet Mountains of southwestern New Mexico. Occurs under loose stones below cliffs in an area supporting very tall piñons (BISON 2004).	Not Likely: Endemic to Big Hatchet Mountains (BISON 2004).
Animas minute moss beetle (<i>Limnebius aridus</i>)	S	S	The entire family Limnebiidae is typically found along the margins of streams in matted vegetation and in sphagnum moss associated with bogs (BISON 2004).	Not Likely: Has been noted in Hidalgo county, but range and species abundance trends are very unknown (BISON 2004). Occurrence of this species does not extend beyond New Mexico State border (BISON 2004).
Mountain silverspot butterfly (<i>Speyeria nokomis nitocris</i>)	S	-	Mainly associated with alpine meadows (BISON 2004).	Not Likely: Subspecies has been noted in Grant and Catron counties (BISON 2004), but generally associated with alpine meadows. Range of this species is restricted to elevations higher than the project area.
Sacramento Mountains silverspot butterfly (<i>Speyeria atlantis capitansensis</i>)	S	-	<i>Speyeria atlantis</i> associated with forest openings, bogs, upland pastures, meadows, and moist canyons (USGS 2004).	Not Likely: Subspecies <i>S.a. capitansensis</i> was described in 1988 from the Capitan Mountains, Lincoln Co. (Cary and Holland 1992) This subspecies is not known to occur in Arizona (BISON 2004).
Plants				
Zuni fleabane (<i>Erigeron rhizomatus</i>)	T	E	Nearly barren detrital clay hillsides with soils derived from shales of the Chinle or Baca formations (often seleniferous); most often on north or east-facing slopes in open piñon-juniper woodlands at 2200-2400 m (7300-8000 ft) (NMRPTC 1999).	Not Likely: This plant is know from 3 locations in the Zuni Mountains near Fort Wingate, 28 locations (probably more) in the Sawtooth and northwest Datil mountains, and 1 location in the Red Valley/Cove area on the Navajo Indian Reservation in Arizona (NMRPTC 1999).
Slender spiderflower (<i>Cleome multicaulis</i>)	S	E	Wet, saline or alkaline soils; often in and around alkali sinks, alkaline meadows, or old lake beds (NMRPTC 1999).	Not Likely: The slender spiderflower has not been seen in New Mexico since 1851. The single New Mexico collection was taken at "the mouth of the Mimbres River" by Charles Wright during the Mexican Boundary Survey (NMRPTC 1999).
Night-blooming cereus, Queen of the night, Deer-horn cactus (<i>Peniocereus greggii</i> var. <i>greggii</i>)	S	E	Mostly in sandy to silty gravelly soils in gently broken to level terrain in desert grassland or Chihuahuan desert scrub. Typically found growing up through and supported by shrubs, especially <i>Larrea divaricata</i> and <i>Prosopis glandulosa</i> (NMRPTC 1999).	Not Likely: New Mexico, Doña Ana, Grant, Hidalgo, and Luna counties; Texas, mostly in the Big Bend Region; Mexico, Chihuahua (NMRPTC 1999). Grows in desert habitats below 760m (2500ft) (AGFD 2005), well below the project area elevation.
Hess' fleabane (<i>Erigeron hessii</i>)	S	E	Andesitic dikes in otherwise rhyolitic rock; growing from bedrock cracks in open areas in upper montane to subalpine conifer forest; 2900-3100 m (9500-10200 ft). A very narrow endemic of the Mogollon Mountains in southwestern New Mexico.	Not Likely: A very narrow endemic of the Mogollon Mountains in southwestern New Mexico. It is presently known from only two locations in the vicinity of Whitewater Baldy (NMRPTC 1999). Range of this species is restricted to elevations higher than the project area.
Arizona sunflower (<i>Helianthus arizonensis</i>)	S	S	Dry, frequently sandy soil at 1200-2100 m (4000-7000 ft) (NMRPTC 1999).	Not Likely: New Mexico, Catron County, west of Quemado; Arizona, Coconino and Navajo counties. This species is poorly known (NMRPTC 1999). Not a plant of riparian areas, known plants are found further north of the project area.
Orcutt pincushion cactus (<i>Escobaria orcuttii</i>)	S	S	In cracks in limestone or in rocky soils of broken mountainous terrain in Chihuahuan desert scrub, desert grassland, and oak woodland; 1600-1800 m (5200-6000 ft) (NMRPTC 1999).	Not Likely: New Mexico, Hidalgo and Luna counties; Mexico, southward to central Chihuahua (NMRPTC 1999). Project area is outside the range for this species; populations are known south of I-10.

Common Name (<i>Scientific name</i>)	Status		General Habitat	Likelihood of Occurrence in Project Area
	FED	STATE		
Wright's dogweed (<i>Adenophyllum wrightii</i> var. <i>wrightii</i>)	S	S	Sandy or silty soils in swales and drainages in piñon-juniper woodland; 2100-2200 m (7000-7200 ft) in New Mexico (NMRPTC 1999).	Not Likely: New Mexico, Grant County; adjacent southeastern Arizona; Mexico, northern Chihuahua (NMRPTC 1999). Range of this species is restricted to elevations higher than the project area.
Gila thistle (<i>Cirsium gilense</i>)	S	S	Moist areas or mountain meadows in montane coniferous forest; 2135-2440 m (7000-8000 ft). Increases with disturbance (NMRPTC 1999).	Not Likely: New Mexico, Catron County; adjacent Arizona, White Mountains. This taxon, along with all other yellow-flowered thistles of the Southwest, needs further study to clarify species boundaries. (NMRPTC 1999). Range of this species is restricted to elevations higher than the project area.
Wootton's alumroot (<i>Heuchera woottonii</i>)	S	S	Mountain slopes and protected, usually north-facing rock outcrops, or Gamble oak thickets in piñon-juniper woodland and lower and upper montane coniferous forest; 2150-3650 m (7000-12000 ft). The disjunct distribution of this rare species is very unusual (NMRPTC 1999).	Not Likely: New Mexico, Lincoln and Otero counties in the White and Sacramento mountains and Catron County in the Datil Mountains. (NMRPTC 1999). Range of this species is restricted to elevations higher than the project area.
Arizona coralroot (<i>Hexalectris spicata</i> var. <i>arizonica</i>)	S	S	In heavy leaf litter in oak, pine, or juniper woodlands over limestone. Widely distributed but in very small colonies (NMRPTC 1999).	Not Likely: New Mexico, Doña Ana, Hidalgo, Otero, and Sierra counties; Arizona and Texas; Mexico, Coahuila. Disjunct populations, but none recorded near Gila (NMRPTC 1999).
New Mexico bitterweed (<i>Hymenoxys ambigens</i> var. <i>neomexicana</i>)	S	S	Rocky to sandy granitic soils on open canyon floors or slopes; oak woodland, Apache pine forests, or along intermittent streamsides with Arizona cypress, Arizona walnut, and Arizona sycamore; 1640-2200 m (5400-7250 ft) (NMRPTC 1999).	Not Likely: New Mexico, Hidalgo County, Peloncillo and Animas mountains (NMRPTC 1999). Occurs in small populations and is known from only three localities, all within a 30 km (19 mi) area in extreme southwestern New Mexico.
Chiricahua mudwort (<i>Limosella pubiflora</i>)	S	S	Muddy edges of ponds and perhaps streams; 1500-2000 m (5000-6500 ft) (NMRPTC 1999).	Not Likely: New Mexico, Southern Hidalgo County; adjacent Arizona, Cochise County (NMRPTC 1999). Occurs primarily on the edges of cattle tanks and in wet meadows in extreme southwestern New Mexico and in AZ. Range of this species is restricted to elevations higher than the project area.
Gypsum hot spring aster (<i>Machaeranthera gypsitherma</i>)	S	S	Riparian – alkaline soils around springs and seeps in Chihuahuan desert scrub; 1200-1400 m (3900-4600 ft). Probably extirpated from New Mexico (NMRPTC 1999).	Not Likely: This species was collected once in New Mexico by Charles Wright during the 1851 U.S./Mexico boundary survey. It has not been seen in New Mexico since that time and probably has been extirpated from the state (NMRPTC 1999). Habitat is alkaline springs in southwestern New Mexico and northern Chihuahua, has not been seen for over 150 years.
New Mexico gumweed (<i>Grindelia arizonica</i> var. <i>Neomexicana</i>)	S	S	Rocky slopes and ledges in piñon-juniper woodland and lower montane coniferous forest; 2000-2300 m (6500-7500 ft). This variety appears narrowly restricted to montane habitats in Grant and Sierra counties, but it may occur in montane habitats in adjacent counties (NMRPTC 1999).	Not Likely: New Mexico, Grant and Sierra counties, Piños Altos Range, Black Range, and Mimbres Mountains. Range of this species is restricted to elevations higher than the project area (NMRPTC 1999).
Mogollon hawkweed (<i>Hieracium fendleri</i> var. <i>mogollense</i>)	S	S	Habitat requirements not known. Possibly similar to variety <i>fendleri</i> , which is an understory plant in montane coniferous forest (NMRPTC 1999).	Not Likely: New Mexico, Catron County, Mogollon Mountains; adjacent Arizona, Apache County, White Mountains. Occurs in montane coniferous forest (NMRPTC 1999).

Common Name (<i>Scientific name</i>)	Status		General Habitat	Likelihood of Occurrence in Project Area
	FED	STATE		
Heartleaf groundsel (<i>Packera cardamine</i>)	S	S	Steep slopes and forest understory in upper montane coniferous forest; 2440-3050 m (8000-10000 ft). Endemic to climax spruce-fir forest in the high mountains of southwestern New Mexico and adjacent Arizona (NMRPTC 1999).	Not Likely: An endemic to climax spruce-fir forest in the high mountains of southwestern New Mexico and adjacent Arizona. Populations are small and sporadic, but not infrequent in suitable habitat. Range of this species is restricted to elevations higher than the project area (NMRPTC 1999).
Gila groundsel (<i>Packera quaerens</i>)	S	S	Wet meadows and stream banks in upper montane coniferous forest; 2450-2750 m (8000-9000 ft) (NMRPTC 1999).	Not Likely: New Mexico, Catron County, Mogollon and San Francisco mountains; adjacent Arizona, mountains of Greenlee and Apache counties. Range of this species is restricted to elevations higher than the project area (NMRPTC 1999).
Chihuahua scurf pea or Contra yerba (<i>Pediomelum pentaphyllum</i>)	S	S	Desert grassland or among creosote bush in sandy or gravelly loam soils; 1350-2000 m (4400-6600 ft) (NMRPTC 1999).	Not Likely: Hidalgo County; adjacent Arizona, Cochise and Graham counties possibly Texas, Presidio County; Mexico, Chihuahua, south to about Ciudad Chihuahua (NMRPTC 1999). Known and collected from desert grasslands south of I-10.
Mount Graham beardtongue (<i>Penstemon deaveri</i>)	S	S	Slopes and rocky areas from ponderosa pine forest to above timberline (in Arizona); 1980-3440 m (6500-11280 ft) (NMRPTC 1999).	Not Likely: Most of the collections are from Arizona, from the White Mountains in the north to the Pinaleno Mountains in the south, in which area it is relatively common. There are a few records from Catron and Cibola counties, New Mexico, where it is apparently not common (NMRPTC 1999).
Mogollon death camas (<i>Anticlea mogollonensis</i>)	S	S	Organic soils in understory of upper montane and subalpine coniferous forest, often with aspen; 2650-3200 m (8700-10500 ft). A very narrow endemic, known only from the Mogollon Mountains in the area of White Water Baldy and adjacent peaks (NMRPTC 1999).	Not Likely: A very narrow endemic, known only from the Mogollon Mountains in the area of White Water Baldy and adjacent peaks (NMRPTC 1999).
Maguire's milkvetch (<i>Astragalus cobrensis</i> var. <i>maguirei</i>)	S	S	Dry creek beds, banks, canyon sides, generally dry, open slopes with oaks, juniper, and pine, 1650-2150 m (5500-7000 ft). Variety <i>maguirei</i> has been collected only once in New Mexico in the Peloncillo Mountains near the Arizona border (NMRPTC 1999).	Not Likely: New Mexico, Hidalgo County, Peloncillo Mountains; Arizona, Cochise County, Chiricahua and Peloncillo mountains (NMRPTC 1999).
Santa Fe milkvetch (<i>Astragalus feensis</i>)	S	S	Sandy benches and gravelly hillsides in piñon-juniper woodland or plains-mesa grassland; 1550-1830 m (5100-6000 ft). There is a single recent collection for the species well outside its normal range from a roadside in Hidalgo County where probably it was introduced and will not persist (NMRPTC 1999).	Not Likely: New Mexico, Bernalillo, Sandoval, Santa Fe, Tarrant, and a single recent collection for the species well outside its normal range from a roadside in Hidalgo County where probably it was introduced and will not persist (NMRPTC 1999).
Zuni milkvetch (<i>Astragalus missouriensis</i> var. <i>accumbens</i>)	S	S	Gravelly clay banks and knolls, in dry, alkaline soils derived from sandstone, in piñon-juniper woodlands; 1890-2410 m (6200-7900 ft). In the Zuni Mountains, this plant is associated with <i>Erigeron rhizomatus</i> , another endemic plant (NMRPTC 1999).	Not Likely: New Mexico, northern Catron, Cibola, and southern McKinley counties (NMRPTC 1999).

Table 2. Special Status Species Not Likely to Occur in the Project Area, continued

Common Name (<i>Scientific name</i>)	Status		General Habitat	Likelihood of Occurrence in Project Area
	FED	STATE		
Nutrioso milkvetch (<i>Astragalus nutriosensis</i>)	S	S	Volcanic silty clay soils in gently sloping grama grassland, occasionally in piñon-juniper woodland; 2140-2240 m (7000-8000 ft). A narrow endemic that has apparently evolved from <i>A. mollissimus</i> via <i>A. mollissimus</i> var. <i>mathewsii</i> . Populations within its range appear to be sporadically distributed (NMRPTC 1999).	Not Likely: New Mexico, northwestern Catron County; adjacent eastern Arizona in the Rio Nutrioso Basin (NMRPTC 1999). Project area is outside the range for this species; the Rio Nutrioso Basin is in northern Catron County and Apache County, AZ (NMRPTC 1999). As of 1991 known only from two localities along Nutrioso Creek between Springerville and the town of Nutrioso (AGFD 1997).
Griffith's saltbush (<i>Atriplex griffithsii</i>)	S	S	Saline playa margins where plants are not submerged for long periods of time (NMRPTC 1999).	Not Likely: New Mexico, Luna and Hidalgo counties; southeastern Arizona, Cochise County (NMRPTC 1999).
Porsild's starwort (<i>Stellaria porsildii</i>)	S	S	In shade and partially open understory of mixed conifer and aspen forests, and occasionally scattered on roadsides with steep, loamy and rocky embankments; 2400-2500 m (7900-8200 ft) (NMRPTC 1999).	Not Likely: New Mexico, Grant County, Piños Altos Mountains; Arizona, Cochise County, Chiricahua Mountains. Range of this species is restricted to elevations higher than the project area (NMRPTC 1999).
Swale paintbrush (<i>Castilleja ornate</i>)	S	S	Flat, seasonally wet areas in arid grasslands; 1570-2100 m (5200-6900 ft) (NMRPTC 1999).	Not Likely: New Mexico, southwestern Hidalgo County; Mexico, western Chihuahua and west-central Durango (NMRPTC 1999). This is a Mexican species known from only location along the border in extreme southwestern Hidalgo County.
Mogollon dock (<i>Rumex tomentellus</i>)	S	S	Presumably stream banks; the type specimen was collected at 2330 m (7640 ft). This species is known only from the type collection (NMRPTC 1999).	Not likely: New Mexico, Catron County, east of Mogollon on Willow Creek is site of only collection (NMRPTC 1999).
Mimbres figwort (<i>Scrophularia macrantha</i>)	S	S	Steep, rocky, usually north-facing igneous cliffs and talus slopes, occasionally in canyon bottoms; piñon-juniper woodland and lower montane coniferous forest; 2000-2500 m (6500-8200 ft) (NMRPTC 1999).	Not Likely: New Mexico, Grant and Luna counties, Mimbres Mountains, Kneeling Nun, and Cook's Peak (NMRPTC 1999). The project area is out of elevation and geographic range, also in a different habitat type.
Thurber's campion, Woolly campion (<i>Silene thurberi</i>)	S	S	In protected locations on rocky areas and slopes; in arroyos and mountains; elevational range not documented, but perhaps 1520-2130 m (5000-7000 ft) (NMRPTC 1999).	Not Likely: New Mexico, eastern Grant, western Sierra and Hidalgo counties; Arizona, Cochise County; adjacent Mexico, Chihuahua and Sonora (NMRPTC 1999). This is not a plant of riparian areas.
Wright's campion (<i>Silene wrightii</i>)	S	S	Cliffs and rocky outcrops in Rocky Mountain montane and subalpine conifer forests; about 2070-2440 m (6800-8000 ft) (NMRPTC 1999).	Not Likely: New Mexico, Catron, Grant, Luna, Sierra, and Socorro counties. Range of this species is restricted to elevations higher than the project area (NMRPTC 1999).
Mogollon clover, White Mountain clover (<i>Trifolium longipes</i> ssp. <i>Neurophyllum</i>)	S	S	Wet meadows, springs and along riparian corridors in montane coniferous forest; 1950-2750 m (6500-9000 ft) (NMRPTC 1999).	Not Likely: Only known from Catron County in New Mexico and adjacent Arizona. Range of this species is restricted to elevations higher than the project area (NMRPTC 1999).
Arizona desert foxglove (<i>Brachystigma wrightii</i>)	S	S	Dry slopes, rocky mountainsides, and mesas, often among oaks; 1520-2290 m (5000-7500 ft) (NMRPTC 1999).	Not Likely: New Mexico, Hidalgo County; Arizona, Cochise, Graham, Pima, Santa Cruz counties; adjacent Mexico, Chihuahua and Sonora (NMRPTC 1999). This is not a plant of riparian areas.
Wooten's hawthorn (<i>Crataegus wootoniana</i>)	S	S	Canyon bottoms and forest understory in lower montane coniferous forest; 1900-2500 m (6500-8000 ft) (NMRPTC 1999).	Not Likely: New Mexico, Catron, Grant and Lincoln counties, Piños Altos and Sacramento mountains (NMRPTC 1999). Range of this species is restricted to elevations lower than the project area.

Table 2. Special Status Species Not Likely to Occur in the Project Area, continued

Common Name (<i>Scientific name</i>)	Status		General Habitat	Likelihood of Occurrence in Project Area
	FED	STATE		
Goodding's onion (<i>Allium gooddingii</i>)	S	-	Moist shaded bottoms typically in dense climax forests. Occasionally found in moist soils on north aspect slopes. Usually found in a narrow strip in low gradient/low erosional soils along perennial, ephemeral, and intermittent streams (64 FR 63044). Found at elevations from 2135-3233 m (7000-10600 ft) in Arizona and up to 3450 m (11300 ft) in New Mexico (AGFD 1999).	Not Likely: Populations known in the Mogollon Mountains (Grant and Catron Counties) and Sierra Blanca Peak (Otero County) (64 FR 63044).
Santa Fe cholla (<i>Opuntia viridiflora</i>)	S	-	Found in gravelly rolling hills in piñon-juniper woodland at 1770-2195 m (5800-7200 ft) (NMRPTC 1999).	Not Likely: The Santa Fe cholla is only found in Santa Fe County, New Mexico and is only known from two areas, Fort Marcy Park in Santa Fe and Pojoaque, New Mexico (NMRPTC 1999).
Limestone rosewood (<i>Vauquelinia californica</i> ssp. <i>Pauciflora</i>)	S	-	Found in dry limestone ridges and hills and rhyolite (AGFD 2005).	Not Likely: Only noted in Hidalgo County, New Mexico and Pima and Maricopa Counties, AZ (USDA 2006, AGFD 2005). This is not a plant of riparian areas.
San Carlos wild-buckwheat (<i>Eriogonum capillare</i>)	S	-	In New Mexico, found in Chihuahuan desert scrub in rock andesitic soils. Typically in areas with little or no competition (AGFD 2003).	Not Likely: Found in Hidalgo County, New Mexico and southeastern Arizona. This species has not been relocated on the San Carlos-Apache Reservation in Arizona since 1992 (AGFD 2003).
Dwarf milkweed (<i>Asclepias uncialis</i> var. <i>uncialis</i>)	S	-	Dry plains and mesas, occasionally with pine at 1000-2000 m (3280-6560 ft) in Arizona (AGFD 2006).	Not Likely: E Colorado and NE New Mexico; disjunct in Wyoming (Sweetwater Co.) and eastern Arizona in Pima, Santa Cruz, and Coconino Counties (AGFD 2006).

Notes:

Threatened (T), Endangered (E), Species of Concern (fed) or Sensitive Species (state) (S), Candidate (C), Proposed (P) and (D) Delisted Plant and Wildlife Species Listed by State or Federal Agency and Known to Occur in Hidalgo, Catron and Grant Counties, New Mexico and in the upper Gila-Mangas drainage in Arizona.

Table 3. Special Status Species That Likely Occur or Species With Uncertain Distributions in the Project Area Based on Preliminary Literature Review

Common Name (<i>Scientific name</i>)	Status		Likelihood of Occurrence in Project Area	Information Gaps
	FED	STATE		
Fish				
Spikedace <i>Meda fulgida</i>	T	T	Occurs in Project Area	Need for Rinne data and quantification of density and abundance; validation of microhabitat use data; effects of floods on habitat availability
Loach Minnow <i>Tiaroga cobitis</i>	T	T	Occurs in Project Area	Need for Rinne data and quantification of density and abundance; validation of microhabitat use data; effects of floods on habitat availability
Roundtail Chub <i>Gila robusta</i>	S	E	Rarely Occurs in Project Area	Need for Rinne data and quantification of density and abundance; microhabitat use data; effects of floods on habitat availability
Desert sucker <i>Catostomus clarki</i>	S	S	Occurs in Project Area	Need for Rinne data and quantification of density and abundance; microhabitat use data; effects of floods on habitat availability
Sonora sucker <i>Catostomus insignis</i>	S	S	Occurs in Project Area	Need for Rinne data and quantification of density and abundance; microhabitat use data; effects of floods on habitat availability
Longfin Dace <i>Agosia chrysogaster</i>	S	-	Occurs in Project Area	Need for Rinne data and quantification of density and abundance; microhabitat use data; effects of floods on habitat availability
Birds				
Southwestern Willow Flycatcher <i>Empidonax traillii extimus</i>	E	E	Occurs in Project Area	Need for identifying factors that maintain riparian habitat structure for nesting and surface water
Brown Pelican <i>Pelecanus occidentalis carolinensis</i>	E	E	Rarely Occurs in Project Area	Evaluate potential use of proposed off channel storage lake
Bald Eagle <i>Haliaeetus leucocephalus</i>	T	T	Occurs in Project Area	Need for identifying factors that maintain winter habitat and riverine environments for foraging
Yellow-billed cuckoo <i>Coccyzus americanus</i>	C	S	Occurs in Project Area	Need for identifying factors that maintain trees for nesting and riverine environments for foraging and surface water
Bell's Vireo <i>Vireo bellii</i>	S	T	Occurs in Project Area	Need for identifying factors that maintain riparian habitat structure for nesting

Table 3. Special Status Species That Likely Occur or Species With Uncertain Distributions in the Project Area Based on Preliminary Literature Review, continued

Common Name (<i>Scientific name</i>)	Status		Likelihood of Occurrence in Project Area	Information Gaps
	FED	STATE		
American Peregrine Falcon <i>Falco peregrinus anatum</i>	D, S	T	Occurs in Project Area	Need for identifying factors that maintain riparian and riverine environments for foraging and surface water
Common Black-Hawk <i>Buteogallus anthracinus anthracinus</i>	S	T	Occurs in Project Area	Need for identifying factors that maintain trees for nesting and riverine environments for foraging and surface water
Mountain Plover <i>Charadrius montanus</i>	S	S	Occurs in Project Area	None were determined during this evaluation.
Cactus Ferruginous Pygmy-Owl <i>Glaucidium brasilianum cactorum</i>	D	E	Occurs in Project Area	Investigate riparian desert habitat needs and need for identifying factors that maintain riparian habitat structure for nesting, foraging, and surface water
Common Ground-dove (<i>Columbina passerina pallescens</i>)	-	E	Occurs in Project Area	Need for current distribution data
Neotropic Cormorant <i>Phalacrocorax brasilianus</i>	S	T	Occurs in Project Area	Evaluate potential use of proposed off channel storage lake
Gila Woodpecker <i>Melanerpes uropygialis uropygialis</i>	S	T	Occurs in Project Area	Need for identifying factors that maintain riparian and riverine environments for foraging, nesting, and surface water
Gray Vireo <i>Vireo vicinior</i>	S	T	Occurs in Project Area	None were determined during this evaluation in terms of changes in hydrology
Abert's Towhee <i>Pipilo aberti aberti</i>	S	T	Occurs in Project Area	Need for identifying factors that maintain riparian and riverine environments for foraging, nesting, and surface water
Northern Goshawk <i>Accipiter gentilis</i>	S	S	May Occur in Project Area	Need for current distribution data
Western Burrowing Owl <i>Athene cunicularia hypugea</i>	S	-	May Occur in Project Area	None were determined during this evaluation
Mammals				
Mexican Gray Wolf <i>Canis lupus baileyi</i>	E	E	Rarely Occurs in Project Area	None were determined during this evaluation

Table 3. Special Status Species That Likely Occur or Species With Uncertain Distributions in the Project Area Based on Preliminary Literature Review, continued

Common Name (<i>Scientific name</i>)	Status		Likelihood of Occurrence in Project Area	Information Gaps
	FED	STATE		
Arizona Montane Vole <i>Microtus montanus arizonensis</i>	S	E	May Occur in Project Area	Need for current distribution data
Spotted Bat <i>Euderma maculatum</i>	S	T	May Occur in Project Area	Need for current distribution data
Allen's big-eared bat <i>Idionycteris phyllotis</i>	S	S	May Occur in Project Area	Need for current distribution data
Western red bat <i>Lasiurus blossevillii</i>	S	S	May Occur in Project Area	Need for current distribution data
Townsend's big-eared bat <i>Corynorhinus townsendii</i>	S	S	May Occur in Project Area	Need for current distribution data
Yellow-nosed cotton rat <i>Sigmodon ochrognathus</i>	S	-	Uncertain as to Occurrence	Need for current distribution data
Reptiles and Amphibians				
Chiricahua Leopard Frog <i>Rana chiricahuensis</i>	T	S	May Occur in Project Area	Need for current distribution data
Lowland Leopard Frog <i>Rana Yavapaiensis</i>	S	E	Occurs in Project Area	Need for identifying factors that maintain breeding habitats
Mexican Garter Snake <i>Thamnophis eques megalops</i>	S	E	Occurs in Project Area	Need to determine factors that maintain riparian and riverine environments for foraging
Reticulate Gila Monster <i>Heloderma suspectum suspectum</i>	-	E	Occurs in Project Area	Need for identifying riparian habitat needs of the species and factors that may maintain those habitats
Narrowhead Garter Snake <i>Thamnophis rufipunctatus rufipunctatus</i>	S	T	Occurs in Project Area	Need to determine factors that maintain riparian and riverine environments for foraging

Table 3. Special Status Species That Likely Occur or Species With Uncertain Distributions in the Project Area Based on Preliminary Literature Review, continued

Common Name (<i>Scientific name</i>)	Status		Likelihood of Occurrence in Project Area	Information Gaps
	FED	STATE		
Invertebrates				
Desert viceroy butterfly <i>Basilarchia archippus obsoleta</i>	S	-	Occurs in Project Area	Need to determine factors that maintain riparian area, especially pertaining to willows, needed by the species.
Plants				
Parish's alkali grass <i>Puccinellia parishii</i>	S	E	May Occur in Project Area	None were determined during this evaluation
Gila brickellbush <i>Brickellia chenopodina</i>	S	S	May Occur in Project Area	None were determined during this evaluation
Metcalfe's ticktrefoil <i>Desmodium metcalfei</i>	S	S	May Occur in Project Area	None were determined during this evaluation
Mogollon whitlowgrass <i>Draba mogollonica</i>	S	S	May Occur in Project Area	None were determined during this evaluation
Rock fleabane <i>Erigeron scopulinus</i>	S	S	May Occur in Project Area	None were determined during this evaluation
Maguire's beardtongue <i>Penstemon linarioides</i> ssp. <i>Maguirei</i>	S	S	May Occur in Project Area	More research is needed to determine the distribution, abundance, and habitat needs of this taxon
Piños Altos fame flower <i>Talinum humile</i>	S	S	May Occur in Project Area	None were determined during this evaluation
Goodding's bladderpod <i>Physaria gooddingii</i>	S	S	May Occur in Project Area	None were determined during this evaluation
Davidson's cliff carrot <i>Pteryxia davidsonii</i>	S	S	May Occur in Project Area	None were determined during this evaluation
Grayish-white giant hyssop (<i>Agastache cana</i>)	S	S	May Occur in Project Area	Additional distribution data is needed for this species

Notes:

Threatened (T), Endangered (E), Species of Concern (fed) or Sensitive Species (state) (S), Candidate (C), Proposed (P) and (D) Delisted Plant and Wildlife Species Listed by any State or Federal Agency and Known to Occur in Hidalgo, Catron and Grant Counties, New Mexico and the Upper Gila-Mangas drainage in Arizona.

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