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Standing Analysis:
Arizona Statewide No Effect Determination Key

Prepared by

Arizona Ecological Services Field Office

IPaC Project code: 2026-0063984

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1 INTRODUCTION

1.1 PURPOSE OF STANDING ANALYSIS

This Standing Analysis provides an optional, streamlined process for federal action agencies to assess whether future actions may have potential effects on listed species and critical habitat in Arizona, pursuant to section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.) (Act). The U.S. Fish and Wildlife Service (Service) developed this standing analysis to provide proactive technical assistance to federal action agencies in making a "no effect" (NE) determination for actions in Arizona. At the same time, it also helps action agencies determine whether their action "may affect" (MA) listed species or critical habitat in Arizona.

Appendix A shows the species and critical habitats covered by this analysis.

This standing analysis process is available for federal actions that meet the criteria described below. In this process, the action agency uses the **Arizona Statewide No Effect Determination Key** (DKey) in the Service's Information for Planning and Consultation (IPaC) application. In the DKey, federal agencies answer questions about their proposed actions. If the action is consistent with the criteria in the DKey, then IPaC produces a "technical assistance letter" to support the action agency's NE determination. If an agency determines that their action will have no effect on species or critical habitat, then they do not need to consult with the Service.

Conversely, if the DKey determines that the action "may affect" a listed species or critical habitat, then the action agency may **not** use this DKey and should instead undergo individual consultation with the Service.

Some activities, as a category, are not eligible to use this DKey. Section 3.1 (Activity-Based Limits) provides a list of ineligible activities.

This standing analysis provides the rationale that supports an NE determination for the covered species and critical habitats (in Appendix A) under the DKey. By screening the project through the DKey, the action agency adopts all or part of this standing analysis.

1.2 BENEFITS OF THE STANDING ANALYSIS

For those federal actions that the Service has accumulated significant knowledge in analyzing previously, the Service is able to develop a standing analysis to give federal action agencies information that helps them arrive at their own NE determination, where appropriate. The streamlined process facilitated by this standing analysis will reduce the amount of time that the Service spends providing technical assistance to federal agencies, consultants, and other project proponents. It also produces a predictable, consistent, and timely technical assistance letter.

Action agencies are not required to use this DKey; however, in most cases, we anticipate that the use of the DKey will substantially decrease the amount of time that action agencies take to make and document their NE determinations.

1.3 ELIGIBILITY FOR USE OF THE STANDING ANALYSIS

A standing analysis does not convey concurrence with NE determinations for individual projects. Rather, it provides acknowledgement that the NE determination is consistent with the project-related information provided by the action agency. The standing analysis may also provide technical information to help agencies identify actions that may affect listed species and

critical habitats and, therefore, require consultation with the Service. For projects that do not qualify to use the standing analysis, action agencies should coordinate directly with the Arizona Ecological Services Field Office (AZ ESFO) and address any consultation requirements, as appropriate.

Note that if the action area does not intersect the ranges of listed species or designated critical habitats, the IPaC user will not be directed to use this DKey.

To determine which species and critical habitats would be covered in this DKey, the Service developed an initial species list by performing an IPaC search for the entire state of Arizona. (IPaC Project code: 2026-0063984, conducted on March 17, 2026).

Some species appeared on the list, but through later research, we confirmed that they did not occur in Arizona, nor would project effects extend into their range. By this rationale, we eliminated Mesa Verde cactus, Shivwits milk-vetch, swale paintbrush, and Pecos sunflower from the DKey.

Additionally, some species from the list (i.e., San Francisco Peaks ragwort and Sentry milk-vetch) occur in Arizona but were eliminated from the DKey because each occurs in an area under the management of a federal landowner that is actively protecting the species. Additionally, each of these federal landowners is well aware of their responsibilities under section 7 of the ESA, the status of the species, and potential pathways of effect; therefore, neither agency is likely to use this DKey.

We also removed *proposed* species and critical habitats, because an NE determination is not applicable to proposed species. This eliminated the monarch butterfly, Suckley's cuckoo bumble bee, Quitobaquito tryonia springsnail, cactus ferruginous pygmy-owl critical habitat, and Quitobaquito tryonia springsnail critical habitat from the DKey.

We also excluded all 10(j) experimental populations and the Mexican wolf endangered population from the DKey and standing analysis. For projects that "may affect" these populations, the user will be instructed to contact the AZ ESFO to discuss consultation options.

The remainder of the species from the list were retained as covered species and critical habitats and appear in Appendix A.

1.4 Ensuring Accurate Determinations

To apply this standing analysis to a project in compliance with the Act, it is the responsibility of the action agency to provide information that is truthful and accurate and that fully represents the entire scope of the project.

1.5 Updates to the Standing Analysis

The Service will review this standing analysis annually and update it as needed to ensure that the analysis contains the best scientific and commercial data available. This update process will also ensure that the analysis is accurate and valid, the document still meets ESA requirements, the logic is sound, and the determinations are appropriate for covered activities. Updates will be dated, signed, and versioned.

Projects reviewed under this standing analysis must rely on the most current version available. For reference, both current and previous versions of the standing analysis will be maintained by

the AZ ESFO. It will be the action agency's responsibility to ensure that they are using the correct and most current version of the standing analysis.

The Service may add additional activities to this standing analysis in the future, as we gain more information about these actions and their effects.

2 COVERED AREA

The covered area is the entire State of Arizona, United States (U.S.). To qualify to use this standing analysis, a project's action area must fall completely within the state of Arizona. Action area means "all areas affected (i.e., modifications to land, air, or water) by the proposed action, and not merely the immediate area involved in the action" (50 CFR 402.02).

3 COVERED ACTIVITY DESCRIPTION

This section describes which specific activities may be appropriate for NE outcomes under this analysis. The activity description, conservation measures, and covered area inform the standing analysis' determination. The inclusion of these activities in the standing analysis does not mean that these types of activities *always* result in no effects to covered species or critical habitat.

All discretionary federal actions within the state of Arizona are covered by this standing analysis and DKey, **except** for those listed under Section 3.1 (Activity-Based Limits) and Section 3.2 (Exposure-Based Limits).

Note that if the action area does not intersect the range of a listed species or a critical habitat, the IPaC user will not be directed to use this DKey. At least one listed species or critical habitat area must be on the IPaC species list to trigger the DKey.

The following conditions will result in an NE determination for the covered species and critical habitats.

1. The species does not occur in the action area, as evidenced by: field surveys that detect no individuals or suitable habitat in the action area. Further, if the field surveys detected no individuals, it is reasonably certain that listed species will not occur within the action area for the entire duration of the action.
2. If critical habitat occurs in the action area, field surveys demonstrate that the Physical and Biological Features (PBFs) are not present and cannot be restored.
3. The project consists solely of work completed within the existing footprint of a building such as electrical, heating, plumbing, or basement and foundation repairs, or repairs and replacements of existing equipment/infrastructure.
4. The action area occurs entirely within incorporated city limits.

Covered activities which will result in an NE determination and technical assistance letter from the DKey are detailed below. All other activities will result in a "MA" determination or a notification that activities do not apply to this DKey, and, in both situations, the user will be advised to contact the Arizona Ecological Services Field Office.

3.1 ACTIVITY-BASED LIMITS

The following activities are **not** eligible, as a category, to receive the Service's technical assistance letter under this standing analysis:

1. Actions that cause effects (even wholly beneficial effects) to a listed species or critical habitat.
2. Actions not authorized, funded, or carried out by a federal agency.
3. Wind or solar energy projects
4. Actions that are already covered by a completed consultation where the action agency is following all conservation measures, project design criteria, best management practices, and reasonable and prudent measures as outlined in a Biological Opinion.
5. Reinitiations of consultation or requests for an extension on the timeline of an existing consultation.
6. Approval of a long-term (in effect, greater than 10 years [yrs]) permit, plan, or other action.
7. Actions that involve the use of crewed or uncrewed aircraft (e.g., airplanes, helicopters, drones, balloons).
8. Actions that involve the permitting of livestock grazing (cattle, horses, sheep, etc.).
9. Actions that involve the remediation of orphaned wells.

3.2 EXPOSURE-BASED LIMITS

Some activities are **not** eligible if they overlap (or are assumed to overlap) with listed species or critical habitat in the action area. These types of activities could expose the species or critical habitat to stressors, and therefore may affect the species or critical habitat. Thus, they are ineligible to receive the Service's NE technical assistance letter.

Under the following conditions, we assume that listed species and critical habitat are present in the action area:

- The species or critical habitat is documented in the action area.
- If the action occurs within the range of the species (determined in IPaC after defining the area of proposed action), but no field surveys for individuals or potential habitat were conducted (therefore, the presence of individuals or the suitability of the habitat in the action area are unknown).
- If a field survey occurred and detected no individuals but it is **not** reasonably certain that listed species will be absent from the action area for the *entire duration of the action*.
- If critical habitat occurs in the action area, but no field surveys were conducted to demonstrate whether the PBFs are present and whether they can be restored (therefore, the quality of the critical habitat is unknown).

Under the above conditions (known or assumed presence of individuals or functioning critical habitat PBFs), the following activities are **not** eligible, because they have the potential to affect listed species or critical habitat or because they fall outside the scope of this standing analysis:

1. Activities associated with communication towers, licensed or regulated by the Federal Communications Commission (FCC), that
    a. do not use avian-friendly configurations described in the *Recommended Best Practices for Communication Towers*
    b. involve any activities other than routine maintenance of existing tower sites or the repair or replacement of existing towers and/or equipment
    c. increase tower mass or height, or add guywires
2. Actions that remove vegetation in areas where listed species or critical habitat is present.

3. Actions that use ANY chemical, including pesticides (insecticide, herbicide, fungicide, rodenticide, etc.)
4. Actions that include ground disturbance.
5. Actions that permanently affect local hydrology (including stream restoration projects).
6. Actions with the potential to impact the riparian zone or indirectly impact a stream or river (e.g., cut and fill; horizontal directional drilling; construction; vegetation removal; pesticide or fertilizer application; discharge; runoff of sediment or pollutants; increase in erosion, etc.). Note: this includes consequences that would not occur but for the proposed action, including consequences at a later time or outside the immediate area involved in the action (for example, downstream of the action).
7. U.S. Housing and Urban Development (HUD) actions that (1) do not fall under eCFR:: 24 CFR Part 58 - Environmental Review Procedures for Entities Assuming HUD Environmental Responsibilities, (2) occur outside existing structures or (3) occur outside medium- or high-development areas.

3.3 Conservation Measures

This standing analysis applies conservation measures to avoid all effects to listed species and critical habitat. Conservation measures, when adopted as part of the project, become required design features enacted during project implementation. Projects must include all applicable conservation measures to qualify for an NE determination under this standing analysis.

In general, conservation measures avoid impacts to listed species and critical habitat when the proposed action:

- Completely avoids spatial overlap with the species, its habitat, or critical habitat
- Occurs completely outside of the time period when the species is present in the action area
- Completely avoids impacts to habitat or critical habitat

Additionally, avoiding the actions shown in the activity-based and exposure-based limits (Sections 3.1 and 3.2) will also avoid effects to listed species and critical habitat.

4 Covered Species and Critical Habitat

This standing analysis only covers the species and critical habitats described in this section of the document. If a proposed action may affect a listed species or critical habitat not addressed in this section, then the action agency must undergo individual consultation with the AZ ESFO.

The following section includes a summary of relevant background information on the covered species and critical habitats. Complete descriptions of the species can be found on the Environmental Conservation Online System (ECOS, https://ecos.fws.gov).

Critical habitat definitions previously used the term “Primary Constituent Elements” (PCEs) to describe the features, essential to the conservation of the species, “that occur in specific areas and that are essential to support the life-history needs of the species” (50 CFR 424.02). Current critical habitat regulations (81 FR 7414) discontinue use of the term “PCE” and instead use the term PBFs for that purpose. To be consistent with that shift in terminology, the text below uses the term “PBF” as a synonym for “PCE.”

4.1 BIRDS

Several listed bird species occur in Arizona: Yellow-billed cuckoo (*Coccyzus americanus*) (T); Masked bobwhite quail (*Colinus virginianus ridgwayi*) (E); Southwestern willow flycatcher (*Empidonax traillii extimus*) (E); Cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*) (T); Yuma Ridgway's rail (*Rallus obsoletus yumanensis*) (E); California least tern (*Sternula antillarum browni)* (E); Mexican spotted owl (*Strix occidentalis lucida*) (T), and California condor (*Gymnogyps californianus*) (E).

Of these, the yellow-billed cuckoo, southwestern willow flycatcher, and Mexican spotted owl have designated critical habitat in Arizona.

4.1.1 Yellow-billed Cuckoo

The Service listed the western Distinct Population Segment (DPS) of the yellow-billed cuckoo as threatened on October 13, 2014 (USFWS, 2014a). These birds have a short hatch-to-fledge time; therefore, they require access to abundant food sources to successfully rear their rapidly growing offspring (Laymon, 1980). Yellow-billed cuckoos eat large insects (e.g., cicadas, caterpillars, katydids, grasshoppers, crickets, large beetles, dragonflies, and moth larvae) and small vertebrates (frogs and lizards) during nesting season (Laymon and Halterman, 1985; Laymon et al., 1997; Halterman, 2001; Halterman, 2009; Griffin, 2015). Home range size is highly variable and may depend on habitat quality and availability. Average 95% Kernal Density Home Range estimates are typically over 20 hectares (ha), with individual estimates ranging from 1.5 to 216 ha (Laymon and Halterman, 1985; Halterman, 2009; McNeil et al., 2013; Sechrist et al., 2012; Dillon and Moore, 2020). Yellow-billed cuckoos breed from late May through September, although most nesting occurs from late June through August. Both adults build loose platform nests composed of dry twigs. Nest height ranges from 1.3 – 17 m (Halterman, 2001; McNeil et al., 2013; Wohner et al., 2021). Clutch size is variable, usually two or three young (Halterman, 2001; McNeil et al., 2013; Dillon and Moore, 2020). Nestlings grow rapidly, with a period of 17 days from start of incubation to fledgling (Hughes, 2015).

The yellow-billed cuckoo breeds in North America and winters in South America (Sechrist et al., 2012; Hughes, 2015a; McNeil et al., 2015). Suitable habitat includes riparian woodlands along low-gradient streams, broad floodplains, and open riverine valleys that provide wide floodplains. Habitat areas are often greater than 325 ft (100 m) wide, usually dominated by willow (*Salix* spp.) or cottonwood (*Populus* spp.), with above-average canopy closure (greater than 70%), and a cooler, more humid environment than the surrounding riparian and upland habitats. Riparian vegetation may also include tree species such as boxelder (*Acer negundo*); ash (*Fraxinus* spp.); walnut (*Juglans* spp.); and sycamore (*Platanus* spp.) (Hamilton and Hamilton, 1965; Gaines, 1974; Laymon, 1980; Gaines and Laymon, 1984; Groschupf, 1987; Corman and Magill, 2000; Dettling and Howell, 2011).

The primary threats are loss and degradation of habitat caused by altered hydrology, livestock overgrazing, encroachment from agriculture, and introduction of nonnative vegetation. Additional threats include the effects of climate change, drought, pesticides, wildfire, and fragmentation of suitable habitat (USFWS, 2014a). In addition, minerals mining projects adversely affect occupied habitat by reducing streamflow and habitat and increasing disturbance (USFWS, 2020a). Mortality from collisions with towers, other tall structures, and solar-power facilities is an ongoing and serious threat that needs further evaluation (Longcore et al., 2005; Kagan et al., 2014).

Critical Habitat

USFWS designated critical habitat for the cuckoo on April 21, 2021 (USFWS, 2021a) encompassing 298,845 acres (ac) (120,939 ha) across the western U.S. The PBFs of the critical habitat are:

1. *Range-wide breeding habitat* - Riparian woodlands across the DPS; Southwestern breeding habitat, primarily in Arizona and New Mexico: Drainages with varying combinations of riparian, xeroriparian, and/or non-riparian trees and large shrubs. This physical or biological feature includes breeding habitat found throughout the DPS range as well as additional breeding habitat characteristics unique to the Southwest.
    a. *Range-wide breeding habitat (including areas in the Southwest)* - Range-wide breeding habitat is composed of riparian woodlands within floodplains or in upland areas or terraces often greater than 325 ft (100 m) in width and 200 ac (81 ha) or more in extent with an overstory and understory vegetation component in contiguous or nearly contiguous patches adjacent to intermittent or perennial watercourses. The slope of the watercourses is generally less than 3% but may be greater in some instances. Nesting sites within the habitat have an above-average canopy closure (greater than 70%), and have a cooler, more humid environment than the surrounding riparian and upland habitats. Range-wide breeding habitat is composed of varying combinations of riparian species including the following nest trees: cottonwood, willow, ash, sycamore, boxelder, alder, and walnut.
    b. *Southwestern breeding habitat* - Southwestern breeding habitat, found primarily in Arizona and New Mexico, is more variable than range-wide breeding habitat. Southwestern breeding habitat occurs within or along perennial, intermittent, and ephemeral drainages in montane canyons, foothills, desert floodplains, and arroyos. It may include woody side drainages, terraces, and hillsides immediately adjacent to the main drainage bottom. Drainages intersect a variety of habitat types including, but not limited to, desert scrub, desert grassland, and Madrean evergreen woodlands (presence of oak). Southwestern breeding habitat is composed of varying combinations of riparian, xeroriparian, and/or non-riparian tree and large shrub species including, but not limited to, the following nest trees: cottonwood, willow, mesquite, ash, hackberry, sycamore, walnut, desert willow, soapberry, tamarisk, Russian olive, juniper, acacia, and/or oak. In perennial and intermittent drainages, Southwestern riparian breeding habitat is often narrower, patchier, and/or sparser than range-wide riparian breeding habitat and may contain a greater proportion of xeroriparian trees and large shrub species. Although some cottonwood and willow may be present in Southwestern riparian habitat, xeroriparian species may be more prevalent. Mesquite woodland may be present within the riparian floodplain, flanking the outer edges of wetter riparian habitat, or scattered on the adjacent hillsides. The more arid the drainage, the greater the likelihood that it will be dominated by xeroriparian and non-riparian nest tree species. Arid ephemeral drainages in southeastern Arizona receive summer humidity and rainfall from the North American Monsoon (PBF 3), with a pronounced green-up of grasses and forbs. These arid ephemeral drainages often contain xeroriparian species like hackberry or non-riparian species associated with the adjacent habitat type like oak, mesquite, acacia, mimosa, greythorn, and juniper. In southeastern Arizona mountains, breeding habitat is typically below pine woodlands (~6,000 ft, 1,829 m).

2. *Adequate prey base* - Presence of prey base consisting of large insect fauna (for example, cicadas, caterpillars, katydids, grasshoppers, large beetles, dragonflies, moth larvae, spiders), lizards, and frogs for adults and young in breeding areas during the nesting season and in post-breeding dispersal areas.
3. *Hydrologic processes* - The movement of water and sediment in natural or altered systems that maintains and regenerates breeding habitat. This physical or biological feature includes hydrologic processes found in range-wide breeding habitat as well as additional hydrologic processes unique to the Southwest in southwestern breeding habitat:
    a) Range-wide breeding habitat hydrologic processes (including the Southwest): Hydrologic processes (either natural or managed) in river and reservoir systems that encourage sediment movement and deposits and promote riparian tree seedling germination and plant growth, maintenance, health, and vigor (e.g., lower-gradient streams and broad floodplains, elevated subsurface groundwater table, and perennial rivers and streams). In some areas where habitat is being restored, such as on terraced slopes above the floodplain, this may include managed irrigated systems that may not naturally flood due to their elevation above the floodplain.
    b) Southwestern breeding habitat hydrologic processes: In southwestern breeding habitat, elevated summer humidity and runoff resulting from seasonal water management practices or weather patterns and precipitation (typically from North American Monsoon or other tropical weather events) provide suitable conditions for prey species production and vegetation regeneration and growth. Elevated humidity is especially important in southeastern Arizona, where western yellow-billed cuckoos breed in intermittent and ephemeral drainages.

4.1.2 Masked Bobwhite Quail

The Service published its decision to list the masked bobwhite as endangered in 1967 under the Endangered Species Conservation Act (USFWS, 1967) and kept its endangered status with the passage of the ESA in 1973 (USFWS, 1974). As with other quail species, the masked bobwhite lives in social groups, or coveys, for a significant part of the year (fall, winter, and early spring). Reproduction is highly tied to the monsoon season, such that the breeding season generally starts in late June. Masked bobwhite quails consume a diet of seeds, invertebrates, and green plant material, which varies in quantity across seasons. Masked bobwhite quail experience high, but similar mortality rates as other bobwhite subspecies, approximately 70% (USFWS, 1995a).

Currently, in the U.S. the masked bobwhite quail is restricted to the Buenos Aires National Wildlife Refuge (NWR), and surrounding lands in the Altar Valley, which is situated on the international border. The population of masked bobwhite quail that inhabits this area are part of the captive breeding and reintroduction program administered by the refuge. Distribution of masked bobwhites within the Altar Valley is a product of release locations, condition of habitat and dispersal—individuals have been documented traveling up 2 miles in a day (USFWS, 2023a). In Mexico, although survey efforts to locate natural populations of masked bobwhite quail are ongoing, a 2013-2015 effort yielded no validated observation of the species (García-Solórzano et al., 2017). Last known locations of masked bobwhite in Sonora suggest that dispersal into the U.S. is highly unlikely.

Much of the decline in masked bobwhite quail populations is attributed to its limited range and the reduction of quality habitat, due to historical overgrazing combined with drought and subsequent increase in non-native vegetation within that narrow distribution. Further, the long history of captive breeding and release, combined with nearly no ability to augment the breeding stock with wild individuals, also poses serious threats to the genetic viability of the species.

4.1.3 Southwestern Willow Flycatcher

The southwestern willow flycatcher was listed as endangered, without critical habitat on February 27, 1995 (USFWS, 1995b).

Throughout its range, the flycatcher arrives on breeding grounds in late April and May (Sogge et al., 1997, 2010; USFWS, 2002a). Nests are open cup structures, and flycatchers typically place them in the fork of a branch. Nesting begins in early May and June, and young fledge from late June through mid-August (Sogge et al., 1997, 2010; USFWS, 2002a). It breeds in the southwestern U.S. and migrates to Mexico, Central America, and possibly northern South America during the non-breeding season. (Phillips, 1948; Stiles and Skutch, 1989; Peterson, 1990, Ridgely and Gwynne, 1989; Howell and Webb, 1995). Suitable habitat includes dense riparian areas from sea level in California to approximately 8,500 ft (2,591 m) in Arizona and southwestern Colorado (Sogge et al., 2010; USFWS, 1995b, 2002a). The flycatcher is an insectivore, foraging in dense riparian shrubs and trees. Historically, southwestern willow flycatchers used willow (*Salix* spp.) for nesting (Phillips, 1948; Phillips et al., 1964; Hubbard, 1987; Unitt, 1987). Currently, flycatchers primarily use saltcedar (*Tamarix* spp.), Goodding's willow (*Salix gooddingii*), coyote willow (*Salix exigua*), Geyer willow (*Salix geyeriana*), boxelder (*Acer negundo*), Russian olive (*Elaeagnus angustifolia*), and live oak (*Quercus agrifolia*) for nesting.

The primary threats are removal, alteration, degradation, and modification of riparian breeding habitat, followed by decline of wintering habitat and brown-headed cowbird brood parasitism (USFWS, 1995b, 2002a; Sogge et al., 1997, 2010; McCarthey et al., 1998). Habitat degradation occurs after water diversion; groundwater pumping; channelization, dam construction; urban, recreational, and agricultural development; and excessive livestock grazing (USFWS, 2002a).

Critical Habitat

Critical habitat encompasses approximately 1,227 stream miles (USFWS, 2013a). We designated areas as stream segments, with the lateral extent including the riparian areas and streams that occur within the 100-yr floodplain or flood-prone areas encompassing a total area of approximately 208,973 ac.

The PBFs are:

1. *Riparian vegetation.* Riparian habitat along a dynamic river or lakeside, in a natural or manmade successional environment (for nesting, foraging, migration, dispersal, and shelter) that is comprised of trees and shrubs (that can include Gooddings willow, coyote willow, Geyer's willow, arroyo willow, red willow, yew-leaf willow, pacific willow, boxelder, tamarisk, Russian olive, buttonbush, cottonwood, stinging nettle, alder, velvet ash, poison hemlock, blackberry, seep willow, oak, rose, sycamore, false indigo, Pacific poison ivy, grape, Virginia creeper, Siberian elm, and walnut) and some combination of:
    a. Dense riparian vegetation with thickets of trees and shrubs that can range in height from about 6 to 98 ft. Lower-stature thickets (6 to 13 ft tall) are found at higher

elevation riparian forests and tall-stature thickets are found at middle and lower-elevation riparian forests;
   b. Areas of dense riparian foliage at least from the ground level up to approximately 13 ft above ground or dense foliage only at the shrub or tree level as a low, dense canopy;
   c. Sites for nesting that contain a dense (about 50-100%) tree or shrub (or both) canopy (the amount of cover provided by tree and shrub branches measured from the ground);
   d. Dense patches of riparian forests that are interspersed with small openings of open water or marsh or areas with shorter and sparser vegetation that creates a variety of habitat that is not uniformly dense. Patch size may be as small as 0.25 ac or as large as 175 ac.
2. *Insect prey populations.* A variety of insect prey populations found within or adjacent to riparian floodplains or moist environments, which can include: flying ants, wasps, and bees (*Hymenoptera*); dragonflies (*Odonata*); flies (*Diptera*); true bugs (*Hemiptera*); beetles (*Coleoptera*); butterflies, moths, and caterpillars (*Lepidoptera*); and spittlebugs (*Homoptera*).

4.1.4 Cactus Ferruginous Pygmy-owl

The cactus ferruginous pygmy-owl is currently listed as a threatened species with a 4(d) rule (USFWS, 2023a) without designated critical habitat.

In Arizona, the pygmy-owl primarily occurs in Sonoran Desert scrub and semi-desert grasslands. In these vegetation communities, pygmy-owls prefer riparian and xeroriparian drainages with large and diverse woody vegetation (USFWS, 2011a). They primarily nest in cavities in saguaro cacti excavated by Gila woodpeckers. Pygmy-owls also rarely occur above 4,000 ft (1,219 m) elevation (Proudfoot and Johnson, 2000).

Historical records for the pygmy-owl in Arizona span at least five counties in southern and south-central Arizona, including Maricopa, Pima, Pinal, Santa Cruz and Yuma Counties (Johnson et al., 2003). In the 1990s and early 2000s, the pygmy-owl was found only in portions of Pima and Pinal Counties. Arizona currently has the lowest pygmy-owl abundance compared to all other areas of the range, estimated to be in the low hundreds (USFWS, 2023b). Habitat fragmentation, urbanization, and increase in invasive species such as buffelgrass (*Cenchrus ciliaris*) have reduced the availability and connectivity of habitat in Arizona. Additionally, increased temperatures and drought have reduced prey availability and vegetative cover. As a result, in Arizona, pygmy-owl population groups were extirpated in two of three watershed regions studied by Flesch et al. (2017), whereas occupancy increased across time in a third region. As a result, pygmy-owls in Arizona have reduced capacity to withstand stochastic events and a low resiliency.

4.1.5 Yuma Ridgway's Rail

The Yuma Ridgway's (clapper) rail is listed as endangered range wide.

The Yuma Ridgway's rail has a relatively broad potential range from the Cienega de Santa Clara in Mexico, north to the Las Vegas Wash in Nevada, east along the lower Gila and Salt Rivers in Arizona, and west to the Salton Sea in California. Within this range, the Yuma Ridgway's rail uses freshwater marsh habitat, predominantly of cattail (*Typha* spp.) and bulrush (*Scirpus* spp.),

with silt dominated substrates and low turbidity. Diet includes crayfish small fish, tadpoles, clams, and other aquatic invertebrates (Ohmart and Tomlinson, 1977; Anderson and Ohmart, 1985; Todd, 1986; Eddleman, 1989; Conway, 1990).

Five population centers occur across the rail's range of 14 watersheds within the Colorado River Basin. Of the five, three are core population areas. The first is along the lower Colorado River, with the highest densities at the Imperial, Cibola, and Havasu NWRs. The second core population is at the Salton Sea in California, which includes the Salton Sea NWR and the Wellton Mohawk Irrigation District. The third core population, the Cienega de Santa Clara in Sonora, Mexico, occurs in the largest marsh in the rail's U.S.-Mexico range and supports more than 70% of the global population (Hinojosa-Huerta et al., 2013).

The primary threat is the limited amount, distribution, and persistence of suitable habitat across its range, especially cattail marshes. Through natural succession, cattail marshes become less suitable over time. Without active management and protection of water sources, the habitat could be lost. Other threats include continuing land-use changes in floodplains, human activities, environmental contaminants (primarily increases in selenium levels), climate change, and reductions in connectivity between habitat areas.

4.1.6 California Least Tern

The California least tern is a subspecies of the least tern, a colonially nesting seabird. The California least tern was federally listed in 1969 under the Endangered Species Preservation Act of 1966; later, it was considered an endangered species under the Act (USFWS, 1969).

The California least tern nests along the Pacific coast of California and the Baja California Peninsula. Least terns nest on open sandy beaches, salt flats within estuarine areas, and unvegetated dredge material islands and shorelines near rivers, bays, or lagoons (USFWS, 2025a).

Nesting in Arizona is extremely rare. The first documented least tern nesting in Arizona occurred in 2009 (Marschalek, 2010; USFWS, 2025a), and least terns have not been documented nesting in Arizona since, except for one possible observation of an adult with two juveniles in Wilcox, Arizona, on May 3, 2013 (eBird, 2025; USFWS, 2025a).

The nonbreeding range of the California least tern is not well understood; however, the California least tern is generally assumed to spend the nonbreeding season far from Arizona, (that is, predominantly in coastal marine areas of southern Mexico and Central America) (USFWS, 2025a).

The number of California least tern breeding pairs in the U.S. has continued in a declining trend since approximately 2010. In 2023 (most recent year of data), approximately 2,716 to 3,353 breeding pairs produced 901 to 1,084 fledglings in California. This means that the fledging rate in California was 0.27 to 0.40 per pair in 2023 (CDFW, 2025). While the estimated number of breeding pairs decreased during the last three years of the count, the estimated number of fledglings has been relatively stable (USFWS, 2025a).

Threats include habitat destruction, human disturbance, and predation (Craig, 1971; CDFG, 1974), though many of these threats, including human disturbance, vegetation encroachment, and predation, are actively managed and reduced through implementation of management plans. Other threats include sea level rise due to climate change, food availability, and predation.

4.1.7 Mexican Spotted Owl

In 1993, the Mexican spotted owl was listed as threatened (March 16, 1993; USFWS, 1993a). Mexican spotted owls have distinct annual breeding periods, with courtship beginning in March. They nest in caves, in stick nests built by other birds, on debris platforms in trees, and in tree cavities. Owls typically lay eggs in late March or early April, with eggs hatching approximately 30 days later. Nestling owls fledge in early to mid-June.

The Mexican spotted owl ranges from Utah, Colorado, Arizona, New Mexico, and the western portions of Texas south into several states in Mexico. Suitable habitat includes forested mountains, canyons, and sometimes steep, rocky canyon lands. This species has also an affinity for older, uneven-aged forest.

The primary threats are stand-replacing wildland fire and timber management practices. Climate change is also a threat to the owl, which can intensify the effects of fire and timber management actions. Since 1995, southwestern forests have experienced larger and more severe wildland fires than occurred previously (Westerling, 2016). Climate variability, combined with unhealthy forest conditions (high trees density, high levels of insects and disease, excessive fuel loads, etc.), also worsen the effects of wildland fire on habitat (Fulé et al., 2003; Littell et al., 2009). The intensification of natural drought cycles and the ensuing stress placed upon overstocked forests could result in even larger and more severe wildland fires in owl habitat (Jones et al., 2016; Ganey et al., 2017). Although spotted owls will forage in severely burned areas, these areas typically lack nesting and roosting habitat, particularly when high-severity fire affects large patches of habitat (Jones et al., 2016).

Critical Habitat

Critical habitat was designated for the Mexican spotted owl in 2004 on approximately 8.6 million ac (3.5 million ha) of Federal lands in Arizona, Colorado, New Mexico, and Utah (USFWS, 2004). The PBFs within mixed-conifer, pine-oak, and riparian forest types that provide for one or more of the owl's habitat needs for nesting, roosting, foraging, and dispersing are:

1. A range of tree species, including mixed conifer, pine-oak, and riparian forest types, composed of different tree sizes reflecting different ages of trees, 30 to 45% of which are large trees with a trunk diameter of 12 in (30 cm) or more when measured 4.5 ft [1.4 m] from the ground);
2. A shade canopy created by the tree branches covering 40% or more of the ground;
3. Large, dead trees (snags) with a trunk diameter of at least 12 in (30 cm) when measured 4.5 ft [1.4 m] from the ground);

PBFs related to maintenance of adequate prey species are:

1. High volumes of fallen trees and other woody debris;
2. A wide range of tree and plant species, including hardwoods; and,
3. Adequate levels of residual plant cover to maintain fruits and seeds and allow plant regeneration.

4.1.8 California Condor

The Service listed the condor as endangered in 1967 (USFWS, 1967). Within Arizona, this endangered population occurs in Mohave County. A nonessential experimental population of condors occurs Northern Arizona and southern Utah, in an area bounded by Interstate 40 on the

south, U.S. Highway 191 on the east, Interstate 70 on the north, and Interstate 15 to U.S. Highway 93 on the west. Most condors occur in this area as part of the experimental population.

California condors are primarily a cavity-nesting species, typically nesting on steep rock formations.

The condor remains one of the world's rarest and most imperiled vertebrate species. Despite intensive conservation efforts, the wild condor population declined steadily until 1987, when biologists captured the last free-flying individual for captive breeding. During the 1980s, the FWS and partners established captive flocks at the San Diego Wild Animal Park and the Los Angeles Zoo. Following several years of successful captive breeding, the Service and partners released captive-produced condors back to the wild in California in early 1992 and in Arizona starting in 1996.

Within Arizona and Utah, The Peregrine Fund (TPF), the Service, and other partners have released a total of 238 condors at two release sites (Vermilion Cliffs and Hurricane Cliffs). Biologists have returned fifteen condors back to captivity, for behavioral and health reasons. Thirty unique pairings have produced 56 young since 2003, of which 24 survive in the wild today. TPF has documented 168 lost or missing condors. In spring (March/April) 2023, we confirmed twenty condor deaths due to HPAI.

Lead poisoning and shooting were largely responsible for the decline of the species in the years just prior to its extirpation from the wild (Snyder & Snyder 2000; Snyder, 2007). Lead continues to be a threat. Secondary poisoning from predator elimination campaigns, which occurred during early Euro-American settlement of the western U.S., may also have been a factor (Snyder & Snyder, 2005). Eggshell thinning was also a major cause of the species' decline during the 1950s and 1960s (Wilbur, 1978; Kiff et al., 1979; Wiemeyer et al., 1988). Most recently (spring 2023), tests confirmed that Highly Pathogenic Avian Influenza (HPAI) killed 20 condors in Arizona. We anticipate that HPAI will continue to be a threat.

4.2 FISH

These listed fish occur in Arizona: Gila chub (*Gila intermedia*) (E); Gila trout (*Oncorhynchus gilae*) (T); Spikedace (*Meda fulgida*) (E): loach minnow (*Tiaroga cobitis*) (E); Zuni bluehead sucker (*Catostomus discobolus yarrowi*) (E); Virgin River chub (*Gila seminuda (=robusta)*) (E); woundfin (*Plagopterus argentissimus*) (E); humpback chub (*Gila cypha*) (T); bonytail (*Gila elegans*) (E); Colorado pikeminnow (*Ptychocheilus lucius*) (E); razorback sucker (*Xyrauchen texanus*) (E); Little Colorado spinedace (*Lepidomeda vittata*) (T); Sonora chub (*Gila ditaenia*) (T); Yaqui chub (*Gila purpurea*) (E); Yaqui catfish (*Ictalurus pricei*) (T); beautiful shiner (*Cyprinella formosa*) (T); Gila topminnow (*Poeciliopsis occidentalis*) (E); Yaqui topminnow (*Poeciliopsis occidentalis*) (E) and desert pupfish (*Cyprinodon macularius*).

Of these, the following have designated critical habitat in Arizona: Gila chub, Spikedace, loach minnow, Zuni bluehead sucker, Virgin River chub, Woundfin, humpback chub, bonytail, Colorado pikeminnow, razorback sucker, Little Colorado spinedace, Sonora chub, Yaqui chub, Yaqui catfish, beautiful shiner, and desert pupfish.

4.2.1 Gila Chub

The Gila chub was listed as endangered with critical habitat in 2005 (USFWS, 2005). The species was proposed for delisting on June 17, 2025 (90 FR 25552).

Gila chub is a habitat generalist (Schultz and Bonar, 2007) and commonly inhabits pools in smaller steams, cienegas, and artificial impoundments throughout its range in the Gila River basin at elevations between 2,000 and 5,500 ft (609 and 1,676 m) (Miller, 1946; Minckley, 1973; Rinne, 1975; Weedman et al., 1996).

Historically, Gila chub was recorded from nearly 50 rivers, streams, and spring-fed tributaries throughout the Gila River basin in southwestern New Mexico, central and southeastern Arizona, and northern Sonora, Mexico (Rinne and Minckley, 1970; Minckley, 1973; Miller and Lowe, 1976; Rinne, 1976; DeMarais, 1986; Sublette et al., 1990; Weedman et al., 1996). Occupancy of Gila chub throughout its range was historically denser, and currently occupied sites were likely more expansive in distribution (Hendrickson and Minckley, 1984; Minckley, 1985; Rinne and Minckley, 1991). Gila chub currently occupies the Agua Fria River, Verde River, Santa Cruz River, San Pedro River, and Upper Gila River Subbasins.

Primary threats to Gila chub include predation by and competition with non-native organisms, and secondary threats include habitat alteration, destruction, and fragmentation.

Critical Habitat

Critical habitat for Gila chub is designated for approximately 160.3 mi of stream reaches in Arizona and New Mexico that includes cienegas, headwaters, spring-fed streams, perennial streams, and spring-fed ponds. Critical habitat includes the area of bankfull width plus 300 ft on either side of the banks.

Critical habitat PBFs include:

1. Perennial pools, areas of higher velocity between pools, and areas of shallow water among plants or eddies all found in headwaters, springs, and cienegas, generally of smaller tributaries;
2. Water temperatures for spawning, ranging from 63°F to 75 °F, and seasonally appropriate temperatures for all life stages (varying from about 50°F to 86 °F;
3. Water quality with reduced levels of contaminants, including excessive levels of sediments adverse to Gila chub health, and adequate levels of pH (e.g. ranging from 6.5 to 9.5), dissolved oxygen (i.e., ranging from 3.0 parts per million [ppm] to 10.0 ppm) and conductivity (i.e., 100 millimhos [mmhos] to 1,000 mmhos);
4. Prey base consisting of invertebrates (i.e., aquatic and terrestrial insects) and aquatic plants (i.e., diatoms and filamentous green algae);
5. Sufficient cover consisting of downed logs in the water channel, submerged aquatic vegetation, submerged large tree root wads, undercut banks with sufficient overhanging vegetation, large rocks and boulders with overhangs, a high degree of stream bank stability, and a healthy, intact riparian vegetation community;
6. Habitat devoid of non-native aquatic species detrimental to Gila chub or habitat in which detrimental nonnative species are kept at a level that allows Gila chub to continue to survive and reproduce; and
7. Streams that maintain a natural flow pattern including periodic flooding.

4.2.2 Gila Trout

The Gila trout is currently listed as threatened with a 4(d) (USFWS, 2006a).

Gila trout habitat typically consists of montane streams ranging from 5,400 to 9,200 ft (1,660–2,800 m) elevation (Propst & Stefferud, 1997). The Gila trout is an inland trout species,

historically found in mountain and headwater streams within the Gila, San Francisco, Agua Fria and Verde River drainages in New Mexico and Arizona (Miller, 1950; Behnke, 1992; Minckley & Marsh, 2009). Although Gila trout were known to occur in the upper Gila River basin since at least 1885, it was not described until 1950, by which time its distribution had been dramatically reduced (Budy et al., 2019). Since the 1990s, there have been several Gila trout translocation efforts in Arizona and New Mexico. Stockings have occurred on the Prescott, Apache-Sitgreaves, Tonto, and Coconino National Forests in Arizona, and the Gila National Forest in New Mexico. All Gila trout populations in New Mexico are in the Gila National Forest, mostly in wilderness areas.

As of 2022, twenty-three populations of Gila trout inhabit approximately 131.0 mi (210.8 km) of stream. They occur in the East Fork Gila River, Sapillo Creek, West Fork Gila River, Mogollon Creek, Big Bug Creek, Middle Fork Gila River, San Francisco River, Middle Gila, East Verde River, and Blue River watersheds (USFWS, 2022a).

Threats to the Gila trout include increased occurrence of high-severity, large-scale wildfires. Predation and competition by nonnative species (primarily brown trout and brook trout), likely reduce Gila trout abundance, increase mortality, reduce growth and survival, and reduce reproduction and recruitment. Human-mediated hybridization between Gila trout and non-native species (primarily rainbow trout) likely results in genetic modification and genomic extinction in Gila trout populations. Historic land uses (for example grazing and logging) reduced the quality and connectivity of Gila trout stream habitat and has resulted in small and fragmented Gila trout populations.

4.2.3 Spikedace

Spikedace is currently listed as endangered with designated critical habitat (USFWS, 2012a).

Spikedace live about two years in the wild, with reproduction occurring primarily in one-year old fish (Barber et al., 1970; Anderson, 1978; Propst et al., 1986). They feed primarily on aquatic and terrestrial insects (Schreiber, 1978; Barber & Minckley, 1983; Marsh et al., 1989). Spikedace live in flowing water with slow to moderate velocities over sand, gravel, and cobble substrates (Propst et al., 1986; Rinne & Kroeger, 1988).

Spikedace were once common throughout much of the Gila River basin, including the mainstem Gila River upstream of Phoenix, and the Verde, Agua Fria, Salt, San Pedro, and San Francisco subbasins. Habitat destruction and competition and predation by nonnative aquatic species reduced their range and abundance (Miller, 1961; Lachner et al., 1970; Ono et al., 1983; Moyle, 1986; Moyle et al., 1986; Propst et al., 1986). Spikedace are now restricted to 10 to 15% of their historical range, in portions of the upper Gila River (Grant, Catron, and Hidalgo Counties, New Mexico); Aravaipa Creek (Graham and Pinal Counties, Arizona); Eagle Creek (Graham and Greenlee Counties, Arizona); and the Verde River (Yavapai County, Arizona) (Marsh et al., 1990; Brouder, 2002; Stefferud & Reinthal, 2005; Paroz et al., 2006; Propst, 2007). Primary threats to spikedace include habitat alteration and destruction, introduction and spread of nonnative species, wildfire, drought, and climate change.

Critical Habitat

The spikedace critical habitat designation includes 630 river miles across eight units of river subbasins, including the Verde River, Salt River, San Pedro, Bonita Creek, Eagle Creek, San Francisco River, Blue River, and Gila River subbasins (USFWS, 2012a).

Critical habitat PBFs include:

1. Habitat to support all egg, larval, juvenile, and adult spikedace, which includes:
    a. Perennial flows with a stream depth generally less than 3.3 ft (1 meter), and with slow to swift flow velocities between 1. 9 and 31. 5 in/sec (4. 8 and 80 cm/sec);
    b. Appropriate stream microhabitat types including glides, runs, riffles, and the margins of pools and eddies, and backwater components over sand, gravel, and cobble substrates with low or moderate amounts of fine sediment and substrate embeddedness;
    c. Appropriate stream habitat with a low gradient of less than approximately 1%, at elevations below 6,890 ft (2,100 m); and
    d. Water temperatures in the general range of 46.4 to 82.4°F (8 to 28°C);
2. An abundant aquatic insect food base consisting of mayflies, true flies, black flies, caddisflies, stoneflies, and dragonflies;
3. Streams with no or no more than low levels of pollutants;
4. Perennial flows, or interrupted stream courses that are periodically dewatered but that serve as connective corridors between occupied or seasonally occupied habitat and through which the species may move when the habitat is wetted;
5. No non-native aquatic species or levels of non-native aquatic species that are sufficiently low as to allow persistence of spikedace; and
6. Streams with a natural, unregulated flow regime that allows for periodic flooding or, if flows are modified or regulated, a flow regime that allows for adequate river functions, such as flows capable of transporting sediments.

4.2.4 Loach Minnow

Loach minnow is currently listed as an endangered species with designated critical habitat (USFWS, 2012a).

Loach minnow is a bottom-dwelling inhabitant of shallow, swift water over gravel, cobble, and rubble substrates (Rinne, 1989; Propst & Bestgen, 1991). Loach minnow feeds exclusively on aquatic insects (Schreiber, 1978; Abarca, 1987).

Loach minnow are believed to occupy approximately 15 to 20% of their historical range, which includes portions of the Gila River and its tributaries: the West Fork, Middle Fork, and East Fork of the Gila River and Bear Creek in Grant, Catron, and Hidalgo Counties, New Mexico (Paroz & Propst, 2007; Propst, 2007; Propst et al., 2009; Johnson et al., 2021; Shollenberger et al., 2021); the San Francisco and Tularosa rivers and their tributaries Negrito and Whitewater creeks in Catron County, New Mexico (Propst et al., 1988; Arizona State University (ASU) 2002; Paroz & Propst, 2007; Propst, 2007; Johnson et al., 2022); the Blue River and its tributaries Dry Blue, Campbell Blue, Pace, and Frieborn creeks in Greenlee County, Arizona and Catron County, New Mexico (Miller, 1998; Arizona State University (ASU), 2002; Carter, 2005, 2008; Clarkson et al., 2008; Robinson, 2009; Hickerson et al., 2021; Shollenberger et al., 2021); Aravaipa Creek and its tributaries Turkey and Deer creeks (Graham and Pinal Counties, Arizona) (Stefferud & Reinthal, 2005); Eagle Creek in Graham and Greenlee Counties, Arizona (Knowles, 1994; Bagley & Marsh, 1997; Marsh et al., 2003; Carter, 2007; Carter et al., 2007; Bahm & Robinson, 2009; Freeport-McMoRan Corporation, 2020); East Fork and North Fork East Fork Black River in Apache and Greenlee Counties, Arizona (Leon, 1989; Lopez, 2000; Gurtin, 2004; Carter,

2007; Robinson, 2009, 2010) and; possibly the White River and its tributaries, the East and North Fork White River in Apache, Gila, and Navajo Counties, Arizona.

Loach minnow have been translocated to several streams as part of the recovery efforts, including Hot Springs and Redfield canyons in the San Pedro Watershed (2007), Fossil Creek in the Verde River Watershed (2007), and Bonita Creek in the Gila River Watershed (2008) in Arizona. Of these three areas, loach minnow is considered established only in Hot Springs Canyon (Shollenberger et al., 2021). Primary threats to loach minnow include habitat alteration and destruction, introduction and spread of nonnative species, wildfire, drought, and climate change.

Critical Habitat

The critical habitat designation includes 610 river miles, including the Verde River, Salt River, San Pedro River, Bonita Creek, Eagle Creek, San Francisco River, Blue River, and Gila River subbasins (USFWS, 2012a).

Critical habitat PBFs include:

1. Habitat to support all egg, larval, juvenile, and adult loach minnow which includes:
    a. Perennial flows with a stream depth generally less than 3.3 ft (1.0 m), and with slow to swift flow velocities between 0.0 and 31.5 inches per second (in/sec) (80.1 cm per second [cm/sec]);
    b. Appropriate stream microhabitat types including pools, runs, riffles, and rapids over sand, gravel, cobble, and rubble substrates with low or moderate amounts of fine sediment and substrate embeddedness;
    c. Appropriate stream habitat with a low gradient of less than approximately 2.5%, at elevations below 8,202 ft (2,500 m); and
    d. Water temperatures in the general range of 46.4 to 77°F (8 to 25°C);
2. An abundant aquatic insect food base consisting of mayflies, true flies, black flies, caddisflies, stoneflies, and dragonflies;
3. Streams with no or no more than low levels of pollutants;
4. Perennial flows, or interrupted stream courses that are periodically dewatered but that serve as connective corridors between occupied or seasonally occupied habitat and through which the species may move when the habitat is wetted;
5. No non-native aquatic species or levels of non-native aquatic species that are sufficiently low as to allow persistence of loach minnow; and
6. Streams with a natural, unregulated flow regime that allows for periodic flooding or, if flows are modified or regulated, a flow regime that allows for adequate river functions, such as flows capable of transporting sediments.

4.2.5 Zuni Bluehead Sucker

The Zuni bluehead sucker was listed as an endangered species on August 24, 2014 (USFWS, 2014b) and critical habitat was designated on June 2, 2016 (USFWS, 2016a). Zuni bluehead suckers occupy a variety of habitats from headwater streams to large rivers but occur most frequently in moderate to fast flowing water above a rubble-rock substrate.

The Zuni River watershed extends west from the continental divide, across the Zuni Pueblo, and drains into the Little Colorado River in Arizona, west of the Zuni Pueblo. In the Zuni River watershed of New Mexico, the subspecies occurs in three isolated populations in 2.3 mi (3.7 km)

of streams within the upper Rio Nutria watershed (Carman, 2008). More specifically, the subspecies occurs in and upstream of the Rio Nutria from the mouth of Rio Nutria Box Canyon near the eastern boundary of the Zuni Pueblo, and upstream in Tampico Draw. In addition, Zuni bluehead sucker also occurs in separate populations in two headwater springs to the Rio Nutria: Tampico Spring (now called Rose Spring) and Agua Remora (Hanson, 1980, Propst et al., 2001).

The principal threats to Zuni bluehead sucker habitat include water withdrawal, sedimentation, impoundments, housing development, wildfire, and climate change (USFWS, 2014b). The species' extremely small range intensifies these threats. Severe degradation to watersheds occupied by Zuni bluehead sucker has occurred through excessive timber harvest, overgrazing, and road construction. Although most of these activities occurred in the late 1800s and early 1900s, the subsequent erosion, gullying, head-cutting, and loss of water have continued to degrade habitat.

Critical Habitat

The Zuni bluehead sucker final critical habitat rule designated approximately 34.6 mi (55.7 km) of the Zuni River Watershed in one unit in McKinley and Cibola Counties, New Mexico (USFWS, 2014b). This one unit consists of two subunits, subunit 1a – Zuni River Headwaters and subunit 1b – Zuni River Mainstem. Subunit 1a consists of 22.0 mi (35.4 km) along Agua Remora, Rio Nutria, Tampico Draw, and Rose Springs in McKinley County, New Mexico.

The PBFs for Zuni bluehead sucker designated critical habitat are:

1. A riverine system with habitat to support all life stages of the Zuni bluehead sucker (egg, larval, juvenile, and adult), which includes:
    a. Dynamic flows that allow for periodic changes in channel morphology and adequate river functions, such as channel reshaping and delivery of coarse sediments;
    b. Stream courses with perennial flows or intermittent flows that serve as connective corridors between occupied or seasonally occupied habitat through which the subspecies may disperse when the habitat is wetted;
    c. Stream mesohabitat types including runs, riffles, and pools with substrate ranging from gravel, cobble, and bedrock substrates with low or moderate amounts of fine sediment and substrate embeddedness;
    d. Streams with depths generally less than 3.3 ft (2 m), and with slow to swift flow velocities less than 1.15 ft/s (0.35 m/s);
    e. Clear, cool water with low turbidity and temperatures in the general range of 35.6 to 73.4 °F (2.0 to 23.0 °C);
    f. No harmful levels of pollutants; and g. Adequate riparian shading to reduce water temperatures when ambient temperatures are high and provide protective cover from predators.
2. An abundant aquatic insect food base consisting of fine particulate organic material, filamentous algae, midge larvae, caddisfly larvae, mayfly larvae, flatworms, and small terrestrial insects.
3. Areas devoid of nonnative aquatic species or areas that are maintained to keep nonnatives at a level that allows the Zuni bluehead sucker to continue to survive and reproduce.

4.2.6 Virgin River Chub

The Virgin River chub was listed as an endangered species in 1989 (USFWS, 1989), and critical habitat was designated in 2000 (USFWS, 2000). Virgin River chub are opportunistic feeders, consuming zooplankton, aquatic insect larvae, other invertebrates, debris, and algae. The diet of many adults is composed primarily of algae, whereas the diets of younger fish contain more animal matter. The species spawns during late spring and early summer over gravel or rock substrate. Adult fish do not provide parental care for the eggs, which hatch in one week or less.

Virgin River chub is endemic to the Virgin River (Utah, Arizona, and Nevada) and the Muddy River (Nevada). Suitable habitat includes deeper areas where waters are swift, but not turbulent, and is most often associated with boulders or other types of cover. Water in the Virgin River is warm, turbid, and saline (USFWS, 2020b).

The primary threats are dewatering from numerous diversion projects; proliferation of nonnative fishes; and alterations to natural flow, temperature, and sediment regimes (USFWS, 1994a, 2020). The limited distribution of Virgin River chub populations reduces its ability to respond to stochastic change and makes them particularly vulnerable to catastrophic environmental events. Limiting factors include poor water quality, high water temperatures, and clear water during low summer flows, predation and competition from nonnative fish, and late summer flow events (USFWS, 2020b).

Critical Habitat

The Virgin River chub final critical habitat rule designated approximately 31.6 mi (150.1 km) of the Virgin River Watershed in Arizona, Utah, and Nevada (USFWS, 2020b). The PBFs of the critical habitat are:

1. River channels, side channels, secondary channels, backwaters, and springs, and other areas which provide access to these habitats; and
2. Areas with slow to moderate velocities, within deep runs or pools, with predominately sand substrates, particularly habitats which contain boulders or other instream cover.

Biological Environment—Food supply, predation, and competition are important elements of the biological environment and are considered components of this constituent element. Food supply is a function of nutrient supply, productivity, and availability to each life stage of the species. Predation and competition, although considered normal components of this environment, are out of balance due to nonnative fish species in many areas. Fourteen introduced species, including red shiner (*Cyprinella lutrensis*), black bullhead (*Ameiurus melas*), channel catfish (*Ictalurus punctatus*), and largemouth bass (*Micropterus salmoides*), compete with or prey upon the listed fishes. Of these, the red shiner is the most numerous and has been the most problematic for the listed fishes. Red shiners compete for food and available habitats and are known to prey on the eggs and early life stages of the listed fishes. Components of this constituent element include the following:

1. Seasonally flooded areas that contribute to the biological productivity of the river system by producing allochthonous (humus, silt, organic detritus, colloidal matter, and plants and animals produced outside the river and brought into the river) organic matter which provides and supports much of the food base of the listed fishes; and
2. Few or no predatory or competitive nonnative species in occupied Virgin River fishes' habitats or potential reestablishment sites.

4.2.7 Woundfin

The woundfin was listed as an endangered species in 1970 (USFWS, 1970), and critical habitat was designated in 2000 (USFWS, 2000). Woundfin spawning begins in April to May and continues through August. This species spawns in swift shallow water over gravel substrate, and eggs and young do not receive parental care. Maturation appears to occur in the second summer, and few if any individuals live more than four years. Woundfin diets are quite varied, consisting of insects, insect larvae, other invertebrates, algae, and detritus.

Woundfin historical range was the mainstem Colorado River from Yuma upstream to the Virgin River in Nevada, Arizona, and Utah and into La Verkin Creek, a tributary of the Virgin River in Utah. Except for the mainstem of the Virgin River, woundfin no longer occur within most of their historical range (USFWS, 2020b). Suitable habitat includes seasonally swift, highly turbid, and extremely warm streams, with sandy, constantly shifting bottoms. Current velocities and depths preferred by adults are 1–2 cubic feet/second (cfs) (0.03 to 0.06 cubic meters/second) and 8–18 in (20.3 to 45.7 centimeters [cm]) deep. Young of the year seek quiet backwaters with sandy substrates. This species can tolerate heavily mineralized waters and extremely high turbidity.

The primary threats are habitat fragmentation, introduction of nonnative species and dewatering due to agriculture, mining, and urbanization (USFWS, 1994a). Damming and drying have caused the disappearance of the woundfin throughout most of its historical range and continue to impact it in the Virgin River (USFWS, 1994a, 2020b). Municipal and agricultural withdrawals have depleted flows. Additionally, nonnative fishes in the system, carrying with them parasites previously unknown to woundfin, are causing declines in the remaining woundfin populations.

Critical Habitat

The woundfin final critical habitat rule designated approximately 31.6 mi (150.1 km) of the Virgin River watershed in Arizona, Utah, and Nevada (USFWS, 2020b). The PBFs are:

1. River channels, side channels, secondary channels, backwaters, and springs, and other areas which provide access to these habitats;
2. Areas inhabited by adult and juvenile woundfin include runs and pools adjacent to riffles that have sand and sand/gravel substrates;
3. Areas inhabited by juvenile woundfin are generally deeper and slower. When turbidity is low, adults also tend to occupy deeper and slower habitats;
4. Areas inhabited by woundfin larvae include shoreline margins and backwater habitats associated with growths of filamentous algae.

4.2.8 Humpback Chub

The humpback chub is currently listed as threatened (86 FR 57588, November 17, 2021).

Humpback chub are long-lived fish from the family Leuciscidae (Coggins et al., 2006; USFWS, 2018a). They become sexually mature at 2 to 3 yrs of age (Mueller and Marsh, 2002). Spawning from March to September. Young of year optimal temperature for growth is 16 to 22ºC (Gorman and VanHoosen, 2000). The diet of young of year is primarily diatoms, algae, and small invertebrates, and aquatic insects (e.g., midges, flies) (Minckley, 1997; USFWS, 2018a). Adults diet consists of invertebrates, vertebrates, and vegetation (USFWS, 2018a). Juveniles are active during the mornings and adults are nocturnal (Valdez and Hoffnagle, 1999; Stone and Gorman, 2006).

The humpback chub is endemic to canyon-bound warm-water habitats of the Colorado and Green Rivers. Suitable habitat includes rivers with flows ranging from 65 to 60,000 cfs, and temperature ranges between 59 to 75ºF (15 to 24ºC) for spawning (Valdez and Clemmer, 1982; Kaeding et al., 1990; Muth and Nesler, 1993). Young of year require water temperatures of 54 to 75ºF (12 to 24ºC) for growth, but optimal temperature for growth is 61 to 72ºF (16 to 22ºC) (Gorman and VanHoosen, 2000). Juvenile or young of year require shallow sheltered (rock or vegetation) nearshore and backwater habitats (Valdez and Ryel, 1995; Van Haverbeke et al., 2022). Sub-adults and adults generally require deeper pools and eddies within canyon-bound habitats during the daytime and can be found nearshore at nighttime (Stone and Gorman, 2006).

The primary threats are habitat loss, habitat modification, streamflow regulation, predation by nonnative fish, parasitism, pesticides, and pollutants (USFWS, 2018a). In addition, potential threats include hybridization with other *Gila* spp. and competition with native and nonnative species of fish.

Critical Habitat

Critical habitat for humpback chub was designated on April 20, 1994, in seven reaches of the Colorado River basin for a total of 379 mi (610 km) (USFWS, 1994b). There are 198 mi (319 km) of critical habitat on the Green and Colorado Rivers in Colorado and Utah and 181 mi (291 km) on the Colorado and Little Colorado Rivers in Arizona. In Arizona, critical habitat includes 173 mi (278 km) of the Colorado River through Marble and Grand Canyons from Nautiloid Canyon to Granite Park, and the lower 8 mi (13 km) of the Little Colorado River. The critical habitat PBFs are:

1. Water (a quantity of sufficient quality that is delivered to a specific location in accordance with a hydrologic regime that is required for the particular life stage);
2. Physical habitat (areas of the Colorado River system that are inhabited or potentially habitable by humpback chub for use in spawning, nursery, feeding, and rearing, or corridors between these areas); and
3. Biological environment (food supply, predation, and competition) that influence all life stages.

4.2.9 Bonytail

The bonytail was listed as an endangered species throughout its range on April 23, 1980 (USFWS, 1980). The bonytail is a large, long-lived fish, reaching at least 49 yrs of age. Bonytail spawning occurs in late spring (April to May) when water temperatures reach 59.9 to 64.9°F (15.5 to 18.3°C), and it is believed that they become sexually mature at age two (Mueller & Marsh, 2002). Bonytail are opportunistic feeders with a diet of terrestrial insects, plant material, and fish. They are active mostly at night, when most foraging activity likely takes place (Minckley & Marsh, 2016). Temperatures of less than 57.2°F (14°C) depress bonytail growth and accelerated growth is observed between 71.6 to 78.8°F (22 and 26°C) (Kappenman et al., 2012).

The bonytail is endemic to warm-water habitats of the Colorado River and its tributaries. It historically ranged from Mexico to Wyoming, but by the late 1970s the population declined to less than 50 known individuals. Most habitat requirements are unknown, but this species requires water temperatures greater than 57.2°F (14°C). This species has been found in shallow areas along the shoreline, as well as in deeper, open waters depending on the time of the day (Marsh &

Mueller, 1999). Field observations from stocked fish suggest that lentic environments may play a role in the life history of this species.

The primary threats are predation from birds and non-native fish (Karam & Marsh, 2010; Mueller et al., 2020). Other threats include loss of riverine habitats, habitat fragmentation, changes in flows due to water development projects, and hybridization with other Gila species.

Critical Habitat

Critical habitat for the bonytail was designated on April 20, 1994, and includes portions of the Colorado, Green, and Yampa rivers in Colorado and Utah, and portions of the Colorado River in Arizona (USFWS, 1994b). The PBFs are:

1. Water (a quantity of sufficient quality that is delivered to a specific location in accordance with a hydrologic regime that is required for the particular life stage);
2. Physical habitat (areas of the Colorado River system that are inhabited or potentially habitable by bonytail for use in spawning, nursery, feeding, and rearing, or corridors between these areas); and
3. Biological environment (food supply, predation, and competition) that influence all life stages.

4.2.10 Colorado Pikeminnow

The Colorado pikeminnow was listed as endangered in the original 1967 List of Endangered Species (32 FR 4001) and in 1974 as endangered (USFWS, 1974) under the Act. In 1994, the Service designated critical habitat for pikeminnow in the Green, upper Colorado, and San Juan subbasins of the Upper Colorado River Basin (USFWS, 1994b). A nonessential experimental population area for pikeminnow was established in 1985 (USFWS, 1985a).

Pikeminnow spawning occurs in the summer months. Larval fish flow downstream for about six days, traveling an average distance of 100 mi (160 km) to reach nursery areas in low-gradient reaches. Young pikeminnow feed primarily on zooplankton and insect larvae. The juvenile and adult life-stages of the species are primarily piscivorous but will also eat small mammals and birds.

The pikeminnow is endemic to the Colorado River basin from Wyoming to México and once occupied both the Colorado and Gila River drainages in Arizona. Suitable habitat includes rivers with high silt content, warm water, turbulence, and variable flow by season under 4,000 ft (1,219 m) in elevation. Adults inhabit pools and eddies just outside the main current, while young of year use backwater areas. During winter, pikeminnow use backwaters, runs, pools, and shallow shoreline areas. In spring and early summer, they use shorelines and lowlands inundated during typical spring flooding.

The primary threats are changes in the flow regime because of water development throughout the Colorado River basin. These include dams and diversions which fragmented habitat and caused direct mortality. Large dams, water storage, and flow management alter water temperatures to ranges not conducive to pikeminnow growth and reproduction. In addition, predation and competition from invasive fishes reduces survival and recruitment in all life stages. Contaminants that reduce water quality, such as toxic spills, can reduce reproduction and survival. Lastly, climate change and extended drought reduce streamflow in many rivers, which strains conservation efforts.

Critical Habitat

The Service designated six reaches of the Colorado River System as critical habitat for the pikeminnow. These reaches total 1,148 mi (1,848 km) in portions of the Colorado, Green, Yampa, White, and San Juan Rivers in the Upper Basin (USFWS, 1994b). The PBFs are:

1. Water (a quantity of sufficient quality that is delivered to a specific location in accordance with a hydrologic regime that is required for the particular life stage);
2. Physical habitat (areas of the Colorado River system that are inhabited or potentially habitable by bonytail for use in spawning, nursery, feeding, and rearing, or corridors between these areas); and
3. Biological environment (food supply, predation, and competition) that influence all life stages.

4.2.11 Razorback Sucker

The razorback sucker was listed as an endangered species on October 23, 1991(USFWS, 1991). Eggs are generally laid on clean, rocky substrates and are adhesive after fertilization (USFWS, 2018b). After hatching, larvae feed on benthic insects, zooplankton, and phytoplankton. Hatchling growth and survival is dependent upon adequate food resources (Marsh & Langhorst, 1988; Bestgen, 1990). As larvae transition to juvenile fish they can occur in both lentic and lotic environments. Breeding adults reach sexual maturity around 4 yrs of age, and they grow indeterminately until death.

Razorback sucker historically inhabited virtually all components of low velocity riverine habitat including backwaters, floodplains, sloughs, oxbow lakes, and other slack-water habitats (Holden, 1973; Holden & Stalnaker, 1975; Behnke & Benson, 1980; Minckley, 1983). Suitable habitat includes riverine areas. Main-channel habitats tend to be low velocity pools, eddies, nearshore runs, and channels associated with sand or gravel bars (Bestgen, 1990; Marsh, et al., 2015). Habitat selection changes seasonally (Bestgen, 1990; Bestgen et al., 2012). In early spring, adults move into flooded bottomlands when available. They use relatively shallow water, 3 ft (0.9 m), during spring and deeper water, 5 to 6 ft (1.5 to 1.8 m), during winter (USFWS, 2002b). In reservoirs, they use all available habitat types but prefer backwaters and the main impoundment (USFWS, 1998).

The primary threats are water manipulation, habitat degradation, and importation and invasion of non-native species. Dams, reservoirs, and diversions have destroyed, altered, and fragmented habitats. Fluctuating flows, such as those from load following (when a hydroelectric power plant adjusts electricity output to match demand) at a dam during spawning season, may cause eggs to dry out where waters recede from spawning habitat (McCall et al., 2017). Channel modifications have reduced habitat diversity, and degradation of riparian and upland areas has altered stream morphology and hydrology. Non-native species compete with or predate eggs and larvae of razorback sucker (Minckley, 1991; Ehlo et al., 2017), resulting in loss of recruitment and age-class range.

Critical Habitat

Critical habitat was designated in fifteen river reaches in the historical range of the razorback sucker on March 21, 1994 (USFWS, 1994b). Critical habitat includes portions of the Colorado, Duchesne, Green, Gunnison, San Juan, White, Yampa, Colorado, Gila, Salt, and Verde Rivers. The PBFs of critical habitat are:

1. Water (a quantity of sufficient quality that is delivered to a specific location in accordance with a hydro logic regime that is required for the particular life stage);
2. Habitable waters (areas of the Colorado River system that are inhabited or potentially habitable by the sucker for use in spawning, nursery, feeding, and rearing, or corridors between these areas); and
3. The biological environment (food supply, predation, and competition) that influence all life stages.

4.2.12 Little Colorado Spinedace

The Service listed the Little Colorado spinedace as threatened with critical habitat on October 16, 1987 (USFWS, 1987a).

The spinedace is native to the Little Colorado River drainage. This fish occurs in disjunct populations throughout much of the drainage in Apache, Coconino, and Navajo counties, Arizona. The spinedace occurs in a variety of stream habitats (Miller, 1963; Nisselson & Blinn, 1989, 1991; Blinn & Runck, 1990). As with most aquatic habitats in the southwest, the Little Colorado River Basin is prone to severe seasonal and yearly fluctuations in water quality and quantity. The spinedace still occupies the streams it is known from historically (Chevelon, Nutrioso, East Clear Creek, and the Little Colorado River), except for Silver Creek where surveys have not located spinedace in over 20 yrs. Populations are small, and the true population size for any occupied stream is unknown, due to yearly fluctuations in their numbers and the difficulty in locating fish.

The spinedace has a limited, highly fragmented distribution and relatively low numbers, making it highly vulnerable to stressors, particularly drought, groundwater and surface -water withdrawals, high-intensity landscape scale wildfires, and predation and competition with nonnative warm water fishes (USFWS, 2008). Uncertainties that may impede recovery include climate change, the effects of extended drought and increased water consumption on the persistence of habitat; the lack of knowledge regarding genetic diversity; and our inability to control invasive non-native aquatic organisms.

Critical Habitat

Critical habitat for the Little Colorado spinedace is designated for approximately 31 river miles: 18 mi in East Clear Creek, eight mi in Chevelon Creek, and five miles in Nutrioso Creek (USFWS, 1987a). Critical habitat PBFs include clean permanent flowing water, with pools and fine gravel or silt-mud substrate (52 FR pg. 35041).

4.2.13 Sonora Chub

The Sonora chub was listed as a threatened species with critical habitat under the ESA on April 30, 1986 (USFWS, 1986a). The Sonora chub native to southeastern Arizona and northern Mexico was known to occur in Sycamore Creek of Santa Cruz County of Arizona at the time of listing in 1986, and the captive population at the Arizona-Sonora Desert Museum (ASDM) within the U.S. was established in 1988. A second population, or more likely a metapopulation that includes Sycamore Creek, is now known to occur in California Gulch and its tributary streams.

The threats faced by the Sonora chub (including habitat loss, non-native fishes and parasites, and water developments), continue to exist in both Sycamore Canyon and California Gulch. Cross-border incursions and the law enforcement response to them represent factors that have been

present since before the 1986 listing, and which continue to affect the species. Climate change, along with water development, threaten their habitat, potentially reducing the species' resilience and ability to persist through stochastic events such as drought and floods. Drought is prevalent throughout the Southwest, as temperatures and precipitation become more variable. Other threats include the degradation, siltation, and water pollution caused by livestock grazing; road construction and runoff; construction and repair of infrastructure; human use, and mining operations.

Critical Habitat

A total of 6.5 miles of critical habitat has been designated for the Sonora chub, which includes five miles of Sycamore Creek from Yank's Spring downstream to the international border; the lower 1.25 mi of Penasco Creek; and 0.25 mi of an unnamed tributary entering Sycamore Creek (USFWS, 1986a). Along Sycamore and Penasco Creeks a 25-foot-wide riparian zone on each side of these creeks was included in the designation. PBFs includes "clean permanent water with pools and intermediate riffle areas and/or intermittent pools maintained by bedrock or by subsurface flows in areas shaded by canyon walls."

4.2.14 Yaqui Chub

The Yaqui chub was listed as threatened in 1984 (USFWS, 1984a).

The Yaqui chub is restricted to the Rio San Bernardino (Black Draw) system in the upper Rio Yaqui drainage of Arizona and Sonora (< 3.0 km from international border). The species may occupy pools or stream segments in a clumped distribution (Hendrickson et al., 1980).

In the 1984 final rule, the Service identified multiple threats to the species, which included habitat modification and introduced predatory fish (USFWS, 1984a). More recently, large-scale pumping threatens managed habitat areas by reducing the amount of available water (USFWS, 2020c). Habitat modification across the range of the Yaqui chub has occurred from arroyo cutting, diversion of stream headwaters, construction of impoundments, and excessive pumping of groundwater (USFWS, 1984a). The presence of introduced predatory fish is a stressor across the Mexican portion of the Yaqui chub's range, as sportfish stocking is common (Ibáñez et al., 2014). In 2020, the construction of the border barrier across the international boundary initiated large scale pumping that reduced flow to many occupied habitats on the San Bernardino NWR, threatening multiple populations of Yaqui chub (USFWS, 2020c).

Critical Habitat

Critical habitat PBFs are "clean permanent water with deep pools and intermediate riffle areas, areas of detritus or heavy overgrown cut banks in the Rio Yaqui drainage, and absence of introduced exotic fishes" (49 FR 34490) (USFWS, 1984a). Critical habitat has only been designated on the San Bernardino NWR.

4.2.15 Yaqui Catfish

The Yaqui catfish was listed as threatened in 1984 (USFWS, 1984a). Yaqui catfish is most abundant in larger rivers with medium to slow water flow, characterized by sandy or rocky bottoms at lower elevations. At higher elevations, Yaqui catfish were frequently found in clear, still pools containing aquatic plants, with gravely or sandy bottoms (Hendrickson et al., 1980).

After a re-evaluation of the Río Yaqui basin, McNatt (1974) indicated that the Yaqui catfish was likely extirpated from the U.S. due to the altered hydrology of Río San Bernardino and lack of

water. Further, after surveys in the 1970s, Hendrickson et al. (1980) noted the absence of Yaqui catfish in the upper reaches of the Río Papigochic, suggesting a contraction of the range. Later, Hendrickson and Varela-Romero (2002) indicated that the species was rare, even in areas where they had been found frequently before as they had been replaced with Channel catfish and hybrids. Varela-Romero et al. (2011) reported that the Yaqui catfish was extirpated from the Riós Sonora and Casa Grandes Basins and restricted to the Riós Yaqui, Mayo and Fuerte Basins, although these areas harbor hybridized individuals, and "pure" Yaqui catfish were increasingly rare (Gutiérrez-Barragán et al., 2021).

Within the U.S. the loss of habitat is the ultimate threat to the conservation of the species. In the Mexican portion of its range, multiple stressors act on the Yaqui catfish. Specifically, the presence of channel catfish and the construction of large water impoundment structures (dams) present the most pressing threats in both magnitude and extent. Other threats include loss of aquatic and riparian habitat, groundwater withdrawal, and impacts from future climate change.

Critical Habitat

Critical habitat PBFs are "clean unpolluted permanent water in streams with medium current with clear pools in the Rio Yaqui drainage. These waters should be without introduced exotic fishes" (49 FR 34490) (USFWS, 1984a). Critical habitat has only been designated on the San Bernardino NWR.

4.2.16 Beautiful Shiner

The Beautiful shiner was listed as a threatened species on August 31, 1984 (USFWS, 1984a). Beautiful shiner is native to Rio Yaqui of southeastern Arizona, the Rio Mimbres of southwestern New Mexico, USA, and the Rio Yaqui of northwestern Chihuahua and northeastern Sonora, Mexico. Its current distribution is largely limited to the San Bernardino and Leslie Canyon NWRs. At San Bernardino NWR, captive beautiful shiner has been observed to lay eggs on submerged structures, such as gravel substrates and artificial plants, and likely use live vegetation and dead wood in refuge wetlands (Radke, pers. com).

Beautiful shiner occupies small and medium-sized streams and open lentic habitats (Minckley, 1973; Miller et al., 2005). Virtually no data exist as to absolute population trends. Beautiful shiners were found in two wetlands at San Bernardino NWR in 2006 and have now been reestablished in about 12 wetlands as of 2019 (USFWS, 2020d). Hendrickson et al. (1981) surveyed the Rio Yaqui (Mexico and the U.S.) and tributaries in the late 1970s and early 1980s, finding that beautiful shiner was relatively widespread but locally uncommon in the upper reaches of the river system. The range of Yaqui beautiful shiner expanded in 2008, when owners of the Bar Boot Ranch implemented a Safe Harbor Agreement upstream from Leslie Canyon NWR. The agreement permitted reestablishment of beautiful shiner populations in two wetlands across 25,000 ac.

The listing package for beautiful shiner named habitat destruction and modification as the greatest threats to the species. From 2019 to 2021, the production of concrete to construct 25 mi of border-security infrastructure in the San Bernardino Valley withdrew large amounts of water (Department of Homeland Security and Environmental Protection Agency, email communication August 8, 2019) from suitable habitat, posing an additional threat to the species. Habitat destruction and modification, invasive species, and climate change are current threats to the

beautiful shiner. Additional pumping may occur in the with planned future border infrastructure in the future, posing another potential threat.

Critical Habitat

The critical habitat PBFs are: "small permanent streams with riffles, or intermittent creeks with pools and riffles in the Rio Yaqui drainage with clean unpolluted water. These waters should be free of introduced exotic fishes" (49 FR 34490) (USFWS, 1984a). Critical habitat has only been designated on the San Bernardino NWR.

4.2.17 Gila Topminnow

Gila topminnow was listed as endangered in 1967 without critical habitat (USFWS, 1967). Originally only Gila topminnow populations in the U.S., and not in Mexico, were listed under the ESA. However, in 2023 the species' listing status was expanded to include wherever the species is found (USFWS, 2023c).

The Gila topminnow is live.bearing fish once ubiquitous in the Gila River Basin. Gila topminnow habitat requirements are broad, including shallow, warm, quiet waters in ponds, ciénegas, tanks, pools, springs, small streams, and the margins of larger streams. A recovery program actively stocks Gila topminnow in Arizona and New Mexico, reestablishing topminnow in "new" sites (Montgomery, 2024). However, the number of natural sites and natural topminnow populations at natural sites continue to slowly decline. Gila topminnow has gone from being one of the most common fishes of the Gila basin to one that exists at no more than thirty localities (twelve natural and eighteen stocked) (Voeltz and Bettaso, 2003). Many existing localities are small and highly susceptible to perturbation.

The reasons for decline of this fish include past dewatering of water bodies, impoundment, channelization, diversion, regulation of flow, land -management practices that promote erosion and arroyo formation, and the introduction of predacious and competing non-native fishes (Miller, 1961; Minckley, 1985).

4.2.18 Yaqui Topminnow

Yaqui topminnow was listed as endangered in 1967 without critical habitat (USFWS, 1967). Originally only Yaqui topminnow populations in the U.S., and not in Mexico, were listed under the ESA.

The Yaqui topminnow is a live-bearing fish once ubiquitous in the Yaqui River Basin. Yaqui topminnow's habitat requirements are broad, including shallow, warm, quiet waters in ponds, ciénegas, tanks, pools, springs, small streams, and the margins of larger streams. A recovery program actively stocks Yaqui topminnow in Arizona, reestablishing topminnow in "new" sites (Montgomery, 2024). However, the number of natural sites and natural topminnow populations at natural sites continue to slowly decline. Yaqui topminnow was never widespread, as they have been restricted to a small portion of southeastern Arizona in the Yaqui River basin. Currently they exist only in the San Bernadino NWR (Hedrick and Hurt, 2012).

The reasons for decline of this fish include past dewatering of water bodies, impoundment, channelization, diversion, regulation of flow, land management practices that promote erosion and arroyo formation, and the introduction of predacious and competing non-native fishes (Miller, 1961; Minckley, 1985).

4.2.19 Desert Pupfish

The desert pupfish was listed as an endangered species with critical habitat on March 31, 1986 (USFWS, 1986b).

Spawning occurs from spring through autumn, but reproduction may occur year-round depending on conditions (Constantz, 1981). Habitats have included clear, shallow waters with soft substrates associated with cienegas, springs, streams, margins of larger lakes and rivers, shoreline pools, and irrigation drains and ditches below 5,200 ft in elevation (Minckley, 1973; Hendrickson and Varela Romero, 1989).

Currently eleven discrete wild populations of desert pupfish persist in the U.S. and Mexico. In Arizona, wild populations occur only in Quitobaquito Springs. Organ Pipe Cactus National Monument staff monitors this population annually. Based on that monitoring, counts ranged from a high of 5,979 in 2016, to a low of 1,272 in 1994 (Gillette, 2026;, cited in USFWS, 2026a). Fifty-three replicate populations also range throughout Arizona. In California, naturally occurring populations occur only to two streams' tributaries, in shoreline pools and irrigation drains of the Salton Sea, and in the Sea itself (Lau and Boehm, 1991; Keeney, 2013). This species is also found in Mexico at scattered localities along the Colorado River Delta and in the Laguna Salada basin (Hendrickson and Varela Romero, 1989; Minckley, 2000). Although many re-establishments have been attempted, only approximately 25 transplanted populations of the desert pupfish exist in the wild at present, although this number fluctuates over time (Moyle 2002) (Tier 2 populations in the Recovery Plan) (USFWS, 1993b; Voeltz and Bettaso, 2003).

Main threats to the species include lack of water due to groundwater pumping or water diversion, contamination from agricultural return flows or other sources, degradation of water quality, recreation, grazing, and climate change (USFWS, 1986b, 2010; Moyle, 2002; Martin and Saiki, 2005; Echelle et al., 2007; Minckley and Marsh, 2009). Nonnative bullfrogs, which may prey on desert pupfish, may also prove problematic in the management and recovery of desert pupfish (Cohen and Howard, 1958; Clarkson and deVos, Jr., 1986).

Critical Habitat

Critical habitat for desert pupfish was designed on March 31, 1986 (USFWS, 1986b). In Arizona, critical habitat is located only in Quitobaquito Springs. The PBFs of the critical habitat are clean unpolluted water that is relatively free of exotic organisms, especially exotic fishes, in small slow-moving desert streams and spring pools with marshy backwater areas (51 FR 10842).

4.3 PLANTS

Numerous listed plants occur in Arizona: Acuña cactus (*Echinomastus erectocentrus var. acunensis) (*E); Arizona cliffrose (*Purshia (=Cowania) subintegra*) (E); Arizona eryngo (*Eryngium sparganophyllum*) (E); Arizona hedgehog cactus (*Echinocereus arizonicus ssp. arizonicus*) (E); Bartram's stonecrop (*Graptopetalum bartramii*) (T); Beardless chinchweed (*Pectis imberbis*) (E); Brady pincushion cactus (*Pediocactus bradyi*), Canelo Hills ladies'-tresses (*Spiranthes delitescens*), Cochise pincushion cactus (*Coryphantha robbinsorum)* (T); Fickeisen plains cactus (*Pediocactus peeblesianus ssp. fickeiseniae*) (E); Gierisch mallow (*Sphaeralcea gierischii*) (E); Holmgren milk-vetch (*Astragalus holmgreniorum*) (E); Huachuca water umbel (*Lilaeopsis schaffneriana var. recurva*) (E); Jones cycladenia (*Cycladenia humilis var. jonesii*) (T); Kearney's blue-star (*Amsonia kearneyana*), Navajo Sedge (*Carex specuicola*) (T); Nichol's Turk's head cactus (*Echinocactus horizonthalonius var. nicholii*) (E); Peebles Navajo cactus

(*Pediocactus peeblesianus ssp. peeblesianus*) (E); Pima pineapple cactus (*Coryphantha scheeri var. robustispina*) (E); Siler pincushion cactus (*Pediocactus (=Echinocactus,=Utahia) sileri*) (T); Ute ladies'-tresses (*Spiranthes diluvialis*) (T); Welsh's milkweed (*Asclepias welshii*) (T); Wright's marsh thistle (*Cirsium wrightii*), Zuni fleabane (*Erigeron rhizomatus*) (T).

Several of these have designated critical habitat in Arizona: Acuña cactus, Arizona eryngo, Beardless chinchweed, Fickeisen plains cactus, Gierisch mallow, Holmgren milk-vetch, Huachuca water umbel, Navajo sedge, and Welsh's milkweed.

4.3.1 Acuña Cactus

On October 1, 2013, we listed the acuña cactus as an endangered species (USFWS, 2013b). The acuña cactus is a small, spherical member of the cactus family with a lifespan exceeding 35 yrs. The acuña cactus populations are known from Maricopa, Pima, and Pinal Counties in Arizona and from Sonora, Mexico (USFWS, 2022b). The current range does not differ from the historical range, with the exception that the current Ajo populations likely had been part of a larger population that occurred before mining activity began there (USFWS, 2022b, 2023d). The acuña cactus occurs in valleys and on small knolls and gravel ridges of up to 30 percent slope in the Palo-Verde-Saguaro Association of the Arizona Upland subdivision of the Sonoran Desert scrub at 1,198 to 3,773 ft (365 to 1,150 m) in elevation (Phillips et al., 1982b; AZ RPGC, 2001). This taxon grows on soil overlying various bedrock types including (1) extrusive felsic volcanic rocks of rhyolite, andesite, and tuff, and (2) intrusive igneous rocks composed of granite, granodiorite, diorite, and Cornelia quartz monzonite (Rutman, 2007).

Data from the acuña cactus monitoring plots at Organ Pipe Cactus National Monument and at Coffeepot Mountain, along with occasional surveys of these and most other populations, indicate that major population declines have occurred across the acuña cactus range over the past 30 yrs. It appears that a combination of drought stress, warmer winters, and insect attack have reduced population numbers, while heat stress, lack of precipitation, and seed predation have reduced or halted reproduction. Cross-border movement, Customs and Border Protection, and National Park Service law enforcement activity in this area may degrade acuña cactus habitat by creating new roads and trails, disturbing vegetation and soils, and moving exotic plant seeds or plant parts, leading competition with acuña cactus (USFWS, 2022b). Direct removal of acuña cactus individuals and substrate due to erosion, or burial of individuals, may occur due to the placement of mineral extraction sites and debris piles or from development. In general, grazing practices can change vegetation composition and abundance and cause soil erosion and compaction, reduce water infiltration rates, and increase runoff (USFWS, 2022b).

Critical Habitat

Acuña cactus critical habitat was finalized on August 18, 2016 (USFWS, 2016b) (along with Fickeisen plains cactus) and included areas within Maricopa, Pima, and Pinal counties, Arizona. In total, approximately 18,535 ac were designated as critical habitat and were organized into six units. The critical habitat PBFs are (81 FR 55266):

1. Native vegetation within the Paloverde-Cacti-Mixed Scrub Series of the Arizona Upland Subdivision of the Sonoran Desert-scrub at elevations between 1,198 to 3,773 ft (365 to 1,150 m). This vegetation must contain predominantly native plant species that:
    a. Provide protection to the acuña cactus. Examples of such plants are creosote bush, ironwood, and palo verde.

b. Provide for pollinator habitat with a radius of 2,953 ft (900 m) around each individual, reproducing acuña cactus.
c. Allow for seed dispersal through the presence of bare soils immediately adjacent to and within 33 ft (10 m) of individual acuña cactus.

2. Soils overlying rhyolite, andesite, tuff, granite, granodiorite, diorite, or Cornelia quartz monzonite bedrock that are in valley bottoms, on small knolls, or on ridgetops, and are generally on slopes of less than 30 percent.

4.3.2 Arizona Cliffrose

We listed the Arizona cliffrose as endangered in 1984 (USFWS, 1984b). The four disjunct populations of cliffrose are spread across 200 mi (320 km) on the northern edge of the Sonoran Desert (USFWS, 1995c). The four populations from west to east are: Burro Creek (on Bureau of Land Management land), Cottonwood and Horseshoe (both on U.S. Forest Service land); and Bylas (on San Carlos Apache Tribal land).

The habitat at the four cliffrose populations has limestone soils (generally white but also reddish in color) derived from Tertiary lacustrine (lakebed) deposits. These soils are relatively infertile and have significantly lower amounts of phosphorus and organic matter compared with surrounding areas where cliffrose is absent (Anderson, 1986, 1993). Each site contains a locally unique vegetative community (Anderson, 1986). The geographic and local distribution appear to be limited by competition from other plant species rather than a requirement for a specific soil type.

Major threats to cliffrose include urbanization, recreation, road development, and grazing. Habitat loss due to urbanization continues to be a substantial threat to the Cottonwood population. In addition, climate change may have or already be having negative effects on cliffrose (Maschinski et al., 2006). We only have long-term data analyzed for one population, Cottonwood. A population viability analysis revealed a declining population growth rate and low recruitment in response to dry conditions (Haskins and Murray, 2018).

4.3.3 Arizona Eryngo

Arizona eryngo was listed as endangered with designated critical habitat on June 10, 2022 (USFWS, 2022c). Arizona eryngo plants flower from June to September (NMRPL, 2019; Stromberg et al., 2020), and dry fruits ripen in September and October (Arizona Game and Fish Department [AZGFD], 2019; Stromberg et al., 2020; Li, 2020). Arizona eryngo occurs only in spring-fed cienega wetlands at elevations ranging from 825 to 1,492 m (Stromberg et al., 2020). Within these wetlands, the plant occurs in soils that are organic, alkali, and perennially moist.

Arizona eryngo was known historically from six sites: three in Arizona, one in New Mexico, one in Sonora, Mexico and one in Chihuahua, Mexico (Sánchez Escalante et al., 2019; Stromberg et al., 2020). The species has been extirpated from one site in Arizona (Agua Caliente) and one site in New Mexico but remains extant at the other four sites. The most current estimates indicate that 56 plants occur at Ojo Vareleno in Chihuahua (2019 survey), hundreds at Rancho Agua Caliente in Sonora (2018 survey), 1,815 at Lewis Springs (2024 survey), and 31,467 at La Cebadilla (2020 survey) (USFWS, 2025b) in Arizona. At these four sites combined, Arizona eryngo populations occupy a total area of 3.6 ac (1.5 ha). Populations are currently widely separated, ranging from about 56 to 208 mi (90 to 335 km) apart, making cross-pollination highly unlikely.

Additionally, the species has been reintroduced to the historical site in Arizona from which it was extirpated (Agua Caliente). From 2020 to 2022, the species was introduced to new sites in Arizona, including Historic Canoa Ranch, Bar V Ranch, Las Cienegas National Conservation Area, Sweetwater Wetlands, St. David Cienega, Ash Canyon, Harshow, and Paton Center for Hummingbirds within its general historical range. Surveys in 2024 and 2025 revealed that about 388 of these individuals remained (USFWS, 2025b).

The primary threats to the species include (1) historical physical loss and alteration of cienega habitat, (2) water loss from cienegas (due primarily to groundwater withdrawal and water diversion) (3) nonnative plant invasion and woody plant encroachment into cienegas, and (4) drought and warming caused by climate change, which exacerbates the previous two threats and reduces Arizona eryngo germination, growth, and flowering. In addition, herbivory by livestock and native herbivores and predation (e.g., seed predation by insects) are potential threats that require more research to determine impacts.

Critical Habitat

Critical habitat for Arizona eryngo was designated on June 10, 2022 (87 FR 35431). This critical habitat consists of 12.7 ac in Cochise and Pima Counties in Arizona. The critical habitat PBFs are:

1. Cienegas within the Chihuahuan and Sonoran Deserts:
    a. That contain permanently moist to saturated, organic, alkaline soils with some standing water in winter and that are moist at or just below the surface in summer; and
    b. That have functional hydrological processes and are sustained by springflow via discharge of groundwater.
2. Areas of open canopy throughout the cienega.

4.3.4 Arizona Hedgehog Cactus

The Service listed the Arizona hedgehog cactus as endangered on October 25, 1979 (USFWS, 1979a) without critical habitat.

The modeled range of the Arizona hedgehog includes approximately 141,747 ac in the vicinity of Superior-Globe in Gila and Pinal counties of central Arizona (USFWS, 2023e). Based on data from AZGFD Heritage Data Management Systems (HDMS) and a digital elevation model created by the U.S. Geological Survey, (2011), individual plants occur from 3,400 to 6,320 ft above mean sea level. Most known locations are associated with Interior Chaparral vegetation (USFS 2022). Suitable habitat is exposed and stable bedrock or boulders exhibiting sufficient fracturing or rock fields.

At the time of listing, we cited the potential loss of habitat through mining activities, significant insect damage, and collection of wild plants as threats to the species' survival (USFWS, 1979a). Our 2023 5-year status review (USFWS, 2023e) named additional threats, such as the relatively low number of known individuals, the limited range of the species, mining and associated infrastructure, roads, transmission lines, pipelines, wildfire, invasive species, and global climate change.

4.3.5 Bartram's Stonecrop

As of August 31, 2021, Bartram's stonecrop was listed as threatened, without critical habitat (USFWS, 2021b). Bartram's stonecrop is typically found in deep, narrow, heavily shaded canyons with erodible soils within Madrean woodlands at elevations ranging from 3,500 to 6,800 ft (1,067 to 2,073 m) (USFWS, 2020e). Bartram's stonecrop is almost always located near water sources (springs, seeps, or intermittent streams), but above the flood line. Proximity to water may provide humidity for the plant's microclimate (USFWS, 2020e).

The current range of Bartram's stonecrop includes 12 mountain ranges with 50 populations in Cochise, Pima, and Santa Cruz Counties of southern Arizona, as well as 4 mountain ranges with one population each in Sonora and Chihuahua, Mexico. Populations on different sky island mountain ranges are widely separated, ranging from roughly 8.7 to 26 mi (14 to 42 km) apart. We assume the current number of Bartram's stonecrop plants is now less than 4,000 individuals, with 83 percent of known populations containing fewer than 150 individuals and more than half of the populations containing fewer than 50 individuals (USFWS, 2025c).

Suitable substrate, humidity, and shade are required for the entire life cycle of the plant. These habitat features are threatened by mining activity. Similarly, mining activity threatens pollinators, which are essential for reproduction. Soil disturbance, erosion, and direct trampling are additional threats that may result from a variety of activities including livestock and wildlife movement; the placement and maintenance of infrastructure, trails, and roads; and foot travel along established trails or cross country. Altered fire regimes can have direct and indirect impacts to Bartram's stonecrop and its habitat, potentially causing extirpation of small populations and or decreasing the abundance of larger populations. Direct harvest is a threat, as Bartram's stonecrop can be easily collected by gardeners and succulent enthusiasts (Phillips et al., 1982a). Continuing drought, more severe freezing events, and increased high intensity rainfall events all pose threats to Bartram's stonecrop across the range of the species. The small size of many populations and the distance between populations both exacerbate these impacts.

4.3.6 Beardless Chinchweed

On June 15, 2021, beardless chinchweed was listed as endangered, with critical habitat (USFWS, 2021c).

Beardless chinchweed historically occurred within the Atascosa-Pajarito, Huachuca, Patagonia, and Santa Rita Mountains and Canelo Hills of Cochise, Pima, and Santa Cruz counties, Arizona, as well as in Chihuahua and Sonora, Mexico. These plants are known from eight extant populations and eight extirpated populations in Arizona, primarily on Forest Service and National Park Service lands. (In addition, there are six populations in northern Mexico for which we have no current information; we presume these populations are extant, but with few individuals.) In Arizona, adjacent beardless chinchweed populations currently occur on different mountain ranges that are widely separated (ranging from roughly 1.7 to 21.7 mi (3 to 35 km) apart). Populations are very small, localized, and widely dispersed across very few localities in the Atascosa-Pajarito, Huachuca, Patagonia, and Santa Rita Mountains, and the Canelo Hills (USFWS, 2023f).

Beardless chinchweed inhabits desert grasslands and oak savannas (at lower elevations) and oak woodlands (at higher elevations) in southeastern Arizona and Chihuahua and Sonora, Mexico (USFWS, 2020d). Plants typically occur on steep, south-facing, sunny to partially shaded

hillslopes, with eroding bedrock and open areas with little competition from other plants (Phillips et al., 1982a). In addition, beardless chinchweed occurs along trails, roads, cow paths, and on mine tailings or overburden (USFWS, 2020d).

Threats to beardless chinchweed include competition from nonnative plants, altered fire cycle, climate change, drought, erosion, removal or burial of individuals (through mining, road and trail maintenance, and recreation), herbivory, and small population size.

Critical Habitat

Critical habitat consists of habitat that was occupied at the time of listing and contained one or more of the PBFs. It also includes unoccupied areas that are essential for the conservation of the species. This critical habitat totals approximately 10,604 ac (4,291 ha) in size. The PBFs are:

1. Native-dominated plant communities, consisting of:
    a. Plains, great basin, and semi-desert grasslands, oak savanna, or Madrean evergreen woodland;
    b. Communities dominated by bunchgrasses with open spacing (adjacent to and within 33 ft (10 m) of individual beardless chinchweed) and with little competition from other plants; and
    c. Communities with plants for pollinator foraging and nesting within 0.62 (1 km) of beardless chinchweed populations.
2. Between elevations 3,799 to 5,699 ft (1,158 to 1,737 m).
3. Eroding limestone or granite bedrock substrate.
4. Steep, south-facing, sunny to partially shaded hillslopes
5. The presence of pollinators (*i.e.*, flies, bees, and butterflies).

4.3.7 Brady Pincushion Cactus

The Brady pincushion cactus was listed as an endangered species on October 26, 1979 (USFWS, 1979b).

Its range is limited to plateaus on both sides of the Colorado River along both rims of Marble Canyon, on lands administered by the Bureau of Land Management (BLM) and National Park Service (NPS), and on the Navajo Nation. Habitat consists of Kaibab limestone chips overlying soil derived from Moenkopi shale and sandstone outcrops. The cactus grows on sloped benches in exposed, sunny locations occurring between 3,861 to 4,488 ft (1,170 and 1,360 m) in elevation (USFWS, 1985b).

The Arboretum at Flagstaff (Arboretum) conducted surveys within the known distribution of the cactus as well as in suitable habitat (Haskins and Murray 2017) across BLM and NPS-managed lands and on the Navajo Nation. The study located over 850 individuals, but of more significance, they located new occurrences of the cactus south of its previously known range (USFWS, 2022d).

Off-highway vehicles, uranium mining, and livestock grazing are all threats that could impact Brady pincushion cacti by destroying, modifying, or curtailing its habitat or range. The cactus is also threatened by drought. Murray (2022) noted during seed collection events from 2019 to 2022 that long-term drought, specifically below-average rainfall and high temperatures in late spring, was responsible for poor cactus condition, a lack of flowers, and reduced seed. As climate change causes more frequent and longer droughts, herbivory may become a larger stressor to cactus persistence than previously anticipated. We do not know the full effect that

illegal cactus collection has on the species' persistence, but it is likely a threat we need to address further with our partners.

4.3.8 Canelo Hills Ladies'-tresses

On January 6, 1997, we listed the Canelo Hills ladies'-tresses (*Spiranthes delitescens*) as an endangered species (USFWS, 1997a).

All populations of Canelo Hills ladies'-tresses occur in cienega habitats where scouring floods are uncommon. Canelo Hills ladies'-tresses are found in finely grained, highly organic, and seasonally or perennially saturated soils in cienegas at elevations ranging from 4,700 to 5,000 ft (1,433 to 1,524 m). Springs are the primary water source, but a creek near one locality contributes near-surface groundwater (McClaran & Sundt 1992).

Canelo Hills ladies'-tresses is known only from four populations in southern Arizona: 1) Canelo Hills (about 24 ac of habitat), 2) Turkey Creek (about 48 ac of habitat), 3) San Rafael Valley (about 17 ac of habitat), and 4) Babocomari (about 151 ac of habitat). Based on the most recent surveys, the Canelo Hills population consisted of five individuals (2002 survey), the Turkey Creek Population consisted of six individuals (2021 survey), the San Rafael Valley population consisted of 80 individuals (2021 survey), and the 2008 Babocomari Population Survey simply noted that the plant was "present." (USFWS, 2022e).

Threats to Canelo Hills ladies'-tresses include, but are not limited to, loss or reduction of cienega habitat from aquifer depletion and drought, non-native species invasion, livestock overuse, alteration of fire regimes, and small population size.

4.3.9 Cochise Pincushion Cactus

We listed the Cochise pincushion cactus as endangered in 1986 (USFWS, 1986c). This species' flowers appear in March-April, followed in July and August by orange-red fruits (NatureServe, 2015).

The Cochise pincushion cactus is known from the San Bernardino Valley, southwestern Cochise County, Arizona, and northern Sonora, Mexico (Lopresti, 1984; USFWS, 1993c). It occurs in Cochise Co., Arizona and Sonora, Mexico (NatureServe, 2015). It is restricted to three small limestone hills in Cochise County, Arizona, along the U.S./Mexico border (USFWS, 2007a). Current population size is unknown, but the results of a 2009 survey indicate that the population trend is stable (USFWS, 2020g).

Threats include grazing by livestock and wildlife, and oil/mineral exploration activities; however, changes in grazing patterns by the local landowner have minimized the potential effects from livestock grazing. A new threat that has been escalating since about 2010 is related to illegal immigration, drug smuggling, and associated law enforcement activities (USFWS, 2020g). During these activities, plants have been directly trampled or otherwise damaged. Depredation by insects was documented in the Cochise pincushion cactus long-term monitoring plots in 1994; this may still be a threat. Drought increases mortality of adults and juveniles and reduces reproduction in some populations (USFWS, 2020g).

4.3.10 Fickeisen Plains Cactus

The Fickeisen plains cactus was listed as endangered on October 1, 2013 (USFWS, 2013b). The primary pollinators of the Fickeisen plains cactus are believed to be small-bodied halictid bees

from the genera *Agapostemon*, *Halictus*, *Lasioglossum*, and *Melissodes*, each with foraging distances of less than 200 m (NNHP, 1994a; USFWS, 2013b; Aslan, 2024).

The Fickeisen plains cactus is a narrow endemic, restricted to exposed layers of shallow, well drained, gravelly loam, predominantly from the Harrisburg Member of the Kaibab formation (limestone) and the Toroweap Formation (gypsum, shale, and limestone) (Travis, 1987). Most populations occur at elevations between 4,200 to 5,950 ft (1,280 to 1,814 m) on the margins of canyon rims, flat terraces, limestone benches, or on the toe of well drained hills on slopes of 0 to 5% (up to 20%) (Phillips et al., 1982b; NNHP, 1994a; AZGFD HDMS, 2011; Goodwin, 2011; Rogers, 2015).

The Fickeisen plains cactus is endemic to the Colorado Plateau in Coconino and Mohave Counties of northern Arizona. There is a report of a single plant being discovered in 2020 just over the Utah line in Washington County (UNPS, 2020). The range of Fickeisen plains cactus extends from Mainstreet Valley of the Arizona Strip (the area north of the Colorado River to the Arizona-Utah border) to House Rock Valley; along the canyon rims of the Colorado River and Little Colorado River; the area of Gray Mountain; and along the canyon rims of Cataract Canyon on the Coconino Plateau.

Threats to the Fickeisen plains cactus include drought and climate change, predation by insects and small mammals, trampling by livestock and off highway vehicles, nonnative invasive species, and mining.

Critical Habitat

On September 19, 2016, approximately 17,456 ac (7,062 ha) in six units were designated as critical habitat for the Fickeisen plains cactus (USFWS, 2016c). The PBFs are:

1. Soils derived from limestone that are found on mesas, plateaus, terraces, the toe of gently sloping hills with up to 20% slope, margins of canyon rims, and desert washes. These soils have the following features:
    a. They occur on the Colorado Plateau in Coconino and Mohave Counties of northern Arizona and are within the appropriate series found in occupied areas;
    b. They are derived from alluvium, colluvium, or eolian deposits of limestone from the Harrisburg Member of the Kaibab Formation and limestone, siltstone, and sandstone of the Toroweap and Moenkopi Formations;
    c. They are non-saline to slightly saline, gravelly, shallow to moderately deep, and well-drained with little signs of soil movement. Soil texture consists of gravelly loam, fine sandy loam, gravelly sandy loam, very gravelly sandy loam, clay loam, and cobbly loam.
2. Native vegetation within the Plains and Great Basin Grassland and Great Basin Desert scrub vegetation communities from 4,200 to 5,950 ft (1,310 to 1,813 m) in elevation that has a natural, generally intact surface and subsurface that preserves the bedrock substrate and are supportive of microbiotic soil crusts where they are naturally found.
3. Native vegetation that provides for habitat of identified pollinators within the effective pollinator distance of 3,280 ft (1,000 m) around each individual Fickeisen plains cactus (USFWS, 2016c).

4.3.11 Gierisch Mallow

The Gierisch mallow was listed as endangered in 2013 (USFWS, 2013c). Gierisch mallow plants die back to the ground during the early winter and then resprout from their woody bases during

late winter and spring. Plants produce flowers within about 1.5 yrs (Cort and Pavlik, 2016). Plants flower from April through June (Cort and Pavlik, 2016) and possibly again in the late summer to early fall with sufficient monsoon moisture (Cort and Pavlik, 2016; McBride, 2022). A variety of small- to medium-sized solitary bees pollinate Gierisch mallow in the spring (McBride, 2022). Seeds germinate in the fall (Cort and Pavlik, 2016; Pavlik et al., 2018).

Gierisch mallow occurs in a small area of Mohave County, Arizona, and Washington County, Utah. Suitable habitat includes gypsum rock outcrops of the Harrisburg Member of the Kaibab Formation (Atwood and Welsh, 2002). Its soils contain high levels of gypsum (gypsiferous soils) (Clark, 2021). Gierisch mallow may also grow sparsely in between gypsum outcrops in other geologic formations, such as the Moenkopi (Rink, G. Far Out Botany, pers. comm., June 1, 2023). Based on this, Gierisch mallow is likely a gypsovag (can colonize both gypsum and other soils) rather than a gypsophile (soil-specific).

The primary threat is destruction and modification of habitat due to mining. Gypsum mining has likely extirpated at least one Gierisch mallow subpopulation, and a recent mine expansion and explorations indicate that mining in the range of Gierisch mallow will likely continue. Recreational use continues to be a potential substantial threat to the north population, and, because of the growing population in the St. George, Utah area, this threat will increase and may expand to other populations. Recent observations indicate that livestock grazing is a potential threat (McBride, 2022). In addition, climate change, nonnative invasive species, and altered fire regimes may negatively affect the species.

Critical Habitat

Three critical habitat units totaling approximately 12,822 ac (5,189 ha) were designated as critical habitat in Mohave County, Arizona, and Washington County, Utah (USFWS, 2013d). The critical habitat PBFs are:

1. Appropriate geological layers or gypsiferous soils, in the Harrisburg Member of the Kaibab Formation, that support individual Gierisch mallow plants or their habitat, within the elevation range of 2,477 to 3,766 ft (775 to 1,148 m). Appropriate soils are defined as:
    - Badland,
    - Fluvaquents and Torrifluvents,
    - Riverwash,
    - Cave-Harrisburg-Grapevine complex,
    - Grapevine-Hobcan complex,
    - Nikey-Ruesh complex,
    - Gypill-Hobog complex,
    - Hobog-Tidwell complex,
    - Hobog-Grapevine complex,
    - Grapevine-Shelly complex, and
    - Hindu-Rock outcrop-Gypill complex.
2. Appropriate Mojave Desert scrub plant community and associated native species for the soil types at the sites listed in PBF 1.
3. Biological soil crusts within the soil types described in PBF 1.

4. The presence of insect visitors or pollinators, such as the globemallow bee and other solitary bees. To ensure the proper suite of pollinators are present, this includes habitat that provides nesting substrate for pollinators in the areas described in PBF 2.
5. Areas free of disturbance and areas with low densities or absence of nonnative, invasive plants, such as red brome and cheatgrass.

4.3.12 Holmgren Milk-vetch

The Holmgren milk-vetch was listed as an endangered species on September 28, 2001 (USFWS, 2001). Holmgren milk-vetch is an herbaceous short-lived perennial. This spring ephemeral grows close to the ground and dies back to the root crown after the flowering season (Rominger et al., 2019a). Holmgren milk-vetch is primarily pollinated by solitary bees, but their flowers attract a range of visitors that include hawkmoths, hummingbirds, and nectar-robbing wasps (Tepedino, 2005; Pavlik and Barlow, 2017). The fruits are pods that retain seeds even after the pods fully open up along the margin. To persist, Holmgren milk-vetch relies on its seedbank and high levels of reproduction in years of favorable precipitation to replenish the seedbank (Searle, 2011; Van Buren et al., 2021). Populations that do not achieve high reproduction in favorable years may become seed limited and have a higher risk of extinction.

Holmgren milk-vetch is endemic to the Mojave Desert, occurring in Washington County, Utah and adjacent Mohave County, Arizona. Suitable habitat includes shallow, sparsely vegetated soils derived primarily from the Virgin limestone member of the Moenkopi Formation and less commonly with the Petrified Forest member of the Chinle formation. Topography plays an important role by providing overland flow of precipitation to support seedling recruitment and reproduction (Meyer et al., 2020). Larger topographic features provide more overland flow to Holmgren milk-vetch plants located along their toe slopes. The two largest Holmgren milk-vetch populations (State Line and Central Valley) contain the largest topographic features (mesas, ridge remnants, fan terraces, and steep swales) to provide overland flow, while the small populations occur near smaller topographic features.

The primary threat is urban development on state and private lands. Approximately 1,000 plants were lost to development in Washington County, Utah. Recreation, specifically from off-highway vehicle (OHV) use, results in habitat degradation, increased erosion, and the spread and establishment of nonnative plants (USFWS, 2006b). Livestock trampling in the largest population (State Line) results in the death of dormant plants (June to February) (Searle and Meyer, 2020). Livestock grazing may also facilitate the spread and establishment of nonnative plants. The threat posed by nonnative plants continues to increase as weed cover increases within Holmgren milk-vetch populations (Rominger et al., 2019b).

Critical Habitat

Approximately 6,289 ac (2,545 ha) comprise the critical habitat designation for Holmgren milk-vetch in Mohave County, Arizona, and Washington County, Utah (USFWS, 2006c). The critical habitat PBFs are:

1. Appropriate geological layers or soils that support individual *Astragalus holmgreniorum* plants. These include the Virgin Limestone member, middle red member, and upper red member of the Moenkopi Formation, and the Petrified Forest member of the Chinle Formation. Associated soils are Badland; Badland, very steep; Eroded land-Shalet complex, warm; Hobog-rock land association; Isom cobbly sandy loam; Ruesh very

gravelly fine sandy loam; Gypill Hobog complex, 6 to 35% slopes; Gypill very cobbly sandy loam, 15 to 40 % slopes; and Hobog-Grapevine complex, 2 to 35 % slopes; These soils are generally found at elevations from 2,430 to 3,000 ft (756 to 914 m), support associated native plant species, and have a low presence or lack of creosotebush (*Larrea tridentata*).

2. Topographic features/relief (mesas, ridge remnants, alluvial fans and fan terraces, their summits and backslopes, and gently rolling to steep swales) and the drainage areas along formation edges with little to moderate slope (0 to 20%). These topographic features/relief contribute to the soil substrate and vegetative community, natural weathering and erosion, and the natural surface and subsurface structure that provides minimally altered or unaltered hydrological conditions (e.g., seasonally available moisture from surface or subsurface runoff) on which *Astragalus holmgreniorum* depends.
3. The presence of insect visitors or pollinators, such as *Anthophora captognatha*, *A. damnersi*, *A. porterae*, other *Anthophora* species, *Eucera quadricincta*, *Omia titus*, and two types of *Dialictus* species.

4.3.13 Huachuca Water-umbel

On January 6, 1997, we listed the Huachuca water-umbel as an endangered species (USFWS, 1997a). The Huachuca water-umbel is an herbaceous, semi-aquatic to fully aquatic perennial plant. Found between 2,805 and 7,120 ft (855 and 2,170 m) in elevation, the range crosses the Sierra Madrean Region of southeastern Arizona and adjacent portions of Sonora, Mexico (Vernadero Group & Desert Botanical Garden, 2012; Titus & Titus, 2008).

Huachuca water-umbel is restricted to ciénegas, rivers, streams, and springs in permanently wet (or nearly so) muddy or silty substrates with some organic content (USFWS, 1999). It is generally found in shallow and slow-flowing waters that are relatively stable or in active stream channels containing refugial sites where the plants can escape the effect of scouring floods (USFWS, 1999). In upper watersheds that generally do not experience scouring floods, Huachuca water-umbel occurs in microsites where interspecific plant competition is low. At these sites, Huachuca water-umbel occurs on wetted soils interspersed with other plants at low density, along the periphery of the wetted channel or in small openings in the understory. In stream and river habitats, Huachuca water-umbel can occur in backwaters, side channels, and nearby springs.

Threats include aquatic habitat degradation; wildfire and resulting sedimentation; invasive non-native plant competition; livestock grazing; recreation; the effects of drought and climate change; and small population size.

Critical Habitat

On July 12, 1999, we designated 51.7 mi (83.2 km) across seven units as critical habitat in the upper San Pedro River, Garden Canyon on Fort Huachuca, and other areas of the Huachuca Mountains, San Rafael Valley, and Sonoita Creek, Cochise and Santa Cruz Counties, Arizona, (USFWS, 1999).

The PBFs of critical habitat for Huachuca water-umbel include, but are not limited to, the habitat components that provide:

1. Sufficient perennial base flows to provide a permanently or nearly permanently wetted substrate for growth and reproduction of Huachuca water-umbel;
2. A stream channel that is relatively stable, but subject to periodic flooding that provides for rejuvenation of the riparian plant community and produces open microsites for Huachuca water-umbel expansion;
3. A riparian plant community that is relatively stable over time and in which non-native species do not exist or are at a density that has little or no adverse effect on resources available for Huachuca water-umbel growth and reproduction; and
4. In streams and rivers, refugial sites in each watershed and in each reach, including but not limited to springs or backwaters of mainstem rivers that allow each occurrence to survive catastrophic floods and recolonize larger areas.

4.3.14 Jones Cycladenia

The Jones cycladenia was listed as a threatened species in 1986, and critical habitat has not been designated (USFWS, 1986d). Jones cycladenia is a long-lived, perennial herb that blooms between mid-April and early June. Although Jones cycladenia can reproduce by seed, it does not produce many fruits or seeds, and its pollinators have either disappeared, appear only episodically, or may be migratory. Therefore, Jones cycladenia primarily grows clonal shoots from its rhizomes (horizontal, underground stems).

Jones cycladenia is known to occur in four areas in the Canyonlands region of southwestern Utah and northern Arizona. Suitable habitat includes mixed desert scrub, juniper communities, and the gypsiferous, saline soils of the Cutler, Summerville, and Chinle formations. It occurs at elevations from 4,390 to 6,000 ft (1,340 to 1,830 m).

Jones cycladenia is threatened by off-road vehicles; exploration for oil, gas, and minerals; and livestock grazing. In addition, because it may be a relict from the Tertiary period, Jones cycladenia may be poorly adapted to the present climate and is threatened by future climate change. The ecosystem where the plant grows is thought to be fragile, easily degraded, and slow to recover.

4.3.15 Kearney's Blue-star

Kearney’s blue-star was listed as an endangered species without designated critical habitat on January 19, 1989 (USFWS, 1989b).

Kearney’s blue-star is known only from the slopes and canyons of the Baboquivari range of Pima County in southern Arizona at elevations from 3,600 to 6,000 ft (1,095 to 1,830 m). Habitat consists of steep, dry, open woodland slopes and coarse alluvium along dry canyon bottoms (USFWS, 2021d). It may require shade from overstory oaks (*Quercus* spp.) and pines (*Pinus* spp.). It may also need intermittent periods of above average precipitation to enable successful germination and growth. Due to a combination of high-severity fire and drought, these habitats are declining in quality, in that they now contain fewer trees and more grasslands (USFWS, 2012b).

Threats to the Kearney’s blue-star include livestock grazing, nonnative plant invasion, altered wildfire regime, border activities, low numbers, limited distribution, drought, and climate change.

4.3.16 Navajo Sedge

Navajo sedge was listed as a threatened species on June 7, 1985 (USFWS, 1974) with critical habitat. Navajo sedge occurs in hanging gardens within the Great Basin Conifer Woodland. Originally found on Navajo Sandstone, this species is now also known from Cedar Mesa, De Chelly, and Kayenta sandstone formations, at elevations of 4,200 to 7,600 ft (1,280 to 2,300 m). The species occurs in a variety of locations in sandstone, from almost inaccessible sheer cliff faces to accessible alcoves. At the time of listing, Navajo sedge was known only from three springs, all within a mile stretch along the Inscription House Ruins Trail and estimated to consist of about 700 individuals (USFWS, 1987b). The three sites are now considered to be one population (NNHP, 2004). Today, 57 populations are known across this species' range on lands managed by the Navajo Nation, National Park Service, Hopi Tribe, and Bureau of Land Management (NNHP, 2012, Hopi Tribe, 2012, NPS, 2013, Rink and Hazelton, 2014). There are 43 populations on the Navajo Nation.

The main threats to the species are livestock-associated water development and livestock grazing and trampling that can significantly impact individual gardens but are probably not a threat across all or a significant portion of the species' range. However, impacts from these activities could exacerbate other threats, namely climate change and groundwater pumping. Increased temperature and altered precipitation patterns may threaten the persistence of the species, which depends on continuous discharge of small volumes of water. In addition, water withdrawals from Colorado Basin aquifers that supply water to the habitat may pose a threat to the species.

Critical Habitat

Critical habitat was designated for Navajo sedge on May 8, 1985 (50 FR 19370). The critical habitat consists of a 40-m by 5-m area in Coconino County, Arizona. PBFs include moist sandy to silty soils at shady seep-springs within the Navajo Sandstone Formation.

4.3.17 Nichol's Turk's Head Cactus

The Nichol's Turk's head cactus was listed as an endangered species on October 26, 1979 (USFWS, 1979c) without critical habitat.

The NTHC is a long-lived (35 to 95 yrs) succulent that occurs within the Upland Division of the Sonoran Desert scrub at 2,400 to 4,000 ft (732 to 1,219 m) elevation on 0 to 30 percent slopes (USFWS, 1986e). The NTHC occurs in isolated mountain ranges that extend from south-central Arizona in Pima and Pinal Counties to a disjunct location in Sonora, Mexico. The plant is found almost entirely on Horquilla limestone.

As of 2020, there are thought to be fewer than 1,300 total individuals (an estimated 1,024 live and 288 dead), most of which occur in the Waterman Mountains of Pima County Arizona. The status of NTHC on the Tohono O'odham Nation is uncertain. Despite surveys from the 1980s through 2020, no new populations have been located outside of the four historical areas (the Waterman Mountains and Koht Kohl Hills in Pima County, Arizona; the Vekol Mountains in Pinal County, Arizona; and the Sierra del Viejo Mountains in Sonora, Mexico). A potential fifth population of 83 plants that resemble the NTHC occurs in central Sonora (Van Devender and Reina-Guerrero, 2012). Their taxonomic status remains uncertain and until verified, the population is not considered part of the listed entity.

Threats to this species include mining on non-federal land; habitat disturbance from illegal immigrants, drug smuggling, and associated law enforcement activities; spread of invasive plants

(e.g., buffelgrass); herbivore predation; illegal collection; and climate change (USFWS, 2009). McIntosh et al., (2019) found nonnative invasive plants and small mammal herbivory effects rare to NTHC in their monitoring plots. More recently, Clark et al. (2020) noted detection of cattle (e.g., trampling), an access road to mining operations (e.g., dust, collection potential, nonnative plants), and illegal human and drug trafficking (e.g., trampling, collection potential, nonnative plant introduction) during their 2020 surveys along the north edge of the Waterman Mountains, all of which could represent threats to the species.

4.3.18 Peebles Navajo Cactus

The Service listed the Peebles Navajo cactus as endangered on October 26, 1979, and no critical habitat was designated (USFWS, 1979d). The Peebles Navajo cactus is a local endemic of northern Arizona occurring in three groupings separated by at least 200 m (the distance their pollinators can travel) in a single area between Holbrook and Joseph City, Arizona. The cacti occur on private, Bureau of Land Management, and possibly State of Arizona managed lands. Most plants occur on a single privately owned ranch. The Peebles Navajo cactus occurs on well drained gravely soils derived from the Shinarump Member of the Chinle Formation (Phillips et al., 1983). The cactus is found in exposed, sunny situations in areas of little slope, often on flat-topped mesas and along canyon rims at 4,900 to 5,500 ft elevation (Butterwick, 1987; Phillips et al., 2022).

Flowers bloom in late April. The number of plants located each year appears highly correlated to rainfall. Within long-term Peebles Navajo cactus monitoring plots, in 1986, 185 individuals were recorded. This number reached a peak of 415 individuals in 1995 following several years of high precipitation and fluctuated to 92 plants in 2001 and 42 plants in 2022 (Phillips et al., 2022). As of 2022, we were aware of at least 150 individuals across the three groupings of plants (USFWS, 2022f).

The Peebles Navajo cactus continues to be affected by the following threats: increased temperatures and decreased precipitation result in little to no recruitment, poor seed set, aborted fruit, and a declining population; and habitat disturbance by recreation, coal-ash dust deposition, infrastructure creation and maintenance, gravel pit operations, and grazing. Small mammal herbivory and potentially illegal collection may also be contributing to population declines (USFWS, 2022f).

4.3.19 Pima Pineapple Cactus

On September 23, 1993, we listed the Pima pineapple cactus (as an endangered species (USFWS, 1993d). In the U.S., Pima pineapple cactus is found across roughly 149,209 ha (368,702 ac) of land within the Altar and Santa Cruz Valleys in Pima and Santa Cruz Counties, Arizona, including acreage of some lands that connect the two valleys.

Generally, the Pima pineapple cactus grows on gentle slopes of less than 15% and along the tops (upland areas) of alluvial bajadas nearest to the basins coming down from steep rocky slopes. The plant is found at elevations between 2,362 to 4,724 ft (720 and 1,440 m) (Roller & Halvorson, 1997; Kidder, 2015), in vegetation characterized as either or a combination of both the Arizona upland of the Sonoran Desert scrub and semidesert grasslands (Roller & Halvorson, 1997).

The Pima pineapple cactus continues to be affected by the following threats: increased temperatures and decreased precipitation resulting in little to no recruitment, poor seed set,

aborted fruit, and a declining population; and habitat disturbance by urbanization, infrastructure creation and maintenance; nonnative plant invasion; alteration of fire regimes; border activity; recreation; and grazing. Small mammal and insect herbivory and potentially illegal collection may also be contributing to population declines.

4.3.20 Siler Pincushion Cactus

The Siler pincushion cactus is currently listed as threatened (USFWS, 1993e). Siler pincushion cactus has populations that occur on federal, tribal, and state lands across northern Arizona and southern Utah border. It is found in the Coconino and Mohave counties, Arizona and in Washington and Kane counties, Utah. Its range extent is approximately 1000 to 5000 square kilometers (sq km) (USFWS, 2024a). Siler pincushion cactus occurs in and appears to be strongly correlated with the geologic Schnabkaib and middle red members of the Moenkopi formation. The species is found exclusively on gypsiferous clay to sandy, highly erodible soils apparently high in soluble salts.

Currently we are aware of 27 populations of Siler pincushion cactus across Arizona and Utah. The BLM has surveyed plots in five areas (Atkin Well, Johnson Spring, Yellowstone, Sunshine, and Warner Ridge) from 2013 to 2023. Of these five areas, four are in Arizona and on the Arizona Strip District, apart from Warner Ridge which lies in Utah. In 2023, the Atkin Well Outside plot contained 22 cacti, and the Atkin Well Inside plot contained 52 cacti. The BLM attributed cacti fatality in the plots to herbivory, drought, or age-related death. The number of cacti within the Yellowstone plot has steadily increased since 2018, with a record high count of 60 cacti reported during the 2023 monitoring season. The Warner Ridge plot has stayed consistent since 2021 at 130 cacti. The Johnson Spring sites experienced a severe drought that started in 2020 and lasted until 2023. No substantial decreases in the number of cacti were observed in the plot during the drought; however, no recruitment was observed either. The population at Johnson Spring West has hovered around 30 cacti since 2018, and Johnson Spring East has had a consistent population of 15 cacti since 2020. The Sunshine monitoring location was surveyed during the 2024 monitoring season, but no cacti were detected during the surveys. Further details about each of these sites can be found within the most recent Siler pincushion cactus 5-Year Review (USFWS, 2024a).

The following threats continue to affect the Siler pincushion cactus: human disturbance and urban development, solar ₋energy development, climate change, and rodent and lagomorph herbivory.

4.3.21 Ute Ladies'-tresses

The Ute ladies’-tresses was listed as a threatened species on January 17, 1992 (USFWS, 1992). On January 7, 2025, the plant was proposed for delisting (USFWS, 2025d). Ute ladies’-tresses is a terrestrial orchid found in the western U.S. and Canada. It inhabits early- to mid-seral stage wetlands along rivers, perennial streams, canals, lakeshores, and springs. It also occurs in wet meadows, both naturally occurring and human-created, borrow pits, and agricultural ditches (USFWS, 2023g).

At the time of listing in 1992, Ute ladies’-tresses was known to occur only in Utah and Colorado. Today, it is known to occur in eight states – Colorado, Idaho, Montana, Nebraska, Nevada, Utah, Washington, and Wyoming – as well as in southern British Columbia. It is believed that this expanded known range is primarily due to the increased survey effort that occurred after listing.

Due to the wide distribution and complex life history of the species, the Service uses “analytical units” (AUs) as surrogates for populations. Each AU is a 6-digit HUC watershed basin. The species is currently known from 19 AUs in Arizona, Nevada, Utah, Colorado, Wyoming, Nebraska, Idaho, Montana, Washington, and British Columbia (USFWS, 2023g).

Threats to Ute ladies’-tresses include drought, loss of pollinators, invasive species, vegetative succession, urbanization and development, livestock grazing, recreation, water management practices, flooding, and agriculture (USFWS, 2023g).

Under the range of plausible future conditions discussed in the SSA, Ute ladies’-tresses would still be likely to withstand plausible stochastic events, catastrophic events, and retain sufficient adaptive capacity to withstand environmental change in the foreseeable future (USFWS, 2023h).

4.3.22 Welsh's Milkweed

The Welsh’s milkweed was listed as threatened throughout its range with critical habitat on October 28, 1987 (USFWS, 1987c). Welsh’s milkweed grows only on active dunes with little to no competing vegetation. It is considered a pioneer species. As sand dunes stabilize and other plant species move in, Welsh’s milkweed may decline or spread via rhizomes into unoccupied, more active dunes (Palmer, 2001). Our current population estimate for the species is approximately 74,000 stems (ramets), and we do not know how many stems (ramets) may belong to a single individual (genet). Approximately 97 percent of the known stems (ramets) are in the Coral Pink Sand Dunes (CPSD) in Utah (Service, 2015; BLM, 2020; Talkington, 2021).

Welsh’s milkweed continues to experience high levels of Off-Highway Vehicle (OHV) use at the CPSD population, and we do not have enough information to determine the long-term effects to the population. The species’ biology, including its life history, reproductive strategies, genetic stability, and long-term population trends still require additional research to better understand the full effects of the known stressors on the species. The response of Welsh’s milkweed to climate change and drought has not been evaluated and remains unknown.

Critical Habitat

Critical habitat for Welsh’s milkweed is located primarily in the CPSD and Sand Hills areas of Kane County, Utah. Specifically, the areas include approximately 4,000 ac of sand dune habitat. The constituent elements of this critical habitat designation are the sand dunes themselves.

4.3.23 Wright's Marsh Thistle

Wright’s marsh thistle was listed as threatened in 2023 (88 FR 25208).

It was historically known to occur in Arizona, New Mexico, and Texas (2003 museum specimens from Presidio County) in the U.S., and Chihuahua and Sonora in Mexico (Sivinski, 2012; USFWS, 2023i). It is currently known from Chihuahua (one site on a private property) and eight general confirmed locations covering an area of approximately 43 ha in New Mexico (NMRPTC, 2009; Sivinski, 1996, 2005; Worthington, 2002; USFWS, 2023i).

Wright’s marsh thistle is a rare wetland species that grows in marshy habitats with year-round, water-saturated soils, at elevations between 3,450 and 7,850 ft (1,150 and 2,390 m) in elevation (Sivinski, 1996, 2005; USFWS, 2023i). It is usually associated with alkaline springs and seeps, ranging from low desert up to ponderosa pine forest (Sivinski, 2005; USFWS, 2023i). It is an obligate of seeps, springs, and wetlands that have saturated soils with surface or subsurface water flow (Sivinski, 1996; Worthington, 2002; NMRPTC, 2009; USFWS, 2023i). Most of the areas

occupied are open cienega or boggy margins of open water, or along excavated drains (USFWS, 2023i).

Wright's marsh thistle does not reproduce vegetatively (USFWS, 2023i). It produces basal rosettes that persist for one to several years, until enough energy is stored in the root to send up a flowering stem in late summer to early autumn (Baker, 2011; USFWS, 2023i). Depending on environmental conditions, it can either complete development in two years and produce flowers in its second year, or live two or more years before flowering, setting seed, and dying (USFWS, 2023i). Flowering occurs August through October. Pollination is achieved by insects, primarily bees (USFWS, 2023i). The mature plant requires direct sunlight to set seeds, and then it dies (USFWS, 2023i). Seed banks may be reduced annually due to predation from insects and birds, by seed moving to non-habitat via wind or water, or by the germination of many seeds (Sivinski, 2012; USFWS, 2023i). After germination, seedlings develop into an intermediate rosette form for most of a year or longer before bolting (producing a stem) and growing into the mature, flowering plant (USFWS, 2023i).

Wright's marsh thistle faces a variety of threats that influence the viability of the species, including groundwater and surface-water depletion, drought and climate change, livestock and native ungulate grazing, nonnative species invasion through (creating competition for nutrients and water and reducing available sunlight and water), oil and gas development, and mining (USFWS, 2023i). The species occupies relatively small areas of seeps, springs, and wetland habitat, which makes it vulnerable to long-term drought and ongoing and future water withdrawals (USFWS, 2023i). The species' highly specific requirements of saturated soils with surface or subsurface water flow make it particularly vulnerable (USFWS, 2023i).

4.3.24 Zuni Fleabane

The Zuni fleabane was listed as a federally threatened on April 26, 1985 (USFWS, 1985c) without critical habitat. Zuni fleabane is a rare regional endemic with three known, widely scattered population centers in western New Mexico and northeastern Arizona. Zuni fleabane habitats are outcrops of course-textured shales on the Baca Formation in west-central New Mexico and the Chinle Formation in northwestern New Mexico and northeastern Arizona (Knight, 1988; Christie, 2004). These soils often have a strong odor of selenium and sometimes support species of seleniphytic plants (Fletcher, 1978; Sabo, 1982; Sivinski and Lightfoot, 1991). Occupied habitats range in elevation from 7,300 to 8,400 ft and in size from less than one acre to about 260 ac.

All known populations of Zuni fleabane are within federal or tribal jurisdictions, where few management threats exist currently. Surveys for Zuni fleabane on U.S. Forest Service lands found no grazing impacts from elk or cattle and confirmed the functionality of a livestock and vehicle exclosure at one of the Zuni Mountains subpopulations (Roth and Slivinski, 2014). Overall, there are no obvious threats from overutilization, disease or predation. Localized threats are present for at least six subpopulations within the Chuska Mountains due to impacts from residential housing development, off-highway vehicle use, and recreation (Christie and McBride, 2020). One subpopulation in the Zuni Mountains borders a state highway and is subject to potential impacts from invasive plant species, road maintenance, and herbicide spraying (Roth and Sivinski, 2014). The Cibola National Forest Land Management Plan was finalized in July 2022. This plan provides management direction for lands that encompass nearly two-thirds of the known Zuni fleabane subpopulations.

The two most significant threats to Zuni fleabane currently are climate change and mineral exploration and development. This species is confined to the Chinle and Baca geologic formations, which are known for uranium claims and subsequent mine operations (Brookins et al., 1977). The Diné Natural Resources Protection Act placed a prohibition on uranium mining, protecting populations in the Chuska Mountains.

4.4 MAMMALS

Several listed mammal species occur within the state of Arizona: Jaguar (*Panthera onca*) (E); New Mexico meadow jumping mouse (*Zapus hudsonius luteus*) (E); Ocelot (*Leopardus (=Felis) pardalis*) (E); Sonoran pronghorn (*Antilocapra americana sonoriensis*) (E and NEP), and Mount Graham red squirrel.

The Jaguar, New Mexico meadow jumping mouse, and Mount Graham red squirrel have designated critical habitat within Arizona.

4.4.1 Jaguar

The jaguar is currently listed as endangered (USFWS, 1997b).

The life history of the jaguar has been summarized by Seymour (1989) and Brown and López-González (2001), among others. Like other large cats, jaguars rely on a combination of cover, surprise, acceleration, and body weight to capture their prey (Schaller, 1972; Hopcraft et al., 2005) as cited by Cavalcanti (2008). Jaguars are known from a variety of vegetation communities throughout their range (Seymour, 1989). They have been documented in arid areas, including thornscrub, desertscrub, lowland desert, mesquite grassland, Madrean oak woodland, and pine-oak woodland communities of northwestern Mexico and southwestern U.S. (López-González and Brown, 2002; Boydston and López-González, 2005; McCain and Childs, 2008).

Jaguars range from the southwestern U.S. to northern Argentina, except for El Salvador and Uruguay (Zeller, 2007) and are estimated to occupy 51% of their historical range (Quigley et al., 2017; Jędrzejewski et al., 2018). Like most large carnivores, jaguars have large home ranges. Jaguars can disperse long distances from their natal home range, and males disperse farther than females. In northern Mexico and southwestern U.S., one juvenile male dispersed about 43.5 mi (70 km) to the north in coastal Jalisco (Núñez et al., 2002).

The population trend of jaguars is decreasing in area of occupancy and extent of occurrence. Habitat quality is also declining (Quigley et al., 2017). The 2017 IUCN jaguar assessment concluded that connectivity among jaguar populations is being lost at local and regional scales, while isolated populations have fewer individuals and are more prone to local extinctions (sources as cited in Quigley et al., 2017; USFWS, 2023j). Range wide, jaguars are threatened by habitat loss and fragmentation, illegal killing associated with livestock depredation and for trophies and trade in body parts, and competition for wild meat with human hunters (sources as cited in Quigley et al., 2017), as well as other factors related to increased human populations such as road density.

Critical Habitat

Critical Habitat for the jaguar was designated in 2014 and currently encompasses approximately 640,124 ac (259,049 ha) in Pima, Santa Cruz, and Cochise counties, Arizona (USFWS, 2014c). The PBFs are expansive open spaces in the southwestern U.S. of at least 38.6 mi^2 (100 km^2) in size which, in brief (USFWS, 2014c) critical habitat PBFs are:

1. Provide connectivity to Mexico.
2. Contain adequate levels of native prey species, including deer and javelina, as well as other medium-sized prey such as coatis, skunks, raccoons, or jackrabbits.
3. Surface water resources available within 12.4 mi (20 km) of each other.
4. Contain from greater than 1 to 50% canopy cover within Madrean evergreen woodland, generally recognized by a mixture of oak, juniper, and pine trees on the landscape, or semidesert grassland vegetation communities, usually characterized by *Pleuraphis mutica* (tobosagrass) or *Bouteloua eriopoda* (black grama) along with other grasses.
5. Are characterized by intermediately, moderately, or highly rugged terrain.
6. Are below 6,562 ft (2,000 m) in elevation.
7. Are characterized by minimal to no human population density, no major roads, or no stable nighttime lighting over any 0.4 mi^2 (1-km^2) area.

4.4.2 New Mexico Meadow Jumping Mouse

The New Mexico meadow jumping mouse (NMMJM) was listed as an endangered species on June 10, 2014 (USFWS, 2014d). Critical habitat for this species was established on March 16, 2016 (USFWS, 2016d). The NMMJM lives in densely vegetated riparian areas along streams from southern Colorado and central New Mexico to eastern Arizona. The NMMJM is typically only active from about late May or early June through late September or early October in high-elevation montane areas (Frey, 2015; Morrison, 1987; Zahratka, 2016a, 2016b, 2019). In lower elevations along the Rio Grande, they are active from mid-May to late October (Najera, 1994; Wright and Frey, 2011).

The NMMJM occurs within elevations ranging from about 4,500 ft (1,372 m) in the middle Rio Grande, New Mexico, generally up to elevations of about 9,500 ft (2,896 m) in montane areas in the White Mountains, Arizona. NMMJM are known to regularly use adjacent upland habitats for dispersal, day nesting, maternal nests, and hibernation (Chambers, 2018; Frey 2017). NMMJM is known to occur within 13 eighth hydrological unit code (HUC8) subunits distributed across the subspecies' historical range in eastern Arizona, southern Colorado, and New Mexico (USFWS, 2023h). As of the 2026 status review, the Servies estimates that the total number of known populations is 79 (USFWS, 2026b).

The threats for the NMMJM are habitat loss and fragmentation across the range. The habitat loss has resulted in the extirpation of historical populations, reduced the size of existing populations, and isolated existing small populations. The primary sources of current and anticipated future habitat losses include: 1) livestock, elk, and feral horse grazing pressure that is incompatible with needed vegetation structure and diversity; 2) incompatible water management (e.g., vegetation loss from intensive mowing near irrigation ditches or drying of soils); 3) lack of water due to drought (exacerbated by climate change); and 4) severe wildland fires that degrade suitable habitat (also exacerbated by climate change). Additional sources of habitat loss are likely to occur from scouring floods, stream incision, loss of beaver ponds, highway reconstruction, residential and commercial development, coalbed methane development, and unregulated recreation.

Critical Habitat

Approximately 13,973 ac (5,655 ha) along 169.3 mi (272.4 km) of flowing streams, ditches, and canal are designated as critical habitat across eight units in New Mexico, Colorado and Arizona (USFWS, 2016d). The critical habitat PBFs are (USFWS, 2016d):

1. Riparian communities along rivers and streams, springs and wetlands, or canals and ditches that contain:
    a. Persistent emergent herbaceous wetlands especially characterized by presence of primarily forbs and sedges; or
    b. Scrub-shrub riparian areas that are composed of willows or alders with an understory of primarily forbs and sedges; and
2. Flowing water that provides saturated soils throughout the NMMJMs active season that supports tall (average stubble height of herbaceous vegetation of at least 24 in (61 cm) and dense herbaceous riparian vegetation composed primarily of sedges and forbs, including, but not limited to one or more of the following associated species: spikerush, beaked sedge (*Carex rostrata*), rushes (*Juncus* spp. and *Scirpus* spp.), and numerous species of grasses such as bluegrass (*Poa* spp.), slender wheatgrass , brome (Bromus spp.), foxtail barley, and forbs such as water hemlock (*Circuta douglasii*), field mint (*Mentha arvense*), asters (*Aster* spp.), or cutleaf coneflower (*Rudbeckia laciniata*); and
3. Sufficient areas of 5.6 to 15 mi (9 to 24 km) along a stream, ditch, or canal that contains suitable or restorable habitat to support movements of individual New Mexico meadow jumping mice; and
4. Adjacent floodplain and upland areas extending approximately 330 ft (100 m) outward from the boundary between the active water channel and the floodplain (as defined by the bankfull stage of streams) or from the top edge of the ditch or canal.

4.4.3 Ocelot

The ocelot is currently listed as endangered (USFWS, 1972). The ocelot has been divided into as many as 11 subspecies that ranged from the southwestern U.S. to northern Argentina (USFWS, 2016e). Two subspecies occur in the U.S.: the Texas ocelot (*L. pardalis albescens*) and the Sonora ocelot (*L. p. sonoriensis*) (USFWS, 2016e).

According to Laack (1991), Laack et al. (2005), Tewes and Schmidly (1987), and others, ocelots inhabit a wide variety of densely vegetated habitat types, including, but not limited to, thorn scrub, semi-arid woodland, tropical deciduous and semi-deciduous forest, subtropical forest, lowland rainforest, palm savanna, and seasonally flooded savanna woodland (Tewes, 1986; Ludlow and Sunquist, 1987; Crawshaw and Quigley, 1989, Fernandez, 2002). Current known ocelot distribution in the U.S. is limited to several counties in southernmost Texas and several counties in Arizona (USFWS, 2016e).

Threats to ocelots vary across the range and include habitat loss and fragmentation due to increased human development, agriculture, and cattle grazing; illegal killing (for example, retaliatory killing due to depredation of poultry); and illegal trade (pet and pelt) (Fernandez, 2002; Caso et al., 2008; USFWS, 2016e). Threats specific to the borderlands management units in Arizona are habitat loss and fragmentation due to human development, increases in roads and vehicle traffic, and decreased connectivity from increased border infrastructure and related activities.

4.4.4 Sonoran Pronghorn

The Sonoran subspecies of pronghorn was listed throughout its range as endangered on March 11, 1967, under the Endangered Species Preservation Act of October 15, 1966, without critical habitat. Life history and habitat are discussed extensively in the 2016 Recovery Plan (USFWS, 2016f). Sonoran pronghorn are found exclusively in the Sonoran Desert scrub Biome. Sonoran

pronghorn only occupies approximately 12% of their historical range. Their current range is limited to approximately 17,224 km^2 (6,660 mi^2), of which 4,057 km^2 (1,566 mi^2) are in Mexico and 13,167 km^2 (5,094 mi^2) are within the U.S.

The endangered Sonoran pronghorn population in Arizona declined from an estimated 99 animals in 2000 to 21 animals in 2002, due primarily to severe drought. Since 2002, this population, now known as the Cabeza Prieta Population, has increased significantly. Based on an aerial survey in November 2021, population was estimated to be 232 individuals (161 pronghorn observed) (USFWS, 2021e), and based on the most recent aerial survey, in November 2022, the population was estimated to be 211 individuals (177 observed) (AZDFG, 2023).

A final 10(j) rule (USFWS, 2011b) was published in May 2011 to establish a nonessential experimental population of Sonoran pronghorn in Arizona. In 2013, the first wild population was established under the 10(j) rule on Kofa NWR with captive-bred animals from Cabeza Prieta NWR. The population continues to be augmented with captive bred animals, and additionally, fawns have been born in the wild population. To establish a third population in Arizona, in December 2015, 26 Sonoran pronghorn were released on Barry M. Goldwater Range East, east of Highway 85, under the 10(j) rule. Based on a November 2023 telemetry flight, the minimum number of animals in this herd is 16 (AZDFG, 2023). High levels of predation in both herds are thought to contribute to low population numbers.

Sonoran pronghorn faces numerous threats throughout their range. These threats include barriers that limit the distribution and movement of pronghorn, vehicle collisions, drowning in canals, a variety of human activities that have the potential to disturb pronghorn or its habitat, including livestock grazing; military activities; recreation; poaching and hunting; clearing of desert scrub and planting of buffelgrass (*Pennisetum ciliare*) in Sonora; gold mining southeast of Sonoyta, dewatering and development along the Gila River and Río Sonoyta; cross-border violator activity across the international border and associated required law enforcement response; viral and bacterial disease; and fire, drought, and climate change.

4.4.5 Mount Graham Red Squirrel

The Mount Graham red squirrel was listed as endangered in 1987 (June 3, 1987; 52 FR 20994) (USFWS, 1987d).

Mount Graham red squirrels are found only in the high-elevation forests of the Pinaleño Mountains (Hoffmeister 1986) in the Safford Ranger District of the Coronado National Forest in southeastern Arizona. It inhabits upper elevation, mature to old-growth mixed conifer and spruce-fir forests above approximately 7,500 ft (2,286 m). Currently, the Mount Graham red squirrel ranges from Turkey Flat in the east to close to Clark Peak in the west and can be found primarily in the areas of Turkey Flat, Shannon/Snow Flat, Grant Hill/Hospital Flat, Old Columbine north into Ash Creek, and from Grand View Peak west to just east of Clark Peak. Mount Graham red squirrels have persisted in areas previously treated through hand thinning and mechanical treatments during the Pinaleño Ecosystem Restoration Project and other projects (USFS, 2022).

Population size may fluctuate naturally over time, corresponding with changes in forest health and food supply. From 1998 to 2000, surveys showed population growth, peaking at over 500, but in 2001 the population dropped 42%, due to habitat loss from multiple insect outbreaks and wildfires. From then until 2017, population estimates remained fairly stable, ranging from 214 to

299, fluctuating an average of +/- 8%. In the summer of 2017, however, the Frye Fire burned through most of the squirrel's habitat, and the population dropped to an estimated 35 (USFWS, 2017a). Since then, the estimate has increased to 75 individuals in 2018, 78 in 2019, 109 in 2020 and 2021, 156 in 2022, and 144 in 2023 (AZGFD, 2019, 2020, 2022, 2023; USFWS, 2024b). The increased estimates in 2022 and 2023 may be due in part to a change in survey methodology (AZGFD, 2022, 2023). Additionally, due to changes in analysis, population estimates before and after 1990 may not be comparable to one another.

Chief threats include potential loss and fragmentation of habitat due to forest insect outbreaks and large-scale high-severity wildfire, climate change, drought, habitat loss from insects and wildfire, predation, competition with Abert's squirrels, and extremely reduced measures of genetic variability, reducing their potential to respond to deterministic and stochastic events and environmental changes (USFWS, 2024b).

Critical Habitat

Critical habitat was first designated on January 5, 1990 (55 FR 425 429). This critical habitat occurs in three areas within the Pinaleño Mountains: above 10,000 ft in surrounding Hawk and Plain View peaks and a portion of the area above 9,800 ft; the north-facing slopes of Heliograph Peak above 9,200 ft; and the east-facing slope of Webb Peak above 9,700 ft (USFWS, 1990a). The critical habitat on Hawk and Plain View peaks is closed to public access.

The critical habitat PBF is dense stands of mature spruce-fir forest.

4.5 REPTILES

Five listed reptile species occur within the state of Arizona: Narrow-headed gartersnake (*Thamnophis rufipunctatus*) (T); New Mexican ridge-nosed rattlesnake (*Crotalus willardi obscurus*) (T); Northern Mexican gartersnake (*Thamnophis eques megalops*) (T); Desert tortoise (*Gopherus agassizii)* (T); Sonoyta mud turtle (*Kinosternon sonoriense longifemorale*) (E). All these reptiles have designated critical habitat within Arizona.

4.5.1 Narrow-headed Gartersnake

The Service published its decision to list the narrow-headed gartersnake as threatened on July 8, 2014 (USFWS, 2014e). Narrow-headed gartersnakes eat fish (Rosen and Schwalbe, 1988; Degenhardt et al., 1996; Rossman et al., 1996; Nowak and Santana-Bendix, 2002; Nowak, 2006; Jennings and Christman, 2012) and are considered prey specialists. Prevalence of native fish species may be the most predictable variable associated with narrow-headed gartersnake occupancy (Jennings et al., 2017). Narrow-headed gartersnakes also use terrestrial, upland habitat and a variety of cover types for their thermoregulatory needs, such as for sheltering during cold-season dormancy, basking during gestation, facilitating digestion, healing from injury or illness. They also require cover to escape flood events.

The narrow-headed gartersnake, distributed across the Mogollon Rim of Arizona and extreme southwestern New Mexico, is widely considered to be one of the most aquatic of the gartersnakes (Drummond and Marcias Garcia, 1983; Rossman et al., 1996). This species is strongly associated with clear, rocky, often perennial streams with moderate grade and interspersed deep pools and riffles, using predominantly pool and riffle habitat that includes cobbles and boulders (Rosen and Schwalbe, 1988; Degenhardt et al., 1996; Rossman et al., 1996; Nowak and Santana-Bendix, 2002; Ernst and Ernst, 2003, Holycross et al., 2020).

Predatory nonnative species such as bass (*Micropterus* spp.), flathead catfish (*Pylodictis* spp.), channel catfish (*Ictalurus* spp.), bullheads (*Ameiurus* spp.), sunfish (*Lepomis* spp.), crappie (*Pomoxis* spp.), brown trout (*Salmo trutta*), American bullfrogs (*Lithobates catesbeiana*), and crayfish (northern virile crayfish, *Orconectes virilis*) and red swamp crayfish (*Procambarus clarkii*) are the most significant threat to narrow-headed gartersnakes and their prey base. Activities that reduce flows or dewater habitat, such as dams and diversions (Ligon et al., 1995; Turner and List, 2007), flood-control projects, and groundwater pumping (Stromberg et al., 1996; Rinne et al., 1998; Voeltz, 2002; Haney et al., 2009; USGS, 2013), seriously threaten the physical habitat of the gartersnakes. Other threats include high severity wildfires, increased demand for water, climate change, drought, and reduced connectivity, and loss of genetic diversity.

Critical Habitat

Critical habitat for the narrow-headed gartersnake was designated in portions of Arizona and New Mexico, totaling 23,785 ac, on October 21, 2021 (USFWS, 2021f). The PBFs are:

1. Perennial streams or spatially intermittent streams that provide both aquatic and terrestrial habitat that allows for immigration, emigration, and maintenance of population connectivity of narrow-headed gartersnakes and contain:
    a. Pools, riffles, and cobble and boulder substrate, with low amount of fine sediment and substrate embeddedness;
    b. Organic and natural inorganic structural features (e.g., cobble bars, rock piles, large boulders, logs or stumps, aquatic vegetation, vegetated islands, logs, and debris jams) in the stream channel for basking, thermoregulation, shelter, prey base maintenance, and protection from predators;
    c. Water quality that meets or exceeds applicable State surface water quality standards; and
    d. Terrestrial habitat within 328 ft (100 m) from the active stream channel (water's edge) that includes flood debris, rock piles, and rock walls containing cracks and crevices, small mammal burrows, downed woody debris, and streamside vegetation (e.g., alder, willow, sedges, and shrubs) for thermoregulation, shelter, brumation, and protection from predators throughout the year.
2. Hydrologic processes that maintain aquatic and riparian habitat through:
    a. A natural flow regime that allows for periodic flooding, or if flows are modified or regulated, a flow regime that allows for the movement of water, sediment, nutrients, and debris through the stream network, as well as maintenance of native fish populations; and
    b. Physical hydrologic and geomorphic connection between the active stream channel and its adjacent terrestrial areas.
3. A combination of native fishes, and soft-rayed, nonnative fish species such that prey availability occurs across seasons and years.
4. An absence of nonnative aquatic predators, such as fish species of the families Centrarchidae and Ictaluridae, American bullfrogs, and/or crayfish, or occurrence of these nonnative species at low enough levels such that recruitment of narrow-headed gartersnakes is not inhibited and maintenance of viable prey populations is still occurring.
5. Elevations of 2,300 to 8,200 ft (700 to 2,500 m).

4.5.2 New Mexican Ridge-nosed Rattlesnake

The New Mexico ridge-nosed rattlesnake was listed as a threatened species on August 4, 1978 (USFWS, 1978). This subspecies is only known from three mountain ranges: the Animas and Peloncillo Mountains in southeastern Arizona and southwestern New Mexico, as well as the Sierra San Luis Mountains in northeastern Sonora and northwestern Chihuahua, Mexico (Degenhardt et al., 1986, Campbell et al., 1989, Painter, 1995, Keegan et al., 1999).

The New Mexico ridge-nosed rattlesnake is a montane subspecies that can be found in pine-oak woodlands, on steep, rocky hillsides, in canyon bottoms, and on talus slopes at elevations ranging from approximately 5,971 to 8,500 ft (1,820 to 2,590 m) in the Animas Mountains and 4,987 ft to 6,200 ft (1,520 to 1890 m) in the Peloncillo Mountains (Degenhardt et al., 1996; Fedorko 2017).

Because populations are small and disjunct, the subspecies is sensitive to habitat destruction or modification, and collection. Fire, combined with climate change and declining forest health (van Mantgem et al., 2009), may be the greatest threat to the subspecies (Smith et al., 2001, Barker 1991). Overgrazing can (USFWS, 1985c) reduce cover for snakes and their prey. It can also reduce the amount and quality of the habitat. Molecular data suggest that small population sizes, genetic isolation, inbreeding, and loss of genetic variation in all populations may be pushing the New Mexico ridge-nosed rattlesnake into the "extinction vortex" (Holycross and Douglas, 2007, Davis et al., 2015).

Critical Habitat

Critical habitat for the New Mexico ridge-nosed rattlesnake occurs in the Bear, Spring, and Indian Canyons in the Animas Mountains between 6,048 ft and 8,320 ft in elevation (USFWS, 1978). The critical habitat PBFs are:

1. Dens are available which provide winter and summer retreats,
2. Vegetation provides cover, and
3. Lizards and rodents are abundant in the area and provide an adequate source of food items.

4.5.3 Northern Mexican Gartersnake

The Service listed the northern Mexican gartersnake as threatened on July 8, 2014 (USFWS, 2014e). The northern Mexican gartersnake's diet consists of aquatic or semi-aquatic prey such as fishes, amphibians, and leeches followed secondarily by terrestrial prey, such as earthworms, lizards, or small rodents (Rosen and Schwalbe, 1988; Manjarrez et al., 2017). The northern Mexican gartersnake uses both aquatic and terrestrial habitats. In some studies, the longest movements from permanent water recorded for northern Mexican gartersnakes were >623 ft (female; Boyarski et al., 2015), 0.4 mi (female; Emmons and Nowak, 2016), 1,422 ft (female; Jones et al., 2020), and 1,624 ft (male; Sprague, 2017). Other data suggest that this species sometimes moves far greater distances, perhaps to exploit seasonally available prey (d'Orgeix, 2013), and it has been found at stock tanks about 3.7 and 6.5 mi from the nearest permanent occupied aquatic sites (Jones et al., 2020). Rangewide, the northern Mexican gartersnake occurs at elevations from 140 to 8,497 ft (Rossman et al., 1996) in Sonoran Desertscrub, Semidesert Grassland, Interior Chaparral, Madrean Evergreen Woodland, and the lower reaches of Petran Montane Conifer Forest (Jones et al., 2020). In the U.S., the highest recorded detection occurs at 6,400 ft (Jones et al., 2020).

In the U.S., the northern Mexican gartersnake is distributed from western, central, and southeastern Arizona into southwestern New Mexico (Jones et al., 2020). It is presumed to occur along most large, perennial mainstem rivers and their larger tributaries (Jones et al. 2020). In Arizona, the northern Mexican gartersnake has a patchy distribution, with records occurring along the Colorado River, and within the Bill Williams, Verde, Salt, Santa Cruz, San Pedro basins.

Threats to northern Mexican gartersnake include the continued existence and proliferation of predatory nonnative species, diminishing surface water, increasing human demands for water, and drought associated with climate change.

Critical Habitat

Critical habitat is currently designated in portions of Arizona and New Mexico, totaling 20,326 ac (USFWS, 2020g). The critical habitat PBFs are:

1. Perennial or spatially intermittent streams that provide both aquatic and terrestrial habitat that allows for immigration, emigration, and maintenance of population connectivity of northern Mexican gartersnakes and contain:
    a. Slow-moving water (walking speed) with in-stream pools, off-channel pools, and backwater habitat;
    b. Organic and natural inorganic structural features (e.g., boulders, dense aquatic and wetland vegetation, leaf litter, logs, and debris jams) within the stream channel for thermoregulation, shelter, foraging opportunities, and protection from predators;
    c. Terrestrial habitat adjacent to the stream channel that includes riparian vegetation, small mammal burrows, boulder fields, rock crevices, and downed woody debris for thermoregulation, shelter, foraging opportunities, brumation, and protection from predators; and
    d. Water quality that meets or exceeds applicable State surface water quality standards.
2. Hydrologic processes that maintain aquatic and terrestrial habitat through:
    a. A natural flow regime that allows for periodic flooding, or if flows are modified or regulated, a flow regime that allows for the movement of water, sediment, nutrients, and debris through the stream network; and
    b. Physical hydrologic and geomorphic connection between a stream channel and its adjacent riparian areas.
3. A combination of amphibians, fishes, small mammals, lizards, and invertebrate prey species such that prey availability occurs across seasons and years.
4. An absence of nonnative fish species of the families Centrarchidae and Ictaluridae, American bullfrogs, and/or crayfish, or occurrence of these nonnative species at low enough levels such that recruitment of northern Mexican gartersnakes is not inhibited and maintenance of viable prey populations is still occurring.
5. Elevations from 130 to 8,497 ft (40 to 2,590 m).
6. Lentic wetlands including off-channel springs, cienegas, and natural and constructed ponds (small earthen impoundment) with:
    a. Organic and natural inorganic structural features (e.g., boulders, dense aquatic and wetland vegetation, leaf litter, logs, and debris jams) within the ordinary high-water mark for thermoregulation, shelter, foraging opportunities, brumation, and protection from predators;

b. Riparian habitat adjacent to ordinary high-water mark that includes riparian vegetation, small mammal burrows, boulder fields, rock crevices, and downed woody debris for thermoregulation, shelter, foraging opportunities, and protection from predators; and
c. Water quality that meets or exceeds applicable State surface water quality standards.

7. Ephemeral channels that connect perennial or spatially intermittent perennial streams to lentic wetlands in southern Arizona where water resources are limited.

4.5.4 Desert Tortoise

The Mojave population of the desert tortoise was listed as a threatened species on April 2, 1990 (USFWS, 1990b). The desert tortoise is a large, herbivorous (plant-eating) burrowing reptile. These tortoises are long lived and grow slowly, requiring 13 to 20 yrs to reach sexual maturity, and they have low reproductive rates during a long period of reproductive potential (Turner et al., 1984; Bury, 1987; Germano, 1994). Growth rates are greater in wet years with higher annual plant production. Data are not available to determine at what age females stop laying eggs (Averill-Murray et al., 2018). Generation times (average time between two consecutive generations in a population) are estimated to be 20 to 25 yrs (Turner et al., 1987; USFWS 1994c; USFWS, 2011c), and individuals may survive 50 yrs or more (Germano, 1992; Curtin et al., 2009; Medica et al., 2012).

The desert tortoise occurs in the Mojave and Sonoran deserts in southern California, southern Nevada, Arizona, and the southwestern tip of Utah in the U.S., as well as in Sonora and northern Sinaloa in Mexico (USFWS, 1990b; USFWS, 1994c; USFWS, 2011c). It occurs in the broadest latitudinal range, climatic regimes, habitats, and biotic regions of any North American tortoise species (Auffenberg and Franz, 1978; Bury, 1982; Patterson, 1982; Bury et al., 1994; Germano, 1994). Suitable habitat includes sandy flats to rocky foothills, alluvial fans, washes, and canyons. This species is associated with desert scrub vegetation, primarily creosotebush and cacti, with a robust herbaceous component.

The primary threats are past wildfire, invasive plants, and drought. Secondary threats include predation from ravens, motorized recreation, non-motorized recreation, disease (Mycoplasm), urbanization, paved roads, and human access (specifically, off-leash dogs and illegal trails). Non-motorized recreation brings with it threats associated with increased human presence, such as loss of habitat from development of recreational facilities, handling and disturbance of individuals, increased roadkill, deliberate maiming or killing, increased raven depredation, degradation of vegetation, and soil compaction (USFWS, 1994c; Averill-Murray, 2002).

Critical Habitat

Critical habitat was designated on over 6,000,000 ac in portions of the Mojave desert and the Colorado desert (located in California west of the Colorado River) (USFWS, 1994d). This designation includes primarily federal lands in southwestern Utah, northwestern Arizona, southern Nevada, and southern California.

PBFs of the desert tortoise critical habitat are: sufficient space to support viable populations within each of the six recovery units and to provide for movement, dispersal, and gene flow; sufficient quantity and quality of forage species and the proper soil conditions to provide for the growth of such species; suitable substrates for burrowing, nesting, and overwintering; burrows, caliche (hard layer of subsoil typically containing calcium carbonate) caves, and other shelter

sites; sufficient vegetation for shelter from temperature extremes and predators; and habitat protected from disturbance and human-caused mortality (USFWS, 1994c).

4.5.5 Sonoyta Mud Turtle

The Sonoyta mud turtle was listed as endangered in 2017 (USFWS, 2017b), and 12.28 ac (4.97 ha) within Organ Pipe Cactus National Monument in southwestern Arizona were designated as critical habitat in 2020 (USFWS, 2020h). The Sonoyta mud turtle is an isolated, endemic subspecies of the Sonora mud turtle (*Kinosternon sonoriense*) found in southern Arizona and northwestern Mexico. Sonoyta mud turtles need perennial or near-perennial surface water for feeding, protection from predators, preventing desiccation, and mating. The subspecies also requires terrestrial riparian habitat with soil moisture during nesting and estivation (a state of dormancy) to prevent desiccation of eggs, hatchlings, juveniles, and adults. Sonoyta mud turtles are opportunistic carnivores, feeding primarily on aquatic invertebrates that live on emergent and submergent vegetation or the substrate of ponds and streams.

The Sonoyta mud turtle has always been limited in its distribution to the Rio Sonoyta basin in Arizona and Sonora, Mexico. The subspecies was historically known from five sites in the Rio Sonoyta basin, including one site in the U.S. and at least four sites in Mexico. One of the historical populations in Sonora is believed to be extirpated (Santo Domingo), and four new populations have been discovered (Quitovac, Sonoyta Sewage Lagoon, Loma Alta, and the Morelia reach). One newly discovered population, Sonoyta Sewage Lagoon, was functionally extirpated in 2019 after the sewage lagoon dried and a fire burned the site. The Sonoyta mud turtle currently occurs as one population in Arizona and three to five populations in Sonora, Mexico.

The primary threat affecting the viability of the Sonoyta mud turtle is the continued loss of water that supports aquatic and riparian habitat. Beyond ongoing water loss, the Sonoyta mud turtle faces additional threats, including dredging at Quitovac and predation by nonnative species in Mexico. These stressors, combined with habitat degradation, have resulted in an estimated 80 to 90% reduction in the subspecies' range within the Rio Sonoyta, Mexico.

Critical Habitat

The Service designated one unit, 12.28 ac (4.97 ha) in size, as critical habitat for the Sonoyta mud turtle. The following PBFs were determined to be essential to the conservation of the Sonoyta mud turtle:

1. Aquatic habitat, such as streams and natural or manmade ponds, with perennial or near-perennial sources of water, containing or including:
    a. Surface water to 2 m (7 feet) deep, with a rocky, muddy, or sandy substrate, and emergent or submergent vegetation, or both;
    b. Surface water free of nonnative predators and competitors, including crayfish, American bullfrogs, and large sunfish;
    c. Shallow water areas with dense emergent vegetation (e.g., cattail, spikerush, and travelling spikerush);
    d. Access to deeper open water in ponds, and submerged vegetation (e.g., holly-leaved water nymph, slender pondweed, ditch-grass, and horned pondweed); and (e) Areas with complex structure, including protective shelter sites such as root masses, rock features, and undercut banks.

2. Aquatic invertebrate prey base (e.g., *Anisoptera*, *Trichoptera*, *Diptera*, *Coleoptera*, aquatic snail species) and their corresponding habitat, including submergent or emergent vegetation and a variety of forage, and prey such as algae, diatoms, other microorganisms.
3. Terrestrial, riparian habitat, adjacent to suitable aquatic habitat, containing or including:
    a. Accessible shoreline for Sonoyta mud turtles without insurmountable rock or artificial vertical barriers to allow movement between wetted sites, between aquatic habitat and terrestrial nest sites, and between aquatic habitat and estivation sites;
    b. Riparian areas that maintain soil moisture to prevent desiccation of eggs and provide estivation sites, located along the banks of ponds and streams with riparian vegetation (e.g., cottonwood, willow, seep-willow, mesquite, greythorn, wolfberry, salt grass, arrowweed); and
    c. Estivation and nesting sites, including depressions under vegetation, soil, or organic matter; rock crevices; and soil burrows under overhanging banks of streams or ponds, that are available year-round.

4.6 AMPHIBIANS

Two listed amphibian species occur within the state of Arizona: Chiricahua leopard frog (*Rana chiricahuensis*) (T) and the Sonoran tiger salamander (*Ambystoma mavortium stebbinsi*) (E). The Chiricahua leopard frog has designated critical habitat in Arizona.

4.6.1 Chiricahua Leopard Frog

The Chiricahua leopard frog is currently listed as threatened range wide with designated critical habitat and a 4(d) rule.

The frog's range extends through the southeastern sections of Arizona and adjacent Sonora, Mexico, at elevations ranging from 1,200 to 4,000 ft (400 to 1,200 m), and from montane central Arizona east and south along the Mogollon Rim to montane parts of west-southwestern New Mexico, at elevations ranging from 3,500 to 8,000 ft (1,100 to 2,400 m). The primary habitat type includes oak, mixed oak, and pine woodlands, although its habitat also ranges into areas of chaparral, grassland, and desert, particularly for the southern populations. This species requires permanent water, including streams, rivers, backwaters, ponds, and stock tanks, that are mostly free from introduced fish, crayfish, and American bullfrogs. Movement of frogs among local populations can occur if those populations are separated by no more than 1.0 mi (1.6 km) overland, 3.0 mi (4.8 km) along ephemeral or intermittent drainages, 5.0 mi (8.0 km) along perennial water courses, or some combination thereof, up to 5.0 mi (8.0 km).

The primary threats to this species are predation by nonnative organisms and die-offs from the infectious disease Chytridiomycosis, caused by the chytrid fungus, *Batrachochytrium dendrobatidis*. Additional threats include drought, floods, degradation and loss of habitat because of water diversions and groundwater pumping, poor livestock management, altered fire regimes, mining, development, and other human activities; disruption of metapopulation dynamics, resulting from small numbers of populations and individuals, and environmental contamination (USFWS, 2007b).

Critical Habitat

Critical habitat for the Chiricahua leopard frog comprises approximately 10,346 ac (4,187 ha) in Arizona and New Mexico (USFWS, 2012c). The PBFs are:

1. Aquatic breeding habitat and immediately adjacent uplands exhibiting the following characteristics:
    a. Standing bodies of fresh water (with salinities less than 5 parts per thousand, pH greater than or equal to 5.6, and pollutants absent or minimally present), including natural and manmade (e.g., stock) ponds, slow-moving streams or pools within streams, off-channel pools, and other ephemeral or permanent water bodies that typically hold water or rarely dry for more than a month. During periods of drought, or less than average rainfall, these breeding sites may not hold water long enough for individuals to complete metamorphosis, but we still consider these sites essential breeding habitat in non-drought years.
    b. Emergent and or submerged vegetation, root masses, undercut banks, fractured rock substrates, or some combination thereof, but emergent vegetation does not completely cover the surface of water bodies.
    c. Nonnative predators (e.g., crayfish, American bullfrogs, nonnative predatory fishes) absent or occurring at levels that do not preclude presence of the frog.
    d. Absence of chytridiomycosis, or if present, then environmental, physiological, and genetic conditions are such that allow persistence of frogs.
    e. Upland areas that provide opportunities for foraging and basking that are immediately adjacent to or surrounding breeding aquatic and riparian habitat.
2. Dispersal and non-breeding habitat, consisting of areas with ephemeral (present for only a short time), intermittent, or perennial water that are generally not suitable for breeding, and associated upland or riparian habitat that provides corridors (overland movement or along wetted drainages) for frogs among breeding sites in a metapopulation with the following characteristics:
    a. Are not more than 1.0 mile (1.6 km) overland, 3.0 miles (4.8 km) along ephemeral or intermittent drainages, 5.0 miles (8.0 km) along perennial drainages, or some combination thereof not to exceed 5.0 miles (8.0 km).
    b. In overland and non-wetted corridors, provides some vegetation cover or structural features (e.g., boulders, rocks, organic debris such as downed trees or logs, small mammal burrows, or leaf litter) for shelter, forage, and protection from predators; in wetted corridors, provides some ephemeral, intermittent, or perennial aquatic habitat.
    c. Are free of barriers that block movement by frogs, including, but not limited to, urban, industrial, or agricultural development; reservoirs that are 50 ac (20 ha) or more in size and contain predatory nonnative fishes, American bullfrogs, or crayfish; highways that do not include frog fencing and culverts; and walls, major dams, or other structures that physically block movement.

4.6.2 Sonoran Tiger Salamander

The Sonora tiger salamander was listed as endangered without critical habitat on January 6, 1997.

Breeding Sonoran tiger salamander adults deposit eggs in aquatic habitats, with the eggs developing into larvae. Some larvae metamorphose into adults on dry land (Collins et al., 1988). However, most larvae remain in the aquatic habitat and develop into paedomorphic gilled adults (mature branchiate morphs).

Sonoran tiger salamanders are endemic to the Santa Cruz and San Pedro River drainages in the San Rafael Valley and surrounding foothills of the Patagonia and Huachuca Mountains in

Arizona (USFWS, 2002c). Populations may also occur in Sonora, Mexico (Hossack et al., 2016a, 2021). Sonoran tiger salamanders currently rely almost exclusively on artificial livestock tanks for aquatic breeding sites because of the loss of natural habitat such as vernal pools (USFWS, 2002c; Hossack et al., 2016b; Brocka et al., 2024).

As many as 300 stock tanks may occur within the range of the Sonoran tiger salamander (USFWS, 2007c). As of the 2024 5-year review (USFWS, 2024c), the subspecies has been documented in at least 81 of these sites, although not all of these sites are concurrently occupied (Hossack et al., 2016b). Periodic drying of the stock tanks results in decreased size and distribution (Hossack et al., 2017). Data suggest that salamanders will not travel to a different stock tank (Brocka et al. 2024), meaning that drying of tanks could be a limiting factor in population size and distribution. When not in stock tanks, salamanders were located most often within small mammal burrows (96%) followed by leaf litter (2%), tree stumps (2%), and rock ledges (<1%) (Brocka et al., 2024).

Threats to this species include habitat loss and degradation, non-native species predation and competition, disease, illegal exploitation, inbreeding, and hybridization with the introduced barred tiger salamander (*Ambystoma mavortium mavortium*). Although Sonoran tiger salamanders have successfully reproduced in stock tanks for decades, human intervention is required to maintain these breeding sites. Stock tanks require occasional maintenance dredging, because they fill in with silt. Stock tanks are also vulnerable to fluctuations in weather and climate. Long-term drought and rising temperatures may result in the long-term drying of stock tanks, which could lead to the local extirpation of salamander populations (Hossack et al., 2017; Brocka et al., 2024). Approximately 75% of the lands that fall within the range of the Sonoran tiger salamander is managed by federal agencies. Overgrazing and other alterations in upland habitats surrounding stock tanks may also negatively affect Sonoran tiger salamanders. The high mortality of dispersing terrestrial adults observed by Brocka et al. (2024) suggests that upland habitat alterations resulting in reduced cover or moisture may increase the risk of predation or desiccation of salamanders, ultimately reducing dispersal and gene flow among populations (Storfer et al., 2014; Hossack et al., 2017; Brocka et al., 2024).

4.7 INVERTEBRATES

These listed invertebrates occur within the state of Arizona: San Bernardino springsnail (*Pyrgulopsis bernardina)* (T) and Three Forks springsnail (*Pyrgulopsis trivialis*) (E). Both springsnails have designated critical habitat within Arizona.

4.7.1 San Bernardino Springsnail

The San Bernardino springsnail is currently listed as threatened with critical habitat (USFWS, 2011d). The San Bernardino springsnail is one of many highly endemic springsnails in Arizona. The San Bernardino springsnail is a fully aquatic snail, and like most other species of springsnails, all life stages occur within watered environments.

The San Bernardino springsnail is endemic to regional springs (within approximately 20 mi) surrounding Snail Spring in Cochise County, Arizona. In 2002, two new occupied sites were discovered in Sonora, Mexico on the Rancho San Bernardino (USFWS, 2003) and since then, an additional four occupied sites were discovered, some at Cajon Bonito in Sonora, Mexico. Other springs within the region have yet to be surveyed for the San Bernardino springsnail, and any new occupied sites would increase the known distribution.

San Bernardino springsnails are vulnerable to changes in water availability due to aquifer depletion, reduced aquifer recharge, climate change, and spring modification. Nonnative crayfish (*Faxonius virilis* and *Procambarus clarkii*) are known predators to springsnails and have both been found in and near occupied habitat in Arizona. The nonnative New Zealand mud snail is an invasive freshwater snail that does not currently co-occur with San Bernardino springsnail but could become a threat, because the springsnail populations are not well protected. If New Zealand mud snail establishes with the springsnail, it may compete with these springsnails and slow their growth (Lysne et al., 2007; Lysne and Koetsier, 2008).

Critical Habitat

Critical habitat for the San Bernardino springsnail is comprised of 2.13 ac (0.815 ha) across four springs (currently, one occupied and three unoccupied). Goat Tank Spring Unit (which is currently occupied) encompasses 0.005 ac (0.002 ha) in Cochise County, Arizona. The Snail Spring Unit encompasses 1.129 ac (0.457 ha) in Cochise County, Arizona. The Horse Spring Unit encompasses 0.078 ac (0.032 ha) in Cochise County, Arizona on land managed by the John Slaughter Ranch Museum. The Tule Spring Unit encompasses 0.801 ac (0.324 ha) in Cochise County, Arizona.

The PBFs of the San Bernardino springsnail critical habitat (USFWS, 2012d) are:

1. Adequately clean spring water (free from contamination) emerging from the ground and flowing on the surface;
2. Periphyton (attached algae), bacteria, and decaying organic material for food;
3. Substrates that include cobble, gravel, pebble, sand, silt, and aquatic vegetation, for egg laying, maturing, feeding, and escape from predators; and
4. Either an absence of nonnative predators (crayfish) and competitors (snails) or their presence at low population levels.

4.7.2 Three Forks Springsnail

The Three Forks springsnail was listed as endangered on November 17, 2011 (USFWS, 2011d). The Service designated approximately 17.2 ac (6.9 ha) of critical habitat for Three Forks springsnail in Apache County, Arizona (USFWS, 2011d).

The Three Forks springsnail occurs in springs and seeps in Boneyard Bog and along Boneyard Creek and its confluence with the North Fork and East Fork of the Black River in the White Mountains in Apache-Sitgreaves National Forest. Each of these spring complexes is in a shallow canyon drainage or open mountain meadow at 8,200 ft (2,500 m) in elevation. The occupied springs are within 3.7 mi (6 km) of each other and contain perennial flowing water. The species historically occupied a third area, the Three Forks springs complex, but this population was declared extirpated in 2004.

The Three Forks springsnail, being a relic of the Pleistocene Epoch, likely has a high degree of resiliency. However, with the decline and eventual extirpation of the Three Forks springs complex in 2004, and the rapid decline of the once robust Lopez Springs population, the future of the Three Forks springsnail remains uncertain. Active management will need to continue to address threats at the remaining occupied springs. These threats include wildfire and use of fire retardant, predation by crayfish, water depletion, habitat alteration from large ungulates, and overgrowth of vegetation in the occupied habitat.

Critical Habitat

Critical habitat encompasses 17.2 ac (6.1 ac at Three Forks Springs Unit, 5.3 ac at Boneyard Bogs Springs Unit, and 5.8 ac at Boneyard Creek Springs Unit; USFWS, 2012d). The PBFs of the San Bernardino springsnail critical habitat are:

1. Adequately clean spring water (free from contamination) emerging from the ground and flowing on the surface;
2. Periphyton (attached algae), bacteria, and decaying organic material for food;
3. Substrates that include cobble, gravel, pebble, sand, silt, and aquatic vegetation, for egg laying, maturing, feeding, and escape from predators; and
4. Either an absence of nonnative predators (crayfish) and competitors (snails) or their presence at low population levels.

5 EFFECTS OF COVERED ACTIVITIES

This section covers the effects of the covered activities on the covered species and critical habitat. This information is provided as technical assistance to action agencies seeking to make a decision as to whether or not their proposed action would have no effect on listed species or critical habitat. Action agencies may incorporate this information by reference when they make an NE determination.

The effects of the action are "all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action but that are not part of the action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action" (50 CFR 402.02).

The DKey ensures that covered actions will have no effect on listed species or critical habitat in the action area in the following ways:

First, some activities that have potential to affect listed species are categorically eliminated from the covered actions in this DKey. These activities appear in Section 3.1, Activity-Based Limits.

Secondly, other activities (shown in Section 3.2, Exposure-Based Limits), occurring within the range of the species or in critical habitat, may be covered, but only if:

- There is no spatial overlap with the species, and therefore no pathway for direct effects to individuals.
- There is no temporal overlap with the species for the entire duration of the project, and therefore no pathway for direct effects to individuals.
- Work will not occur in potential habitat, unless surveys demonstrate that the habitat is not suitable. Therefore, there is no pathway for effects to suitable habitat or individuals.
- Work will not occur in critical habitat unless field surveys demonstrate that the PBFs are not present or functioning. Therefore, the work will not affect functioning PBFs of critical habitat.

6 SUMMARY AND CONCLUSION

After considering the relevant information pertaining to the species and critical habitat, reviewing the covered activities and associated required conservation measures, and evaluating their anticipated effects, we conclude that the actions subject to this standing analysis will support a federal action agency determination of "No Effect" for the subject species and critical habitat as described above. This standing analysis is based on the information cited.

We will review and revise this standing analysis, as needed, if 1) new information reveals that the action(s) now results in any effects to the covered species or critical habitat; or 2) a covered species becomes delisted or covered critical habitat is no longer designated.

This standing analysis will be provided through IPaC via a link within the DKey output letter as described in Appendix B.

7 WORKS CITED

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8 APPENDIX A – SPECIES AND CRITICAL HABITAT COVERED BY THIS STANDING ANALYSIS

Table A-1 shows the species and critical habitats addressed in this standing analysis and DKey. As additional species are listed and critical habitat designated, the Service will update this standing analysis, according to **Section 1.5**.

Table A-1. Species and Critical Habitat Covered by this Standing Analysis

Species Name	ESA Status	Critical Habitat
Birds		
Yellow-billed Cuckoo (*Coccyzus americanus*)	Threatened	Yes
Masked Bobwhite Quail (*Colinus virginianus ridgwayi*)	Endangered	No
Southwestern Willow Flycatcher (*Empidonax traillii extimus*)	Endangered	Yes
Cactus Ferruginous Pygmy-owl (*Glaucidium brasilianum cactorum*)	Threatened	No
Yuma Ridgway's Rail (*Rallus obsoletus yumanensis*)	Endangered	No
California Least Tern (*Sternula antillarum browni)*	Endangered	No
Mexican Spotted Owl (*Strix occidentalis lucida*)	Threatened	Yes
California Condor (*Gymnogyps californianus*)	Endangered	No
Fish		
Gila Chub (*Gila intermedia*)	Endangered	Yes
Gila Trout (*Oncorhynchus gilae*)	Threatened	No
Spikedace (*Meda fulgida*)	Endangered	Yes
Loach Minnow (*Tiaroga cobitis*)	Endangered	Yes
Zuni Bluehead Sucker (*Catostomus discobolus yarrowi*)	Endangered	Yes
Virgin River Chub (*Gila seminuda [=robusta]*)	Endangered	Yes
Woundfin (*Plagopterus argentissimus*)	Endangered	Yes
Humpback Chub (*Gila cypha*)	Threatened	Yes
Bonytail (*Gila elegans*)	Endangered	Yes
Colorado Pikeminnow (*Ptychocheilus lucius*)	Endangered	Yes
Razorback Sucker (*Xyrauchen texanus*)	Endangered	Yes
Little Colorado Spinedace (*Lepidomeda vittata*)	Threatened	Yes
Sonora Chub (*Gila ditaenia*)	Threatened	Yes
Yaqui Chub (*Gila purpurea*)	Endangered	Yes
Yaqui Catfish (*Ictalurus pricei*)	Threatened	Yes

Beautiful Shiner (*Cyprinella formosa*)	Threatened	Yes
Gila Topminnow (*Poeciliopsis occidentalis*)	Endangered	No
Yaqui Topminnow (*Poeciliopsis occidentalis*)	Endangered	No
Plants		
Acuña Cactus (*Echinomastus erectocentrus var. acunensis*)	Endangered	Yes
Arizona Cliffrose (*Purshia [=Cowania] subintegra*)	Endangered	No
Arizona Eryngo (*Eryngium sparganophyllum*)	Endangered	Yes
Arizona Hedgehog Cactus (*Echinocereus arizonicus ssp. arizonicus*)	Endangered	No
Bartram's Stonecrop (*Graptopetalum bartramii*)	Threatened	No
Beardless Chinchweed (*Pectis imberbis*)	Endangered	Yes
Brady Pincushion Cactus (*Pediocactus bradyi*)	Endangered	No
Canelo Hills Ladies'-tresses (*Spiranthes delitescens*)	Endangered	No
Cochise Pincushion Cactus (*Coryphantha robbinsorum)*	Threatened	No
Fickeisen Plains Cactus (*Pediocactus peeblesianus ssp. fickeiseniae*)	Endangered	Yes
Gierisch Mallow (*Sphaeralcea gierischii*)	Endangered	Yes
Holmgren Milk-vetch (*Astragalus holmgreniorum*)	Endangered	Yes
Huachuca Water-umbel (*Lilaeopsis schaffneriana var. recurva*)	Endangered	Yes
Jones Cycladenia (*Cycladenia humilis var. jonesii*)	Threatened	No
Kearney's Blue-star (*Amsonia kearneyana*)	Endangered	No
Navajo Sedge (*Carex specuicola*)	Threatened	Yes
Nichol's Turk's Head Cactus (*Echinocactus horizonthalonius var. nicholii*)	Endangered	No
Peebles Navajo Cactus (*Pediocactus peeblesianus ssp. peeblesianus*)	Endangered	No
Pima Pineapple Cactus (*Coryphantha scheeri var. robustispina*)	Endangered	No
Siler Pincushion Cactus (*Pediocactus [=Echinocactus,=Utahia] sileri*)	Threatened	No
Ute Ladies'-tresses (*Spiranthes diluvialis*)	Threatened	No
Welsh's Milkweed (*Asclepias welshii*)	Threatened	Yes
Wright's Marsh Thistle (*Cirsium wrightii*)	Threatened	No
Zuni Fleabane (*Erigeron rhizomatus*)	Threatened	No

Mammals		
Jaguar (*Panthera onca*)	Endangered	Yes
New Mexico Meadow Jumping Mouse (*Zapus hudsonius luteus*)	Endangered	Yes
Ocelot (*Leopardus [=Felis] pardalis*)	Endangered	No
Sonoran Pronghorn (*Antilocapra americana sonoriensis*)	Endangered	No
Mount Graham Red Squirrel (*Tamiasciurus fremonti grahamensis*)	Endangered	Yes
Reptiles		
Narrow-headed Gartersnake (*Thamnophis rufipunctatus*)	Threatened	Yes
New Mexican Ridge-nosed Rattlesnake (*Crotalus willardi obscurus*)	Threatened	Yes
Northern Mexican Gartersnake (*Thamnophis eques megalops*)	Threatened	Yes
Desert Tortoise (*Gopherus agassizii)*	Threatened	Yes
Sonoyta Mud Turtle (*Kinosternon sonoriense longifemorale*)	Endangered	Yes
Amphibians		
Chiricahua Leopard Frog (*Rana chiricahuensis*)	Threatened	Yes
Sonoran Tiger Salamander (*Ambystoma mavortium stebbinsi*)	Endangered	No
Invertebrates		
San Bernardino Springsnail (*Pyrgulopsis bernardina*)	Threatened	Yes
Three Forks Springsnail (*Pyrgulopsis trivialis*)	Endangered	Yes

9 APPENDIX B – STRUCTURED QUESTIONS FOR SCREENING A PROJECT VIA A DKEY TO DETERMINE WHETHER IT IS APPLICABLE FOR USE UNDER THIS STANDING ANALYSIS

[Automatically generated when DKey is completed]