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Standing Analysis for the New Mexico Statewide No Effect Determination Key

IPaC Record Locator 2026-0142568

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1 INTRODUCTION

1.1 PURPOSE OF STANDING ANALYSIS

This standing analysis (SA) provides a streamlined process for federal action agencies and their designated non-federal representatives (both of these referred to as “action agency” in this document) to determine whether their future proposed federal actions (“actions”) that will be conducted, permitted, funded, or licensed may have potential effects to listed species and critical habitats, pursuant to section 7 of the Endangered Species Act (ESA or Act) of 1973, as amended (16 U.S.C. 1531 et seq.). The U.S. Fish and Wildlife Service (Service) developed this SA to provide proactive technical assistance (TA) to action agencies in making a determination consistent with “no effect” (NE) or “may affect” (MA) to listed species and their habitats in the state of New Mexico.

This SA process is available for actions that meet the criteria described below. In this process, the action agency uses the New Mexico Statewide NE Determination Key (DKey) in the Service’s Information for Planning and Consultation (IPaC) application. In the DKey, the action agencies answer questions about their proposed actions while considering their geospatial relationship to the species area of influence (AOI), habitat suitability within their action area, and overlap with proposed or designated critical habitat. If the action is consistent with the “no effect” criteria in the DKey, then IPaC produces a “technical assistance letter” of consistency supporting the action agency’s NE determination. If an action agency determines that their action will have NE on species or critical habitat, then they do not need to consult with the Service and the DKey will generate a TA letter for the action agency. Conversely, if the DKey determines that the action “may affect” a listed species or critical habitat, then the action agency should instead contact the Service to undergo consultation.

Some actions, as a category, are not eligible to use this DKey due to their scale, scope, or impact. Section 3.1 (Ineligible Activities and Actions) provides a list of ineligible categories. This SA provides the rationale that supports consistency with a NE determination for the species and critical habitats covered under this DKey. By screening the project through the DKey, the action agency adopts all or relevant portions of this SA.

Species/Habitats

Species and habitats covered by the New Mexico NE DKey include the federally listed and proposed species and critical habitats that occur within the state, as found on the IPaC Species List and as follows. These are subject to future change as species are proposed, listed, recovered, and down or de-listed (i.e. removed from the ESA). For the most current version, please use the IPaC generated Official Species List (OSL).¹:

Mammals

- Black-footed ferret (*Mustela nigripes*) – E

¹T = threatened, E = endangered, CH = critical habitat, NEP = nonessential experimental population, PT = proposed threatened, PE = proposed endangered, PCH = proposed critical habitat, UR = under review

- Canada lynx (*Lynx canadensis*) – T – CH (no CH in NM)
- Jaguar (*Panthera onca*) – E – CH (no CH in NM)
- Mexican long-nosed bat (*Leptonycteris nivalis*) – E
- Mexican wolf (*Canis lupus baileyi*) – E, and – NEP
- New Mexico meadow jumping mouse (*Zapus hudsonius luteus*) – E – CH
- Peñasco least chipmunk (*Neotamias minimus atristriatus*) – E - CH
- Tricolored bat (*Perimyotis subflavus*) – PE

Birds

- Lesser prairie-chicken (*Tympanuchus pallidicinctus*) – UR
- Mexican spotted owl (*Strix occidentalis lucida*) – T – CH
- Northern aplomado falcon (*Falco femoralis septentrionalis*) – NEP
- Piping Plover (*Chadrius melodus*) T-CH (no CH in NM)
- Southwestern willow flycatcher (*Empidonax traillii extimus*) – E – CH
- Yellow-billed cuckoo (*Coccyzus americanus*) – T – CH

Reptiles

- Dunes sagebrush lizard (*Sceloporus arenicolus*) UR
- Narrow-headed gartersnake (*Thamnophis rufipunctatus*) – T – CH
- New Mexico ridge-nosed rattlesnake (*Crotalus willardi obscurus*) – T – CH
- Northern Mexican gartersnake (*Thamnophis eques megalops*) – T – CH

Amphibians

- Chiricahua leopard frog (*Rana chiricahuensis*) – T – CH
- Jemez Mountains salamander (*Plethodon neomexicanus*) – E – CH

Fish

- Arkansas River shiner (*Notropis girardi*) – T – CH (No CH in NM)
- Chihuahua chub (*Gila nigrescens*) – T – CH
- Colorado pikeminnow (*Ptychocheilus lucius*) – E/NEP – CH
- Gila chub (*Gila intermedia*) – E – CH
- Gila topminnow (including Yaqui) (*Poeciliopsis occidentalis*) – E
- Gila trout (*Oncorhynchus gilae*) – T
- Loach minnow (*Tiaroga cobitis*) – E – CH
- Pecos bluntnose shiner (*Notropis simus pecosensis*) – E – CH
- Pecos gambusia (*Gambusia nobilis*) – E
- Pecos pupfish (*Cyprinodon pecosensis*) PT - PCH
- Peppered chub (*Macrhybopsis tetranema*) – E – CH
- Razorback sucker (*Xyrauchen texanus*) – T– CH
- Rio Grande silvery minnow (*Hybognathus amarus*) E – CH
- Spikedace (*Meda fulgida*) – E – CH
- Woundfin (*Plagopterus argentissimus*) – E/NEP
- Yaqui catfish (*Ictalurus pricei*) – T – CH

- Zuni bluehead sucker (*Catostomus discobolus yarrowi*) – E – CH

Clams

- Texas hornshell (*Popenaias popeii*) – E – PCH

Snails

- Alamosa springsnail (*Tryonia alamosae*) – E
- Chupadera springsnail (*Pyrgulopsis chupadera*) – E – CH
- Koster's springsnail (*Juturnia kosteri*) – E – CH
- Pecos assiminea snail (*Assiminea pecos*) – E – CH
- Roswell springsnail (*Pyrgulopsis roswellensis*) – E – CH
- Socorro springsnail (*Thermosphaeroma thermophilum*) – E

Crustaceans

- Noel's amphipod (*Gammarus desperatus*) – E – CH
- Socorro isopod (*Pyrgulopsis neomexicana*) – E

Insects

- Monarch butterfly (*Danaus plexippus*) – PT – PCH (No PCH in NM)
- Sacramento Mountains checkerspot butterfly (*Euphydryas anicia cloudcrofti*) – E – PCH
- Silverspot butterfly (*Speyeria nokomis nokomis*) – E
- Suckley's cuckoo bumble bee (*Bombus suckleyi*) - PE

Plants

- Cochise pincushion cactus (*Coryphantha robbinsorum*) – T
- Gypsum wild-buckwheat (*Eriogonum gypsophilum*) – T – CH
- Holy ghost ipomopsis (*Ipomopsis sancti-spiritus*) – E
- Huachuca water-umbel (*Lilaeopsis schaffneriana* var. *recurva*) – E – CH (No CH in NM)
- Knowlton's cactus (*Pediocactus knowltonii*) – E
- Kuenzler hedgehog cactus (*Echinocereus fendleri* var. *kuenzleri*) – T
- Lee pincushion cactus (*Escobaria sneedii* var. *leei*) – T
- Mancos milk-vetch (*Astragalus humillimus*) – E
- Mesa Verde cactus (*Sclerocactus mesae-verdae*) – T
- Pecos sunflower (*Helianthus paradoxus*) – T – CH
- Sacramento Mountains thistle (*Cirsium vinaceum*) – T
- Sacramento prickly poppy (*Argemone pleiacantha* ssp. *pinnatisecta*) – E
- Sneed pincushion cactus (*Escobaria sneedii* var. *sneedii*) - E
- Todsen's pennyroyal (*Hedeoma todsenii*) – E – CH
- Wright's marsh thistle (*Cirsium wrightii*) – T – CH
- Zuni fleabane (*Erigeron rhizomatus*) – T

Ferns and Allies

- American Hart's-tongue Fern (*Asplenium scolopendrium* var. *americanum*) – T

1.2 ENSURING ACCURATE DETERMINATIONS

To apply this SA and associated DKey to a proposed project and be 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. If a question is unclear, an outcome seems incorrect, or if a user would like further information not provided in this SA, please contact the NM Ecological Services Field Office (ESFO) for additional technical assistance. If the problem is a technical issue with the DKey process, please contact the [ECOS help desk](#) with a description of the problem you are having as well as a PDF file of a print-out illustrating the technical problem, if possible and applicable.

1.3 BENEFITS OF THE STANDING ANALYSIS

The Service can develop a SA for those federal actions that they have analyzed previously with regularity and for which significant knowledge has been accumulated. The SA and associated DKey provide an expedited resource for action agencies to aid in determinations consistent with “no effect” or “may affect.” This facilitates a streamlined process to reduce the amount of time the Service and the action agency or their designated non-federal representatives spend engaged in technical assistance. Additionally, a predictable, consistent, and timely TA letter is produced, or information for a biological evaluation or assessment is established that can be used towards the next steps of consultation. 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 species determinations.

1.4 ELIGIBILITY FOR USE OF THE STANDING ANALYSIS

A SA does not convey concurrence with NE determinations for specific actions. Rather, it provides acknowledgement that the NE determination is consistent with information provided by the action agency. The SA 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. This information can be used towards a biological evaluation or biological opinion, as appropriate. For projects that do not fall under the NE determination DKey, action agencies should follow the instructions in the “Next Steps” sections of the TA letter generated by the DKey to coordinate directly with the NM ESFO and address any consultation requirements.

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.

1.5 UPDATES TO THE STANDING ANALYSIS

The Service will review this SA regularly, and at a minimum annually, to make updates with the best available scientific and commercial data that reflects current regulatory statuses. This update process will ensure that the analysis is accurate and valid, the document still meets ESA requirements, the logic is sound, and the determinations are appropriate. Updates will be dated, signed, versioned, and uploaded to the IPaC interface for reference. The SA is provided via the NM ESFO website and linked within the DKey introduction through the IPaC platform.

The NM ESFO will maintain records of the current and previous versions of the SA. The most current version will be maintained on their website, also available via the link on the IPaC interface. Projects reviewed under this SA should rely on the most current version available. For reference, both current and previous versions of the SA will be maintained by the NM ESFO.

The Service will add or remove species and include additional actions to this SA and associated DKey. This will occur as we automate and apply the listing and delisting actions. Lastly, this SA and DKey will serve as the framework to incorporate information about additional actions and analysis of their effects to species and their habitat.

2 COVERED AREA

The covered area is the entire State of New Mexico, United States (U.S.). To qualify to use this SA, a project's action area must fall completely within the state of New Mexico. 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). As updates are made, the covered area may extend to include adjacent states such as Arizona, Colorado, Oklahoma, Texas, and/or Utah for proposed actions that are interstate, or that have action areas with upstream, downstream, or adjacent effects that extend beyond New Mexico boundaries and into adjoining states. Consideration for potential project overlap with trust resources such as Service Refuges, migratory bird species, bald and golden eagles, wetland and floodplain features identified via the National Wetland Inventory map program, candidate and other sensitive species including State-listed endangered and threatened species are also components of official species list to aid project proponents with their impact analysis, assessments, reviews and determinations.

3 COVERED ACTION DESCRIPTION

This section describes which specific actions may be appropriate for determinations consistent with a NE outcome under this SA. Criteria such as geographic locations, activity descriptions, and results of surveying and habitat assessments inform the SA and associated DKey determinations. The inclusion of actions in this SA does not mean that these types of actions will *always* result in no effects to listed species or critical habitat.

All discretionary federal actions within the state of New Mexico are covered by this SA and DKey, **except** for those listed under [Section 3.1 \(Ineligible Activities and Actions\)](#) 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 and/or critical habitat area must be on the IPaC OSL to trigger the DKey.

The following conditions will result in a NE determination for the covered species and critical habitats:

1. If the species does not occur in the action area, as evidenced by field surveys and/or habitat assessments that do not detect individuals or suitable habitat. Further, if the field surveys did not detect individuals, it should be reasonably certain that none of the species on the IPaC generated OSL will occur within the action area at a later time in the future

and for the entire duration of the action, including applicable project maintenance and decommissioning activities.

2. If field surveys and/or habitat assessments demonstrate that the Physical and Biological Features (PBFs) of critical habitat are not present and/or cannot be restored in the future.

Covered actions generating a TA letter from the DKey consistent with a NE determination are detailed below. All other actions and scenarios will result in a TA letter with a “MA” determination or a notification that this DKey is not applicable. In both situations the user will be advised to contact the NM ESFO.

3.1 INELIGIBLE ACTIONS AND ACTIVITIES

The following activities are **not** eligible, as a category, to receive the Service’s TA letter for consistency with a NE determination under this SA:

1. Actions that cause purposeful, intentional take of a species, including research activities.
2. Actions that cause effects (even wholly beneficial effects) to a listed species or critical habitat.
3. Actions not conducted, permitted, funded, or licensed by a federal agency.
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 letter/memo of concurrence and/or biological opinion.
5. Reinitiations of consultations or requests for extensions on the timelines of existing consultations.
6. Approval of a long-term (in effect, greater than 10 years) permit, plan, or other action.
7. Actions that involve the permitting of livestock grazing (cattle, horses, sheep, etc.).
8. Actions that involve the remediation of orphaned wells.
9. Actions that involve the use of crewed or uncrewed aircraft (e.g., airplanes, helicopters, drones, balloons).

3.2 EXPOSURE BASED LIMITS

To assist action agencies/project proponents in determining whether their project meets the requirements of this SA, the Service will provide a series of questions in the associated NM NE DKey ([Appendix A](#)). These questions include screening criteria that allow the action agency or project proponent to determine whether this SA applies to their individual project and will only apply to projects that meet screening criteria. Actions that include certain activities, occur in certain geographic areas, or meet one or more context-dependent conditions will receive a TA letter with a “may affect” determination. Actions that do not qualify under the screening criteria will be provided with directions for the next steps including coordination/consultation with the NM ESFO in their TA letter.

This SA does not cover actions under the following context-dependent conditions:

- Actions that are already covered by an existing consultation, including actions where the action agency is following all conservation measures, project design criteria, best

management practices, and reasonable and prudent measures as outlined in a letter/memo of concurrence and/or biological opinion.

- Reinitiations of consultation, or requests for an extension on the timeline of an already existing formal consultation.
- Actions that are already covered by recovery permits and/or intra-service biological opinions associated with Section 10 permitting.²
- Actions that do not consider all impacts to federally listed species that may result from the entirety of the project (not just the activities under federal jurisdiction) during their effects analysis are not eligible to use this SA and associated DKey.

For projects pertinent to this SA, additional questions provide for assessment of whether the action is likely to affect a listed species or critical habitat. Actions that are likely to affect a listed species or critical habitat do not qualify under this SA.

3.3 CONSERVATION MEASURES

This SA and associated DKey consider conservation measures that avoid, minimize, or reduce impacts to listed species and critical habitats. Conservation measures, when adopted as part of the project, become required design features enacted during project implementation. Project proponents should include all applicable conservation measures when they submit project information to the NM ESFO. Species specific conservation measures may be available in IPaC through the consultation package builder, OSLs, project design features including emergencies, and links within species profile pages.

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.

4 COVERED SPECIES AND CRITICAL HABITAT

This SA only covers the species and critical habitats described in this section of the document where they occur in New Mexico and are based on the current version of the IPaC generated OSL, record number 2026-0142568. If a proposed action may affect a listed species or critical

² Section 10 of the ESA outlines activities that are exceptions to the activities prohibited in Section 9 of the Act. The exceptions most relevant to Section 7 consultations are takings allowed by two kinds of permits issued by the Services: (1) “take” permits for scientific purposes or to enhance populations; and (2) takes of listed species that occur incidental to otherwise legal activities. The ESA defines any attempt to harass, pursue, hunt, shoot, wound, kill, trap, capture, or collect a listed species as a “take”.

habitat not addressed in this section, then the action agency should undergo individual consultation with the NM ESFO and/or other appropriate Ecological Services Field Office.

The following section includes a summary of relevant background information on the covered species and critical habitats. Complete descriptions and associated documents can be found on the species profile page of the Environmental Conservation Online System (ECOS, <https://ecos.fws.gov>) and focus page of the U.S. Fish and Wildlife Service website (<https://www.fws.gov/>). Links for each species are provided below, links to profile pages are also available in project associated OSLs.

Critical habitat definitions previously used the term “Primary Constituent Elements” (PCEs) to describe the features “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 “Physical and Biological Features” (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 MAMMALS

Species	ESA Status	Focus Page	Profile Page
Black-footed ferret	Endangered, Experimental	Focus Page	Profile Page
Canada lynx	Threatened	Focus Page	Profile Page
Jaguar	Endangered	Focus Page	Profile Page
Mexican long-nosed bat	Endangered	Focus Page	Profile Page
Mexican wolf	Endangered, Experimental	Focus Page	Profile Page
New Mexico meadow jumping mouse	Endangered	Focus Page	Profile Page
Peñasco least chipmunk	Endangered	Focus Page	Profile Page
Tricolored Bat	Proposed Endangered	Focus Page	Profile Page

4.1.1 *Black-footed Ferret, Mustela nigripes*

The Black-footed Ferret was listed as endangered without critical habitat in 1967 ([32 FR 4001](#)). The species is part of the non-essential Southwest Experimental Population Area revised in 2023 ([88 FR 69045](#)) which includes portions of Arizona, Colorado, Montana, South Dakota, and Utah. In New Mexico, the species is listed as endangered in suitable locations of Colfax, Mora, and Taos counties.

The species has upper body parts that are yellowish buff, occasionally whitish, feet and tail tips that are black, with distinctive black “masks” across the eyes (Hillman and Clark 1980, Anderson et al. 1986, Service 2019a). The black-footed ferret was historically found throughout the Great Plains, mountain basins, and semi-arid grasslands of North America wherever prairie dogs occurred (Hillman and Clark 1980, Service 2019a). Currently, all known ferret populations are a result of reintroduction efforts (Service 2019a).

Ferrets select areas within prairie dog colonies that contain high burrow densities and thus high densities of prairie dogs (Biggins et al. 2006, Eads et al. 2011, Jachowski et al. 2011, Livieri and Anderson 2012, Service, 2019a). Home ranges of female ferrets occupying high density black-tailed prairie dog habitat average approximately 60 hectares (ha) whereas males average approximately 130 ha (Jachowski et al. 2010, Livieri and Anderson 2012, Service 2019a).

The black-footed ferret is solitary, except for breeding and the period when mother and young are together (Forrest et al. 1985, Service 2019a). The ferret breeds at approximately one year of age from mid-March through early April in the wild (Wilson and Ruff 1999, Service, 2019a). Gestation is about 42–45 days and parturition (whelping) takes place below ground with an average litter size of 3.5 individuals (Wilson and Ruff 1999, Service 2019a). The kits are born helpless and require parental care. Kits develop quickly, nearly reaching adult weight after 125 days (Vargas and Anderson 1996, Service 2019a). The kits are mobile enough to appear above ground in July and are generally ready to disperse from their mother by September or October (Service 2019a). The black-footed ferret depends almost exclusively on prairie dogs for food and on prairie dog burrows for shelter (Hillman 1968, Biggins et al. 2006). They have also been known to consume mice, voles, and other small mammals (Brickner et al. 2014, Service 2019a). Dispersal occurs in the fall months among the young of the year (Forrest et al. 1988), with movements up to 49 kilometers (km) recorded (Biggins et al. 1999, Service 2019a).

Black-footed ferret populations declined due to a major conversion of native range to cropland, particularly in the eastern portion of the species' range, began in the late 1800s (Service 2013). Poisoning of prairie dogs to reduce competition with domestic livestock for forage began in the early 1900s, and harmed black-footed ferrets as well (Service 2013). The exotic disease sylvatic plague first impacted prairie dogs and ferrets in the 1930s and has caused considerable population declines in the species (Eskey and Haas 1940, Service 2013).

4.1.2 Canada Lynx, *Lynx canadensis*

The Canada Lynx was listed as threatened in 2000 ([65 FR 16053](#)). The Canada lynx is a medium-sized cat with long legs, large, well-furred paws, and grayish-brown fur (Service 2017a). Currently the Canada lynx is distributed among boreal and montane forest populations across northern North America from eastern Canada to Alaska, including California, Colorado, Idaho, Maine, Michigan, Minnesota, Montana, New Hampshire, New Mexico, Utah, Vermont, Washington, Wisconsin, and Wyoming (McCord and Cardoza 1982, Poole 2003, McKelvey et al. 2008, [79 FR 54782](#), Murray and Thornton 2025, Service 2017a). Populations in the United States are relatively isolated from one another, though most are directly connected via dispersal to lynx populations in Canada (McKelvey et al. 2000a, Service 2017a). U.S. populations are at the periphery of the species' range and some, particularly in the West (geographic units 3-6), may behave as islands in a mainland-island metapopulation configuration (Service 2017a).

Lynx are strongly associated with moist boreal forests, where winters are long, cold, and snowy (Bittner and Rongstad 1982, McCord and Cardoza 1982, Quinn and Parker 1987, Agee 2000, Aubry et al. 2000, Hodges 2000a, 2000b, McKelvey et al. 2000b). The predominant vegetation of boreal forest is conifer trees, primarily species of spruce (*Picea spp.*) and fir (*Abies spp.*)

(Elliot-Fisk 1988). Stands of differing ages and conditions provide lynx foraging or denning habitat, and some serve as travel routes for lynx moving between foraging and denning habitats (McKelvey et al. 2000c, Hoving et al. 2004, Service 2017). Mature forests may be a source of snowshoe hares for other, adjacent forest types (Griffin and Mills 2009), and may provide especially important winter foraging habitats (Squires et al. 2010), which may be the most limiting habitat for lynx (Squires et al. 2010, Service 2017a). Lynx dens are typically located in areas of dense cover, where coarse woody debris such as downed logs and windfalls provide security and thermal cover for lynx kittens (McCord and Cardoza 1982, Koehler 1990, Slough 1999, Squires and Laurion 2000, Organ et al. 2008, Squires et al. 2008, Moen and Burdett 2009, Service 2017a).

Although lynx take a variety of alternate prey species, especially red squirrels, hare abundance is the major driver of lynx population dynamics (O'Donoghue et al. 1997, 1998, Ivan and Shenk 2016, Service 2017a). Lynx denning area selection, pregnancy rates and litter sizes, as well as survival, recruitment, and dispersal rates, and population age structure, home range sizes, density, and distribution are all strongly influenced by hare abundance (Koehler and Aubry 1994, Apps 2000, Aubry et al. 2000, Mowat et al. 2000, Moen et al. 2008, Organ et al. 2008, Vashon et al. 2012, Service 2017a).

Lynx typically mate in March and April, and kittens are born from late April to mid-June after a 60- to 70-day gestation period (Koehler and Aubry 1994, Mowat et al. 2000, Service 2017a). Females attend kittens at the natal den site and 1 or more (up to 5) alternate or maternal dens until kittens are about 6-10 weeks old (Squires et al. 2008, Olson et al. 2011, Vashon et al. 2012, Service 2017a). Thereafter, kittens remain with their mothers through their first winter, apparently learning from her how to hunt and capture prey, initially on a small portion of her home range, but by fall on the larger area the female used before kittens were born (Mowat et al. 2000; Service 2017a). Juveniles remain closely associated with their mothers until February or March, when family groups begin to break up, with young typically dispersing in April and May (Mowat et al. 2000) to establish their own home ranges (Service 2017a). Female offspring may establish home ranges overlapping or adjacent to their mother's home range and maintain mother-daughter bonds throughout their lives (Mowat et al. 2000, Service 2017a).

Global climate change presents the greatest challenge to the long-term conservation of lynx and their boreal forest habitats in the contiguous United States (Service 2005a, 2024a). Decreases in the amount and duration of snow and increased wildfire and forest insect activity are likely to reduce the amount and quality of lynx habitats, lynx numbers, and the resiliency of lynx populations in the contiguous United States (Service 2017a, 2024a).

Canada Lynx Critical Habitat

Canada lynx Critical Habitat was designated in 2014 ([79 FR 54782](#)) with a revision proposed in 2024 ([89 FR 94656](#)) and the revision finalized in 2026 ([91 FR 43732](#)). The PCEs, now PBFs, are as follows:

- (i) Presence of snowshoe hares that support lynx residency and reproduction over time within a mosaic of boreal/subalpine forest structural stages that includes snowshoe hare habitat with dense horizontal cover at ground- or snow-level.

- (ii) Winter conditions that provide and maintain deep persistent unconsolidated (fluffy) snow.
- (iii) Presence of denning structures, including downed trees, root wads, and accumulations of coarse woody debris.
- (iv) Habitat types, such as dry forest or meadows, that are between boreal forest patches and are likely to be used by lynx traveling between those patches within and among home ranges.
- (v) Landscapes with suitable habitat large enough (483 mi² (greater than or equal to 1,250 km²)) to support breeding populations.

Critical habitat does not include manmade structures (lands covered by buildings, houses, pavement, and other structures; paved highways and roads; active mines and existing mining infrastructure; existing developed ski runs and tree islands, ski lifts, and associated ski area infrastructure and buildings; and irrigation infrastructure) and the land on which they are located existing within the legal boundaries on August 17, 2026.

There is no critical habitat for the species designated in the state of New Mexico.

4.1.3 *Jaguar, Panthera onca*

Jaguars were listed as endangered in 1972 ([37 FR 6476](#)). Jaguars measure about 1.5-2.4 meters (m) (5-8 feet (ft)) from nose to tip of tail and weigh from 36-158 kilograms (kg) (80-348 pounds (lb)) (Seymour 1989, Nowak 1999, Service 2018a). Jaguars historically occurred in California, Arizona, New Mexico, Texas, and possibly Louisiana (Service 1997, Service 2018a). Occurrences in the U.S. since 1963 have been limited to south-central Arizona and extreme southwestern New Mexico (Service 2018a).

Jaguars are known from a variety of vegetation communities (Seymour 1989, Service 2018a). Jaguars have been documented in arid areas, including but not limited to thornscrub, desertscrub, chaparral, semidesert grassland, Madrean evergreen woodland, deciduous forest, and conifer forest communities of northwestern Mexico and southwestern U.S. (Brown and López González 2001, López González and Brown 2002, Boydston and López González 2005, Culver 2016, Service 2018a). Like most large carnivores, jaguars have relatively large home ranges. Some studies have estimated Jaguar home range sizes estimated between 10 km² (3.9 mi²) (Rabinowitz and Nottingham 1986) to 959 km² (370 mi²) (Hernandez-Santin 2007) (Service 2018a). Jaguars can disperse long distances from their natal home range, and males disperse farther than females, but little data exist on jaguar dispersal, including dispersal distance and duration (Service 2018a).

Jaguars may breed year-round range wide, but tend to breed seasonally at the southern and northern ends of their range (Seymour 1989, Service 2018a). On average, gestation is 101 days with cubs being born in a sheltered place (Seymour 1989, Service 2018a). Litters range from one to four but usually consist of two cubs (Seymour 1989, Service 2018a). Cubs remain with their mother for 1.5 to 2 years (Seymour 1989, Service 2018a). Sexual maturity ranges from 2 to just over 3 years for females and 3 to 4 years for males (Seymour 1989, Service 2018a). The lifespan of the jaguar in the wild is estimated to be approximately 10-15 years, and generation length is 6.84 years (Quigley et al. 2017, Service 2018a). Jaguars are considered opportunistic hunters, and the list of prey taken by them range wide includes more than 85 species (Seymour 1989, Service 2018a).

Range wide, habitat destruction, modification, and fragmentation form one of the two most significant threats to the jaguar (Nowell and Jackson 1996, Medellín et al. 2002, Núñez et al. 2002, Chávez and Ceballos 2006, Medellín 2009, Rodríguez-Soto et al. 2013, Petracca et al. 2014b, Quigley et al. 2017, Jędrzejewski et al. 2018). Rates of jaguar extirpations continue to increase, mainly due to habitat alteration (Jędrzejewski et al. 2018, Service 2018a). Fragmentation of forest habitat isolates jaguar populations so that jaguars are more vulnerable to human persecution (Nowell and Jackson 1996, Quigley et al. 2017, Service 2018a). Prey density is also reduced in leftover forest patches, which can lead to increased interactions between jaguars and livestock (Quigley et al. 2017, Service 2018a).

Jaguar Critical Habitat

Jaguar critical habitat was designated in 2014 ([79 FR 12572](#)) with a revision finalized in 2024 ([89 FR 46822](#)). The PCEs, now PBFs, for designated critical habitat are as follows: Expansive open spaces in the southwestern United States of at least 100 km² (38.6 mi²) in size which:

1. Provide connectivity to Mexico;
2. Contain adequate levels of native prey species, including deer and javelina, as well as medium-sized prey such as coatis, skunks, raccoons, or jackrabbits;
3. Include surface water sources available within 20 km (12.4 mi) of each other;
4. Contain from greater than 1 to 50 percent canopy cover within Madrean evergreen woodland, generally recognized by a mixture of oak (*Quercus* spp.), juniper (*Juniperus* spp.), and pine (*Pinus* spp.) 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 2,000 m (6,562 feet) in elevation; and
7. Are characterized by minimal to no human population density, no major roads, or no stable nighttime lighting over any 1-km² (0.4-mi²) area.

The current total acreage of designated critical habitat for the jaguar is approximately 640,124 acres (259,049 ha) in Pima, Santa Cruz, and Cochise Counties, Arizona. There is no critical habitat designated in the state of New Mexico.

4.1.4 Mexican Long-nosed bat, *Leptonycteris nivalis*

The Mexican Long-nosed bat was listed as endangered in 1988 ([53 FR 38456](#)). The species does not have designated critical habitat. They are relatively large and they have a drab brown color, darker in the dorsum and paler ventrally (Hall 1981, Service 2018a). It currently inhabits areas in central Mexico, along the eastern coast, to southwestern United States, as far south as the states of Guerrero and Puebla in Mexico, and in the United States this species is known from western Texas (Presidio and Brewster Counties) and Hidalgo County, New Mexico (Service 2018a).

They roost in caves and engage in long distance movements coinciding with the blooming of cacti and Agave in the deserts and pine-oak habitats at elevations between 1490 and 2300 meters (Service 2018b). Mexican long-nosed bats typically use caves as day roosts (and to a lesser

extent, mines) found at elevations of 1,000 to 2,300 m typically in pine-oak habitats (Baker and Cockrum 1966, Arita 1991, Service 2018b). They seem to be physiologically adapted for cool environments (Ayala-Berdón et al. 2013, Service 2018b). In New Mexico, foraging habitat is that which supports Agave, and the densest patches of Agave were encountered on rocky, precipitous slopes primarily in the Animas Mountains (Bogan et al. 2017, Service 2018b).

They mate and give birth only once a year (Racey and Entwistle 2000, Service 2018b). They gather in Central Mexico during fall-winter to mate (Téllez-Zenteno 2001). Cueva del Diablo (Tepoztlán, Morelos) is the only known mating roost where males and females concentrate in the winter range and likely is where most mating occurs (Téllez-Zenteno 2001, Service 2018b). By the end of February some authors have reported early stage pregnant females in Central Mexico roosts, the results of mating during October-November (Téllez-Zenteno 2001, Torres-Knoop 2014, Service 2018b). In March, only small groups (mostly inactive males) remained in the cave (Téllez-Zenteno 2001, Service 2018b). They are nectar-feeders that utilize a number of agave and cactus species, and in New Mexico *Agave palmeri* is suspected to be the main component of their diet (Bogan et al. 2017, Service 2018b).

The species spends fall and winter in Central Mexico, migrating northward to northern Mexico and the southwestern United States at the end of February/early March (Service 2018b). They remain in this area forming maternity colonies during spring and early summer and start migrating to central Mexico by mid-summer (Easterla 1972, Arita 2005, Service 2018b). This migration is mainly made by pregnant females, moving northward by the end of winter, and post-lactating females moving southward by the end of summer; while it is still uncertain what happens to males and research suggests they remain scattered in roosts in central Mexico (Téllez-Zenteno 2001, Service 2018b). Generally, they are present in New Mexico in late summer (mid-July through September) (Bogan et al. 2017, Service 2018b). Juveniles and adult females are thought to return to southern sites in the late summer or early fall, however much is unknown about the migratory paths of this species throughout the year (Service 2018b).

The loss of food resources due to conversion of foraging habitat to agriculture and ranching in addition to the disturbance by humans is thought to have contributed to the decline of the population sizes of this species (Service 2018b). Anthropogenic activities, such as disturbance from people entering a roost, pollution (e.g., trash), noise, vibrations, and development around roosts are the main threat to the conservation of roosts (Service 2018b). The loss of any floral resources listed, but especially Agave, near roosts and along migratory corridors will have a detrimental effect on the health of the population (Service 2018b).

4.1.5 Mexican Wolf, *Canis lupus baileyi*

The Service listed the Mexican wolf as endangered in 1975 ([40 FR 17590](#)), the rule later being revised in 2015 ([80 FR 2488](#)), wherever it is found, except in the Mexican Wolf Experimental Population Area where it is listed as a nonessential experimental population ([80 FR 2512](#)).

Critical habitat has not been designated. For section 7 consultation purposes, any nonessential experimental population located within a National Park or National Wildlife Refuge System is treated as a threatened species. Any nonessential experimental population located outside of a National Park or National Wildlife Refuge System is treated as a proposed species.

Mexican wolves are typically a patchy black, brown to cinnamon, and cream color, with primarily light underparts (Brown 1983). The subspecies historically inhabited portions of the southwestern U.S. and central and northern Mexico (Service 2023a). The Mexican wolf's current range includes central and southern Arizona and New Mexico in the U.S., and portions of the States of Sonora and Chihuahua in Mexico (Service 1996b, 2023a).

Mexican wolves historically occupied montane woodland habitats ranging from foothills characterized by evergreen oaks (*Quercus* spp.), pinyon (*Pinus edulis*) and juniper (*Juniperus* spp.) to higher elevation pine (*Pinus* spp.) and mixed conifer forests. Factors making these habitats suitable to Mexican wolves likely included an abundance of prey, availability of water, the presence of cover, and suitable den sites (Service 2017b).

Basic life history for Mexican wolves is similar to that of other gray wolves (Mech 1974; Service 1982; Service 2010b). Mexican wolves predominantly prey on elk in the U.S., but other sources of prey throughout their current range include deer, small mammals, birds, and occasionally livestock (Service 2023a).

The primary threats to Mexican wolves include illegal shooting, genetic issues (inbreeding, loss of heterozygosity, and loss of adaptive potential), and small population size ([80 FR 2488](#); Service 2022a).

4.1.6 New Mexico Meadow Jumping Mouse, *Zapus hudsonius luteus*

The New Mexico meadow jumping mouse was listed as endangered in 2014 ([79 FR 33119](#)). They are dark brownish above with a white underside and yellowish-brown sides (Service 2023b). The New Mexico meadow jumping mouse is currently known to occur in reduced portions the subspecies' historical range in eastern Arizona, southern Colorado, and New Mexico (Service 2023b).

The New Mexico meadow jumping mouse is a habitat specialist (Frey 2017, Frey and Malaney 2009) that requires dense riparian herbaceous vegetation associated with seasonally available or perennial (persistent) flowing water and adjacent uplands that can support the vegetation characteristics needed for foraging, breeding, and hibernating (Service 2020a). The typical habitat is a wet meadow-perennial stream complex with a dense mixture of herbs and grasses. Tall, dense riparian herbaceous vegetation provides the jumping mouse with adequate food resources and a hospitable environment including refuge from potential predators (Service 2020a). Females will use maternal nests in areas outside the moist riparian areas for giving birth and rearing young (Service 2020a). Although the jumping mouse commonly uses riparian vegetation immediately adjacent to a perennial stream, other features that may provide habitat for the jumping mouse likely include: seasonal streams; wetland or marshes that contain areas of high soil moisture, but no visible running water; agricultural ditches and canals; and wet meadows or seeps, sometimes in association with beaver (*Castor canadensis*) complexes (Frey 2005, 2006, Frey and Malaney 2009, Frey and Wright 2012, Morrison 1988, Zahratka 2019, Service 2020a).

The New Mexico meadow jumping mouse has a very limited active period; it is active mainly during the summer when the forb, grass, and sedge seeds on which it depends are available

(Service 2020f). The jumping mouse is typically only active from about late May or early June to late September or early October in high elevation montane areas (Frey 2015, Morrison 1987, Zahratka 2016, 2019) and mid-May to late October in the lower elevations along the Rio Grande (Najera 1994, Wright and Frey 2011, Service 2020a). The jumping mouse is a true hibernator, usually entering hibernation in September or October and emerging the following May or June (Frey 2015, Service 2020f), totaling about eight or nine months out of the year, longer than most mammals (Frey 2005, Morrison 1987, Service 2020a). Little research has been conducted on jumping mouse hibernacula (Service 2020a). Upon emergence from hibernation, they breed in July or August and likely produce only one litter each year (Chambers 2018a, Frey 2015, Morrison 1987, 1989, Service 2020a). Jumping mice produce two to seven young after an average 18- to 21-day gestation (Frey 2015, Service 2020a). Young are fully developed and weaned at four weeks after birth (Frey 2015, Morrison 1987, Service 2020a). New Mexico meadow jumping mice exhibit limited movement and dispersal capabilities (Frey and Wright 2012, Morrison 1988, Service 2020f). During the active season, its diet consists primarily of grass seeds and forb seeds (Morrison 1990; Chambers 2018b, Service 2023b).

The sources of current and anticipated future jumping mouse habitat loss, degradation, and fragmentation include grazing pressure from livestock that is incompatible with needed vegetation structure and diversity (loss of riparian herbaceous vegetation needed for forage, cover, and stream bank stability); incompatible water use and management (dams and diversions) that alter flow regimes needed to support suitable riparian habitat; global climate change and drought that affect vegetation and water flow; high severity wildland fires and their resultant post-fire flooding that cause changes to riparian habitat (Service 2020a).

New Mexico Meadow Jumping Mouse Critical Habitat

New Mexico Meadow Jumping Mouse critical habitat was designated in 2016 ([81 FR 14264](#)). PCEs, now PBFs for designated critical habitat are as follows:

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 (*Carex* spp. Or *Schoenoplectus pungens*); or
 - b. Scrub-shrub riparian areas that are dominated by willows (*Salix* spp.) or alders (*Alnus* spp.) with an understory of primarily forbs and sedges; and
2. Flowing water that provides saturated soils throughout the jumping mouse's active season that supports tall (average stubble height of herbaceous vegetation of at least 61 cm (24 inches)) and dense herbaceous riparian vegetation composed primarily of sedges (*Carex* spp. or *Schoenoplectus pungens*) and forbs, including, but not limited to, one or more of the following associated species: Spikerush (*Eleocharis macrostachya*), beaked sedge (*Carex rostrata*), rushes (*Juncus* spp. And *Scirpus* spp.), and numerous species of grasses such as bluegrass (*Poa* spp.), slender wheatgrass (*Elymus trachycaulus*), brome (*Bromus* spp.), foxtail barley (*Hordeum jubatum*), or Japanese brome (*Bromus japonicas*), and forbs such as water hemlock (*Circuta douglasii*), field mint (*Mentha arvensis*), asters (*Aster* spp.), or cutleaf coneflower (*Rudbeckia laciniata*); and

3. Sufficient areas of 9 to 24 km (5.6 to 15 mi) along a stream, ditch, or canal that contain suitable or restorable habitat to support movements of individual New Mexico meadow jumping mice; and
4. Adjacent floodplain and upland areas extending approximately 100 m (330 ft) 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.

There are 8 units of critical habitat totaling 5,657 ha; 2,766 ha are in New Mexico, 2,448 ha are in Arizona, and 443 ha are in Colorado. The critical habitat units in New Mexico are Chicorica Creek on New Mexico State Land (this unit also extends into Colorado), Coyote Creek on private and State land, Jemez Mountains on private and federal Forest Service land, Sacramento Mountains on private and federal Forest Service land, Bosque del Apache on federal Service land, and the Florida unit on private and federal Bureau of Land Management (BLM) land. Critical habitat units are in Colfax, Mora, Otero, Sandoval, and Socorro Counties in New Mexico; Las Animas, Archuleta, and La Plata Counties in Colorado; and Greenlee and Apache Counties in Arizona. Critical habitat in these units do not include manmade structures (such as buildings, fire lookout stations, runways, roads, and other paved areas) and the land on which they are located existing within the legal boundaries on designation on April 15, 2016.

4.1.7 Peñasco Least Chipmunk, *Neotamias minimus atristriatus*

The Peñasco least chipmunk, a subspecies of least chipmunk (*Neotamias minimus*), was listed as endangered in 2025 ([89 FR 99656](#)). The Peñasco least chipmunk is grayish-brown mixed with cinnamon-buff on the rump and thighs (Sullivan 1993, Service 2024b). The Peñasco least chipmunk is reported as once having a broad distribution throughout the Sacramento and White Mountains of southcentral New Mexico (Frey 2010, Service 2024b). It is currently known only from a limited distribution in the White Mountains of Lincoln and Otero Counties (Service 2024b).

In the Sacramento Mountains, habitat for an ostensibly extirpated population is described as meadows and grasslands in canyon bottoms, as well as interspersed open meadows within old growth ponderosa pine forests. Elevations range from approximately 2,103 to 2,438 m (6,900 to 8,000 ft, (Frey 2018, Service 2024b). In the White Mountains, north of the Sacramento Mountains, the habitat of the Peñasco least chipmunk is described as occurring in sub-alpine Thurber's fescue (*Festuca thurberi*) meadow communities that are associated with rock outcrops at high elevations above 3,109 m (10,200 ft; (Frey 2018, Service 2024b). Individuals are also found in similar open meadows with sparse, old growth Englemann spruce (*Picea engelmannii*). A robust shrub community, typically dominated by gooseberry current (*Ribes montigenum*), is ubiquitous and provides necessary visual obstruction and cover (McKibben and Frey 2020, McKibben 2022, Service 2024b). An additional population has recently been located in the northern White Mountains. Habitat in this area is substantively different from the southern White Mountains being dominated by shrub- and tree-form Gambel oak (*Quercus gambelii*), rockspirea (*Holodiscus dumosus*), and sagebrush (*Artimesia* spp) at a maximum elevation of approximately 2,960 m (9,711 ft). While the vegetation community for the northern population differs greatly from the southern White Mountains, the shrub structure itself provides a similar degree of cover and visual obstruction which is a central characteristic of Peñasco least chipmunk habitat (Grooms and Frey 2025).

Burrows for nesting, winter torpor, and predator evasion are often under large rocks or other objects (Bihr and Smith 1998, Service 2024b). They may also use tree cavities or other natural structures (Verts and Carraway 2001, Service 2024b). Peñasco least chipmunks will forage and cache food throughout the active season, approximately April through September/October (Service 2024b). The subspecies prepares for winter by collecting and caching food in underground burrows where it will periodically emerge from torpor and feed; thus, the Peñasco least chipmunk does not hibernate but rather uses a strategy of reduced physiological activity to overwinter (Service 2024b). Food items include a variety of seeds of shrubs, grasses, forbs, and some conifers, as well as fungi. They may also feed on arthropods, carrion, and bird eggs (Bailey 1931, Vaughn 1974, Reid 2006, Service 2024b).

The Peñasco least chipmunk emerges from its winter torpor after spring snowmelt; however, the exact timing or cues are not well understood, nor is the timing for reproduction, nesting activities, or young leaving the nest (Service 2024e). Young least chipmunks are considered to be adults at approximately 100 days post-birth (Conley 1970, Service 2024b).

Decades of synergistic land management practices, including logging, livestock grazing, and fire suppression, have culminated in a substantial reduction of suitable habitat for the Peñasco least chipmunk (Service 2024b). Drought and climate change are intensifying these impacts as events such as catastrophic wildfire are increasing in both frequency and magnitude.

Peñasco Least Chipmunk Critical Habitat

Peñasco least chipmunk critical habitat was designated with the final listing of endangered for the species in 2025 ([89 FR 99656](#)). The physical and biological features essential to the conservation of the species are:

(1) Areas within the White Mountains that:

- (a) Are between elevations of 2,500–3,597 meters (m) (8,200–11,800 feet (ft));
 - (b) Contain rock outcrops or talus;
 - (c) Are subalpine Thurber’s fescue meadow/grassland communities found within openings of spruce-fir forest, above treeline in the glacial cirque, containing tall bunchgrasses, including Thurber’s fescue, sedges, flowering forbs, and shrubs; and
 - (d) Contain widely spaced large-diameter conifers, such as Engelmann spruce or ponderosa pine, intermixed in low densities with the meadow/grassland vegetation.
- (2) Forage, including species of Asteraceae, flowers and fruits of gooseberry (*Ribes* spp.), wild strawberry (*Fragaria* spp.), pinyon (*Pinus edulis*) nuts, Gambel oak (*Quercus gambelii*) acorns, and insects.

Three areas have been designated as critical habitat, totaling 1,774 ha (4,386 ac) on federal Forest Service land in the Lincoln National Forest. The units are primarily in designated wilderness made up of 393 ha (972 ac) in the Nogal Peak unit, 910 ha (2249 ac) in the Crest Trail unit, and 471 ha (1,165 ac) in the Sierra Blanca unit.

4.1.8 **Tricolored Bat, *Perimyotis subflavus***

The tricolored bat was proposed endangered September 14, 2022, and critical habitat designation has been determined to be not prudent for this species ([87 FR 56381](#)). For actions that may affect a proposed species, agencies cannot consult, but they can confer (i.e. conference) under the authority of section 7(a)(4) of the ESA. Such conferences can follow the procedures for a consultation and be adopted as such if and when the proposed species is listed. Should the tricolored bat be listed, agencies must review projects that are not yet complete, or projects with ongoing effects within the range of the species that previously received a determination from a Dkey to confirm that the determination is still accurate.

The tricolored bat is a small insectivorous bat that is distinguished by its unique tricolored fur and often appears yellowish to nearly orange. The once common species is wide ranging across the eastern and central United States and portions of southern Canada, Mexico and Central America. During the winter, tricolored bats are often found in caves and abandoned mines, although in the southern United States, where caves are sparse, tricolored bats are often found roosting in road-associated culverts where they exhibit shorter torpor bouts and forage during warm nights. During the spring, summer, and fall, tricolored bats are found in forested habitats where they roost in trees, primarily among leaves of live or recently dead deciduous hardwood trees, but may also be found in Spanish moss, pine trees, and occasionally human structures (Service 2021a). Females exhibit high site fidelity, returning year after year to the same summer roosting locations (Allen 1921, Veilleux and Veilleux 2004a). Females form maternity colonies and switch roost trees regularly (e.g., between 1.2 days and 7 days at roost trees in Indiana) (Veilleux and Veilleux 2004a, Quinn and Broders 2007, Poissant et al. 2010). Males roost singly (Perry and Thill 2007, Poissant et al. 2010). Tricolored bats are opportunistic feeders and consume small insects including caddisflies, moths, beetles, wasps, flying ants and flies. They emerge early in the evening and forage at treetop level or above but may forage closer to ground later in the evening. This species of bat exhibits slow, erratic, fluttery flight, while foraging and are known to forage most commonly over waterways and forest edges. (Service 2021a). Tricolored bats face extinction due primarily to the rangewide impacts of white-nose syndrome, a deadly disease affecting cave-dwelling bats across the continent. White-nose syndrome has caused estimated declines of more than 90 percent in affected tricolored bat colonies across the majority of the species range (Service 2021a).

For projects with action areas intersecting the range of tricolored bat, there are three additional Dkey options available to use concurrently with the NE DKey for analysis of potential impacts to the species relative to the associated proposed actions. The northern long-eared bat and tricolored bat range-wide key is designed as a tool to help the action agencies decide if their proposed action has the potential to jeopardize the continued existence of the proposed tricolored bat and covers certain routine and predictable projects for which predetermined consultation outcomes are feasible. It is not appropriate for project types that include wind turbine operation or sustainable forestry, or projects included under other programmatic consultations. The second option is the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), and/or Federal Transit Administration (FTA) Federal Highways key is available for projects funded or authorized by FHWA, FRA, or FTA, that require consultation with the Service under Section 7 of the ESA and may affect the Indiana bat, northern long-eared bat, or tricolored bat.

This Dkey should only be used to verify project applicability with the Service’s December 13, 2024 Programmatic Biological Opinion/Conference Opinion for Transportation Projects in the Range of the Indiana bat, northern long-eared bat, and tricolored bat. The programmatic consultation limited transportation activities that may affect the covered bat species and addresses situations that are both likely and not likely to adversely affect the covered bat species. This Dkey assists in identifying the effect of a specific project/activity and the applicability of the programmatic consultation. The programmatic consultation is not intended to cover all types of transportation actions, and activities outside the scope of the programmatic consultation, or that may affect ESA-listed species other than the Indiana bat, northern long-eared bat, or tricolored bat, or their designated critical habitat, may require additional ESA Section 7 consultation. This DKey can not be used concurrently with the NM NE Dkey if it occurs in states other than New Mexico. The third DKey option for tricolored bat effect determinations is for Department of War (DOW) projects. The DOW Bat key is an optional key developed to address a subset of military activities that were not included in the Northern Long-eared bat and Tricolored Bat Rangewide Determination key. The DOW Key is designed to be consistent with the Northern Long-eared Bat and Tricolored Bat Rangewide Determination key, as a result, project proponents can choose to use either key for activity types that are covered by both.

4.2 BIRDS

Species	ESA Status	Focus Page	Profile Page
Lesser prairie-chicken	Under Review	Focus Page	Profile Page
Mexican spotted owl	Threatened	Focus Page	Profile Page
Northern aplomado falcon	Experimental	Focus Page	Profile Page
Piping plover	Endangered	Focus Page	Profile Page
Southwestern willow flycatcher	Endangered	Focus Page	Profile Page
Yellow-billed cuckoo	Threatened	Focus Page	Profile Page

4.2.1 Lesser prairie-chicken, *Tympanuchus pallidicinctus*

The lesser prairie-chicken first became a candidate for listing under the ESA in June of 1998; however, the species was not listed until April of 2014, when it was listed as a threatened species. The listing was then vacated in September 2015 following a lawsuit. Several years later the Service listed two Distinct Population Segments (DPS) of the lesser prairie-chicken under the ESA ([88 FR 4087](#)). The southern DPS of the lesser prairie-chicken, which encompassed eastern New Mexico and the southwest Texas panhandle, was listed as endangered. The Northern DPS of the lesser prairie-chicken, which included portions of Colorado, Kansas, Oklahoma, and Texas, was listed as threatened with a section 4(d) rule. However, on August 12, 2025, the U.S. District Court for the Western District of Texas issued an order vacating the final listing rule for both the northern DPS and southern DPS of the lesser prairie-chicken. This order became effective immediately. This ruling means that the lesser prairie-chicken is no longer a protected species under the ESA ([91 FR 9474](#)). However, the species remains under review for potential listing under the ESA. In the meantime, consultation is not required, the species is not currently

included in OSL's produced by the IPaC planning tool, and the following information can be used towards voluntary conservation efforts. For questions, please contact the NM ESFO.

The lesser prairie-chicken is a species of prairie grouse endemic to the southern and central high plains of New Mexico, Texas, Colorado, Oklahoma, and Kansas. The lesser prairie-chicken is commonly recognized for its stout build, feathered legs, ground-dwelling habit, and elaborate breeding behavior. Plumage of the lesser prairie-chicken is characterized by a cryptic pattern of alternating brown and buff-colored barring, with body length ranging from 38 to 41 cm (15 to 16 in) (Johnsgard, 1973). Lesser prairie-chickens are polygamous and exhibit a lek mating system. The lek is a place where males traditionally gather to conduct a communal, competitive courtship display. The males use their specialized plumage and vocalizations (commonly referred to as booming) to attract females for mating. Leks are normally located on the tops of wind-swept ridges, exposed knolls, sparsely vegetated dunes, and similar features in areas having low vegetation height (10 cm (4 in)) or less or bare soil and enhanced visibility of the surrounding area (Copelin 1963, Jones 1963, Taylor and Guthery 1980, Giesen 1998). Males gather to display on leks at dusk and dawn beginning in late February and extending through June, females arrive at the lek in early spring with peak hen attendance during mid-April (Copelin 1963, Hoffman 1963, Davis et al. 1979, Merchant 1982, Haukos 1988).

Within 1-2 weeks of successfully mating, the hen will select a nest site based upon available nesting habitat, normally within 1 to 5 km (0.6 to 2.4 mi.) of an active lek (Copelin 1963, Giesen, 1994), construct a nest, and lay a clutch of 8 to 14 eggs with regional variability (Bent, 1932, Copelin 1963, Merchant 1982, Pitman et al., 2006a). Incubation lasts 24 to 27 days (Coats 1955, Sutton 1968, Pitman et al. 2006a). Re-nesting may occur when the first attempt at a nest fails to produce offspring (Johnsgard 1973, Merchant 1982, Pitman et al. 2006a). Females will typically establish nests at sites with tall and dense herbaceous cover, residual cover from the previous growing season, and sites free from vertical structures and anthropogenic disturbance. These characteristics provide concealment of nests and females from predators and weather events (Suminski 1977, Riley 1978, Riley et al. 1992, Giesen 1998).

Chicks are mobile upon hatching and typically leave the nest within hours of hatching (Coats 1955). Broods may remain with females for up to 18 weeks (Giesen, 1998, Pitman et al. 2006c), but brood breakup generally occurs by September when the chicks are approximately 70 days of age (Taylor and Guthery 1980). Brood rearing of chicks requires areas more open than nesting habitat, with a high density of forbs. The forbs support a high biomass of invertebrate prey base, an important food and cover source. Additionally, good brood rearing habitat will have less grass cover and more forb cover than nesting habitat, as dense grass cover impedes movements of the chicks (Pitman et al. 2006b, Hagen et al. 2013). Throughout winter, juveniles and adults require large spans of short- and mixed grass prairies that provide food and physical cover to protect from predation and weather (Giesen 1998; Robinson et al. 2018).

Typically, lesser prairie-chicken home ranges vary both by sex and by season and may be influenced by a variety of landscape conditions (Zavaleta and Haukos, 2013). Lesser prairie-chickens are not territorial, except for the small area defended by males on the lek, so home ranges of individual birds likely overlap to some extent. Habitat quality presumably influences the extent to which individual home ranges overlap. Adults tend to spend much of their daily and seasonal activity within 4.8 km (3.0 mi.) of a lek (Giesen 1994, Riley et al. 1994, Woodward et

al. 2001). Males tend to have smaller home ranges than do females, with the males generally remaining closer to the leks than do the females (Giesen 1998). Male lesser prairie-chickens exhibit strong site fidelity to their lek (Copelin 1963, Hoffman 1963, Campbell, 1972). Once a lek site is selected, males persistently return to that same lek year after year (Wiley 1974) and may remain faithful to that site for life.

The primary threat across the range of lesser prairie-chicken, including New Mexico, includes habitat degradation, loss, and fragmentation. Habitat loss and fragmentation may result from conversion of grasslands as a result of petroleum and natural gas production, renewable energy development, construction of linear features such as roads and transmission lines, and woody vegetation encroachment (Service 2022b). These activities remove or degrade grasslands to a point where they may no longer provide for the habitat requirement of the species' life cycle (for example, over for nesting or thermoregulation). Additionally, these activities can cause changes in behavior due to the avoidance of vertical structures, noise, and human presence. An increase in vertical structures (such as distribution lines, meteorological towers, and mesquite encroachment) may also lead to increased predation of lesser prairie-chicken. Other threats to the species include incompatible grazing, shrub control and eradication (particularly shinnery oak eradication), fires, anthropogenic noise, and fences (as a result of collision).

4.2.2 *Mexican Spotted Owl, *Strix occidentalis lucida**

The Mexican spotted owl was listed as threatened in 1993 ([58 FR 14248](#)). As adults, they are a medium-sized owl characterized by dark eyes and ashey-chestnut brown plumage with irregular white spots and devoid of ear tufts (Gutiérrez et al. 1995, Service 2012). The owl occurs in disjunct areas that correspond with mountain ranges and canyon systems across Utah, Colorado, Arizona, New Mexico, and the western portions of Texas, south into several states of México (Service 2012, 2023f). The current distribution of owls follows their historical extent, with a few exceptions (e.g., riparian areas along major rivers such as the San Pedro in Arizona and Rio Grande in New Mexico) (Service 2012, 2023c).

Owls occur in forested mountains and canyonlands throughout the southwestern U.S. and México (Service 2023c). In southern Arizona and New Mexico specifically, mixed conifer, Madrean pine-oak, Arizona cypress, encinal oak woodlands, and associated riparian forests or rocky canyons provide habitat in the small mountain ranges (Service 2023c). Forest-dwelling owls tend to choose nest and roost in large diameter trees within mature or old-growth stands with complex structures (Service 2012). Canyon-dwelling owls may also nest in potholes, ledges, or small caves within a variety of steep, rocky-canyon habitats (Service 2012). Mexican spotted owls will use a wider variety of cover types for foraging including managed and unmanaged forests, pinyon-juniper woodlands, mixed-conifer and ponderosa pine forests, cliff faces and terraces between cliffs, and riparian zones (Ganey and Balda 1994, Willey 1998, Ganey et al. 2003, Willey and Van Riper 2007, Service 2012).

Courtship begins in March with pairs roosting together during the day and calling to each other at dusk (Ganey 1988, Service 2012). Typically, one to three eggs are laid in late March or, more often, early April (LaHaye 1997, Gutiérrez et al. 2003, Service 2012). Incubation begins shortly after the first egg is laid and lasts approximately 30 days with eggs usually hatching in early May (Ganey 1988, Service 2012). Nestling owls generally fledge in early- to mid-June, four to five

weeks after hatching (Ganey 1988, Service 2012). Fledglings usually disperse from nest sites mid-September to early October and have been observed to travel 1-92 km (0.6-57 mi.) (Arsenault et al. 1997, Forsman et al. 1984, Ganey et al. 1998, Willey and Van Riper 2000, Service 2012). Most studied adult Mexican spotted owls remained on or near their breeding territory throughout the year, though some territorial owls migrated during winter (Service 2012). Both adults and young commonly eat small- and medium-sized rodents such as woodrats, deer mice, pocket gophers, and voles, but they also consume bats, birds, reptiles, and arthropods (Ward and Block 1995, Service 2012).

The primary threat to the owl and their habitat in the U.S. has transitioned from timber harvest to an increased risk of stand replacing wildland fire (Service 2012, Wan et al. 2018, Jones et al. 2023, Service 2023c). Actions that open up or remove mature or old-growth forests (logging, wildfire, road or site construction that results in fragmentation of the forest) are detrimental to the local owl population (Service 2012). Human activity (hiking, shooting, off-road vehicle activity) in or near nesting, roosting, or foraging sites may result in abandonment of an area, and indirectly may affect habitat parameters from trampling, vegetation removal, or increased fire risk (Service 2012).

In the Recovery Plan (Service 2012), the Recovery Team defined specific forest cover types (mixed conifer and pine-oak) and rocky-canyon habitats that provide nesting, roosting, and foraging habitat for Mexican spotted owls (Service 2012). The availability of habitat used for nesting/roosting of Mexican spotted owls in forested and rocky-canyon environments limits owl distribution (meaning the nesting and roosting habitat is a limiting factor for spotted owls). Habitat used for nesting/roosting also provides adequate conditions for foraging and dispersal activities. Thus, sustaining nesting/roosting habitat meets other survival and recovery requirements. Based on the specific forest cover type and rocky-canyon definitions, the Recovery Plan (Service 2012) focuses management recommendations on two categories of owl habitat: Protected Activity Centers (PACs) and “recovery habitat” (the Recovery Team previously called recovery habitat “restricted habitat” in the 1995 Recovery Plan; the terms are synonymous). PACs are intended to sustain and enhance areas that are presently, recently, or historically occupied by breeding Mexican spotted owls (Service 2012). Minimum PAC area is 600 acres and is based on the median size of the adaptive kernel contour enclosing 75% of the foraging locations for 14 pairs of radio-marked owls (595 ac) (Ganey and Dick 1995). Thus, PACs used by owls rather than entire home ranges. Consequently, there is no upper limit for PAC sizes; managers may create larger PACs if appropriate. The Service and land managers establish PACs around owl sites (as defined in the Recovery Plan). All PACs should contain a designated 100-acre nest/roost core area, designed to offer additional protection to the nest or primary roost areas. The Recovery Plan (Service 2012) emphasizes protection of habitat used for nesting and roosting within PACs because the owls are most selective for such habitat (Ganey and Dick 1995, Service 2012) and these forest conditions are most limited across the landscape. These areas also provide resources to meet other life-history needs of the owl. Therefore, designating PACs protects and maintains occupied owl habitat. Recovery habitat occurs in forest types and rocky canyons used by owls for roosting, foraging, dispersal and other life history needs; however, recovery habitat occurs outside of PACs. Recovery habitat is intended to: 1) provide protection for areas that may be used by owls; 2) foster creation of nest/roost habitat; 3) simultaneously provide managers with greater management flexibility than is allowed in PACs;

and, 4) facilitate development and testing of management strategies that could be applied in PACs (Service 2012). Areas not classified as either PACs or recovery habitats, are classified as “Other Forest and Woodland Types” and “Other Riparian Forest Types” (Service 2012). These areas, which nesting owls rarely use, but owls may use for foraging and dispersal, generally include pure ponderosa pine forest, pinyon juniper woodland, or other habitat types. Given their relatively limited importance to nesting owls, the Recovery Plan (Service 2012) contains no owl-specific recommendations in “Other Forest and Woodland Types” and “Other Riparian Forest Types”. In addition to this natural variability in habitat influencing owl distribution, human activities also vary across the owl’s range. The combination of natural habitat variability, human influences on owls, international boundaries, and logistics of implementation of the Recovery Plan necessitates subdivision of the owl’s range into smaller management areas. The 1995 Recovery Plan subdivided the owl’s range into 11 “Recovery Units” (RUs): six in the United States and five in Mexico. In the revision of the 2012 Recovery Plan, RUs were renamed as “Ecological Management Units” (EMUs). The Recovery Team divided the owl’s range within the United States into five EMUs: Colorado Plateau (CP), Southern Rocky Mountains (SRM), Upper Gila Mountains (UGM), Basin and Range-West (BRW), and Basin and Range-East (BRE) (Service 2012). Within Mexico, the revised Recovery Plan delineated five EMUs: Sierra Madre Occidental Norte, Sierra Madre Occidental Sur, Sierra Madre Oriental Norte, Sierra Madre Oriental Sur, and Eje Neovolcanico.

It is important to note that the entire range of Mexican spotted owls covers area in five U.S. states (Arizona, Colorado, New Mexico, Texas, and Utah, Table 1) and a large area of Mexico. Within the United States, Region 3 (Southwestern) National Forest Service lands are located in Arizona and New Mexico, which is only a portion of the range of the Mexican spotted owl.

Land Management Authority	BRE (Acres)	BRW (Acres)	CP (Acres)	SRM (Acres)	UGM (Acres)
<i>Federal Lands</i>					
Bureau of Land Management	7,175,283	3,659,160	24,785,929	4,255,136	322,759
Forest Service	1,431,950	5,580,169	8,213,269	15,366,721	8,699,145
National Park Service	277,714	79,015	4,462,161	421,810	42,427
Total Federal	8,884,947	9,318,344	37,461,358	20,043,666	9,064,332
<i>State Lands</i>					
Arizona	0	5,241,675	2,407,042	0	47,040
Colorado	0	0	60,665	758,348.2	0
New Mexico	3,239,861	550,383	736,495	690,190	503,161
Utah	0	0	2,554,155	0	0
Total State	3,239,861	5,792,058	5,758,356	1,448,538	550,200
<i>Tribal Lands</i>	995,043	1,613,903	21,620,638	1,404,035	2,321,912
<i>Private Lands</i>	9,596,717	6,429,327	15,733,239	16,453,866	1,569,134
<i>Other</i>	2,909,785	239,686	336,922	552,411	29,284
TOTAL	25,626,351	23,393,319	80,910,514	39,902,516	13,534,861

Table 1. Land management area by Ecological Management Unit (EMU Colorado Plateau (CP), Southern Rocky Mountains (SRM), Upper Gila Mountains (UGM), Basin and Range-West

(BRW), and Basin and Range-East (BRE)) in the United States for the Mexican spotted owl (Service 2012). Not all acres within an EMU meet the definition of Mexican spotted owl habitat.

Mexican Spotted Owl Critical Habitat

Mexican Spotted Owl Critical Habitat was designated in 2004 ([69 FR 53182](#)).

The PCEs, now PBFs, essential to the conservation of the Mexican spotted owl include those physical and biological features that support nesting, roosting, and foraging, including:

- A. Primary constituent elements related to forest structure:
 - 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 percent to 45 percent of which are large trees with a trunk diameter of 12 inches (0.3 meters) or more when measured at 4.5 feet (1.4 meters) from the ground;
 - 2. A shade canopy created by the tree branches covering 40 percent or more of the ground; and
 - 3. Large dead trees (snags) with a trunk diameter of at least 12 inches (0.3 meters) when measured at 4.5 feet (1.4 meters) from the ground.
- B. Primary constituent elements related to maintenance of adequate prey species:
 - 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, seeds, and allow plant regeneration.
- C. Primary constituent elements related to canyon habitat include one or more of the following:
 - 1. Presence of water (often providing cooler and often higher humidity than the surrounding areas);
 - 2. Clumps or stringers of mixed conifer, pine-oak, pinyon-juniper, and/ or riparian vegetation;
 - 3. Canyon wall containing crevices, ledges, or caves; and
 - 4. High percent of ground litter and woody debris.

The Service designated critical habitat 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 ([69 FR 53182](#)). Critical habitat includes only those areas in designated critical habitat units that meet the definition of protected (PAC and steep slopes, as defined) and restricted (now called “recovery”) habitat (unoccupied owl foraging, dispersal, and future nest/roost habitat) as defined in the 1995 Recovery Plan (Service 1995a). In New Mexico, 2,089,523 ac of critical habitat has been designated on federal Forest Service Land (263,026 ac), Bureau of Land Management Land (2,171 ac), and National Park Service Land (30,817 ac).

4.2.3 Northern Aplomado Falcon, *Falco femoralis septentrionalis*

The Northern aplomado falcon was listed as endangered in 1986 ([51 FR 6686](#)). The falcon is found in the South Texas Gulf Coast and Trans-Pecos regions of west Texas. Their geographical distribution extends to the southern tip of South America. Aplomado falcons require open grassland or savannah habitat with scattered trees or shrubs. Critical habitat has not been designated for this subspecies (Service 2025b.).

On July 26, 2006, the Service published a final rule to establish a nonessential experimental population of northern aplomado falcons in Arizona and New Mexico ([71 FR 422298](#)). Section 10(j) of the Act established that, for the purposes of interagency consultation, individuals of nonessential experimental population are to be treated as species that are proposed for listing. This condition does not apply to individuals that occur on lands managed by the National Park Service or within the National Wildlife Refuge System, where they are treated as threatened.

Northern aplomado falcons are small, with rufous (rust) underparts, gray backs, long and banded tails, and a distinctive black and white facial pattern (Service 2014a). Their historical range was from Trans-Pecos Texas, southern New Mexico and southeastern Arizona, to Chiapas and the northern Yucatan along the Gulf of Mexico, and along the Pacific slope of Central America north of Nicaragua (Service 1990, 2014a). Currently, their range includes Arizona, New Mexico, and Texas (Service 2014a).

Aplomado falcons do not build their own nests but use nest sites constructed by large raptors or corvids and are dependent on nesting activities of such stick nest-building birds and their habitat requirements (Service 2024c). Nest sites are found in structures such as large multi-stemmed yuccas and mesquite trees, as well as other trees (Service 2024c). Adult northern aplomado falcons usually occur in pairs and are primarily nonmigratory, remaining together as mated pairs year-round in the same territory and tend to exhibit strong nesting territory fidelity (Keddy-Hector 2000; Service 2024c). Home range estimates for northern aplomado falcons ranged from 3.3 to 21.4 km² (Montoya et al. 1997, Service 2024c).

Northern aplomado falcons in eastern Mexico nest during the dry season (January-June) (Service 1990). The average clutch contains 2.6 eggs (Hector 1988, Service 1990). Adults may produce clutches throughout this period. Most clutches are laid March-May (Service 1990). However, these falcons have been found incubating in mid-June, indicating that some young must still be dependent on their parents in August (Service 1990). Incubation lasts 31-32 days, nestlings fledge at 32-40 days, and post-fledging dependence lasts approximately 4 weeks (Hector 1988, Service 1990). With a breeding season of 6-8 months, northern aplomado falcons could raise more than one brood per year (Service 1990). Soon after their young fledge the parents begin to display at nest platforms, copulate, and defend their nest sites (Service 1990). Aplomado falcons feed on a variety of prey, including birds, insects, rodents, small snakes, and lizards (Ligon 1961, Service 2014a).

The causes for decline of the northern aplomado falcon included widespread shrub encroachment that resulted from control of range fires and intense overgrazing ([51 FR 6686](#); Burnham et al. 2002) and agricultural development in grassland habitats used by the aplomado falcon (Hector 1987, Keddy-Hector 2000, Service 2014a). Pesticide exposure was likely a significant cause of the subspecies' continued decline and eventual disappearance from the United States with the initiation of widespread use of the bio-accumulative, toxic pollutants DDT and dieldrin after World War II ([51 FR 6686](#), Hector 1987, Service 2014b).

Principal threats to the northern aplomado falcon come from development and climate change. Climate change impacts the northern aplomado falcon primarily through effects of increases in

drought intensity and duration in Chihuahuan Desert population habitat and increases in hurricane intensity and sea level rise in the Texas Coastal population habitat. Development from agricultural conversion (primarily in Mexico) and urban/commercial development (primarily in the United States) influence the northern aplomado falcon through the degradation, fragmentation, and loss of habitat. In the United States, 2 percent of Chihuahuan Desert grassland (approximately 758,313 acres) has been lost to some form of change over 34 years between 1986 and 2020. Most of this was lost to agricultural conversion (48 percent), but a substantial portion has also been lost to urban and commercial development (26 percent) and other vegetation loss resulting in disturbed or barren land (27 percent). In the same timeframe, 7,1789 acres (14 percent) were also lost in Texas Coastal habitat, primarily to urban development (5 percent) and agricultural development (8 percent) (Service 2024c).

Current threats to this subspecies include habitat loss, specifically conversion of grasslands to croplands and pastures. Other threats include livestock overgrazing on grasslands, human disturbance during the breeding season, and electrocution through contact with improperly designed electrical transmission lines. Collisions with wind power infrastructure, may also have reduced the amount of avian prey available to the species (Service 2014a).

4.2.4 Piping Plover, *Chadarius melodus*

The piping plover Atlantic Coast and Northern Great Plains populations in Alabama, Arkansas, Colorado, Connecticut, Delaware, Florida, Georgia, Illinois, Iowa, Kansas, Louisiana, Maine, Maryland, Massachusetts, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Oklahoma, Puerto Rico, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Virginia, Virgin Islands, and Wyoming were listed as threatened, and the Great Lakes watershed distinct population segment (Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, Wisconsin, Ontario, Canada, and the wintering population of Texas) was listed endangered in 1985 ([50 FR 50726](#)). Piping plovers are approximately 17 centimeters (7 inches) long, and breeding birds have white underparts and a light beige back and crown with orange legs and bill in the summer (Service 1996b). Historically, they occurred between the southern coast of Newfoundland and South Carolina (Service 1996b). While the extent of their current range does not appear to be substantially different from the historic range, piping plovers are absent from many former nesting beaches on the Atlantic Coast (Cairns and McLaren 1980, Litwin et al. 1993, CWS 1994, VDGIF 1994, Service 1996b).

Piping plover nests are situated above the high tide line on coastal beaches, sandflats at the ends of sand spits and barrier islands, gently sloping foredunes, blowout areas behind primary dunes, and wash over areas cut into or between dunes (Service 1996b). Nests are usually found in areas with little or no vegetation although, on occasion, piping plovers will nest under stands of American beachgrass or other vegetation (Patterson 1988, Flemming et al. 1990, MacIvor 1990, Service 1996b). Feeding areas include intertidal portions of ocean beaches, wash over areas, mudflats, sandflats, wrack lines, and shorelines of coastal ponds, lagoons, or salt marshes (Gibbs 1986, Coutu et al. 1990, Loegering 1992, Goldin 1993, Service 1996b). In general, wintering plovers on the Atlantic Coast are found at accreting ends of barrier islands, along sandy peninsulas, and near coastal inlets (Service 1996b). Roosting plovers are generally found along inlet and adjacent ocean and estuarine shorelines and their associated berms (with wrack and

other debris often used as wind-shields), and on nearby exposed tidal flats (Fussell 1990, Nicholls and Baldassarre 1990, Service 1996b).

Northward migration to the breeding grounds occurs during late February, March and early April (Service 1996b). By early April, males begin to establish territories (Patterson 1988, MacIvor 1990, Cross 1991, Service 1996b). Plovers are known to breed at one year of age (MacIvor 1990, Strauss 1990, Haig 1992, Service 1996b). Eggs may be present from mid-April to late July (Service 1996b). Full-time incubation usually begins with the completion of the clutch, averages 27-30 days (Wilcox 1959, Cairns 1977, MacIvor 1990, Service 1996b). Chicks often leave the nest within hours of hatching (Wilcox 1959, Cairns 1982, Wolcott and Wolcott 1994, Service 1996b). Chicks remain together with one or both parents until they fledge at 25 to 35 days of age (Service 1996b). Flightless chicks may be present from mid-May until late August, although most fledge by the end of July (Patterson 1988, Goldin 1990, MacIvor 1990, Howard et al. 1993, Service 1996b). Southward migration to the wintering grounds extends from late July, August, and September (Service 1996b). The piping plover's winter range extends along the Atlantic and Gulf Coasts from North Carolina to Mexico and into the Bahamas and West Indies (50 FR 50726, Haig and Oring 1985, 1988, Hoopes et al. 1989, Service 1996b). Plover foods consist of invertebrates such as marine worms, fly larvae, beetles, crustaceans, and mollusks (Forbush 1925, Bent 1929, Cairns 1977, Nicholls 1989, Gibbs 1986, Shaffer and Laporte 1994, Service 1996b).

Habitat loss and degradation, disturbance by humans and pets, and increased predation were cited as important causes of the downward trend that started in the late 1940's ([50 FR 50726](#)) and continues to the present time in some portions of the Atlantic Coast (Service 1996b). Destruction of beach habitat by residential, resort, and seawall development constitutes irrevocable habitat loss for piping plovers (Service 1996b).

Piping Plover Critical Habitat

Critical habitat for the endangered distinct population segment of the species was designated in 2001 ([66 FR 22938](#)), and revised to include the wintering population in Texas in 2009 ([74 FR 23476](#)). The threatened Atlantic Coast and Northern Great Plains populations, which include individuals in New Mexico, do not have designated critical habitat.

4.2.5 *Southwestern Willow Flycatcher, *Empidonax traillii extimus**

The Southwestern willow flycatcher was listed as endangered in 1995 ([60 FR 10695](#)). The flycatcher is a small, neotropical migrant that grows to about 15 centimeters (5.8 inches) in length with a brownish-olive body that is gray-green above (Service 2002a). Southwestern willow flycatchers are currently distributed in Arizona, California, Colorado, Nevada, New Mexico, Texas, and Utah (Service 2002a).

The flycatcher currently breeds in areas from near sea level to over 2,600 meters (m) (8,500 ft) (Durst et al. 2008) in vegetation alongside rivers, streams, or other wetlands (riparian habitat) (Service 2025a). They establish nesting territories, build nests, and forage in areas with dense and expansive growths of trees and shrubs, near or adjacent to surface water, or underlain by saturated soil (Sogge et al. 2010; Service 2025a). Nests are typically placed in trees where the plant growth is most dense, where trees and shrubs have vegetation near ground level, and where

there is a low-density canopy. While there are exceptions, generally flycatchers are not found nesting in areas without willows, tamarisk, or both (Service 2025a). They eat a wide range of invertebrate prey including flying, and ground- and vegetation-dwelling, insect species of terrestrial and aquatic origins (Drost et al. 1997, Service 2025a).

Southwestern willow flycatchers arrive on breeding grounds between early May and early June (Willard 1912, Ligon 1961, Maynard 1995, Skaggs 1996, Sferra et al. 1997) and nest from about May to September (Sogge et al. 2010, Service 2002a). Females typically lay one egg per day, until the nest contains 3 or 4 eggs. Incubation begins after the last egg is laid, and lasts 12 to 13 days (Service 2002a). Nestlings fledge 12 to 15 days after hatching (Service 2002a). Fledglings stay close to the nest and each other for 3 to 5 days, and may repeatedly return to and leave the nest during this period (Spencer et al. 1996, Service 2002a). Fledglings typically stay in the general nest area a minimum of 14 to 15 days after fledging, possibly much longer (Service 2002a). Adults that are successful in raising young may remain at breeding sites through mid-August to early September (Service 2002a). All willow flycatcher subspecies spend time migrating in the United States from April to June and from July through September. Riparian areas in the southwestern United States are important to both migrating southwestern willow flycatchers and other subspecies (Sogge et al. 2010, Service 2002a).

The primary cause of the flycatcher's decline is loss and modification of habitat. Its riparian nesting habitat tends to be uncommon, isolated, and widely dispersed (Service 2002a). With increasing human populations and the related industrial, recreational, agricultural, and urban developments, these habitats have been modified, reduced, and destroyed by various mechanisms, including groundwater pumping, channelization, dams, and overutilization by livestock (Service 2002a). Human disturbances at nesting sites may result in nest abandonment (Service 2002a). Fire is an increasing threat to the species habitat, especially in monotypic saltcedar vegetation and where water diversions and/or groundwater pumping desiccates riparian vegetation (Busch 1995, Paxton et al. 1996, Sogge et al. 1997, Service 2002a). Their nests can be parasitized by brown-headed cowbirds, which lay their eggs in the host's nest. The presence of livestock and range improvements such as waters and corrals, agriculture, urban areas, golf courses, bird feeders, and trash areas can enhance brown-headed cowbird-feeding sites. When these feeding areas are in proximity to breeding habitat, especially coupled with habitat degradation, brown-headed cowbird parasitism of southwestern willow flycatcher nests may increase (Service 2002a).

Southwestern Willow Flycatcher Critical Habitat

Southwestern willow flycatcher Critical Habitat was designated in 2013 ([78 FR 344](#)). PCEs, now PBFs, for designated critical habitat are as follows:

1. 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 2 to 30 m (about 6 to 98 ft). Lower-stature thickets (2 to 4 m or 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 4 m (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 percent to 100 percent) 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 0.1 ha (0.25 ac) or as large as 70 ha (175 ac).
2. 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).

A total of 1,227 river miles within southern California, Arizona, New Mexico, southern Nevada, and southern Utah were included in the final designation of critical habitat. In New Mexico, these total 250 river miles (64,039 ac), 78 river miles (15,613 ac) on federally owned land, 18 river miles (11,812 ac) on State owned land, and 154 river miles (36,613 ac) on privately owned land. These include the Lower Colorado Recovery Unit in Nevada, California and Arizona Border, Arizona, Utah, and New Mexico, the Upper Colorado Recovery Unit in Arizona, Utah, Colorado, and New Mexico, the Gila Recovery Unit in Arizona and New Mexico, the Upper Gila Management Unit - Gila River in Arizona and New Mexico, the San Francisco Management Unit - San Francisco River in Arizona and New Mexico, the Rio Grande Recovery Unit in New Mexico and Colorado, the Upper Rio Grande Management Unit - Coyote Creek, Rio Grande, Rio Grande del Rancho, and Rio Fernando, New Mexico, and the Middle Rio Grande Management Unit - Rio Grande, New Mexico.

4.2.6 *Yellow Billed Cuckoo, Coccyzus americanus*

The Yellow-Billed Cuckoo was listed as threatened in 2014 ([79 FR 59992](#)). They are medium-sized birds about 30 cm (12 in.) with fairly stout and slightly down-curved bills; slender, elongated bodies with a long-tailed look; and a narrow yellow rings of colored, bare skin around the eyes ([86 FR 20798](#)). Their former breeding range extended throughout North America from southeastern and western Canada south to the Greater Antilles and northern Mexico ([86 FR 20798](#)). The Western DPS's currently includes Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Texas, Utah, Washington, and Wyoming ([86 FR 20798](#)). Their historical range in the United States included Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Texas, Utah, Washington, and Wyoming ([86 FR 20798](#)).

Cuckoos use wooded habitat with dense cover and water nearby, including woodlands with low, scrubby, vegetation, overgrown orchards, abandoned farmland, and dense thickets along streams and marshes ([86 FR 20798](#)). In the West, nests are often placed in willows along streams and

ivers, with nearby cottonwoods serving as foraging sites (86 FR 20798). Little is known about migration, stop-over, or dispersal habitat within the breeding range (86 FR 20798).

The cuckoo is a Neotropical migrant bird that winters in South America and breeds in North America (86 FR 20798). Cuckoos breed throughout much of the eastern and central U.S., winter almost entirely in South America east of the Andes, and migrate through Central America (86 FR 20798). They are rare breeders in California, Arizona, New Mexico, and west Texas (86 FR 20798). Breeding generally occurs from June to September (86 FR 20798). The male and female build a flat, oblong platform nest together, the nest constructed of loose sticks, using twigs collected from the ground or snapped from nearby trees and shrubs (86 FR 20798). Clutch sizes are between 2 to 5 eggs, and cuckoos generally have a short hatch-to-fledge time (86 FR 20798). Individual cuckoos eat thousands of caterpillars per season, as well as webworms (the larvae of gypsy, brown-tailed, and white-marked tussock moths), beetles, ants, spiders, cicadas, katydids, and crickets, and will hop to the ground to chase frogs and lizards (86 FR 20798).

The decline of the western yellow-billed cuckoo is primarily the result of riparian habitat loss and degradation (86 FR 20798). Principal causes of riparian habitat destruction, modification, and degradation in the range of the western yellow-billed cuckoo have occurred from alteration of hydrology due to dams, water diversions, management of riverflow that differs from natural hydrological patterns, channelization, and levees and other forms of bank stabilization that encroach into the floodplain (86 FR 20798). These losses are further exacerbated by conversion of floodplains for agricultural uses, such as crops and livestock grazing (86 FR 20798). Other threats to riparian habitat include long-term drought and climate change (86 FR 20798).

Western Yellow-Billed Cuckoo Critical Habitat

Western yellow-billed cuckoo Critical Habitat was designated in 2021 (86 FR 20798). The PBFs for designated critical habitat are as follows:

1. Rangewide 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 nonriparian trees and large shrubs. This PBF includes breeding habitat found throughout the DPS range as well as additional breeding habitat characteristics unique to the Southwest.
 - a. Rangewide breeding habitat (including areas in the Southwest): rangewide 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 percent but may be greater in some instances. Nesting sites within the habitat have an above-average canopy closure (greater than 70 percent), and have a cooler, more humid environment than the surrounding riparian and upland habitats. Rangewide 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 rangewide 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 nonriparian 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 rangewide 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 nonriparian nest tree species. Arid ephemeral drainages in southeastern Arizona receive summer humidity and rainfall from the North American Monsoon with a pronounced green-up of grasses and forbs. These arid ephemeral drainages often contain xeroriparian species like hackberry or nonriparian 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 (~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 PBF includes hydrologic processes found in rangewide breeding habitat as well as additional hydrologic processes unique to the Southwest in southwestern breeding habitat:
 - c. Rangewide 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.
 - d. 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.

Designated critical habitat is located in Arizona, California, Colorado, Idaho, New Mexico, Texas, and Utah totaling 120,939 ha. In New Mexico, a total of 23,252 ha are designated in 7 units including the San Francisco River Unit, the Agila River Unit, the Mimbres River Units, the Upper Rio Grande Units, the Middle Rio Grande Unit, and the Upper Rio Grande Unit. 4,633 ha are on federally owned land, 5,445 ha are on State owned land, and 13,173 ha are on other lands with county, city, unclassified, or unknown ownership.

4.3 REPTILES

Species	ESA Status	Focus Page	Profile Page
Dunes sagebrush lizard	Under Review	Focus Page	Profile Page
Narrow-headed gartersnake	Threatened	Focus Page	Profile Page
New Mexico ridge-nosed rattlesnake	Threatened	Focus Page	Profile Page
Northern Mexican gartersnake	Threatened	Focus Page	Profile Page

4.3.1 *Dunes sagebrush lizard, Sceloporus arenicolus*

The following has been sourced from the SA for the Texas Statewide Determination Key (2025) unless otherwise noted. The dunes sagebrush lizard was listed as endangered on June 20, 2024, designating critical habitat for the species was considered to be prudent, however was not designated at the time of listing ([89 FR 43748](#)). This listing has been vacated and remanded to the Service by court order on July 21, 2026 ([State of Texas v. U.S. Department of the Interior; U.S. Fish and Wildlife Service; 7:24-cv-233](#)). In the meantime, while the species is under review, consultation is not required. The species is not currently included in OSLs produced by the IPaC planning tool, and the following information can be used towards voluntary conservation efforts. For questions please contact the NM ESFO.

The dunes sagebrush lizard is endemic to the shinnery oak (*Quercus havardii*) dunelands and shrublands of the Mescalero and Monahans sandhills in southeastern New Mexico and western Texas. This species is a habitat specialist that depends on shinnery oak duneland habitat to provide appropriate substrate for nests, cover, and forage for young. Dunes sagebrush lizards form small, localized populations called “neighborhoods” that are interconnected through dispersal. Since the Mescalero and Monahans sandhills are dynamic ecosystems, habitat patches for dunes sagebrush lizards can shift over time. Long-term stability is maintained through interconnected neighborhoods experiencing localized colonization and extirpation. The dunes sagebrush lizard is composed of three populations (Northern Mescalero, Southern Mescalero, and Monahans), subdivided into several genetically distinct groups that occupy discrete portions of the species’ range. Due to their reliance on a very specific and restricted habitat within the Mescalero and Monahans sandhills, dunes sagebrush lizards are highly susceptible to habitat loss and fragmentation. Removal of habitat can impair breeding, feeding, sheltering, dispersal, and survival, causing declines in abundance or even loss of populations. Habitat loss and fragmentation have reduced dispersal and colonization among populations. Degradation and

fragmentation of shinnery oak dunelands may be non-reversible: once disturbed, they shift to different habitat types and attempts to restore this habitat have been unsuccessful.

Because the dunes sagebrush lizard is a habitat specialist, reliant on shinnery oak duneland, they are more sensitive to habitat loss and fragmentation (Henle et al. 2004, Devictor et al. 2008, Walkup et al. 2017). The removal of shinnery oak duneland can impair individual lizard breeding (e.g. female nesting, juvenile dispersal), feeding, sheltering (e.g. thermoregulation, predator avoidance), dispersal, and survival (Machenberg 1984, Degenhardt et al. 1996, Snell et al. 1997, Fitzgerald et al. 1997, Peterson and Boyd 1998, Painter et al. 1999, Sartorius et al. 2002, Painter 2004, Dhillon and Mills 2009, Leavitt and Acre 2014, Hibbitts and Hibbitts 2015). At the population level, habitat loss and fragmentation can lead to the reduction or loss of populations (Henle 2004, Devictor et al. 2008, Hibbitts et al. 2013, Leavitt and Fitzgerald 2013, Walkup et al. 2017), loss of genetic diversity and reduced gene flow due to reduced dispersal capability, and the potential for genetic drift and inbreeding depression (Hokit and Branch 2003, Chan et al. 2009). Habitat loss and fragmentation can disrupt the landscape-scale dynamics of dune-blowout ecosystems, resulting in degradation of the remaining duneland beyond the immediate footprint of developed areas. These poor-quality sites are less likely to support robust and healthy populations of lizards (Leavitt and Fitzgerald 2013, Walkup et al. 2017). Furthermore, as habitat patches disappear across the landscape, movements of dispersing lizards are hindered or precluded such that dispersal rates are not sufficient to sustain population demographics necessary to prevent localized extirpations (Leavitt and Fitzgerald 2013, Ryberg et al. 2013, Walkup et al. 2017, Young et al. 2018). Over time, this can result in progressive isolation of the remaining lizard populations and a progressive decline in population abundance across the landscape (Leavitt and Fitzgerald 2013). Dunes sagebrush lizard habitat overlaps with the Permian Basin, a geologic province that hosts multiple basins each with multiple stratigraphic units from which hydrocarbons, water, and/or minerals are extracted (Dancy 2018). As such, the primary drivers of habitat loss and fragmentation within dunes sagebrush lizard habitat are oil and gas development, including activities such as surface exploration, exploratory drilling, field development, and facility construction, including access roads, well pads, and operation and maintenance; and frac sand mining, including the facilities to support excavation, sediment processing, groundwater pumping, transport, and reclamation (Mossa and James 2013, Benson and Wilson 2015, Engel et al. 2018, Forstner et al. 2018, Mace 2019). Currently, frac sand mining is restricted to the Texas portion of the lizard range. Some additional sources of development that can lead to habitat loss and fragmentation in shinnery oak duneland include (but are not limited to) wind and solar energy development, transmission lines and other linear infrastructure, shinnery oak treatments, honey mesquite encroachment, grazing, and recreational off-highway vehicle use.

The dunes sagebrush lizard is a shinnery oak duneland specialist, found in the Mescalero and Monahans Sandhills ecosystems of southeastern New Mexico and northwest Texas. These landscapes are composed of ancient sand dune fields maintained by wind and moving sand, partially stabilized by shinnery oak (Walkup et al. 2017) and are characterized by a patchy arrangement of narrow sand dunes embedded in a matrix of shinnery oak shrubland flats (Fitzgerald and Painter 2009, Ryberg et al. 2015). Within the sand dunes, open dune blowouts (bowl-shaped depressions) form when disturbances remove the stabilizing vegetation. The dunes sagebrush lizard selects for these open blowouts and uses the interface between shinnery oak and sand (Walkup et al. 2022) but will also use other habitats such as shinnery oak shrublands and

open dunes to move and disperse between blowout patches (Snell et al. 1997, Johnson et al. 2016, Hardy et al. 2018, Walkup et al. 2022).

Because the dunes sagebrush lizard is a shinnery oak duneland specialist, their range is limited to the shinnery oak duneland and shrubland landscapes in southeastern New Mexico and western Texas, within the elevational range of 2559 – 4593 feet (Painter et al. 1999). Within the landscape, the lizard's distribution is naturally patchy (Fitzgerald et al. 1997), and the species is primarily associated with sand dune blowouts occurring within active sand dunes dominated by shinnery oak and scattered sandsage (*Artemisia filifolia*).

Preferred measures for avoiding impacts to the dune sagebrush lizard include conducting all activities outside of sand dunes within shinnery oak habitat, or shinnery oak flat habitat. Suitable habitat consists of sand dunes within six feet of shinnery oak, a very specific and restrictive habitat within the Mescalero and Monahans sandhills. Dunes sagebrush lizard preferred habitat includes hollowed-out depressions in sand dunes (dune blowouts) embedded within a matrix of shinnery oak. Restoration of degraded dunes to acceptable habitat has, thus far, proved unsuccessful, largely due to the inability to reestablish shinnery oak. This is, therefore, not considered to be a post-project mitigation measure. Dunes sagebrush lizards tend to be dormant within sandy dune, or dune blowout, habitat during the colder months. Dormancy generally occurs between October and April. Any ground disturbance during this period would impact dormant lizards using this habitat. Minimal ground disturbance within an existing right of way (specifically activities using specialized equipment for installing underground utilities such as a vibratory plow or directional boring), if conducted outside of the dormant period, would likely result in insignificant or discountable effects. Projects that do not contain the dunes sagebrush lizard's preferred habitat would qualify for an NE determination. Projects that occur in areas that contain the dunes sagebrush lizard's preferred habitat (sand dunes shinnery oak habitat and/or shinnery oak flat habitat) and involve activities that will result in ground-disturbing activities, have the potential to impact this species during construction. Therefore, such projects would result in a "may affect" determination. If project work is completed outside the dunes sagebrush lizard dormant period (October 1 through March 31), projects that involve minimal disturbance to shinnery oak dunes/shinnery oak flat habitat during ground disturbing activities (and using special equipment such as a vibratory plow or directional boring) might qualify for an Not Likely to Adversely Affect determination.

The key requirement for the maintenance of long-term viability in lizard populations is intact shinnery oak duneland (TAMU 2016). There are three divergent and spatially discrete evolutionary lineages of dunes sagebrush lizards: the northern Mescalero, southern Mescalero, and Monahans. Each of these representation units is composed of genetically distinct groups, corresponding to natural and anthropogenic breaks in the shinnery oak duneland landscape that have resulted in limited dispersal and low connectivity between sites (Chan et al. 2013, 2020). Due to the limited gene flow between these groups, there is limited potential for recolonization, should these groups become extirpated.

Projects that occur in areas that contain the dunes sagebrush lizard preferred habitat, and involve the removal, modification, or degradation of habitat, would receive a "may affect" determination. These activities include, but are not limited to, human disturbance or ground disturbance within undisturbed areas within sand dunes shinnery oak habitat and/or shinnery oak flat habitat. Activities that include ground disturbance during the lizard's dormant period (October 1 through

March 31) would receive a “may affect” determination. Such activities include but are not limited to: vehicles; tracked equipment; excavating; grading; and placing fill material in undisturbed areas within sand dunes shinnery oak habitat and/or shinnery oak flat habitat.

4.3.2 Narrow-headed Gartersnake, *Thamnophis rufipunctatus*

The narrow-headed gartersnake was listed as threatened in 2014 ([79 FR 38678](#)). It is a small to medium-sized gartersnake, with eyes set high on unusually elongated heads, and tan to grey-brown base colors and brown, black, or reddish spots (Rosen and Schwalbe 1988, [79 FR 38678](#)). Narrow-headed gartersnakes were historically distributed in headwater streams of the Gila River subbasin that drain the Mogollon Rim and White Mountains in Arizona, and the Gila Wilderness in New Mexico ([79 FR 38678](#)). As of 2011, the only known narrow-headed gartersnake populations were persisting in New Mexico at Whitewater Creek, Tularosa River, Diamond Creek, and Middle Fork Gila River, and in Arizona at Oak Creek Canyon ([79 FR 38678](#)).

The narrow-headed gartersnake is considered to be one of the most aquatic of the gartersnakes (Drummond and Marcias Garcia 1983, Rossman et al. 1996, [79 FR 38678](#)). This species is strongly associated with clear, rocky streams, 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; [79 FR 38678](#)). Rossman et al. (1996) also note the species has been observed using lake shoreline habitat in New Mexico. Narrow-headed gartersnakes occur at elevations from approximately 2,300 to 8,000 ft (701 to 2,430 m), inhabiting Petran Montane Conifer Forest, Great Basin Conifer Woodland, Interior Chaparral, and the Arizona Upland subdivision of Sonoran Desert scrub communities (Rosen and Schwalbe 1988; Brennan and Holycross 2006; [79 FR 38678](#)). Bank-line vegetation is an important component to suitable habitat for this species (Nowak and Santana-Bendix 2002; [79 FR 38678](#)).

Sexual maturity in narrow-headed gartersnakes occurs at 2.5 years of age in males and at 2 years of age in females (Degenhardt et al. 1996; [79 FR 38678](#)). Narrow-headed gartersnakes are viviparous (give birth to live young; [79 FR 38678](#)). They breed annually, and females give birth to 4 to 17 offspring from late July into early August, perhaps earlier at lower elevations (Rosen and Schwalbe 1988; [79 FR 38678](#)). The narrow-headed gartersnake is surface-active generally between March and November ([79 FR 38678](#)). They specialize on fish as their primary prey (Rosen and Schwalbe 1988; Degenhardt et al. 1996; Rossman 1996; Nowak and Santana-Bendix 2002; [79 FR 38678](#)).

The presence of harmful nonnative species constitutes the most significant threat to the gartersnake. Harmful nonnative species directly prey upon the gartersnake and compete with them for prey ([79 FR 38678](#)). Declines in their prey base have led to subsequent declines in the distribution and density of gartersnake populations ([79 FR 38678](#)).

Narrow-headed Gartersnake Critical Habitat

Narrow-headed Gartersnake Critical Habitat was designated in 2021 ([86 FR 58474](#)). PCEs, now PBFs, for designated critical habitat are as follows:

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 a 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 up to 328 feet (100 meters) 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 (*Lithobates catesbeianus*), and/or crayfish (*Orconectes virilis*, *Procambarus clarki*, etc.), 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).

Final critical habitat has been designated for eight units on 23,785 acres (9,625 hectares) in portions of Arizona and New Mexico. In New Mexico these are 7,005 acres (2,835 hectares) in Upper Gila River Subbasin Unit, 5,895 acres (2,386 hectares) in the San Francisco River Subbasin Unit, and a portion of the Blue River Subbasin Unit that is 3,368 acres (1,363 hectares) in Greenlee County, Arizona and Catron County, New Mexico. 10,926 acres (4,422 hectares) are on federally owned land, 556 acres (225 hectares) are on State land, and 4,785 acres (1,936 hectares) are on privately owned land.

4.3.3 Northern Mexican Gartersnake, *Thamnophis eques megalops*

The northern Mexican gartersnake was listed as threatened in 2014 ([79 FR 38678](#)). It ranges in color from olive to olive-brown or olive-gray with three lighter-colored stripes that run the length of the body, the middle of which darkens toward the tail ([79 FR 38678](#)). Within the United States, the northern Mexican gartersnake historically occurred predominantly in Arizona at elevations ranging from 130 to 6,150 ft (40 to 1,875 m), and a limited distribution in New

Mexico that consisted of scattered locations throughout the Upper Gila River watershed (Price 1980, Degenhardt et al. 1996, Holycross et al. 2006, [79 FR 38678](#)). Currently, there are only five northern Mexican gartersnake populations in the United States where it remains reliably detected and is considered viable, and all are located in Arizona ([79 FR 38678](#)).

The northern Mexican gartersnake is considered a “terrestrial-aquatic generalist” (Drummond and Marcías-García 1983, [79 FR 38678](#)) and is generally found in riparian areas when not engaged in dispersal, gestation, or hibernation behaviors. It occurs chiefly in the following general habitat types: small, often isolated wetlands (e.g., ciénegas, which are mid-elevation wetlands with highly organic, reducing [basic or alkaline] soils), or stock tanks (small earthen impoundment)); large-river riparian woodlands and forests; and streamside gallery forests (as defined by well-developed broadleaf deciduous riparian forests with limited herbaceous ground cover or dense grass) (Hendrickson and Minckley 1984, Rosen and Schwalbe 1988, [79 FR 38678](#)). They are most commonly found in protected backwaters, braided side channels and beaver ponds, isolated pools near the river mainstem, and edges of dense emergent vegetation that offer cover and foraging opportunities (Emmons and Nowak 2013, [79 FR 38678](#)).

Sexual maturity in northern Mexican gartersnakes occurs at 2 years of age in males and at 2 to 3 years of age in females (Rosen and Schwalbe 1988, [79 FR 38678](#)). Northern Mexican gartersnakes are viviparous (give birth to living young rather than eggs) ([79 FR 38678](#)). Mating has been documented in April and May followed by the live birth of between 7 and 38 newborns (average is 13.6) in June, July, and August (Rosen and Schwalbe 1988, Nowak and Boyarski 2012, [79 FR 38678](#)). Unlike other gartersnake species, which typically breed annually, one study suggests that only half of the sexually mature females within a population of northern Mexican gartersnake might reproduce in any one season (Rosen and Schwalbe 1988, [79 FR 38678](#)). In the northern-most part of its range, the northern Mexican gartersnake appears to be most active during July and August, followed by June and September (Emmons and Nowak 2013, [79 FR 38678](#)). Northern Mexican gartersnakes may use different sites as hibernacula during a single cold-season basking occasionally and will use terrestrial habitat to hibernate, gestate, mate, and disperse (Young and Boyarski 2012, [79 FR 38678](#)). They may travel at least 528 feet (161 m) from the nearest water and as much as 0.4 mi (0.6 km) in a single day (total distance traveled) ([79 FR 38678](#)). Generally, its diet consists of native amphibians and fishes, such as adult and larval (tadpoles) native leopard frogs, as well as juvenile and adult native fish species (Rosen and Schwalbe 1988, [79 FR 38678](#)).

The presence of harmful nonnative species constitutes the most significant threat to the gartersnake. Nonnative species directly prey upon the gartersnake and compete with them for prey ([79 FR 38678](#)). Declines in their prey base have led to subsequent declines in the distribution and density of gartersnake populations ([79 FR 38678](#)).

Northern Mexican Gartersnake Critical Habitat

Northern Mexican Gartersnake critical habitat was designated in 2021 ([86 FR 22518](#)). PCEs, now PBFs, for designated critical habitat are as follows:

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 (*Lithobates catesbeianus*), and/or crayfish (*Orconectes virilis*, *Procambarus clarki*, etc.), 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 feet (40 to 2,590 meters).
6. Lentic wetlands including off-channel springs, ciénegas, 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.

Final critical habitat was designated for eight units on 20,326 acres (8,226 hectares) in portions of Arizona and New Mexico. There is one unit in New Mexico, the Upper Gila River subbasin unit, 1,133 acres (458 hectares) along 13 stream miles. 22 acres (9 hectares) are on State owned land and 1,006 acres (407 hectares) are on privately owned land.

4.3.4 *New Mexico Ridge-nosed Rattlesnake, Crotalus willardi obscurus*

The New Mexico ridge-nosed rattlesnake was listed as threatened with critical habitat in 1978 ([43 FR 34476](#)). All ridge-nosed rattlesnakes are distinguished by the tip of the snout and the anterior canthus rostrals raised into a sharp internasal ridge. The New Mexico ridge-nosed rattlesnake has no white flash-mark unlike other subspecies (Klauber 1972, Service 1985a). They occur in the Animas Mountains, New Mexico, the Peloncillo Mountains of New Mexico and Arizona, and in the Sierra San Luis Mountains in Mexico (Service 2019b). The distribution of the ridge-nosed rattlesnake in the Animas Mountains of southwestern New Mexico consists of four areas of canyon bottom and adjacent slopes totaling approximately one to two square miles (Applegarth et al. 1980; Service 1985a).

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 feet (ft) (1,820 meters (m) 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 (NMDGF 1990; Degenhardt et al. 1996; Service 2019b). Holycross (1995) reported habitat use in the Animas Mountains on steep east and southeast facing slopes, dominated by bunchgrass and beargrass, with widely spaced oaks and junipers or on steep east and southeast facing slopes with New Mexico locust and talus (Service 2019b). Rocky areas or talus with spaces between the rocks may be an important habitat component (Service 2019b).

Mating and copulation has been reported to occur in the wild from June through October (Holycross and Goldberg 2001; Service 2019b). Male New Mexico ridge-nosed rattlesnakes appear to be capable of inseminating females from June through September and females likely have a biennial or longer reproductive cycle (Service 2019b). The female reproductive cycle likely includes yolk deposition in one or more reproductive seasons, followed by a season with ovulation, development of young, and parturition (Service 2019b). New Mexico ridge-nosed rattlesnakes are live-bearers (young are born fully formed) from late July through August (Holycross and Goldberg 2001). Birth period may be coincident with occurrence and emergence of certain prey types that are suitable for baby snakes (Service 2019b). Young typically disperse from their birthplace within a few days (Service 1985a). Records of New Mexico ridge-nosed rattlesnake (and closely related subspecies) activity are from July through September, with isolated records as early as April and as late as October and November (Armstrong and Murphy 1979; Applegarth et al. 1980; Service 1985a). The species has been observed to feed on a broad range of prey, including small mammals, birds, lizards, other snakes, and arthropods (Applegarth et al. 1980; Service 1985a).

Habitat alteration and loss currently affects the subspecies, primarily from the interrelated effects of forest type conversions, climate change, and wildfire (Service 2019b). Forest type conversions are the result from long-term forest management practices over the last century including grazing and fire suppression (Service 2019b). Exacerbated by climate change, forest management over the last century has caused shifts in the natural fire regime resulting in large-scale, unplanned wildfires or unnatural prescribed fire regimes, and ultimately vegetation type conversion from suitable woodland habitat to unsuitable chaparral and grassland habitat (Holycross and Smith 2001; Service 2019b).

New Mexico Ridge-Nosed Rattlesnake Critical Habitat

New Mexico Ridge-Nosed Rattlesnake Critical Habitat was designated in 1978 ([43 FR 34476](#)). The PBFs for designated critical habitat are as follows:

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

The critical habitat for the New Mexico ridge-nosed rattlesnake is entirely in the state of New Mexico in areas between 6,200 feet and 8,532 feet in Bear, Indian, and Spring Canyons of the Animas Mountains in Hidalgo County.

4.4 AMPHIBIANS

Species	ESA Status	Focus Page	Profile Page
Chiricahua leopard frog	Threatened	Focus Page	Profile Page
Jemez Mountains salamander	Endangered	Focus Page	Profile Page

4.4.1 *Chiricahua Leopard Frog, *Rana chiricahuensis**

The Chiricahua leopard frog was listed as threatened with a special rule in 2002 ([67 FR 40790](#)). Designated critical habitat and the species' status was reassessed due to taxonomic revision of the frog in 2012, though it continued to receive threatened status ([77 FR 16324](#)). They are large, often green frogs with dorsolateral folds, stocky body proportions, relatively rough skin, and a distinctive pattern on the rear of the thighs (Service 2007). Chiricahua leopard frogs are currently distributed from central and southeastern Arizona; west-central and southwestern New Mexico; and in Mexico, northeastern Sonora, the Sierra Madre Occidental of northwestern and west-central Chihuahua, and possibly as far south as northern Durango ([77 FR 16324](#)). Historical records exist for Pima, Santa Cruz, Cochise, Graham, Apache, Greenlee, Gila, Coconino, Navajo, and Yavapai counties, Arizona; Catron, Grant, Hidalgo, Luna, Socorro, and Sierra counties, New Mexico; and northern Mexico, however distribution of the species in Mexico is unclear (Service 2007; [77 FR 16324](#)).

The Chiricahua leopard frog is native to permanent and semi-permanent aquatic systems including ciénegas or springs, pools, livestock tanks, lakes, reservoirs, streams and rivers, and other water bodies at approximate elevations between 3200-8,900 ft (975-2,715 m) ([76 FR 58441](#)). Suitable habitat contains emergent and or submerged vegetation, root masses, undercut banks, fractured rock substrates, or some combination thereof, and is devoid of or contains low numbers of nonnative predators. Sites as small as 6.0 ft (1.8 m) diameter steel troughs can serve as important breeding sites ([76 FR 58441](#)). Chiricahua leopard frogs are reasonably likely to disperse 1 mi (1.6 km) overland, 3.0 mi (4.8 km) along ephemeral or intermittent drainages (water existing only briefly), and 5.0 mi (8.0 km) along perennial water courses (water present at all times of the year), or some combination thereof not to exceed 5.0 mi (8.0 km) ([77 FR 16324](#)). The life history of the Chiricahua leopard frog consists of eggs and larvae that are entirely aquatic and adults that are primarily aquatic (Service 2007). Eggs are laid mainly from February through October, with most masses found in the warmer months, and hatching time ranging

between 8-14 days (Service 2007). Tadpoles have a long larval period, from three to nine months, and may overwinter. After metamorphosis, male juvenile frogs typically reach sexual maturity and full adulthood in less than a year ([77 FR 16324](#)). Adult Chiricahua leopard frogs do not hibernate, rather they seek temporary shelter during periods of inactivity, generally from November to February (Arizona Game and Fish Department 2015; Service 2007). A detailed study of wintertime activity or habitat use has not been done (Service 2007). Although amphibians are known to have limited dispersal and colonization abilities, Chiricahua leopard frogs can disperse to avoid competition, predation, or unfavorable conditions (Stebbins and Cohen 1995). As tadpoles, they eat vegetative matter, small diatoms, bacteria, and other small foods (Service 2007). After metamorphosis, Chiricahua leopard frogs eat an array of invertebrates and small vertebrates (Service 2007; [76 FR 58441](#)).

Predominant threats include predation by nonnative organisms, especially American bullfrogs, fish, and crayfish; the fungal disease chytridiomycosis (Bd) and emerging pathogen (ranavirus); and degradation and habitat loss from drought, water diversions, groundwater pumping, improper livestock management, and mining operations (Service 2007; [76 FR 58441](#); 2023d). Habitats are at risk from erosion causing sedimentation that reduces forage opportunities, smothers egg masses, or fills in the small tanks where most frog populations remain (Service 2007). These threats limit recruitment and dispersal, which can disrupt metapopulation dynamics, and increase the likelihood of local extirpation (Wake and Vredenburg 2008; Hof et al. 2011; Service 2023d).

The special rule replaces the Act's general prohibitions against take of the Chiricahua leopard frog with special measures tailored to the conservation of the species on all non Federal lands. Through the maintenance and operation of stock tanks for livestock, habitat is provided for the leopard frogs, hence there is a conservation benefit to the species. Under the special rule, take of Chiricahua leopard frog caused by livestock use of or maintenance activities at livestock tanks located on private, State, or Tribal lands are exempt from section 9 of the Act ([67 FR 40790](#)). Landowners and ranchers are encouraged to continue to maintain these tanks as they provide habitat for the leopard frogs. Livestock use and maintenance of tanks on Federal lands is addressed through the section 7 process with the Service.

Chiricahua Leopard Frog Critical Habitat

Chiricahua leopard frog critical habitat was designated in 2012 ([77 FR 16324](#)). PCEs, now PBFs, for designed critical habitat are as follows:

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 they would still be considered 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, bullfrogs, nonnative fish) absent or occurring at levels that do not preclude presence of the Chiricahua leopard frog.
 - d. Absence of chytridiomycosis, or if present, then environmental, physiological, and genetic conditions are such that allow persistence of Chiricahua leopard frogs.
 - e. Upland habitats that provide opportunities for foraging and basking that are immediately adjacent to or surrounding breeding aquatic and riparian habitat.
2. Dispersal and nonbreeding 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 mi (1.6 km) overland, 3.0 mi (4.8 km) along ephemeral or intermittent drainages, 5.0 mi (8.0 km) along perennial drainages, or some combination thereof not to exceed 5.0 mi (8.0 km);
 - b. In overland and nonwetted corridors, provide 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, provide ephemeral, intermittent, or perennial aquatic sites.
 - c. Are free of barriers that block movement by Chiricahua leopard frogs, including but not limited to, urban, industrial, or agricultural development; reservoirs that are 50 ac (20 ha) or more in size and contain nonnative predatory fish, bullfrogs, or crayfish; highways that do not include frog fencing and culverts; and walls, major dams, or other structures that physically block movement.

Thirty-nine units, grouped into eight recovery units, have been designated in Arizona, New Mexico, and Mexico comprising 10,346 total acres (4,187 hectares). The recovery units in New Mexico are portions of 3, 6, 7, and 8 and include the Peloncillo Mountains Tank Unit, the Kerr Canyon Unit, the Tularosa River Unit, the Deep Creek Divide Area Unit, the West Fork Gila River Unit, the Main Diamond Creek Unit, the Beaver Creek Unit, the Blue Creek Unit, the South fork Palomas Creek Unit, the Seco Creek Unit, the Alamosa Warm Springs Unit, the Cuchillo Negro Warm Springs Unit, the Ash and Bolton Springs Unit, and the Mimbres River Unit,

4.4.2 Jemez Mountains Salamander, *Plethodon neomexicanus*

The Jemez Mountains salamander was listed as endangered in 2013 ([78 FR 55600](#)). The Jemez Mountains salamander is uniformly dark brown above, with occasional fine gold to brassy coloring with stippling dorsally and is sooty gray ventrally ([78 FR 55600](#)). They have likely occupied the Jemez Mountains for at least 10,000 years and are now restricted to the Jemez Mountains in northern New Mexico, in Los Alamos, Rio Arriba, and Sandoval counties, around the rim of the collapsed caldera ([78 FR 55600](#)).

The Jemez Mountains salamander predominantly inhabits mixed-conifer forest, consisting primarily of Douglas fir (*Pseudotsuga menziesii*), blue spruce (*Picea pungens*), Engelman spruce (*Picea engelmannii*), white fir (*Abies concolor*), limber pine (*Pinus flexilis*), Ponderosa pine (*Pinus ponderosa*), Rocky Mountain maple (*Acer glabrum*), and aspen (*Populus tremuloides*) (Degenhardt et al. 1996, [78 FR 55600](#)). They predominantly occur at an elevation between 7,200 and 9,500 ft (2,200 and 2,900 m) (Degenhardt et al. 1996), but have been found as low as 6,998 ft (2,133 m) (Ramotnik 1988) and as high as 10,990 ft (3,350 m) (Ramotnik 1988, [78 FR 55600](#)). When active above ground, they are usually found under decaying logs, rocks, bark, or moss mats or inside decaying logs or stumps ([78 FR 55600](#)). Subsurface geology and loose rocky soil structure may be an important attribute of underground salamander habitat (Degenhardt et al. 1996; [78 FR 55600](#)).

The Jemez Mountains salamander is strictly terrestrial, does not possess lungs, and does not use standing surface water for any life stage ([78 FR 55600](#)). As such, substrate moisture through its effect on absorption and loss of water is probably the most important factor in their ecology (Heatwole and Lim 1961). Mating is believed to occur above ground between July and August during the rainy season (Williams 1976, [78 FR 55600](#)). Females likely lay 7 or 8 eggs every 2 to 3 years in the spring, about 9 to 10 months after mating occurs (Williams 1978, [78 FR 55600](#)). Fully formed Jemez Mountains salamanders hatch from the eggs, though sexual maturity isn't attained for another 3 to 4 years (Williams 1976, [78 FR 55600](#)). Adult Jemez Mountains salamanders spend much of their lives underground but can be found above ground when relative environmental conditions are warm and wet, typically from July through September ([78 FR 55600](#)). During the active season, individual salamanders typically move less than 3.3 ft (1 m) (Ramotnik 1988, [78 FR 55600](#)). Salamander prey from aboveground foraging is diverse in size and type, with ants, mites, and beetles being most important in the salamander's diet (Cummer 2005, [78 FR 55600](#)).

The principal threats to Jemez Mountains salamander habitat included historical fire exclusion (the act of preventing fire), fire suppression (the act of putting out fire), and severe wildland fires (wildfire); forest composition and structure conversions; post-fire rehabilitation; forest and fire management; roads, trails, and habitat fragmentation; and recreation (Service 2026b). Severe wildfires continue to be a principal threat to Jemez Mountains salamander habitat (Service 2026b). Because the Jemez Mountains salamander makes very small horizontal movements and has limited potential for long-distance horizontal movements, habitat connectivity limitations could have profound effects on populations ([78 FR 55600](#)).

Jemez Mountains Salamander Critical Habitat

Jemez Mountains Salamander Critical Habitat was designated in 2013 ([78 FR 69569](#)). PCEs, now PBFs for designated critical habitat are as follows:

1. Moderate to high tree canopy cover, typically 50 to 100 percent canopy closure, that provides shade and maintains moisture and high relative humidity at the ground surface, and:
 - a. Consists of the following tree species alone or in any combination: Douglas fir (*Pseudotsuga menziesii*); blue spruce (*Picea pungens*); Engelman spruce (*Picea engelmannii*); white fir (*Abies concolor*); limber pine (*Pinus flexilis*); Ponderosa pine (*Pinus ponderosa*); and aspen (*Populus tremuloides*); and

- b. Has an understory that predominantly comprises: Rocky Mountain maple (*Acer glabrum*); New Mexico locust (*Robinia neomexicana*); oceanspray (*Holodiscus spp.*); or shrubby oaks (*Quercus spp.*).
- 2. Elevations from 6,988 to 11,254 ft (2,130 to 3,430 m).
- 3. Ground surface in forest areas with:
 - a. Moderate to high volumes of large fallen trees and other woody debris, especially coniferous logs at least 10 in (25 cm) in diameter, particularly Douglas fir, which are in contact with the soil in varying stages of decay from freshly fallen to nearly fully decomposed; or
 - b. Structural features, such as rocks, bark, and moss mats, that provide the species with food and cover.
- 4. Underground habitat in forest or meadow areas containing interstitial spaces provided by:
 - a. Igneous rock with fractures or loose rocky soils;
 - b. Rotted tree root channels; or
 - c. Burrows of rodents or large invertebrates.

There are two critical habitat units, both occupied at the time of listing, in the Western Jemez Mountains and Southwestern Jemez Mountains Units totaling 90,716 acres (36,711 hectares) in the state of New Mexico. 87,840 acres (35,548 hectares) are on federally owned land, 2,803 acres (1,134 hectares) are on privately owned land, and 73 acres (30 hectares) are on land owned by the State of New Mexico.

4.5 FISH

Species	ESA Status	Focus Page	Profile Page
Arkansas River shiner	Threatened	Focus Page	Profile Page
Chihuahua chub	Threatened	Focus Page	Profile Page
Colorado pikeminnow	Endangered, Experimental	Focus Page	Profile Page
Gila chub	Endangered	Focus Page	Profile Page
Gila topminnow (incl. Yaqui)	Endangered	Focus Page	Profile Page
Gila trout	Threatened	Focus Page	Profile Page
Loach minnow	Endangered	Focus Page	Profile Page
Pecos bluntnose shiner	Endangered	Focus Page	Profile Page
Pecos pupfish	Proposed Threatened	Focus Page	Profile Page
Pecos gambusia	Endangered	Focus Page	Profile Page
Peppered chub	Endangered	Focus Page	Profile Page
Razorback sucker	Threatened	Focus Page	Profile Page
Rio Grande silvery minnow	Endangered	Focus Page	Profile Page
Spikedace	Endangered	Focus Page	Profile Page
Yaqui catfish	Threatened	Focus Page	Profile Page
Yaqui chub	Endangered	Focus Page	Profile Page
Zuni bluehead sucker	Endangered	Focus Page	Profile Page

4.5.1 *Arkansas River Shiner, Notropis girardi*

The Arkansas River shiner was listed as threatened in 1998 ([63 FR 64772](#)). They are small, robust shiners with small, dorsally flattened heads, rounded snouts, and small subterminal mouths (Miller and Robison 2004; Robison and Buchanan 1988, Service 2018c). They were once widespread and common in the western portion of the Arkansas River basin in Kansas, New Mexico, Oklahoma, Arkansas, and Texas (Service 2018c). They are no longer found in over 83 percent of their historical range (3,896 river miles) and now appear to be entirely restricted to portions of the South Canadian River in eastern New Mexico, the Texas panhandle, and Oklahoma (673 river miles) ([63 FR 64772](#); Service 2018c, Service 2024d).

Habitat consisted historically of the main channels of wide, shallow, sandy bottomed rivers and larger streams of the Arkansas River basin (Service 2018c). Adults prefer shallow channels where currents flow over clean fine sand, and generally avoid calm waters and silted stream bottoms (Service 2018c). They have adaptations to tolerate drought, elevated temperatures, and low dissolved oxygen concentrations (Service 2018c). The Arkansas River shiner needs a minimum length (135 miles) of unimpounded and connected river for long-term successful reproduction (Service 2018c). Microhabitat selection by Arkansas River shiners in the Canadian River of New Mexico and Texas included mean water depths between 6.6 and 8.3 in (17-21 cm) and relatively slow current velocities between 11.7 and 16.4 in/s (29.7-41.6 cm/s) (Wilde et al. 2000; Service 2018c). Juvenile Arkansas River shiners are associated most strongly with the presence of backwater and island habitat types, slower currents, and lower conductivity (total dissolved solids) (Polivka and Matthews 1997; Service 2018c).

Arkansas River shiners are members of a reproductive guild that broadcast spawns semi-buoyant eggs, which are kept suspended until hatching in flowing water (Service 2018c). Arkansas River shiners spawn multiple times during the spawning season, under a variety of flow regimes, from no flow to high flow (Bonner 2000; Service 2018c). After hatching, adequate stream length provides the extended flow time needed by larval fish to keep them suspended in the water column until they are strong enough to leave the main channel (Service 2018c). Approximately 3 days elapse between the time of spawning and the time that the larvae are capable of horizontal movement (Service 2018c). Without stream flow, eggs sink to the bottom where they may be covered with silt and die (Service 2018c). Eggs could be transported 72-144 km (45-90 mi) before hatching and could be transported as far as 216 km (134 mi) before becoming free-swimming juveniles (Service 2018c). The Arkansas River shiner is a generalized forager and feeds upon both items suspended in the water column and items lying on the substrate (Jimenez 1999; Bonner et al. 1997; Service 2018c).

They have experienced substantial declines in distribution and abundance due to habitat destruction and modification from stream dewatering or depletion from diversion of surface water and groundwater pumping, construction of impoundments, and water quality degradation (Service 2018c). Additional sources of stressors include development, invasive vegetation, weather conditions affected by large-scale climate, commercial bait fish harvesting, and off-road vehicle use within habitat (Service 2018c, Service 2024d).

Arkansas River Shiner Critical Habitat

Arkansas River Shiner Critical Habitat was designated in 2005 ([70 FR 59808](#)). PCEs, now PFBs for designated critical habitat are as follows:

1. A natural, unregulated hydrologic regime complete with episodes of flood and drought or, if flows are modified or regulated, a hydrologic regime characterized by the duration, magnitude, and frequency of flow events capable of forming and maintaining channel and instream habitat necessary for particular Arkansas River shiner life-stages in appropriate seasons;
2. A complex, braided channel with pool, riffle (shallow area in a streambed causing ripples), run, and backwater components that provide a suitable variety of depths and current velocities in appropriate seasons;
3. A suitable unimpounded stretch of flowing water of sufficient length to allow hatching and development of the larvae;
4. Substrates of predominantly sand, with some patches of silt, gravel, and cobble;
5. Water quality characterized by low concentrations of contaminants and natural, daily and seasonally variable temperature, turbidity, conductivity, dissolved oxygen, and pH;
6. Suitable reaches of aquatic habitat, as defined by PCEs 1 through 5 above, and adjacent riparian habitat sufficient to support an abundant terrestrial, semiaquatic, and aquatic invertebrate food base; and
7. Few or no predatory or competitive non-native fish species present.

A total of 532.7 acres have been designated in the states of Kansas and Oklahoma. Texas and New Mexico do not contain critical habitat for the species.

4.5.2 Chihuahua chub, *Gila nigrescens*

On October 11, 1983, the Chihuahua chub was listed as threatened without critical habitat ([48 FR 46053](#)). The Republic of Mexico also considers the species to be threatened (Propst 1999). This species declined substantially in abundance and range (Miller and Chernoff 1979; Propst and Stefferud 1994). The Service has recommended that the species should be up listed to endangered (Service 2010b). Populations range-wide appear to be decreasing, particularly in Mexico (Propst 1991). However, only a fraction of potentially occupied habitat in Chihuahua, Mexico, has been surveyed. There have not been any surveys since 1990; therefore, current knowledge regarding the distribution and status in Mexico is limited (Service 2010b).

The Chihuahua chub is a medium-sized fish in the minnow family (*Cyprinidae*), averaging between five to six inches in length. Adults are a dark green or grey dorsally and cream to white ventrally. Reproductive adults are reddish-orange around the base of paired fins, and around the mouth, and ventrally. The males have brighter colors and contain numerous small nuptial tubercles on the head (Propst 1999). The species is an opportunistic carnivore in its feeding behavior, taking terrestrial insects, aquatic invertebrates, and some fish and vegetation (Sublette et al. 1990). The adult Chihuahua chub is a habitat specialist and is found primarily in lateral scour pools, beneath undercut banks, or under other solid objects (e.g., logs, boulders). Occupied pools are typically 3 to 7 ft. (1 to 2 m) deep with a small-grained substrate (Service 2010b). Adults select habitats adjacent to moderate to fast-flowing water in small to medium-sized streams (Miller and Chernoff, 1979, Propst and Stefferud 1994). Backwater pools with large woody debris are also important habitats. Juveniles prefer more shallow water with or without

cover (Miller and Chernoff 1979). All suitable habitat for this species contains cover composed of organic debris and roots of large trees. Propst and Stefferud (1994) suggest that the spawning season could extend from early spring through autumn across the Chihuahua chubs' range. In New Mexico, spawning probably occurs from spring to summer, eggs are probably scattered randomly over sandy or silt substrates, and young most likely occupy quiet backwaters (New Mexico Department of Game and Fish (NMDGF), now New Mexico Department of Wildlife (NMDW) 1988). Chihuahua chubs in captivity mature at age two or three (Propst 1999). Wild fish probably do not live more than four or five years.

The historical habitat for the Chihuahua chub has been dramatically reduced and degraded (Service 2010b). Historically, Chihuahua chub probably occupied all the warm water reaches of the Mimbres River drainage within or downstream of the Gila NF (Propst 1999). Experts believed the Chihuahua chub was extirpated in New Mexico until its rediscovery in 1975 (Koster 1957, Rogers 1975). In New Mexico, the population of Chihuahua chub in the Mimbres River is probably stable. However, its status remains precarious due to the population's dependence on stocking and ongoing threats (Service 2010b). The Mimbres River populations are located primarily on lands managed by TNC, Department, and private landowners; the Mimbres River at Cooney Canyon and the McKnight Creek populations were on Gila NF lands. However, the population stocked in McKnight Creek is presumed absent following surveys in 2014. Chihuahua chubs were again, recently, stocked in McKnight Creek, above a fish passage barrier. The status of this repatriated population is unknown. A small population continues to persist on the Gila NF in the Mimbres River.

Habitat loss and modification is the primary threat to the chub in the Mimbres River. Historically, the Mimbres River was a relatively deep (2.5 ft. (0.8 m)), slow-moving river with a series of pools or lagoons at its terminus, bordered with thickets of native willows (*Salix spp.*) (Antisell 1856). Presently, river conditions have been drastically altered through numerous diversions and stream modifications, reducing both the quantity of water in the river and the quality of its adjacent riparian habitat. Ash flows resulting from wildfires reduce water quality and increases sedimentation (Propst 1999). These impacts decrease habitat suitability for the chub and probably caused local extirpations of the species. The presence of the parasitic yellow grub (*Clinostomum complanatum*) is a threat due to the possibility of reduced survival caused by excessively infected fish (Propst 1999). The species might now be more highly imperiled in Mexico than when it was last surveyed in 1990 due to increasing threats from exotic species, water extraction, groundwater pumping, and stream drying (Service 2010b).

4.5.3 Colorado pikeminnow, *Ptychocheilus lucius*

The Colorado pikeminnow was listed as endangered in 1967, in the original List of Endangered Species ([32 FR 4001](#)). It was re-listed as endangered in 1974 ([39 FR 1158](#)) wherever found in Arizona, Colorado, New Mexico, and Utah. A nonessential experimental population area for pikeminnow was established in 1985 ([50 FR 30188](#)) in the Salt and Verde River drainages of Arizona. For section 7 consultation purposes, any nonessential experimental population located within a National Park or National Wildlife Refuge System is treated as a threatened species, and any nonessential experimental population located outside of a National Park or National Wildlife Refuge System is treated as a proposed species.

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. Historically, Colorado pikeminnow occurred throughout the Colorado River basin, including the Green, Colorado, and San Juan River subbasins of Wyoming, Colorado, Utah, and New Mexico; downstream through the Colorado River mainstem in Arizona, Nevada, California, and Mexico; and the Gila River subbasin in Arizona and New Mexico (Service 2023e). They are now found in the Colorado, Green, and San Juan rivers in Colorado, Utah, and New Mexico (Service 2023e).

Colorado pikeminnow is North America's largest minnow from the family *Cyprinidae*. Historically, individuals grew up to 1.8 meters (6 feet) long and weighed more than 45 kilograms (100 pounds). Currently, specimens rarely exceed 2.3 kilograms (5 pounds). Adults are dark brownish to bright olive green on the back, silvery white or yellow along the sides, and dingy yellow or white on the belly. Adults in spawning condition may have a light rosy-red tinge on the head (Service 2022c).

Colorado pikeminnow inhabit river reaches that historically experienced extremes in both flow and temperature on an annual basis, in addition to high turbidity from sediment inputs as a result of spring snow melt or flash floods (Service 2022c). Both adult and nursery habitats, as well as spawning bars, are formed and maintained by high spring peak flows that move sediment, clean cobble substrates, and maintain channel complexity to provide a diversity of habitats (Service 2022c). They require habitat with variable flow regimes, specifically spring peak flows to maintain channel complexity and spawning habitats; summer base flows to provide suitable nursery habitats; suitable water temperatures for spawning and growth; complex, redundant riverine habitats that provide a combination of the necessary elements of spawning, nursery, and foraging areas; and an abundant and suitable food base (Service 2020c, 2025c).

Colorado pikeminnow are known to make long distance migrations between February and June for spawning and return to their home range where they inhabit deep runs, pools, and eddies (Service 2022c). They spawn in groups in the summer over areas composed of cobble and gravel that have been recently cleaned by spring peak flows. They broadcast adhesive, demersal eggs that adhere to the substrate. Given warm water temperatures (18-30°C [64- 86°F]), eggs hatch within four to seven days within the river substrate as spring peak flows decline, with the larvae carried potentially long distances by river flows to low velocity nursery habitats downstream of the cobble spawning bars (Service 2022c). Recently hatched larvae linger within the interstitial spaces between gravel and cobble for another 4-8 days before emerging into the current. As larvae drift from July to August, they tend to occupy low velocity nursery habitat where they transform into juveniles between September and December (Snyder et al. 2016; Service 2022c). Adults migrate out of spawning grounds between September and November (Service 2022c). They are apex predators and are believed to be almost entirely piscivorous as adults (Service 2022c).

Changes in the flow regime as a result of water development throughout the Colorado River basin led to initial declines in Colorado pikeminnow populations (Service 2023e). In some cases, this development included barriers to movement in the form of dams and diversions, which have fragmented river reaches and limited access to historical habitats (Service 2023e). Water storage and flow management often reduce spring peaks necessary to create and maintain spawning and

nursery habitats needed by Colorado pikeminnow. They also reduce base flows, which can limit the pikeminnow's range and reduce habitat availability (Service 2023e). Predation and competition from invasive, nonnative fishes reduce survival and recruitment of Colorado pikeminnow in all life stages (Service 2023e). Contaminants such as toxic spills reduce water quality and can reduce reproduction and survival. Climate change and extended drought reduces streamflow in many rivers which strains pikeminnow viability and conservation efforts (Service 2022c).

Colorado Pikeminnow Critical Habitat

The Service designated critical habitat for the Colorado pikeminnow in portions of the Green, upper Colorado, and San Juan subbasins of the Upper Colorado River Basin. These reaches total 1,848 river km (1,148 mi) (59 FR 13374). The critical habitat PCEs, now 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.

Critical habitat is in San Juan County in New Mexico and Utah in the San Juan River and its 100 year floodplain from the hogback diversion to the full pool elevation at the mouth of the Neskahai Canyon on the San Juan arm of Lake Powell.

4.5.4 Gila Chub, *Gila intermedia*

The Gila chub was listed as endangered with critical habitat in 2005 ([70 FR 66664](#)). It was formerly considered a separate taxonomic entity but is currently recognized, along with headwater chub and roundtail chub, as a single taxonomic species—the roundtail chub (*Gila robusta*) (Service 2022d, 2025d). Gila chub is a thick-bodied species, chunky in aspect, and body coloration is typically dark overall, sometimes black or with diffuse, longitudinal stripes, with a lighter belly speckled with gray.

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). In the past they were more abundant and widespread throughout the range (Hendrickson and Minckley 1984, Minckley 1985, Rinne and Minckley 1991). They currently persist in portions of the Agua Fria River, Verde River, Santa Cruz River, San Pedro River, and Upper Gila River Subbasins in southeastern Arizona and in remnant populations in two creeks (Mule Creek and Turkey Creek) in southwestern New Mexico.

Gila chub is considered a habitat generalist (Schultz and Bonar 2007). In the Gila River basin it commonly inhabits pools in smaller streams, cienegas, and artificial impoundments at elevations between 609 and 1,676 m (2,000 to 5,500 ft) (Miller 1946, Minckley 1973, Rinne 1975,

Weedman et al. 1996). They are highly secretive, preferring quiet, deeper waters, especially pools, or remaining near cover including terrestrial vegetation, boulders, and fallen logs (Minckley 1973, [67 FR 51948](#)). Young-of-the year use the shallow margins of pools with aquatic vegetation or debris for cover. Older juveniles may be found in higher velocity runs and riffles ([67 FR 51948](#)).

Chubs breed in late spring to summer, and males follow the larger females over beds of aquatic plants, with no parental care for offspring ([67 FR 51948](#)). Temperature may be the primary cue for initiation of spawning ([67 FR 51948](#)). They are endemic to the Gila River Basin, and may be isolated due to surface and groundwater development that eliminated connectivity of aquatic habitats ([67 FR 51948](#)). Gila chub commonly inhabit pools in smaller streams, springs, and ciénegas (a desert wetland), and can survive in small artificial impoundments (Miller 1946, [Minckley 1973](#), [Rinne 1975](#), [67 FR 51948](#)). Their primary food items are aquatic and terrestrial insects and filamentous algae ([67 FR 51948](#)).

Threats to the chub include introduction of non-native aquatic competitors and predators (fish, bullfrogs, crayfish), continued water use for development purposes, and habitat degradation due to improper land management ([67 FR 51948](#)). Erosion from roads or bare ground can fill in the deep pools needed by the chub ([67 FR 51948](#)). Within the historical range of the Gila chub, much wetland habitat has been destroyed or degraded, and loss of this habitat continues today (Rinne and Minckley 1991, Propst 1999, [67 FR 51948](#)). Groundwater pumping, surface water diversions, impoundments, channelization, improperly managed livestock grazing, wildfire, agriculture, mining, road building, residential development, and recreation all contribute to riparian and cienega habitat loss and degradation in Arizona and New Mexico (Rinne and Minckley 1991, Weedman et al. 1996, Propst 1999, [67 FR 51948](#)).

Gila Chub Critical Habitat

Gila Chub Critical Habitat was designated in 2005 ([70 FR 66664](#)). PCEs, now PBFs for designated critical habitat are as follows:

1. Perennial pools, areas of higher velocity between pools, and areas of shallow water among plants or eddies all found in headwaters, springs, and ciénegas, generally of smaller tributaries;
2. Water temperatures for spawning range from 17 to 24 °C (62.6 to 75.2 °F), and seasonally appropriate temperatures for all life stages (varying from approximately 10 °C to 30 °C).
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 (e.g. ranging from 3.0 to 10.0) and conductivity (e.g. 100 to 1000 mmhos).
4. Food base consisting of invertebrates (e.g. aquatic and terrestrial insects) and aquatic plants (e.g. 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 streambank stability, and a healthy, intact riparian vegetation community;

6. Habitat devoid of nonnative aquatic species detrimental to Gila chub or habitat in which detrimental nonnatives 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.

A total of 160.3 river miles of critical habitat have been designated in the states of New Mexico and Arizona. 146.1 river miles are in Arizona, and 14.2 river miles are in New Mexico. 11.7 river miles in New Mexico are on federally owned land and 2.5 river miles are on privately owned land in the Upper Gila River Area, including Turkey Creek.

4.5.5 Gila Topminnow, *Poeciliopsis occidentalis occidentalis*

The Gila topminnow was listed as endangered in 1967 without critical habitat ([32 FR 4001](#)). The Gila Topminnow was listed along with the Yaqui Topminnow, another subspecies of the Sonoran topminnow. Gila topminnows are tan to olive-bodied and usually white on the belly, scales of the dorsum are darkly outlined, and the fin rays contain melanophores (Service 1999). Gila topminnows were historically widespread in the Gila River drainage in Arizona, New Mexico, and Mexico (Service 1999). They are currently known from the Gila River drainage, Arizona, particularly in the upper Santa Cruz River, Sonoita and Ciénega creeks, and the middle Gila River (Service 1999).

Habitat requirements are broad, as topminnow prefer shallow, warm, fairly quiet waters in ponds, ciénegas, tanks, pools, springs, small streams and the margins of larger streams (Service 1999). Preferred habitats contain dense mats of algae and debris, usually along stream margins or below riffles, with sandy substrates sometimes covered with organic muds and debris (Minckley 1973, Service 1999). Topminnows are usually found in the upper 1/3 of the water column and young show a preference for the warmest and shallowest areas (Forrest 1992; Service 1999). Simms and Simms (1992) found topminnows occupying pools, glides, and backwaters more frequently than marshes or areas of fast flow (Service 1999). Topminnows can tolerate almost total loss of water by burrowing into the mud for 1-2 days (Service 1999). They historically occurred in backwaters of large rivers but are currently isolated to small streams and springs (Service 1999).

4.5.6 Gila Trout, *Oncorhynchus gilae*

The Gila trout was listed as threatened in 1967 without critical habitat ([32 FR 4001](#)). In 2006, the Gila trout was reclassified from endangered to threatened ([71 FR 40657](#)). The 2006 reclassification included a special rule under section 4(d) of the ESA that enabled the New Mexico Department of Game and Fish, now the New Mexico Department of Wildlife, and the Arizona Game and Fish Department to promulgate special regulations, in collaboration with the Service, allowing recreational fishing for Gila trout ([71 FR 40657](#)). Gila trout are readily identified by their iridescent gold sides that blend to a darker shade of copper on the opercles (*i.e.*, bony plates surrounding the gills). During spawning season the normally white belly may be streaked with yellow or reddish orange (Miller 1950, Service 2022e).

The Gila trout is one of several inland Pacific trout species of the genus *Oncorhynchus*, including rainbow, cutthroat, golden, Mexican golden, and Apache trouts (Smith and Stearley 1989). The historical range of Gila trout is not definitively known, but included

mountain and headwater stream areas throughout the Gila River Basin in Arizona and New Mexico (Service 2022e). It was historically found in the Gila, San Francisco, Agua Fria and Verde River drainages in New Mexico and Arizona (Miller 1950, Behnke 1992, Minckley and Marsh 2009, Service 2022e). They are currently distributed in Main Diamond Creek, South Diamond Creek, Whiskey Creek, Spruce Creek, and Iron Creek in the Gila River Basin in Arizona and New Mexico (Service 2022e). 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.

Gila trout habitat typically consists of montane streams ranging from 1,660–2,800 m (5,400–9,200 feet) elevation (Propst and Stefferud 1997, Service 2022e). Suitable streams are found in coniferous and mixed woodland, montane coniferous forest, and subalpine coniferous forest (Service 2022e). Suitable substrate composition for development of eggs and embryos is characterized by coarse sands and gravel, with approximately seven percent or less fines (Rinne 1980, Service 2022e). Suitable nursery habitat for trout includes areas with slow current velocity such as stream margins, seeps, shallow bars, and side channels (Behnke 1992, Service 2022e). Cover includes overhanging woody and herbaceous riparian vegetation, undercut banks, woody debris in the stream channel, boulders, and deep water (Service 2022e). Overwintering areas afford shelter in deep water with low current velocity and protective cover (Behnke 1992) during low temperature periods, generally from November through February (Service 2022e).

Spawning of Gila trout occurs mainly in April (Rinne 1980) when water temperatures reach about 8°C (46° F), but day length may also be an important cue (Service 2022e). They require perennial stream flow and a diversity of habitats to support all life stages (Service 2022e). Female Gila trout typically construct redds (spawning nests) in fine gravel and coarse sand substrate (Service 2022e). Gila trout fry emerge from redds in 56 to 70 days (Rinne 1980; Service 2022e). Adult Gila trout are typically quite sedentary but individual fish may move considerable distances (over 1.5 km [0.9 mi]) (Rinne 1982, Service 2022e). Gila trout show a tendency to move upstream, possibly to perennial reaches with suitable pool habitat in response to low summer discharge (Service 2022e). Dispersal by Gila trout is likely slow, even when there are no physical barriers to movement (Service 2022e). Gila trout are generally insectivorous, eating adult true flies, caddisfly larvae, mayfly nymphs, and aquatic beetles; however there is some evidence of piscivory in Gila trout (Regan 1964, Service 2022e).

Threats to the Gila trout include increased occurrence and probability of high-severity, large-scale wildfires, effects of climate change, grazing, illegal harvest, predation and competition from nonnative trout, disease, human-mediated introgressive hybridization, and small, isolated populations (Service 2022e). Predation and competition by nonnative species (primarily brown trout and brook trout) likely results in reduced Gila trout abundance, increased mortality, reduced growth and survival, and reduced 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 (*e.g.*, grazing,

logging) reduced the quality and connectivity of Gila trout stream habitat and has resulted in small and fragmented Gila trout populations (Service 2022e).

4.5.7 Loach Minnow, Tiaroga cobitis

The loach minnow was listed as threatened in 1967 ([32 FR 4001](#)), then endangered in 2012 ([77 FR 10810](#)). They have small, terminal mouths with no barbels, and olive-colored bodies with whitish spots on the dorsal fin and portions of the caudal fin base, while breeding males have bright red-orange spots on the fins (Service 1991a). Their historical range included the Gila River basin of Arizona and New Mexico, and Sonora, Mexico (Service 1991a). Currently they are restricted to scattered tributary populations in Arizona and New Mexico (Service 1991a).

The loach minnow inhabits turbulent, rocky riffles of mainstream rivers and tributaries up to about 2200 meters in elevation (Service 1991a). Because the species has a reduced gas bladder, it is restricted almost exclusively to a bottom-dwelling habit, swimming in swift water only for brief moments as they dart from place to place (Service 1991a). Most habitat occupied by loach minnow is relatively shallow, with moderate to swift current velocity and gravel-to-cobble dominated substrate (Barber and Minckley 1966, Minckley 1973, Propst et al. 1988, Rinne 1989, Propst and Bestgen 1991, Service 1991a). Loach minnow may locally (e.g., Aravaipa Creek, Arizona) associate with dense growths of filamentous green algae (Barber and Minckley 1966), while in other places this association has not been observed (Service 1991a).

Loach minnow first spawn at age 1 in late winter to early spring (Minckley 1973) and from late March into early June in New Mexico (Britt 1982, Propst et al. 1988, Service 1991a). Spawning occurs in the same riffles occupied by adults during the non-reproductive season (Service 1991a). Adhesive eggs are deposited on the underside of flattened rocks; cavities usually are open on the downstream side while the upstream portion of the rock is embedded in the substrate (Service 1991a). The number of eggs per rock ranges from fewer than 5 to more than 250, and embryos retrieved from beneath spawning rocks and incubated at 18 to 20° C hatched in 5 to 6 days (Service 1991a). Loach minnow are opportunistic, benthic insectivores, largely deriving their foods from among riffle-dwelling, larval ephemeropterans and simuliid and chironomid dipterans (Britt 1982, Propst et al. 1988, Propst and Bestgen 1991, Service 1991a).

Changes in distribution and abundance of loach minnow are directly or indirectly tied to man's uses of rivers, streams and landscapes, which have been variously modified by past and present activities (Hastings and Turner 1965, Hendrickson and Minckley 1985, Service 1991a). Direct impacts have resulted from stream habitat alterations accompanying a suite of land and water use practices; most often cited are dewatering, impoundment, and livestock grazing (Service 1991a). Certain introduced and established non-native fishes may interact negatively with native kinds, and independently or in concert with habitat alteration, result in their extirpation (Service 1991a).

Loach Minnow Critical Habitat

Loach minnow Critical Habitat was designated in 2007 and revised in 2012 and also includes the spikedace ([77 FR 10810](#)). PCEs, now PBFs for designated critical habitat are as follows:

1. Permanent, flowing, unpolluted water;

2. Living areas for adult loach minnow with moderate to swift flow velocities in shallow water with gravel, cobble, and rubble substrates;
3. Living areas for juvenile loach minnow with moderate to swift flow velocities in shallow water with sand, gravel, cobble, and rubble substrates;
4. Living areas for larval loach minnow with slow to moderate velocities in shallow water with sand, gravel, and cobble substrates and abundant instream cover; Spawning areas for loach minnow with slow to swift flow velocities in shallow water with uncemented cobble and rubble substrate;
5. Low amounts of fine sediment and substrate embeddedness;
6. Riffle, run, and backwater components present in the aquatic habitat;
7. Low to moderate stream gradient;
8. Water temperatures in the approximate range of 1-30°C (35-85°F), with natural diurnal and seasonal variation;
9. Abundant aquatic insect food base;
10. Periodic natural flooding;
11. A natural unregulated hydrograph or, if flows are modified or regulated, then a hydrograph that demonstrates an ability to support a native fish community; and
12. Habitat devoid of nonnative aquatic species detrimental to loach minnow, or habitat in which detrimental nonnative species are at levels which allow persistence of loach minnow.

Critical habitat has been designated in 8 total units in Arizona and New Mexico, three of which are in the state of New Mexico including the San Francisco Subbasin - 228.1 km (141.7 miles) of stream segments from the San Francisco River and its tributaries Tularosa River, Negrito Creek, and Whitewater Creek, the Blue River Subbasin- 106.6 km (66.3 mi) of stream segments including Pace Creek, Dry Blue Creek, Frieborn Creek, and Little Blue Creek, and the Gila River Subbasin - 258.6 km (160.7 mi) of stream segments in the Upper Gila River and five tributaries including West Fork Gila River, Middle Fork Gila River, East Fork Gila River, Mangas Creek, and Bear Creek.

4.5.8 Pecos Bluntnose Shiner, *Notropis simus pecosensis*

The Pecos bluntnose shiner was listed as threatened in 1987 ([52 FR 5295](#)). Adults reach lengths of up to 3.5 in (9 cm), with deep, spindle-shaped, silvery bodies, and fairly large, sub-terminal mouths overhung by bluntly rounded snouts ([Koster 1957](#); [52 FR 5295](#)). Historically, they occurred throughout the Pecos River system in New Mexico and Texas ([Service 1992](#)). They are currently restricted to a 306 km (190 mile) reach of the Pecos River in New Mexico from the Taiban Creek confluence downstream to the Brantley Reservoir delta ([Service 2026c](#)).

The Pecos bluntnose shiner occurs perennial reaches of the Pecos River ([Service 1992](#)). They occupy most major mesohabitats but were typically found in lower velocity sand substrates at depths between 7 in and 16 in (17 and 41 cm ([Hatch et al. 1985](#); [52 FR 5295](#); [Service 1992](#))). Backwaters, riffles, and pools were also used by younger individuals ([52 FR 5295](#)).

The Pecos bluntnose shiner is a member of the pelagic spawning minnow guild found in large plains rivers ([Platania 1995](#); [Platania and Altenbach 1998](#); [Service 2010c](#)). These minnows release non-adhesive, semi-buoyant eggs that float in the water column ([Platania and Altenbach 1998](#); [Service 2010c](#)). The spawning season extends from late April through September, with the

primary period occurring from June to August ([Platania 1993, 1995](#); [Service 2010c](#)). Spawning is cued by substantial increases in discharge, including flash floods and block releases of water ([Platania 1993, Dudley and Platania 1999](#); [Service 2010c](#)). Eggs hatch in 24 to 48 hours ([Platania 1993](#); [Service 2010c](#)). Newly-hatched larvae float downstream for another two to four days ([Service 2010c](#)). Large terminal mouths and pointed, hooked pharyngeal teeth indicate that the Pecos bluntnose shiner is carnivorous ([Hubbs and Cooper 1936](#); [Bestgen and Platania 1990](#)), and their diet is indicative of drift foraging ([Starrett 1950](#); [Griffith 1974](#); [Mendelson 1975](#); [Service 2010c](#)).

The occupied reach of the Pecos River is bounded by reservoirs which limit the ability for the species to disperse into adjacent areas. Other stressors include a highly altered flow regime, point and non-point sources of pollution, and invasive species ([52 FR 5295](#); [Service 1992](#); [Service 2026c](#)). Over the last 20 years, however, long-term monitoring has conclusively demonstrated that river drying/intermittency is the greatest threat to the species and long-term drought/climate change intensify these problems ([Service 2026c](#)).

Pecos Bluntnose Shiner Critical Habitat

Pecos bluntnose shiner critical habitat was designated in 1987 ([52 FR 5295](#)). Critical habitat for the Pecos bluntnose shiner includes two sections of the Pecos River in New Mexico. The first section begins approximately 10 mi (16 km) south of Fort Sumner, De Baca County, and extends approximately 64 mi (103 km) downstream into Chaves County. The second area is approximately 37 mi (60 km) long, between Hagerman and Artesia in Chaves and Eddy Counties. These areas were chosen for critical habitat designation because they presently support relatively abundant, self-perpetuating populations and tend to have perennial flow under normal water years.

4.5.9 *Pecos Gambusia, Gambusia nobilis*

The Pecos gambusia was listed as endangered in 1970 without critical habitat ([35 FR 16047](#)). They are generally light reddish-brown in color with a somewhat paler underside. The Pecos gambusia is endemic to the Pecos River Basin in southeastern New Mexico and western Texas and originally ranged from near Fort Sumner, New Mexico, to the area around Fort Stockton, Texas. Currently, the species occurs in four widely separated localities in the Pecos River drainage of western Texas and southeastern New Mexico ([Service 2018d, 2025e](#)).

The primary habitats for Pecos gambusia include stenothermal (narrow temperature range) springs, runs, spring-influenced marshes (ciénegas), and irrigation canals carrying spring waters. Some populations are also known from areas with little spring influence; these habitats generally have abundant overhead cover, and include sedge-covered marshes and gypsum sinkholes ([Service 1983, 2018d, 2025e](#)). All populations, including those at historic and current locations, occur between 822 m (2697 ft) and 1187 m (3894 ft) in elevation ([Service 2018d](#)).

The Pecos gambusia is a carnivorous surface feeder that consumes amphipods, dipterans, cladocerans, filamentous algae, arachnids and mollusks ([Bednarz 1979, Hubbs et al. 1978; Winemiller and Anderson 1997, Service 2018d](#)).

The Pecos gambusia is presumed to have a life-span of at least three years, and is capable of reproducing for two of those years (Swenton and Kodric-Brown 2012, Service 2018d). The species produces live young, and averages from one to four broods during the April through August breeding season (Swenton and Kodric-Brown 2012, Service 2018d). Pecos gambusia reproductive strategy shifts over the breeding season from investment in many small embryos to fewer, larger offspring (Swenton and Kodric-Brown 2015, Service 2018d).

At present, the species is restricted to four main areas, two in New Mexico and two in Texas. In New Mexico, populations are known from various springs and sinkholes in Bitter Lake National Wildlife Refuge and Blue Spring on the Black River, a tributary to the Pecos River. In Texas, populations are known from the Diamond Y Springs and Draw that includes Leon Creek near Fort Stockton; and the San Solomon Springs System near Balmorhea. Although the mainstem Pecos River was not likely permanent habitat, it presumably served as a dispersal route between tributary springs and streams. Important habitats have been impacted by extensive ground water pumping of the aquifers surrounding the Pecos River in the mid-1900s, causing cessation of flow and extirpation from Comanche and Tunis Springs in Texas and North Spring River in New Mexico, and causing reduced flow with loss of habitat in other areas. Phantom Springs in the Solomon Springs complex is dry and no longer supports the species. As a result of these habitat losses, the species has become isolated in permanent springs and is totally dependent upon spring flow for their survival. The best available scientific information indicates that the primary threats to Pecos gambusia in New Mexico are: 1) habitat loss and degradation associated with declining spring flows, 2) hybridization or competition with western mosquitofish, and 3) potential contamination of aquatic habitat as a result of local oil and gas development. The threat of habitat loss and degradation is the most immediate and pressing of the threats (Service 2025e).

4.5.10 Pecos pupfish, Cyprinodon pecosensis

Pecos pupfish has been proposed for listing as threatened with a 4(d) rule and proposal of designation of critical habitat November 22, 2024 ([89 FR 92744](#)). For actions that may affect a proposed species, agencies cannot consult, but they can confer under the authority of section 7(a)(4) of the ESA. Such conferences can follow the procedures for a consultation and be adopted as such if and when the proposed species is listed. Should the species be listed, agencies must review projects that are not yet complete, or projects with ongoing effects within the range of the species that previously received a determination from a Dkey to confirm that the determination is still accurate.

Pecos pupfish are small, deep-bodied fish varying in body color from gray to-brown to iridescent blue. Females have blotched lateral bars on their sides. Pecos pupfish vary phenotypically amongst isolated habitat types, which may be advantageous for adapting to different food availability, dissolved oxygen availability, and salinity levels. Adults range in size from 28–46 millimeters (1.1–1.8 inches) in standard length. (Service 2024e).

Most individuals in the wild live less than one year (Kodric-Brown 1977). Adult Pecos pupfish breed in the late spring through early fall (May to September); however, breeding peaks when water temperatures are warm and food is abundant (late-June to July). Larvae hatch approximately one month after fertilization. Pecos pupfish are sexually mature at 20 mm (0.8 in) standard length, within a few months of hatching (Kodric-Brown 1983). Female Pecos pupfish

lay individual eggs that adhere to spawning substrate, such as vegetation or rocks (Kodric-Brown 1977). Female Pecos pupfish lay an average of 10 eggs per day (Kodric-Brown 1977). Males exhibit three different behavior techniques around mating based on size: large males maintain and defend territories, average-sized males use satellite positioning around the periphery of territories, and small males that “sneak” into territories to quickly mate with females before escaping. Pecos pupfish are opportunistic omnivores and vary their diet depending on available food sources; however, diet can be reflective of habitat, sex, and gut length. Stomach content analysis shows that Pecos pupfish consume diatom-detritus mixtures, animal material, filamentous algae, macrophytes, sand, and seeds (Service 2024e).

All currently known extant populations of the Pecos pupfish exist within or near Bitter Lake National Wildlife Refuge and Bottomless Lakes State Park, the BLM’s Overflow Wetlands, the Pecos River between Bitter Lake National Wildlife Refuge and north of Brantley Reservoir in New Mexico, and Salt Creek in Texas. The species has been extirpated from the entirety of the Pecos River south of Brantley Reservoir, and several historically occupied off-channel habitats throughout New Mexico and Texas, excluding those mentioned below. Extirpation of the Pecos pupfish from the Middle and lower Pecos River in New Mexico and Texas is attributed to introgression with sheepshead minnow. The State of Texas maintains two ponds with Pecos pupfish descended from the Salt Creek, Texas lineage in locations outside the historical range of the species. The Fort Worth Zoo has also maintained a captive population since 2000. Current monitoring methodology does not have the power to determine abundance or population trends. The Pecos pupfish species status assessment determined that, based on occurrence data, four of nine population analysis units were in high condition, three were in moderate, and two were extirpated (Service 2024e).

The best available scientific information indicates that several threats are acting on Pecos pupfish at present. These threats include introgression and hybridization with sheepshead minnow (*Cyprinodon variegatus*), loss and decline of surface and ground water, climate change and drought, and direct habitat loss and fragmentation (Service 2024e).

Pecos pupfish Critical Habitat

Critical habitat has been proposed for Pecos pupfish ([89 FR 92744](#)) The following physical and biological features are essential to the conservation of Pecos pupfish:

1. Water quality parameters that support all life stages of the Pecos pupfish, including:
 1. Absence of pollutants, or a level of contaminants low enough that it does not negatively impact necessary water quality conditions for Pecos pupfish individuals;
 2. Salinity less than 35,000 mg/L;
 3. Temperature less than 42.7 °C (108.9 °F); and
 4. Dissolved oxygen greater than 2.5 mg/L.
2. Sufficient water quantity parameters that support all life stages of the Pecos pupfish, including:
 1. Permanent water in some area of habitat; and
 2. Water depth less than 2 m (6.56 ft) deep to allow for thermal refugia and breeding.

3. Presence of silt-free underwater features such as crevices, boulders, large rocks, scattered pebbles, and aquatic plants that are used for egg deposition.
4. Absence of nonnative invasive sheepshead minnow.

Proposed critical habitat includes 136.12 river miles (219.06 river kilometers) of instream habitat (to the ordinary high water mark, not including riparian areas) and 26,555.54 acres (10,746.64 hectares) of lands that encompass numerous isolated sinkholes and wetland areas. The five areas proposed as critical habitat are: (1) Upper Pecos River Unit, New Mexico (2) Salt Creek Wilderness Unit, New Mexico (3) Bitter Lake Unit, New Mexico (4) BLM Overflow Wetlands/Bottomless Lakes Unit, New Mexico, and (5) Salt Creek Unit, Texas.

4.5.11 Peppered Chub, *Macrhybopsis tetranema*

The peppered chub was listed as endangered with critical habitat in 2022 ([87 FR 11188](#)). They are small minnows with bodies that rapidly taper to a conical head and have two distinct pairs of barbels (Service 2018c). They historically occurred in the upper Arkansas River basin in Oklahoma, Kansas, Texas, New Mexico, and Colorado but is now functionally extirpated from 94 percent of its former range (2,601 river miles) (Luttrell et al 1999, Service 2018c). Distribution is currently limited to the South Canadian River between Ute Reservoir in New Mexico and Lake Meredith in the Texas panhandle represents only 6 percent of its historical range (Service 2018c).

Habitat consisted historically of the main channels of wide, shallow, sandy bottomed rivers and larger streams of the Arkansas River basin, with peppered chubs appearing adapted for headwater areas (Service 2018c). Adults prefer shallow channels where currents flow over clean fine sand, and generally avoid calm waters and silted stream bottoms (Service 2018c). They have adaptations to tolerate the adverse conditions of the drought prone prairie streams they inhabit, including a high capacity to endure elevated temperatures and low dissolved oxygen concentrations (Service 2018c). Peppered chubs appear associated with turbid water (Service 2018c). They need a minimum length (135 miles) of un-impounded, connected river for long-term successful reproduction (Service 2018c). Peppered chub juvenile-specific habitat information is lacking, but they are assumed to share similar preferences shown by juvenile Arkansas River shiners which are associated most strongly with the presence of backwater and island habitat types, slower currents, and lower conductivity (total dissolved solids) (Polivka and Matthews 1997, Service 2018c).

Peppered chubs are members of a reproductive guild that broadcast spawns semi-buoyant eggs, which are kept suspended until hatching in flowing water (Service 2018c). Without stream flow, eggs sink to the bottom where they may be covered with silt and die (Service 2018)c. They deposit eggs broadcast into strong currents when water temperatures reach 21°C, usually between May and August (Cross and Collins 1995, Robison and Buchanan 1988, Bottrell et al. 1964, Service 2018c). After hatching, adequate stream length likewise provides the extended flow time needed by larval fish which may require strong currents to keep them suspended in the water column (Service 2018c). Fertilized eggs develop as they drift in the current and hatch 25-28 hours after fertilization (Bottrell et al. 1964, Robison and Buchanan 1988, Service 2018c). Three days after hatching young fish begin to swim with purposeful movements and to take food

(Bottrell et al. 1964, Service 2018c). Eggs could be transported 72-144 km (45-90 mi) before hatching and, depending on fry developmental rates, could be transported total distances as great as 216 km (134 mi) before becoming free-swimming juveniles (Service 2018c). Peppered chubs are generalist feeders that feed aggressively to fuel rapid growth, and have evolved for feeding in highly turbid streams (Bottrell et al. 1964, Service 2018c).

The species has experienced substantial declines in distribution and abundance due to habitat destruction and modification from stream dewatering or depletion from diversion of surface water and groundwater pumping, construction of impoundments, and water quality degradation (Service 2018c). Additional sources of stressors include development, invasive vegetation, weather conditions affected by large-scale climate, commercial bait fish harvesting, and off-road vehicle use within habitat (Service 2018c).

Peppered Chub Critical Habitat

Critical habitat was designated for the peppered chub in March 2022 ([87 FR 11188](#)) and includes 3 areas in Oklahoma, New Mexico and Texas.

The PBFs and habitat characteristics required to sustain the peppered chub life-history processes consist of a riverine system with habitat to support all life stages of peppered chub, which includes:

- Unobstructed river segments greater than 127 river miles (rmi) (205 river kilometers (rki)) in length that are characterized by a complex braided channel and substrates of predominantly sand, with some patches of silt, gravel, and cobble.
- Flowing water with adequate depths to support all life stages and episodes of elevated discharge to facilitate successful reproduction, channel and floodplain maintenance, and sediment transportation.
- Water of sufficient quality to support survival and reproduction, which includes, but is not limited to, the following conditions:
 - o water temperatures are generally less than 98.2°F (36.8°C);
 - o dissolved oxygen concentrations are generally greater than 3.7 parts per million (ppm);
 - o conductivity is generally less than 16.2 mS/cm;
 - o pH generally ranging from 5.6 to 9.0; and
 - o sufficiently low petroleum and other pollutant concentrations such that reproduction and/or growth are not impaired.
- Native riparian (riverside) vegetation capable of maintaining river water quality, providing a terrestrial prey base, and maintaining a healthy riparian ecosystem.
- A level of predatory or competitive, native or nonnative fish present such that peppered chub population's resiliency is not affected.

Within New Mexico, critical habitat includes a portion of Unit 1 of the Upper South Canadian River, also shared with Texas. Unit 1 consists of approximately 197 rmi (317 rkm) comprising a portion of the South Canadian River originating below the Ute Dam west of Logan, New Mexico, and extending downstream to the delta of Lake Meredith, Texas; and a portion of Revuelto Creek originating at the Interstate Highway 40 bridge extending downstream to the confluence with the South Canadian River, New Mexico. Revuelto Creek is an important source

of water and sediment for the Upper South Canadian River and is considered occupied. Unit 1 occurs largely within private land or land described as “other,” which is land with non-Federal ownership that could not be determined but is likely to be Tribal or private. Approximately 21 rmi (34 rkm) of adjacent lands are federally owned and managed by the National Park Service (NPS), and the Bureau of Reclamation (BOR). In addition, several small segments of public lands occur at bridge crossings, road easements, and the like. There are state own lands adjacent to approximately 9 rmi (~15 rkm). The remaining lands are in private ownership status and are adjacent to approximately 167 rmi (~268 rkm) of the unit 1 designation.

Critical habitat includes only wetted channel river width and extends beyond the Texas state border. These areas were designated as critical habitat because they provide the primary needs of peppered chub populations including a minimum, unobstructed, wide, flat, flowing river segment necessary to support development of their life history stages.

4.5.12 Razorback Sucker, Xyrauchen texanus

The razorback sucker was listed as endangered in 1991 ([56 FR 54957](#)), and has been reclassified for downlisting to threatened with a special 4(d) final rule July 17, 2026, effective August 17, 2026 ([91 FR 44756](#)). The 4(d) rule specifically tailors the incidental take exceptions for the razorback sucker to provide protective mechanisms to State and Federal partners so that they may continue certain activities that will further recovery of the species. The 4(d) rule will accommodate recovery activities such as propagation and stocking, educational display, habitat restoration, catch-and-release angling, and nonnative control efforts.

Razorback suckers have bony, dorsal keels abruptly rising posterior of the head, and a body shape that is elongate and dark brown to olive-colored, with breeding males showing bright yellow and orange (Service 2018e). Their historical range was throughout the Colorado River Basin, which encompasses parts of Arizona, California, Colorado, Nevada, New Mexico, Utah and Wyoming as well as parts of Sonora and Baja California, Mexico (Service 2018e). Currently they are present in the Upper Colorado River basin in the Green, Colorado and San Juan subbasins and Lake Powell, and in the Lower Colorado River basin in Lake Mead (and the Colorado River upstream of Lake Mead), Lake Mohave, the Colorado River between Davis and Parker dams (Lake Havasu), and the Colorado River below Parker dam (Service 2018e).

Historically, razorback sucker inhabited virtually all components of low velocity riverine habitat; backwaters, floodplains, sloughs, oxbow lakes, and other slackwater habitats within the main channel were particularly important (Holden 1973; Holden and Stalnaker 1975; Minckley 1983; Service 2018e). Seasonally submerged off-river habitats including bottomlands and other marsh-like, lowland habitats likely were important habitat for razorback sucker prior to the construction of mainstream dams (Tyus and Karp 1989; Bestgen 1990; Service 2018e). The razorback sucker is also known to complete its entire life cycle within lentic habitat types (Albrecht et al. 2010; Service 2018e).

In the Upper Colorado River riverine habitats, ripe razorback sucker have been collected from mid-April to mid-June (4-5 weeks) when temperatures reach 14-16°C and springtime flows peak (Tyus 1987; Osmundson and Kaeding 1989; Bestgen 1990; Tyus and Karp 1990; Service 2018e). In lotic environments where higher spring flows connect backwater and floodplain habitats, adult

razorback sucker have been documented moving into these areas that are typically 2-4°C warmer than main channel environments (Service 2018e). In the Upper Colorado River, spawning razorback sucker used substrate consisting largely of cobble, located in water velocities of approximately 1.0 m/s and depths of about 1 m (McAda and Wydoski 1980; Service 2018e). Spawning and egg deposition also occurs in flooded lowlands and in eddies formed at river confluences or on main-channel gravel and cobble bars (McAda and Wydoski 1980; Tyus 1987; Tyus and Karp 1990; Modde and Irving 1998; Service 2018d). Spawning activities are most frequently associated with relatively shallow, flat to gently sloping, wave-washed shoreline areas over relatively clean gravel and cobble (Mueller et al. 1998; Bestgen 1990; Service 2018e).

Adults returned annually to previously used spawning sites, but also used additional spawning sites as well. (Mueller et al. 1998). Distances and frequency of post-spawning migrations were as prevalent as pre-spawning migrations (Mueller et al. 1998). Dispersal of razorback sucker larvae from spawning bars in rivers occurs during high spring runoff flows (Service 2018d). Dispersal movements are frequent until adequate habitat is found, which varies between shallower habitats with cover during most of the year and deeper retreats during warm summer months (Kegerries et al. 2016, 2017; Service 2018e).

Larvae from lentic (standing or still-water) systems feed mainly on phytoplankton and small zooplankton, while in lotic (flowing water) systems larvae are assumed to feed largely on chironomids and other benthic insects (Minckley and Gustafson 1982; Marsh and Langhorst 1988; Bestgen 1990; Papoulias and Minckley 1990; Service 1998). Lotic adult razorback suckers consume a mixture of benthic invertebrates, algae, detritus, and inorganic materials, but there is little evidence of zooplankton consumption in rivers (Jones and Sumner 1954; Service 2018e).

Streamflow regulation and associated habitat modification were identified as primary threats to the razorback sucker at the time of listing (Service 2002b). Regulation of streamflows in the Colorado River Basin is manifested as reservoir inundation of riverine habitats and changes in flow patterns, sediment loads, and water temperatures (Service 2002b). The razorback sucker has been determined to be a threatened species due to the following threats: changes in river flows, predation, and competition with nonnative fish species. Dam installations and subsequent alterations to river flow regimes limit access to floodplain nursery habitat and reduce in-river channel complexity, such as backwaters and submerged vegetative cover needed by larval and juvenile razorback sucker. Predation of young razorback sucker by nonnative fish species is a major cause of recruitment failure throughout the basin, and some larger nonnative species are capable of consuming adults. Nonnative fishes may also hybridize and compete for food and habitat with razorback sucker ([91 FR 44756](#)).

Razorback Sucker Critical Habitat

Razorback Sucker Critical Habitat was designated in 1994 ([59 FR 13374](#)). PCEs, now PBFs for designated critical habitat are as follows:

1. Presence of known or suspected wild spawning populations, although recruitment may be limited or nonexistent.
2. Areas where juvenile razorback suckers have been collected or which could provide suitable nursery habitat (backwaters, flooded bottom lands, or coves).

3. Areas presently occupied or that were historically occupied that are considered necessary for recovery and that have the potential for reestablishment of razorback suckers.
4. Areas and water required to maintain range-wide fish distribution and diversity under a variety of physical, chemical, and biological conditions.
5. Areas that need special management or protection to insure razorback survival and recovery. These areas once met the habitat needs of the razorback sucker and may be recoverable with additional protection and management.

The Service has designed 15 reaches of the Colorado River system as critical habitat for the razorback sucker. These reaches total 2,776 km (1,724 mi) as measured along the center line of the river within the subject reaches. This represents approximately 49 percent of the historical habitat for the species. In the Upper Basin, critical habitat is designated for portions of the Green, Yampa, Duchesne, Colorado, White, Gunnison, and San Juan Rivers. Portions of the Colorado, Gila, Salt, and Verde Rivers are designated in the Lower Basin. These reaches flow through a variety of landownerships, both public and private. In New Mexico, 63 rkm (39 rmi) are designated for the razorback sucker in San Juan County into San Juan County, Utah, including the San Juan River and its 100-year flood plain from the Hogback Diversion in T.29N., R.16W., sec. 9 (New Mexico Meridian) to the full pool elevation at the mouth of Neskahai Canyon on the San Juan arm of Lake Powell in T.41S., R.11E., sec. 26 (Salt Lake Meridian).

4.5.13 *Rio Grande Silvery Minnow, Hybognathus amarus*

The Rio Grande silvery minnow was listed as endangered in 1994 ([59 FR 36988](#)). In December 2008, a special rule was published establishing a nonessential experimental population in the Big Bend reach of the Rio Grande in Texas ([73 FR 74357](#)). They are small, relatively heavy-bodied minnows, with moderately small eyes and a small, slightly oblique mouth (Pfleiger 1980; Service 2010d). They historically occupied approximately 3,862 river km (2,400 mi) of the Rio Grande (New Mexico, through Texas to the Gulf of Mexico) and in the Pecos River in New Mexico (Bestgen and Platania 1991; Service 2010d). Currently, the Rio Grande silvery minnow is known to occur only in one reach of the Rio Grande in New Mexico, a 280 km (174 mi) stretch of river from Cochiti Dam to the headwaters of Elephant Butte Reservoir (Service 2010d).

The Rio Grande silvery minnow uses only a small portion of the available aquatic habitat. In general, the species most often uses silt substrates in areas of low or moderate water velocity (e.g., eddies formed by debris piles, pools, and backwaters; Service 2010d). They are rarely found in habitats with high water velocities, such as main channel runs, which are often deep and swift (Service 2010d). Passively drifting eggs and larvae may be found throughout all habitat types (Service 2010d). During the free swimming stage, larvae almost without exception use relatively shallow areas with low or no water velocity and a fine particulate substrate (silt or silt/sand mixture) (Pease et al. 2006; Dudley and Platania 1997; Service 2010d). As they grow larger, Rio Grande silvery minnows demonstrate an overall expansion in habitat use from low velocity areas to also include moderate-velocity areas (Service 2010d). Low velocity habitats where small individuals are generally found, include backwaters, pools, and along shoreline habitats (Service 2010d). Floodplain inundation is important for the development and recruitment of silvery minnow (Valdez et al. 2019, Service 2010d).

The Rio Grande silvery minnow is a pelagic spawner (Platania 1995) that produces thousands of semi-buoyant, non-adhesive eggs that passively drift while developing (Platania and Altenbach 1998, Service 2010d). Spawning is associated with high and or increased flow events such as spring runoff or summer rainstorms, and typically occurs over a relatively brief period (1 month) in May or June (Service 2010d). Each female may produce 3 to 18 clutches of eggs in a 12-hour period. Following fertilization, the eggs drift with the current for up to 50 hours, remaining suspended in the water column during development (Platania 1995, Service 2010d). Egg hatching time is temperature dependent but rapid, generally occurring within 24-48 hours (Platania 2000, Service 2010d). Recently hatched, passively drifting larval fish remain a part of the drift by swimming vertically in the water column. Approximately four days post-spawning at 25° C, the fish begin feeding from their environment, and free-swimming is initiated (Dudley and Platania 2007, Service 2010d). Free-swimming larvae are capable of swimming horizontally and appear to actively seek low velocity habitats (Platania and Altenbach 1998). Rio Grande Silvery Minnows are herbivorous, and the presence of sand and silt in their guts suggests that epipsammic algae (algae growing on the surface of sand) is an important food (Service 2010d).

The ecological aspects of Rio Grande silvery minnow movement are not fully understood (Service 2010d). The distance traveled by recaptured fish ranged from 1.1 km (0.68 mi) to more than 25 km (15.5 mi) (Platania et al. 2003; Service 2010d). Recapture data indicates that movement was generally downstream and the majority of recaptures were within approximately 16 to 24 km (10 to 15 mi) downstream of the release site (Remshardt 2008, Service 2010d). Maximum distance traveled from release to recapture was 59.4 km (36.9 mi) downstream 300 days after release, (Remshardt 2008, Service 2010d). Large concentrations of Rio Grande silvery minnow have been found immediately downstream of diversion dams in late summer and fall and suggest that movement is occurring at this time (Remshardt 2006, Service 2010d).

Throughout much of its historic range, the decline of the Rio Grande silvery minnow is attributed primarily to destruction and modification of its habitat due to dewatering and diversion of water, water impoundment, and modification of the river (channelization) (Service 2010d). Competition and predation by introduced non-native species, water quality degradation, and other factors also have contributed to its decline (Service 2010d).

Rio Grande Silvery Minnow Critical Habitat

Rio Grande Silvery Minnow Critical Habitat was designated in 2002 ([68 FR 8088](#)). PCEs, now PBFs for designated critical habitat are as follows:

1. A hydrologic regime that provides sufficient flowing water with low to moderate currents capable of forming and maintaining a diversity of aquatic habitats, such as, but not limited to: backwaters (a body of water connected to the main channel, but with no appreciable flow), shallow side channels, pools (that portion of the river that is deep with relatively little velocity compared to the rest of the channel), eddies (a pool with water moving opposite to that in the river channel), and runs (flowing water in the river channel without obstructions) of varying depth and velocity which are necessary for each of the particular silvery minnow life-history stages; e.g., the silvery minnow requires habitat with sufficient flows from early spring (March) to early summer (June) to trigger spawning, flows in the summer (June) and

- fall (October) that do not increase prolonged periods of low or no flow; and a relatively constant winter flow (November to February), in appropriate seasons;
2. The presence of low velocity habitat (including eddies created by debris piles, pools, or backwaters, or other refuge habitat (e.g., connected oxbows or braided channels)) within unimpounded stretches of flowing water of sufficient length (i.e., river miles) that provide a variation of habitats with a wide range of depth and velocities;
 3. Substrates of predominantly sand or silt; and
 4. Water of sufficient quality to maintain natural, daily, and seasonally variable water temperatures in the approximate range of greater than 1°C (35°F) and less than 30°C (85°F) and reduce degraded water quality conditions (decreased dissolved oxygen, increased pH, etc.).

Designated critical habitat in the state of New Mexico is located in Socorro, Valencia, Bernalillo, and Sandoval Counties, which includes the area from Cochiti Reservoir downstream to the utility line crossing the Rio Grande just east of the Bosque Well as demarcated on USGS Paraje Well 7.5 minute quadrangle (1980), with the Universal Transverse Mercator (UTM) coordinates of UTM Zone 13: 311474 E, 3719722 N (as referenced with the 1927 North American Datum (NAD27)). The designation also includes the upper section of the tributary Jemez River from Jemez Canyon Dam to the upstream boundary of Santa Ana Pueblo, Sandoval County. The river reaches in the middle Rio Grande include: (i) Jemez Canyon Reach—1 mi (1.6 km) of the Jemez River immediately downstream of Jemez Canyon Dam to the upstream boundary Santa Ana Pueblo; (ii) Cochiti Diversion Dam to Angostura Diversion Dam (Cochiti Reach)—21 mi (34 km) of river immediately downstream of Cochiti Reservoir to the Angostura Diversion Dam; (iii) Angostura Diversion Dam to Isleta Diversion Dam (Angostura Reach)—38 mi (61 km) of river immediately downstream of the Angostura Diversion Dam to the Isleta Diversion Dam; (iv) Isleta Diversion Dam to San Acacia Diversion Dam (Isleta Reach)—56 mi (90 km) of river immediately downstream of the Isleta Diversion Dam to the San Acacia Diversion Dam; and (v) San Acacia Diversion Dam to the Elephant Butte Dam (San Acacia Reach)—92 mi (147 km) of river immediately downstream of the San Acacia Diversion Dam to the utility line crossing the Rio Grande just east of the Bosque Well demarcated on USGS Paraje Well 7.5 minute quadrangle (1980) with UTM coordinates of UTM Zone 13: 311474 E, 3719722 N. This includes the stream channels within the identified river reaches and areas within these reaches included within the existing levees, or if no levees are present, then within a lateral distance of 300 ft (91.4 m) on each side of the river width at bankfull stage. Bankfull stage is the flow at which water begins to leave the channel and move into the floodplain. The bankfull stage is not defined by water, and can be determined by visual or physical indicators, including: The top of the highest depositional features (e.g., point bars), staining of rocks, exposed root hairs, and other features. This designation does not include the ephemeral or perennial irrigation canals and ditches outside of natural stream channels, including the low flow conveyance channel that is adjacent to a portion of the river reach within the middle Rio Grande (i.e., downstream of the southern boundary of Bosque del Apache National Wildlife Refuge to the Elephant Butte Dam). Lands located within the exterior boundaries of the critical habitat designation (i.e., within the existing levees, or if no levees are present, then within a lateral distance of 300 ft (91.4 m) on each side of the stream width at bankfull discharge) that are not considered critical habitat and are therefore excluded by definition, include: Developed flood control facilities; existing paved roads; bridges; parking lots; dikes; levees; diversion structures; railroad tracks; railroad trestles; water diversion and irrigation canals outside of natural stream channels; the low flow

conveyance channel; active gravel pits; cultivated agricultural land; and residential, commercial, and industrial developments. The Pueblo lands of Santo Domingo, Santa Ana, Sandia, and Isleta are excluded from designation.

4.5.14 Spikedace, *Meda fulgia*

The spikedace was originally listed as threatened in 1986 ([51 FR 23769](#)), and reclassified to endangered status in 2012, along with a designation of critical habitat ([77 FR 10810](#)). Spikedace are slender and bright silver-colored on the sides of the body, with vertically-elongated, black specks. The common name alludes to the well-developed spine in the dorsal fin. Breeding males become golden (Minckley 1973, Service 1991b). 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 with, and predation by nonnative aquatic species reduced their range and abundance (Miller 1961, Lachner et al. 1970, Ono et al. 1983, Moyle et al. 1986, Propst et al. 1986). Spikedace are now restricted to 10 -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, Service 1991b, Stefferud and Reinthal 2005, Paroz et al. 2006, Propst 2007).

Spikedace live in flowing water with slow to moderate velocities over sand, gravel, and cobble substrates (Propst et al. 1986, Rinne and Kroeger 1988). Adults often aggregate in shear zones along gravel-sand bars, quiet eddies on the downstream edge of riffles, and broad, shallow areas above gravel-sand bars (Rinne and Kroeger 1988, Service 1991b). Smaller, younger fish are found in quiet water along pool margins over soft, fine-grained bottoms (Service 1991b). In larger rivers (e.g., Salt River canyon), spikedace were often observed in association with the mouths of tributaries (Service 1991b). Spikedace use shallower, strongly-flowing areas in springtime, often over sandy-gravelly substrates (Service 1991b). Spikedace are carnivores that feed mostly upon aquatic and terrestrial insects entrained in stream drift (Anderson 1978, Schreiber 1978, Barber and Minckley 1983, Propst et al. 1986, Service 1991b).

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). Spikedace breed in spring (April-June). Breeding is apparently initiated in response to a combination of stream discharge and water temperature; timing varies annually and geographically (Anderson 1978, Barber et al. 1970, Propst et al. 1986, Service 1991b). Males patrol in shallow, sandy— gravelly riffles where current is moderate (Service 1991b). Receptive females move into the area, often from up- or down-stream pools, and are approached at once by multiple males (Service 1991b). Females may be fractional spawners, with elapsed periods of a few days to several weeks between spawn events (Service 1991b).

Primary threats to spikedace include habitat alteration and destruction, introduction and spread of nonnative species, wildfire, and drought and climate change. Habitat destruction or alteration and interaction(s) with non-native fishes have acted both independently and in concert to extirpate or deplete spikedace populations (Service 1991b). Spikedace do not persist in reservoirs, and populations occupying tailwaters are subjected to impacts ranging from dewatering to altered

chemical and thermal conditions (Service 1991b). Stream channelization, bank stabilization, or other instream management for flood control or water diversion, have also directly destroyed spikedace habitats (Service 1991b).

Spikedace Critical Habitat

Spikedace critical habitat was designated in 2007 and revised in 2012 ([77 FR 10810](#)) and also includes the Loach minnow. The spikedace critical habitat designation includes 630 river miles (1,013 km) 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. PCEs, now PBFs for designated critical habitat are as follows:

1. Habitat to support all egg, larval, juvenile, and adult spikedace, which includes:
 - a. 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. 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. c. Appropriate stream habitat with a low gradient of less than approximately 1%, at elevations below 6,890 ft (2,100 m); and
 - d. 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.

Critical habitat has been designated in 8 total units in Arizona and New Mexico, three of which are in the state of New Mexico including the San Francisco Subbasin - 228.1 km (141.7 miles) of stream segments from the San Francisco River and its tributaries Tularosa River, Negrito Creek, and Whitewater Creek, the Blue River Subbasin- 106.6 km (66.3 mi) of stream segments including Pace Creek, Dry Blue Creek, Frieborn Creek, and Little Blue Creek, and the Gila River Subbasin - 258.6 km (160.7 mi) of stream segments in the Upper Gila River and five tributaries including West Fork Gila River, Middle Fork Gila River, East Fork Gila River, Mangas Creek, and Bear Creek.

4.5.15 Woundfin, *Plagopterus argentissimus*

The woundfin (*Plagopterus argentissimus*) was listed as an endangered species under the Endangered Species Conservation Act in 1970 ([35 FR 16047](#)) and subsequently under the Endangered Species Act. In 1972, woundfin were transplanted into four locations in the Gila

River system, but populations did not establish (Service 2008). In 1985, a 10(j) ruling ([50 FR 30188](#)) was established for further woundfin reintroductions in the Gila River drainage. Fish released in that drainage would be considered an experimental, nonessential population in Arizona up to the New Mexico state border, where they are considered endangered.

Historically, the woundfin occupied the Virgin River and its tributaries across Utah, Arizona, and Nevada. As of 1970, they occupied only 87.5 miles of the Virgin River, which represented 12.5% of their historic range. Recent assessments between 2000 and 2020 indicate that woundfin have been extirpated from at least 35 miles of designated critical habitat in the lower Virgin River, and their abundance has declined significantly in Utah. Currently, a viable population persists in a 16.3-mile stretch of the upper Virgin River between Ash Creek and Washington Fields Diversion (Fridell and Bennion 2019).

Currently, the only viable population of woundfin occurs within a 26.2 km (16.3 mi) reach in the upper Virgin River between Ash Creek and Washington Fields Diversion (WFD) (Fridell and Bennion 2019). Woundfin are occasionally found downstream of this reach to the confluence of the Beaver Dam Wash in Arizona, with individuals periodically captured downstream into Nevada. The sporadic distribution of woundfin in the lower Virgin River is the result of drift following good reproduction years in the upper Virgin River; however, woundfin rarely persist or reproduce in the lower Virgin River due largely to low instream flows, predation and competition from nonnative fishes (Fridell and Bennion 2019).

The primary stressors affecting the species include nonnative fish, drought, altered streamflow, water diversions, elevated water temperatures, and habitat degradation and continue to act both independently and synergistically to limit population recovery (Service 2025f).

Woundfin Critical Habitat

In 2000 critical habitat was designated for the woundfin in the occupied portion of their range in the Virgin River ([65 FR 4140](#)). The PFBs essential to the conservation of the species 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 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.

At the time of listing, woundfin occupied 140.8 kilometers (87.5 miles), which accounted for 12.5 percent of its historical range. In the past 20 years, woundfin were eliminated from at least 56.3 kilometers (35 miles) of critical habitat in the lower Virgin River in Arizona and Nevada, and abundance declined to precariously low levels in the Utah portion of the species' range (Fridell and Bennion 2019).

4.5.16 Yaqui Catfish, *Ictalurus pricei*

The Yaqui catfish (Family: *Ictaluridae*) was listed as threatened in 1984 ([49 FR 34490](#)). Yaqui catfish are bottom-dwelling omnivores representing the only known native Ictalurids west of the Continental Divide (Minckley 1973, Service 1995b, Service 2019c). They have slender bodies

that are dark gray to black dorsally and white to grayish beneath with jet-black barbels (Service 2019g). A small portion of their historic range included Arizona and New Mexico, with most of the historic range in the Yaqui, Sonora, Mayo, Fuerte, and Casas Grandes drainage basins in northwestern Mexico (Varela-Romero et al. 2011; Service 2019c). The species is extirpated from the Sonora and Casas Grandes basins and numerous drainages in the Yaqui Basin (Varela-Romero et al. 2011). Currently in the United States they are extirpated where they had been found only in the Rio Yaqui drainage, and they had been reintroduced to San Bernardino National Wildlife Refuge and West Turkey Creek in Cochise County, Arizona (Service 2019c, Service 2026d). Similarly, in Mexico, they are extirpated from much of the former range, and are also hybridizing with non-native Ictalurid species (Varela-Romero et al. 2011).

Besides basic information on habitat preferences, little is known about the biology of the Yaqui catfish, but it is thought to be similar to that of the channel catfish (Minckley 1973; [49 FR 34490](#)). Yaqui catfish are usually found in large streams in areas of medium to slow current (Butler and Wahl 2011, Service 2019d). For Ictalurid catfish species in general, rocky and woody material that provide interstitial spaces and cavities are necessary habitat components. Such features provide space for spawning, refugia from predation of younger age classes, and feeding areas for all size and age classes of Ictalurids (Daugherty et al. 2011).

Populations have been greatly reduced by habitat modifications including arroyo cutting, water diversion, impoundment construction, development of canal systems for irrigated agriculture, and excessive pumping of underground aquifers ([49 FR 34490](#)). An imminent threat to the remaining populations of Yaqui catfish is the possible release of exotic fish such as the channel catfish, which may result in intense competition and/or genetic swamping ([49 FR 34490](#)).

Yaqui Catfish Critical Habitat

Critical habitat for the Yaqui catfish was designated in 1984 ([49 FR 34490](#)). The PBFs for designated critical habitat are as follows:

- 1) Clean, small, permanent streams and spring pools without any exotic fishes;
- 2) The streams should have deep pool areas separated by riffles and flowing areas with moderate current; and
- 3) Backwater areas of stream and springs with overgrown cut banks and accumulations of detritus are necessary for feeding and shelter.

Critical habitat includes areas of Arizona in Cochise County in the Rio Yaqui drainage and all aquatic habitats of San Bernardino NWR in Douglas, Arizona. There is no critical habitat designated in the Hidalgo County portion of their range in New Mexico.

4.5.17 Zuni Bluehead Sucker, *Catostomus discobolus yarrow*

The Zuni bluehead sucker was listed as endangered in 2014 ([79 FR 43131](#)). They have torpedo-shaped bodies with a subterminal mouths, bluish heads, silvery-tan to dark green backs, and yellowish to silvery-white sides and abdomens, while breeding males have a bright red horizontal band ([79 FR 43131](#)). Their historical range included streams in east-central Arizona and west-central New Mexico ([79 FR 43131](#)). The range of this species was formerly widespread within the Little Colorado and San Juan River drainages in Arizona and New Mexico. Over the

years, the range-wide distribution of Zuni bluehead sucker has been reduced by over 90 percent and it is currently restricted to a few isolated populations ([79 FR 43131](#); Service 2020g).

Zuni bluehead sucker habitat is stream reaches with clean, perennial water flowing over hard substrate (material on the stream bottom), such as bedrock, mainly in pool and pool-run habitats (Propost and Hobbes 1996, [79 FR 43131](#)). These habitat areas were shaded with water velocities of less than 0.1 meter per second (0.3 feet per second) (Propost and Hobbes 1996). Most specimens were found in water that was 30 to 50 cm (12 to 20 in) deep with cobble, boulders, and bedrock substrate (Propost and Hobbes 1996). Pools were often edged by emergent aquatic plants and riparian vegetation (mainly willows (*Salix spp.*)) (Propost and Hobbes 1996). Bluehead suckers, including the Zuni bluehead sucker, require clean gravel substrate with minimal silt for spawning (Maddux and Kepner 1988) because silt covers eggs and leads to suffocation. Zuni bluehead sucker feed primarily on algae scraped from rocks, rubble, and gravel substrates (Sublette et al. 1990; [79 FR 43131](#)).

The principal threats to Zuni bluehead sucker habitat include water withdrawal, sedimentation, impoundments, housing development, wildfire, climate change, and nonnative predators ([79 FR 43131](#); Service 2020g). Climate change impacts include reduced water availability and higher water temperatures (Service 2020g). Degradation to watersheds occupied by Zuni bluehead sucker has occurred through excessive timber harvest, overgrazing, and road construction ([79 FR 43131](#)). Erosion, gully, headcutting (an erosional feature of some intermittent or perennial streams where an abrupt vertical drop occurs in the stream bed creating a steep riffle zone or waterfall that continues to erode upstream) continue to degrade habitat for the Zuni bluehead sucker ([79 FR 43131](#)). The species' range has been significantly reduced, and the remaining habitat and populations are threatened by above factors acting in combination to reduce the overall viability of the species (Service 2020d).

Zuni Bluehead Sucker Critical Habitat

Zuni Bluehead Sucker Critical Habitat was designated in 2016 ([81 FR 36762](#)). The PCEs, now PBFs for designated critical habitat are as follows:

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 2 m (3.3 ft), and with slow to swift flow velocities less than 0.35 m/sec (1.15 ft/sec);
 - e. Clear, cool water with low turbidity and temperatures in the general range of 2.0 to 23.0 °C (35.6 to 73.4 °F);
 - 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; and
- 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.

This includes space for individual and population growth and for normal behavior, including a variety of stream habitats, including riffles, runs, and pools, with appropriate flows and substrates, with low to moderate amounts of fine sediment and substrate embeddedness, as maintained by natural, unregulated flow that allows for periodic flooding or, if flows are modified or regulated, flow patterns that allow the river to mimic natural functions, such as flows capable of transporting sediment.

Food, water, air, light, minerals, or other nutritional or physiological requirements, including an abundant source of algae production and an aquatic insect food base consisting of caddisflies, mayflies, midges, and various terrestrial insects; streams with no harmful levels of pollutants; areas with low levels of sediment deposition; 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 subspecies may disperse when the habitat is wetted; and dynamic flows that allow for periodic changes in channel morphology.

Cover or shelter composed of streams with large rocks, boulders, undercut banks, woody debris or aquatic macrophytes. Sites for breeding, reproduction, or rearing (or development) of offspring; and gravel and cobble substrates; pool and run habitats; slower currents along stream margins with appropriate stream velocities for larvae; instream flow velocities that are less than 0.35 m/sec (1.15 ft/sec); and dynamic flows that allow for periodic changes in channel morphology. Habitats that are protected from disturbance or are representative of the historical, geographical, and ecological distributions of a species such as nondegraded habitat devoid of nonnative aquatic species, or habitat in which nonnative aquatic species are at levels that allow persistence of the Zuni bluehead sucker.

There is one critical habitat unit with two subunits and 5 stream segments totaling 20.3 km (12.6 mi). Subunit 1a is the Zuni River Unit and consists of 35.4 km (22.0 mi) along Agua Remora, Rio Nutria, Tampico Draw, and Tampico Springs in McKinley County, New Mexico. We exclude approximately 38.9 km (24.2 mi) of Subunit 1a, which was primary along the Rio Nutria on the Zuni Reservation. The land in this subunit is primarily owned by Forest Service, and private landowners with a small amount of State inholdings. At the time of listing, the Zuni bluehead sucker occupied all stream reaches in this subunit, and the subunit contains all of the physical or biological features essential to the conservation of the Zuni bluehead sucker. This unit represents the only remaining headwater spring habitats occupied by Zuni bluehead sucker. Subunit 1b, the Zuni River mainstem consists of 20.3 km (12.6 mi) of potential Zuni bluehead sucker habitat along Cebolla Creek in McKinley and Cibola Counties, New Mexico. Land within this subunit is primarily owned by private landowners, with a small amount owned by Forest Service and the State of New Mexico.

4.6 CLAMS

Species	ESA Status	Focus Page	Profile Page
Texas hornshell	Endangered	Focus Page	Profile Page

4.6.1 *Texas Hornshell, Popenaias popeii*

The Texas hornshell was listed as endangered in 2018 ([83 FR 5720](#)). It is a medium sized freshwater mussel with a dark brown to green, elongate, laterally compressed shell (Howells et al. 1996, Carman 2007, Service 2018e). The Texas hornshell historically ranged throughout the Rio Grande drainage in the United States (New Mexico and Texas) and Mexico in the Pecos River system, in the Black River in New Mexico, in the Rio Grande system from Bullis Ford, Texas to Falcon Dam, Texas, in Devils River, Las Moras Creek, and the Rio Salado, all tributaries to the Rio Grande (Howells 1999, Johnson 1999, Lang 2001, Service 2018f). As of 2018, five extant populations of Texas hornshell were known: the Black River, Pecos River, Devils River, Lower Canyons of the Rio Grande, and the Lower Rio Grande near Laredo, Texas (Service 2018f).

Adult Texas hornshell occur in medium to large rivers, generally in crevices, undercut riverbanks, travertine shelves, and under large boulders adjacent to runs (Carman 2007, Karatayev et al. 2015, Randklev et al. 2016, Randklev et al. 2017, Service 2018f). They can be found in gravel beds at the heads of riffles and rapids (Randklev et al. 2016, Service 2018f). Small-grained material, such as clay, silt, or sand, gathers in these crevices and provides suitable anchoring substrate (Service 2018f). These areas are considered to be flow refuges from the large flood events that occur regularly in the rivers this species occupies (Service 2018f). Texas hornshell are able to use these flow refuges to avoid being swept away as large volumes of water move through the system, as there is relatively little particle movement in the flow refuges, even during flooding (Strayer 1999, Service 2018f). Texas hornshell need flowing water for survival (Service 2018f). River reaches lacking continuous flow are not considered to be suitable habitat (Service 2018f). Texas hornshell are filter feeders, siphoning suspended phytoplankton and detritus from the water column (Yeager et al. 1994, Carman 2007, Service 2018f).

Males release sperm into the water column, which is taken in by the female (Service 2018f). The sperm fertilizes the eggs, which are held during maturation in an area of the gills called the marsupial chamber (Service 2018f). The developing larvae remain in the gill chamber until they mature and are ready for release (Service 2018f). Spawning generally occurs from March through August (Smith et al. 2003), and fertilized eggs are held in females for four to six weeks (Smith et al. 2003, Service 2018f).

These mature larvae, called glochidia, cannot live independently of their fish hosts (Vaughn and Taylor 1999, Service 2018f). The known primary host fishes for the Texas hornshell are river carpsucker, grey redhorse, and red shiner (Levine et al. 2012, Service 2018f). The glochidia will remain encysted for about a month through transformation to the juvenile stage (Service 2018f). Once transformed, the juveniles will excyst from the fish and drop to the substrate (Service 2018f). Juvenile freshwater mussels burrow into interstitial substrates and grow to a larger size that is less susceptible to predation and displacement from high flow events (Yeager et al. 1994,

Service 2018f). Throughout the rest of their life cycle, mussels generally remain within the same small area where they excysted from the host fish (Service 2018f).

Threats to Texas hornshell populations include habitat modification such as sediment accretion, loss of flowing water, decreased water quality, climate change, and bridge and road construction projects. Salinity has been observed to increase in the Black River, and increased drought events were observed in recent surveys. Climate change is expected to increase temperatures and increase the number of drought events, increasing potential emersion events (stranding above water) for Texas hornshell (Service 2023f). The species has also been impacted by nitrogen pollution through eutrophication, lowering dissolved oxygen levels in water, or causing algal blooms that alter habitat by covering up substrate (Hernandez et al. 2016, Service 2023f).

Texas Hornshell Critical Habitat

Texas hornshell Critical Habitat was proposed in 2021 ([86 FR 30888](#)). The PBFs are as follows:

1. A riverine system with habitat to support all life stages of the Texas hornshell, which includes:
 - a. Flowing water at rates high enough to support clean-swept substrate but not so high as to dislodge individuals;
 - b. Crevices beneath boulders, shelves, and within undercut banks with seams of fine sediment;
 - c. River carpsucker, red shiner, and gray redbreast present; and
 - d. Water quality parameters within the following ranges:
 - i. Salinity below 0.9 ppt;
 - ii. Ammonia below 0.7 mg/L;
 - iii. Low levels of contaminants; and
 - iv. Dissolved oxygen levels within substrate greater than 1.3mg/L.

Critical habitat has been proposed in 5 units in Texas and New Mexico. The Pecos Tributary unit has two subunits on public and private land; 15.6 km/9.7 miles on the Black River in southeast New Mexico and 50 km/31.1 miles on the Delaware River in both New Mexico and Texas. The remaining units are in Texas. The Pecos River unit has 137.9 km/85.7 miles of private, federal, and non-governmental organization (NGO) land. Devils River unit is comprised of 53.1 km/33 miles of federal, private, non-governmental organization's (NGO), and State land. The Rio Grande River-Lower Canyons unit has two subunits comprised of 107.3 km/66.7 miles on federal and state land in the Lower Canyons Reach and 74.8 km/46.5 km on private and federal land on the Langtry Reach. The Rio Grande-Laredo has 2 subunits of 223.2 km/138.7 miles on private, city, and tribal land on the Eagle Pass Reach and 84 km/52.2 miles of private and city land on the Laredo Reach. For actions that may adversely modify proposed critical habitat, agencies can confer, and such conferences can follow the procedures for a consultation and be adopted as such if and when the proposed critical habitat is designated.

4.7 SNAILS

Species	ESA Status	Focus Page	Profile Page
Alamosa springsnail	Endangered	Focus Page	Profile Page

Chupadera springsnail	Endangered	Focus Page	Profile Page
Koster's springsnail	Endangered	Focus Page	Profile Page
Pecos assiminea snail	Endangered	Focus Page	Profile Page
Roswell springsnail	Endangered	Focus Page	Profile Page
Socorro springsnail	Endangered	Focus Page	Profile Page

4.7.1 *Alamosa Springsnail, Tryonia alamosae*

The Alamosa springsnail was listed as endangered in 1991 with critical habitat ([56 FR 49646](#)). Distinguishing features include a conical shell that is up to 3 mm (0.1 inch) long, with well-impressed sutures separating regularly convex whorls (Service 1994). The Alamosa springsnail is endemic to central New Mexico; it is known only from a thermal spring complex in Socorro County, New Mexico (Service 1994).

Alamosa springsnails require fresh, flowing, geothermal spring water with a temperature of 17 to 28 degrees centigrade (Service 1994). Habitat elements important to continued survival of this species include a continual supply of free-flowing thermal spring water that is free of pollutants, and a zone of organic detritus and vegetation (Service 1994).

The Alamosa springsnail is found mainly in situations where minor rivulets flow out of the main channel downstream of the springhead (Taylor 1987, Service 1994). In these situations, there is a mat of watercress and filamentous green algae over water 1-2 inches deep flowing over fine gravel and sand among rhyolitic cobbles and rocks (Taylor 1987, Service 1994). The species is found in slow current on gravel and among vegetation, and is most abundant where an organic film covers the pebbles and cobbles (Service 1994). As spring runs join and form a narrow, swifter, flowing brook, snails become less numerous (Service 1994).

Few studies have been conducted on the biology of the Alamosa springsnail (Service 1994). The Alamosa springsnail is ovoviviparous, and hold a series of embryos in various stages of development (Service 1994). Because the Alamosa springsnail lives in a thermally constant environment, reproduction is probably not seasonal (NMDGF 1985, Service 1994). They are herbivorous, and feed on algae and other materials that occur in the organic film on plants and debris (Service 1994).

Any activity that would interrupt the flow of water, lessen the quantity of both the aquatic and terrestrial habitat, or degrade the water quality of inhabited habitats could threaten their existence (Service 1994). Alterations to the watersheds, springs, or associated runs could cause a reduction in water flow, change in water temperature or water quality, modify habitat or food source, thus have a devastating impact on existing populations. (Service 1994). The miniscule range of the Alamosa springsnail amplifies their vulnerable to habitat loss or alteration (Service 1994).

4.7.2 *Chupadera Springsnail, Pyrgulopsis chupaderae*

The Chupadera springsnail was listed as endangered in 2012 ([77 FR 41088](#)). The Chupadera springsnail is tiny (1.6-3.0 millimeter (mm) (0.06 to 0.12 inches (in)) long), with tan to brown shells and short, pointed spires (Taylor 1987, Service 2024f). Historically, Chupadera springsnails occurred in Willow Spring and a second, unnamed spring 0.5 kilometers (0.3 miles) north of Willow Spring, in the Rio Grande Basin at the southeast end of the Chupadera

Mountains in Socorro County, New Mexico. Currently, it occupies only Willow Spring (Service 2024d). Limited information about Chupadera springsnail habitat, reproduction, and behavior is available (Service 2024f). Where specific details are lacking, we provide information on other *Pyrgulopsis* species (Service 2024f).

Chupadera springsnails need constantly flowing water, adequate water quality, rigid substrates, and aquatic vegetation to survive and complete their life cycles (Service 2024f). Many springsnail species are more abundant near the springhead (Hershler 1984, Hershler and Sada 2002, Martinez and Thome 2005), indicating that springsnails likely require stable water chemistry and flow regime provided by the spring (Service 2024f). Generally, habitats with coarse substrates, high vegetation density, shallow water depth, and low-velocity flows are suitable for this genus (Malcolm et al. 2005, Service 2024f). Chupadera springsnails adhere to the underside of the cobble and other large debris within the water. Species of *Pyrgulopsis* likely depend on rigid substrates to provide suitable surfaces for egg-laying and juvenile dispersal (Hershler 1998; Hershler & Sada 2002, Service 2024f). These coarse substrates usually exist within aquatic systems with higher water velocities and a steep gradient (Malcolm et al. 2005), such as on the hillside at Willow Spring (Service 2024f). *Pyrgulopsis* appear more abundant in habitats with high vegetation density and shallow water depth (Malcolm et al. 2005; Service 2024f).

The Chupadera springsnail reproduces sexually using internal fertilization. They likely reproduce continuously throughout the year, depending on water temperature (Service 2024f). *Pyrgulopsis* females lay single small eggs, one at a time, on a hard surface (Hershler 1998, Service 2024f). Juvenile snails develop in their eggs and emerge with their shells fully formed (Service 2024f). It takes approximately six weeks for other species of *Pyrgulopsis* to develop from juvenile to adult (Pearson et al. 2014, Service 2024f). Once they hatch, juvenile snails have similar habitat needs to adult snails (Hershler & Sada 2002, Service 2024f). Species of *Pyrgulopsis* feed on plants and detritus within aquatic ecosystems (Service 2024f).

Because of their small size and dependence on water, springsnails do not disperse from one habitat to another without assistance ([77 FR 41088](#), Service 2024f). We assume Chupadera springsnails do not readily colonize new spring systems or expand their range across the desert matrix. Some aquatic snails can disperse rather quickly when there is flowing water and adjacent habitat (Service 2024f). However, the Chupadera springsnails at Willow Spring population exist within a matrix of dry, arid grassland habitats that are not conducive to natural springsnail dispersal. (Service 2024f).

Degradation and loss of aquatic and riparian habitats are significant threats to the persistence of the Chupadera springsnail (Service 2024f). Under climate change scenarios, drought and changes in precipitation regime increase the risk that flowing water does not remain permanent, which would reduce or eliminate habitat and the resiliency of the Chupadera springsnail at Willow Spring (Service 2024f). Because of their dependence on groundwater in arid landscapes, springsnails are vulnerable to both groundwater and surface habitat perturbations (Hershler et al. 2014; Service 2024f).

Chupadera Springsnail Critical Habitat

Chupadera springsnail Critical Habitat was designated in 2012 ([77 FR 41088](#)). PCEs, now PBFs for designated critical habitat are as follows:

1. Unpolluted spring water (free from contamination) emerging from the ground and flowing on the surface;
2. Periphyton (an assemblage of algae, bacteria, and microbes) 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. Nonnative species either absent or present at low population levels.

Critical habitat has been designated in two units in Socorro County, New Mexico. Willow Spring unit is 0.5 ha (1.4 ac) on private land, and Unnamed Spring unit, 0.2 ha (0.5 ac) also on privately owned land.

4.7.3 *Koster's Springsnail, Juturnia kosteri*

The Koster's springsnail was listed as endangered in 2005 ([70 FR 46304](#)). Koster's springsnail shell lengths are <4.56 mm (0.18 in), and operculum color is used to differentiate them from Roswell springsnail (Taylor 1987, Morningstar et al. 2014, Service 2019d). They are associated with spring systems among the arid grasslands in the Roswell Basin of southeastern New Mexico (Service 2019d). Koster's springsnail was historically known from Bitter Lake National Wildlife Refuge throughout Bitter Creek, Sago Springs, the Unit 3 spring ditch, Unit five and six, and North Spring on the Roswell Country Club (Taylor 1987, Service 2019d). The recent distribution of Koster's springsnail appears to be restricted to Bitter Lake National Wildlife Refuge and at a location found on City of Roswell property near the BLNWR boundary (Warrick 2005, Service 2019d).

They require clean, permanently flowing spring water that derives from regional groundwater that may originate at depths and distances far from their protected habitat (Service 2019d). They need algae, detritus, and bacteria associated with native vegetation and natural spring and seep systems (Service 2019d). Habitat of Koster's springsnail consists of soft substrates of springs and seeps (i.e., on deep organic substrates as opposed to hard, gypsum substrate) (Taylor 1987, Service 2019d).

Little is known about the specific reproductive characteristics of Koster's springsnail (Service 2019d). The following is based largely on characteristics known from other species within the genus (Service 2019d). The species breeds seasonally from March through September (NMDGF 1998, Service 2019d). They produce eggs that hatch in the body of a parent, usually the female, with serial production of live young as opposed to broods (Service 2019d). Thus, population recruitment is continuous throughout the breeding season (Service 2019d). Freshwater gastropods are chiefly vegetarian, consuming primarily algae, bacteria, and fungi from submerged surfaces (Service 2019d).

Predominant threats to these invertebrates include diminished water quantity due to groundwater pumping and drought (which lowers aquifer levels and subsequently reduces outflow from springs and seeps), and water quality contamination, and climate change ([Service 2019d](#)).

Koster Springsnail Critical Habitat

Koster springsnail Critical Habitat was designated in 2011 ([76 FR 33036](#)). PCEs, now PBFs for designated critical habitat are as follows:

1. Have permanent, flowing water with no or no more than low levels of pollutants;
2. Have slow to moderate water velocities;
3. Have substrates ranging from deep organic silts to limestone cobble and gypsum;
4. Have stable water levels with natural diurnal (daily) and seasonal variations;
5. Consist of fresh to moderately saline water;
6. Vary in temperature between 50-68 °F (10-20 °C) with natural seasonal and diurnal variations slightly above and below that range; and
7. Provide abundant food, consisting of:
 - a. Algae, bacteria, and decaying organic material; and
 - b. Submergent vegetation that contributes the necessary nutrients, detritus, and bacteria on which these species forage.

Critical habitat is designated into two areas in the state of New Mexico for both Koster's and Roswell springsnail, the Sago/Bitter Creek Complex and the Springsnail/Amphipod Impoundment Complex. These units total 70.2 ac (28.4 ha) on land owned by the Service (31.9 ac, 12.9 ha and 35.5, ac, 14.3 ha, respectively), and 2.8 ac, 1.1 ha of land owned by the City of Roswell.

4.7.4 Pecos Assiminea Snail, *Assiminea pecos*

The Pecos assiminea snail was listed as endangered in 2005 ([70 FR 46304](#)). The species is a very small, golden snail, and the eyes occur instead in the tips of short eye 4 stalks (Service 2019d). The Pecos assiminea snail was historically distributed on Bitter Lake National Wildlife Refuge in New Mexico, Diamond Y Spring in Pecos County, Texas, and in the Bolsón de Cuatro Ciénegas, Coahuila, Mexico (Taylor 1987, Service 2019d). Currently, Pecos assiminea occurs at Diamond Y Spring Preserve in Pecos County, Texas (NMDGF 2000), at East Sandia Spring in Reeves County, Texas (NMDGF 2000), and on Bitter Lake National Wildlife Refuge in New Mexico (Lang 2002, Roesler 2016, Service 2019d). Pecos assiminea likely forage on live and dead vegetation and coarse organic matter, upon which they probably consume bacteria, detritus, fungi, and algae (NMDGF 2000, Service 2019d).

Within karst formations, they are found in isolated limestone and gypsum springs, seeps, and wetlands located in and around Roswell, New Mexico, and in Pecos and Reeves Counties, Texas (Service 2019d). They require clean, moist habitats, mud or vegetation very close to flowing water (Service 2019d). They need algae, detritus, and bacteria associated with native vegetation and natural spring and seep systems (Service 2019d). Habitat of Pecos assiminea includes moist earth beside seepages or springbrooks, never beside standing water, and occurs beneath salt grass or sedges, less often on exposed surfaces (Taylor 1987, Service 2019d). They are closely

associated with wetland habitats characterized by soils saturated at the surface and vegetation (Lang 2002, Service 2019d). The snail typically occurs near the surface of the soil beneath litter and vegetation in these habitats (Service 2019d).

Specific breeding and reproductive characteristics of Pecos assiminea have not been studied (Service 2019d). The following discussion is based largely on characteristics known from other species within the genus (Service 2019d). Pecos assiminea fertilize internally (Service 2019d). Eggs are likely deposited in gelatinous masses, as is characteristic of most mesogastropod snails (Barnes 1980; Service 2019d). Some gastropods may reach sexual maturity in as little as six months (Barnes 1980); however nothing is known about specific development in Pecos assiminea (Service 2019d). Similarly, nothing is known about the seasonality, frequency of breeding, fecundity, or other aspects of reproduction of Pecos assiminea (Service 2019d). Little is known about factors regulating population size of Pecos assiminea (Service 2019d). Fluctuating surface water levels and winter freezing of inundated areas appear to limit population size and possibly persistence of the species (NMDGF 2000, Service 2019d).

The primary threats to these invertebrates are diminished water quantity due to groundwater pumping and drought (which lowers aquifer levels and subsequently reduces outflow from springs and seeps), and water quality contamination; secondary threats include inadequate existing regulatory mechanisms, localized range, limited mobility, fragmented habitat, and climate change, and tertiary threats may include invasive species, disease, and predation (Service 2019d). Removal of vegetative cover by burning in habitats of Pecos assiminea has been suggested as an important factor in decline or loss of populations (Taylor 1987; Service 2019d). Complete combustion of vegetation and litter, high soil temperatures during fire, or extensive vegetation removal resulting in soil and litter drying, may eliminate populations and render habitat unsuitable (Service 2019d)

Pecos Assiminea Snail Critical Habitat

Pecos assiminea snail critical habitat was designated in 2011 ([76 FR 33036](#)). PCEs, now PBFs for designated critical habitat are as follows:

1. That consists of wet mud or occurs beneath mats of vegetation;
2. That is within 1 in (2 to 3 cm) of flowing water;
3. That has native wetland plant species, such as salt grass or sedges, that provide leaf litter, shade, cover, and appropriate microhabitat;
4. That contains wetland vegetation adjacent to spring complexes that supports the algae, detritus, and bacteria needed for foraging; and
5. That has adjacent spring complexes with:
 - a. Permanent, flowing, fresh to moderately saline water with no or no more than low levels of pollutants; and
 - b. Stable water levels with natural diurnal and seasonal variations.

A total of 494.7 ac (200.2 ha) of critical habitat has been designated for the Pecos assiminea in 4 areas, 31.9 ac (12.9 ha) in the Sago/Bitter Creek Complex owned by the Service, 15.5 ac (6.3 ha) owned by the Service and 2.8 ac (1.1 ha) owned by the City of Roswell in the Assiminea Impoundment Complex in the State of New Mexico; and 441.4 ac (178.6 ha) in the Diamond Y

Springs Complex and 3 ac (1.2 ha) in the East Sandia Spring Complex owned by the Nature Conservancy in the State of Texas.

4.7.5 *Roswell Springsnail, Pyrgulopsis roswellensis*

The Roswell springsnail was listed as endangered in 2005 ([70 FR 46304](#)). Roswell springsnail shell lengths are less than 3.8 mm (0.15 in) with four to five whorls, and operculum color is used to differentiate them from Koster's springsnail (Hershler 1994; Taylor 1987; Morningstar et al. 2014; Service 2019d). Like Koster's springsnail, they are associated with spring systems among the arid grasslands in the Roswell Basin of southeastern New Mexico (Service 2019d). The Roswell springsnail historically occurred within Chaves County in Unit 6 and Unit 7 of Bitter Lake National Wildlife Refuge spring ditches, Sago Springs in the North Spring on the Roswell Country Club, and in the Berrendo River (Taylor 1987; Service 2019d). Current distribution of Roswell springsnail appears to be restricted to Bitter Lake National Wildlife Refuge and at a City of Roswell property near the refuge (Sanchez 2009; Service 2019d).

They require permanent, flowing water (Service 2019d). They need algae, detritus, and bacteria associated with native vegetation and natural spring systems (Service 2019d). Roswell springsnails have been observed to be most abundant on hard, gypsum substrate in Sago Springs outflow channels and pools (NMDGF 1998, Service 2019d).

Specific breeding and reproductive characteristics of the Roswell springsnail has not been studied (Service 2019d). The following is based largely on characteristics known from other species within the genus (Service 2019d). The species breeds seasonally from March through September (NMDGF 1998, Service 2019d). Unlike most hydrobiid snails that lay eggs in adhesive masses, Roswell springsnails produce eggs that hatch in the body of a parent, usually the female, with serial production of live young as opposed to broods (Service 2019d). Thus, population recruitment is continuous throughout the breeding season (Service 2019d). Freshwater gastropods are chiefly vegetarian, consuming primarily algae, bacteria, and fungi from submerged surfaces (Service 2019d).

Predominant threats to these aquatic invertebrates include diminished water quantity due to groundwater pumping and drought (which lowers aquifer levels and subsequently reduces outflow from springs and seeps), and water quality contamination, and climate change (Service 2019d).

Roswell Springsnail Critical Habitat

Roswell springsnail critical habitat was designated in 2011 ([76 FR 33036](#)). PCEs, now PBFs for designated critical habitat are as follows:

1. Have permanent, flowing water with no or no more than low levels of pollutants;
2. Have slow to moderate water velocities;
3. Have substrates ranging from deep organic silts to limestone cobble and gypsum;
4. Have stable water levels with natural diurnal (daily) and seasonal variations;
5. Consist of fresh to moderately saline water;

6. Vary in temperature between 50-68 °F (10-20 °C) with natural seasonal and diurnal variations slightly above and below that range; and
7. Provide abundant food, consisting of:
 - a. Algae, bacteria, and decaying organic material; and
 - b. Submergent vegetation that contributes the necessary nutrients, detritus, and bacteria on which these species forage.

Critical habitat is designated into two areas in the state of New Mexico for both Koster's and Roswell springsnail, the Sago/Bitter Creek Complex and the Springsnail/Amphipod Impoundment Complex. These units total 70.2 ac (28.4 ha) on land owned by the Service (31.9 ac, 12.9 ha and 35.5, ac, 14.3 ha, respectively), and 2.8 ac, 1.1 ha of land owned by the City of Roswell.

4.7.6 *Socorro Springsnail, Pyrgulopsis neomexicana*

The Socorro springsnail was listed as endangered in 1991 without critical habitat ([56 FR 49646](#)). The Socorro springsnail has an elongate-ovate conical shell that is light tan, short-spined, and up to 2.5 millimeters (mm) (0.1 inch) in length (NMDGF 1985, Service 1994). Currently, the Socorro springsnail is known from only one spring in Socorro County, New Mexico (Service 1994). The species has also been reported from other springs in Socorro County (Landye 1981), although there is disagreement on whether the species historically occurred in those springs (Taylor 1987, Service 1994).

Socorro springsnails require fresh, flowing, geothermal spring water with a temperature of 17 to 28 degrees centigrade (Service 1994). Habitat elements important to continued survival of this species include a continual supply of free-flowing thermal spring water that is free of pollutants, and a zone of organic detritus and vegetation (Service 1994).

The principal spring source where the Socorro springsnail is currently found has been impounded, which reduced the flowing-water habitat to a very small pool (less than 1 m² in area) (Service 1994). The species was observed to be abundant on rootlets in this pool. They have also been found to occupy the outflow channel that runs about 2.5 meters (8 feet) to an irrigation ditch (Service 1994). They are not found in the ditches and pools radiating from the spring into irrigation structures (Service 1994).

Few studies have been conducted on the biology of the Socorro springsnail (Service 1994). The Socorro springsnail is oviparous, and probably lays its eggs in spring and summer (Service 1994). They are herbivorous, and feed on algae and other materials that occur in the organic film on plants and debris (Service 1994).

Any activity that would interrupt the flow of water, lessen the quantity of both the aquatic and terrestrial habitat, or degrade the water quality of inhabited habitats could threaten their existence (Service 1994). Alterations to the watersheds, springs, or associated runs could cause a reduction in water flow, change in water temperature or water quality, modify habitat or food source, thus have a devastating impact on existing populations. (Service 1994). The miniscule range of the Socorro springsnail amplifies their vulnerability to habitat loss or alteration (Service 1994).

4.8 CRUSTACEANS

Species	ESA Status	Focus Page	Profile Page
Noel's amphipod	Endangered	Focus Page	Profile Page
Socorro isopod	Endangered	Focus Page	Profile Page

4.8.1 *Noel's Amphipod, Gammarus desperatus*

Noel's amphipod was listed as endangered in 2005 ([70 FR 46304](#)). Males range in size from 9.45 to 14.8 millimeters (mm) (0.37 to 0.58 in) while females are 8.5 to 12.6 mm (0.34 to 0.50 in) long (Cole 1988, Service 2019d). Noel's amphipods are associated with spring systems among arid grassland in the Roswell Basin in southeastern New Mexico (Service 2019d). They were historically known from Lander Springbrook, a tributary of the South Spring River near Roswell (Noel 1954), North Spring on the Roswell Country Club (Cole 1988), and from Bitter Creek (Lost River) on Bitter Lake National Wildlife Refuge (Cole 1988, Service 2019d). Noel's amphipod currently persists on Bitter Lake National Wildlife Refuge at the Snail Unit and the Sago Springs complex (Service 2019d).

Noel's amphipods require permanent, flowing water associated with natural spring and seep systems (Service 2019d). They depend on regional groundwater that often originates at depths and distances far from the occupied habitat (Service 2019d). Gammarid amphipods typically are found in shallow, cool, well-oxygenated waters of small streams, ponds, ditches, sloughs, and springs (Holsinger 1976, Smith 2001, Service 2019d). Typically, amphipods are found beneath stones and in aquatic vegetation during daylight hours (Smith 2001, Service 2019d). Noel's amphipod was found mainly on rubble and rubble-sand substrate at Lander Springbrook and less frequently on silt substrate or vegetation (Noel 1954, Service 2019d).

Specific breeding and reproductive characteristics of Noel's amphipod have not been studied extensively (Service 2019d). The following discussion is based largely on characteristics known from other species within the genus (Service 2019d). Most amphipods breed between February and October (Smith 2001; Service 2019d). Gammarus males and females pair for one to seven days, feeding and swimming together prior to copulation which lasts less than 1 minute (Smith 2001; Service 2019d). Fertilized eggs are retained in the female's brood pouch, or marsupium, where they incubate for 1 to 3 weeks (Smith 2001, Service 2019d). Young remain in the marsupium for another 1 to 8 days before being released (Smith 2001, Service 2019d). The breeding season for Noel's amphipod is likely from February through October and is dependent on water temperature. Most amphipods live 1 year or less (Smith 2001, Service 2019d). Seasonal or long-term movements of amphipods have been reported, indicating that, in intact ecosystems, hydrologically connected habitats may be recolonized following local extirpation (Smith 2001, Service 2019d). Noel's amphipod is generally found in beds of submerged aquatic plants and detritus, which indicates that they probably browse on a surface film of algae, diatoms, bacteria, and fungi (Smith 2001, Service 2019d).

The primary threats to these invertebrates are diminished water quantity due to groundwater pumping and drought (which lowers aquifer levels and subsequently reduces outflow from springs and seeps), and water quality contamination; secondary threats include inadequate existing regulatory mechanisms, localized range, limited mobility, fragmented habitat, and

climate change, and tertiary threats may include invasive species, disease, and predation (Service 2019d).

Noel's Amphipod Critical Habitat

Noel's Amphipod Critical Habitat was designated in 2011 ([76 FR 33036](#)). PCEs, now PBFs for designated critical habitat are as follows:

1. Have permanent, flowing water with no or no more than low levels of pollutants;
2. Have slow to moderate water velocities;
3. Have substrates including limestone cobble and aquatic vegetation;
4. Have stable water levels with natural diurnal (daily) and seasonal variations;
5. Consist of fresh to moderately saline water;
6. Have minimal sedimentation;
7. Vary in temperature between 50-68 °F (10-20 °C) with natural seasonal and diurnal variations slightly above and below that range; and
8. Provide abundant food, consisting of:
 - a. Submergent vegetation and decaying organic matter;
 - b. A surface film of algae, diatoms, bacteria, and fungi; and
 - c. Microbial foods, such as algae and bacteria, associated with aquatic plants, algae, bacteria, and decaying organic material.

Critical habitat is designated into three areas in the state of New Mexico for the species, the Sago/Bitter Creek Complex, the Springsnail/Amphipod Impoundment Complex, and the Rio Hondo units. These units total 70.2 ac (28.4 ha) on land owned by the Service and the City of Roswell, 31.9 ac, 12.9 ha of Service land are in the Sago/Bitter Creek complex, 35.5, ac, 14.3 ha are in the Springsnail/Amphipod Impoundment Complex, and 5.8 ac (2.3 ha) are in the Rio Hondo unit. 2.8 ac, 1.1 ha of land are in the Springsnail/Amphipod Impoundment Complex on land owned by the City of Roswell.

4.8.2 Socorro Isopod, *Thermosphaeroma thermophilus*

The Socorro isopod was listed as endangered in 1978 without critical habitat designation ([43 FR 12690](#)). The species is a crustacean in the order *Isopoda* (pillbugs, sow bugs), family *Sphaeromatidae*. The Socorro isopod was originally described as *Sphaeroma thermophilum* in 1897 (Richardson 1897). Richardson subsequently moved the species to the genus *Exosphaeroma* in 1905. Cole and Bane (1978) reviewed the genus while describing a new species and determined that some of the species that were included in *Exosphaeroma*, including *E. thermophilum*, did not conform to the generic description. Consequently, they described a new genus, *Thermosphaeroma*, which now includes *T. thermophilum* and seven other species (Cole and Bane 1978, Bowman 1981, Bowman 1985, Schotte 2000). It should be noted that both the generic (*Exosphaeroma*) and specific epithet (*thermophilus*) in the Final Rule listing ([43 FR 12690](#)) the Socorro isopod were misspelled.

The Socorro isopod is native to a single, thermal spring in Socorro, New Mexico. The native spring, known as Sedillo spring, was converted into a bathhouse in the early 1900s, known as the “Evergreen” facility, and is now abandoned (Shuster 1981). The Socorro isopod can still be found in the remains of the bathhouse structures (Trujillo pers. comm. 2021). However, the natural habitat does not exist, and we know little about the specific conditions in which the

species evolved. Nearly all isopods in the family Sphaeromatidae inhabit marine or brackish waters. It is hypothesized that the ancestors of *Thermosphaeroma* inhabited the marine waters that once covered most of central and eastern Mexico, Texas, and New Mexico during the middle to late Mesozoic. As the water receded, the ancestral sphaeromatids were stranded in isolated bodies of water. The confinement to hot springs and evolution into several species (eight described thus far) is probably a recent event (Bowman 1981). *Thermosphaeroma* species occupy small, isolated thermal springs in the Chihuahuan Desert in New Mexico, Texas, and Mexico (Chihuahua, Durango, Aguascalientes). Bowman (1981) hypothesizes that the isopods have been successful in hot springs because of reduced competition and predation from aquatic insects, which are more abundant and prevalent in temperate waters.

Thermosphaeroma thermophilum is the most northern representative of *Thermosphaeroma*. The type locality for the species is Sedillo Spring, a warm spring west of Socorro, New Mexico. Much of the flow from Sedillo Spring was diverted into a spa referred to as “Evergreen” historically. The bathhouse was abandoned in the mid-1970s, although a small flow from the spring remained to supply irrigation water. The isopod is restricted to the remains of this plumbing system supplied with water from Sedillo Spring, which originates a few hundred feet away; consequently, the water quality and thermal characteristics are retained. A flow of five gallons per minute is transmitted from Sedillo Spring through the old plumbing system, maintaining the “natural” habitat of the species. It is estimated that Sedillo Spring originally had a flow of 151 – 172 gallons per minute. It is unknown if the Socorro isopod once occupied two adjacent thermal springs, Cook and Socorro Springs. Cook, Socorro, and Sedillo Springs are located about three miles west of Socorro, New Mexico and are capped for municipal and private water supply, eliminating the original habitat. In addition to the natural habitat, the Socorro Isopod Propagation Facility was built in 1992. The facility is located near the native habitat on property owned by the city of Socorro. Two parallel artificial streams, each with four cement tanks, provide additional habitat for the isopod. Backup populations are also maintained at the Albuquerque Biological Park, Northern Arizona University, and New Mexico Department of Game and Fish facilities in Santa Fe, New Mexico. Field and laboratory data indicate that the life span of the Socorro isopod is one year or less (Shuster 1981a). There is marked sexual dimorphism; males are much larger than females. In monthly samples collected from March 1978 to February 1979, the mean size of males ranged from 13.9 – 26.7 mm², while mean female size ranged from 8.5 mm² – 15.4 mm² (Shuster 1981a). Sex ratio over the same time frame was consistently biased towards males and ranged from 1.2 – 5.5 (Shuster 1981a). Females are iteroparous and breed throughout the year, although peaks in reproduction occur in the spring and fall. Males guard females prior to copulation, through the molting period. Gestation lasts approximately three weeks as fertilized eggs and developing young are retained in the female’s marsupium (Lang 1998). Larger, older females have larger broods. Up to three broods of 3 – 20 individuals are produced. Juveniles (manicas) reach sexual maturity within 6 – 8 weeks, with males growing faster and maturing faster than females (Shuster 1981a, b). Two types of feeding behavior have been observed in the field: grazing on vegetative matter (the thin film of blue-green that covers most surfaces within the pool or organic debris that falls into their habitat) and predatory feeding frenzies (Shuster 1981a). Feeding frenzies occurred when 10 – 30 isopods attacked an injured isopod, an apparently healthy isopod, or an insect larva. Cannibalism has been observed, with males more cannibalistic than females but both sexes and life stages (juvenile and adult) cannibalizing to some degree, even in the presence of alternative food (Shuster 2005). Shuster (1981a) suggested food in the pools was most likely limiting based on

the cannibalistic behavior and the fact that species richness in the spring was very limited, unlike many spring ecosystems. The Socorro isopod is native to a single, thermal spring in Socorro, New Mexico. The native spring, known as Sedillo spring, was converted into a bathhouse in the early 1900s, known as the “Evergreen” facility, and is now abandoned (Shuster, 1981). The Socorro isopod can still be found in the remains of the bathhouse structures (Trujillo pers. comm. 2021). However, the natural habitat does not exist, and we know little about the specific conditions in which the species evolved. The Socorro Isopod Propagation Facility (SIPF) contains two runs of artificial pools that are separated into the North and South series. Gene flow is possible within each series, but there is probably no gene flow between north and south. We refer to the constructed habitat features associated with the “Evergreen” water system and the SIPF as “natural” sites since they are sustained by warm water piped from Sedillo spring and all sites contain similar constructed habitat features (Service 2019b). There is no natural gene flow between the SIPF and Sedillo spring (Bleakley et al. 2013). Between 2013 and 2014, populations of Socorro isopods were sampled almost monthly (NMDGF, 2014). Annual surveys were then conducted in 2015 and 2016. All populations were stable between 2013 and 2016 (NMDGF 2013, NMDGF 2014, NMDGF 2016). Socorro isopod populations have been sampled bi-annually for the past three years. Each population has contained all life stages; males, females, adults, and mancas (juveniles) (NMDGF 2019, NMDGF 2020, NMDGF 2021a). At the Socorro Isopod Propagation Facility (SIPF), isopods have been present in all pools during survey efforts (NMDGF 2020). Demographics in the pools at the SIPF have changed over the past 12 years. In 2009, Department found that mancas were the most common life stage (NMDGF 2009). Recent surveys have shown a more even distribution between males, females, and mancas (NMDGF 2021a). Density of the species at the Sedillo spring in 2020 was 3040 isopods/m² (NMDGF 2021a). At the SIPF, density in the North pools averaged 333 isopods/m², and density in the South pools averaged only 42 isopods/m² (NMDGF 2021a). It is possible that predation and substrate structure have affected population density at these sites (Trujillo pers. comm. 2021). Recent studies have removed individuals from all populations for scientific purposes (Jones and Berg, 2020). These experiments have not affected the status of the Socorro isopod, and numbers remain stable within all populations (NMDGF 2021a). Data from these experiments have led to a greater understanding of the biology of the species, thus enabling our ability to better conserve and recover the Socorro isopod. There is also an extant, captive population of Socorro isopods at the Albuquerque BioPark (ABP) (NMDGF 2021a). The ABP contains 5 large tanks, with approximately 300 individual isopods between all tanks. These populations are self-sustaining and continually reproduce (Ward pers. comm. 2021). Sedillo spring, the SIPF, and the ABP comprise the three extant populations of the Socorro isopod. Socorro isopods breed throughout the year, and populations are structured by both age and size (NMDGF 2019). All isopod populations appear to be healthy during recent bi annual studies (NMDGF 2020).

In 2020, tree roots began to occlude the outflow to the SIPF facility. This has caused water to back up into the pools within areas of the SIPF. Standing water temporarily degraded the mesh screens which protect the pools from external threats such as predatory dragonflies. Screens were repaired and replaced by Service and Department biologists, and plans are underway to construct permanent structures (NMDGF 2021b). There have been several contaminations and dewatering events that have resulted in local extirpations at the SIPF and Sedillo spring. In both cases, the species was successfully repatriated from captive populations. The species remains vulnerable to changes that effect water flow and quality within suitable habitat (NMDGF 2019). When flooding degraded the structures protecting the SIPF in 2020, predatory dragonfly (order

Odonata) larvae colonized the south run at the SIPF, reducing the density of Socorro isopods at that site. Dragonflies were manually removed, and protective structures were repaired. It is imperative that dragonflies do not colonize either run at the SIPF in the future (NMDGF 2021a). Socorro isopods are subject to many perturbations that puts this species at risk of extinction. The geologic stability of the area surrounding Sedillo spring is not well understood (NMDGF, 2019). The NMDGF (2013) identified perlite mining as a possible threat to the long-term geologic stability of the Socorro thermal area – including Sedillo spring and the SIPF. Explosive forces could affect the ground water supply in the area. Changes in stream discharge has locally extirpated the Socorro isopod before (Service 2009). However, the exact effect of local mining on the Socorro isopod's habitat remains undetermined (NMDGF 2013).

4.8.3 *Gypsum Wild-buckwheat, Eriogonum gypsophilum*

The Gypsum wild-buckwheat was listed as threatened in 1981 ([46 FR 5730](#)). It is a small erect herbaceous perennial 1.2-2 dm high, and flowers are yellow, 1-1.7 mm long, with finely white-pubescent along the midribs and bases (Reveal 1976, Service 2022g). Currently, all four known populations of Buckwheat occur in Eddy County in southeastern New Mexico (Service 2022g).

Gypsum wild-buckwheat is an endemic, edaphic specialist that occupies erosive gypsum exposures along tributaries to the Pecos and Black rivers in Eddy County, New Mexico (Knight 1993; Service 2022g). Buckwheat is a gypsophile that depends on broad, gently to moderately sloping, slightly erosional escarpments or hills of hypergypsic, slightly alkaline, loose, moderately developed clay soils containing adequate soil moisture—possibly including hydrated gypsum (water of crystallization)—and soil nutrients for survival and recruitment (Service 2022g). Areas known to be occupied lie adjacent to riparian corridors and near (within approximately 3 km (1.8 mi) of springs in the Chihuahuan Desert ecoregion (Service 2022g). Canopy cover is low and sparse (Service 2022g). Known populations occur where elevations range from 990 to 1090 m (3,240 to 3,580 ft) (Service 2022g).

Buckwheat branches underground, and it is a biologically unique plant which may consist of several genetically identical shoots or branches (Service 2022g). The growing season starts by early April and extends to late-October (Service 2022g). Buckwheat leaves out by late March, sets flower buds starting in mid-April, begins flowering by late April, and blooms fully after mid-May. Seeds ripen beginning in late June, are typically at peak ripeness in early-July, and have mostly dispersed by late-July (Spurrier 1989, Service 2022g). Seedling emergence is presumed to occur infrequently, starting in mid-April and extending throughout the growing season (Service 2022g). Buckwheat pollination success is more likely to depend on a diverse community of pollinators than on a single, specialized pollinator (Service 2022g). Buckwheat seedling establishment occurs whenever infrequent climatic episodes suitable for seed germination and seedling establishment occur during the growing season (Spellenberg 1977, Knight 1993, Service 2022g).

The primary stressors that influence buckwheat's viability include habitat degradation and climate change (Service 2022g). Significant causes of buckwheat habitat degradation include surface disturbance resulting in decreased soil stability, soil compaction, hydrological alteration, exposure to hazardous substances, and edge effects resulting from habitat fragmentation (Service 2022g).

Gypsum Wild-buckwheat Critical Habitat

Gypsum wild-buckwheat critical habitat was designated in 1981 ([46 FR 5730](#)). Critical habitat for the species includes 130 acres in New Mexico where the species was known to occur. This area is public land administered by the Bureau of Land Management. In the future, adjacent suitable habitat may be included as essential to the conservation of these species, because it is necessary to provide areas for proper management, reintroduction, and natural expansion.

4.9 INSECTS

Species	ESA Status	Focus Page	Profile Page
Monarch butterfly	Proposed Threatened	Focus Page	Profile Page
Sacramento Mountains checkerspot butterfly	Endangered	Focus Page	Profile Page
Silverspot butterfly	Endangered	Focus Page	Profile Page
Suckley's cuckoo bumblebee	Proposed Endangered	Focus Page	Profile Page

4.9.1 Monarch Butterfly, *Danaus plexippus plexippus*

The Monarch butterfly was proposed for listing as threatened in 2024 with a 4(d) rule and critical habitat ([89 FR 100662](#)). For actions that may affect a proposed species, agencies cannot consult, but they can confer under the authority of section 7(a)(4) of the ESA. Such conferences can follow the procedures for a consultation and be adopted as such if and when the proposed species is listed. Should the species be listed, agencies must review projects that are not yet complete, or projects with ongoing effects within the range of the species that previously received a determination from a Dkey to confirm that the determination is still accurate.

Adult monarch butterflies are large, with bright orange wings surrounded by a black border and covered with black veins (Bouseman and Sternburg 2001, Service 2024g). The monarch butterfly is currently widely distributed across the United States. North America contains two migratory populations of the monarch and the species breeds year-round in South Florida. The largest migratory population, which we refer to below as the Eastern North American Population, breeds across the central and eastern part of the continent and winters in Mexico. A smaller migratory population breeds in western North America and winters primarily along the California coast south into Baja California, Mexico. The monarch also occurs in parts of South America; Aruba and nearby islands; Central America and the Caribbean; Australia, New Zealand, and other Pacific Islands; Hawaii; and, the Iberian Peninsula (including Spain, Portugal, Morocco, and nearby Atlantic islands) The primary drivers affecting the health of the two North American migratory populations are loss and degradation of habitat (from conversion of grasslands to agriculture, widespread use of herbicides, logging/thinning at overwintering sites in Mexico, incompatible management of overwintering sites in California, urban development, and drought), exposure to insecticides, and effects of climate change (Service 2024g).

Loss and fragmentation of overwintering habitat is a threat to the long-term survival of monarchs. Both western and eastern monarchs rely on the microclimatic conditions present in the forests at their overwintering sites (Leong et al. 2004, Williams and Brower 2015). Loss of trees occurs at overwintering sites in Mexico because of small- and large-scale logging, storms, and an increasingly unsuitable climate. Most overwintering sites for the Eastern North American (ENA) population occur within the Monarch Butterfly Biosphere Reserve (MBBR), a 56,259-ha protected area. There is a logging ban within the 13,551-ha core zone at the MBBR (Ramírez et al. 2015), but illegal logging still occurs (Vidal et al. 2014, Brower et al. 2016).

Based on patterns of use, chemical characteristics, exposure, laboratory toxicity tests, and the results of field studies, insecticides are a threat to monarch populations across the species' range. Authors have hypothesized that sub-lethal effects of insecticide exposure decrease the number of monarchs that migrate successfully to wintering grounds in Mexico (Inamine et al. 2016). Insecticides pose a threat to monarchs due primarily to the following: insecticides are used in areas where monarchs occur; they are designed to kill insects; and, insecticides likely make contact with monarchs where they are applied and outside of application sites, due to drift of droplets, vapor, and dust. Monarchs are likely to ingest insecticides that plants have incorporated into their tissues. We do not understand precisely the extent of monarch exposure to insecticides or the magnitude of the effects to monarch populations. Insecticide use varies in time and space. Outbreaks of certain pests and emerging pests change geographic patterns and intensity of insecticide use (e.g., O'Neal 2005). The development and use of new insecticides, the regulation of older insecticides, and the unknown effects of pesticide mixtures in the environment influence the degree of toxicity. Factors that contribute to our uncertainty about the effects of pesticides to the monarch that we may manage to reduce that uncertainty include: General awareness of insecticide use (e.g., ornamental plants and other consumer products that may contain neonicotinoids) and public policy affecting insecticide registration and use, extent of development and adoption of best management practices, including Integrated Pest Management and drift control measures, extent of agricultural land uses with monoculture systems that increase the potential for, and frequency of, insect pest outbreaks and the economic need for control (e.g., see Meehan et al. 2011), societal expectations for widespread use of mosquito control insecticides, technological capability to develop chemical controls that could reduce monarch exposure or toxicity by being more selective, shorter-lived, and less mobile, lack of standardized toxicity testing protocols to determine effects to the monarch, field measurements of insecticide residues in select components of monarch habitat across a variety of land use sectors (i.e., quantified exposure) (Service 2024g).

Roadkill of monarchs during autumn migration is a significant factor in the decline of the ENA population, but may be less important than declines in milkweed and nectaring habitat and overwintering mortality (Grant and Bradbury 2019, Kantola et al. 2019, Voorhies et al. 2019). Roadkill mortality during autumn migration can be substantial, especially where the migration pathway narrows in the southern U.S. and in Mexico. In the "Central Funnel" of the monarch's Central Flyway in 2016, for example, roadkill of monarchs was equal to about 5% of the number estimated on the wintering grounds in 2016-2017 (Kantola et al. 2019, Tracy et al. 2019). Roadkill averaged 2.8% of the wintering population size over the two years of their study, 2016-2017 (Kantola 2019). Roadkill mortality during migration may be especially important in this "Central Funnel" and in the "Coastal Funnel" (Tracy et al. 2019). Kantola et al. (2019) described

a ‘hotspot’ of roadkill mortality on the stretch of U.S. Interstate 10 between Sheffield and Sonora, Texas and discussed five additional hotspots in Mexico. The location of roadkill hotspots shift over time and with traffic volume and can be significant even north of the migratory funnels. Kantola et al. (2019) found that roadkill rates varied from 6 to 646 dead monarchs per km depending on year, road type, and location. At the Sheffield-Sonora, Texas hotspot, for example, estimated monarch roadkill was 70,000 in 2016 compared to about 5,000 in 2017 (Kantola et al. 2019). McKenna et al. (2001) estimated that vehicles killed more than 500,000 monarchs on or about the week of September 16, 1998 along interstate highways in Illinois. They found “many more” males than females and suggested that male chasing behavior was to blame (McKenna et al. 2001). They also suggested that the abundance of whorled milkweed (*A. verticillata*) “within two m of the roadway edge” might have led to the high mortality of monarchs (McKenna et al. 2001).

In addition to the concentrating effect of continental autumn migration patterns, the authors in these studies hypothesize that local stochastic weather events, such as unfavorable winds “extended roosting and nectaring...in the vicinity of roadways” and local geography affect roadkill number (Kantola et al. 2019). Increased time spent flying low to the ground to seek shelter from heat or to find nectar could also increase roadkill mortality (Kantola et al. 2019). Successful efforts to reduce roadkill during autumn migration might have a substantial effect on the status of the ENA population. For example, a 0.5% annual reduction in roadkill mortality “could significantly contribute to a reversal in the long-term 7.2% annual exponential decline in monarch populations” (Kantola et al. 2019). Suggestions for reducing roadkill include strategic placement of nets to steer monarchs above traffic; closing lanes; and, reduced speed limits. In the coastal portions of the Eastern Flyway, Tracy et al. (2019) suggest that wildflower plantings be placed away from roads to mitigate the impacts of roadkill.

Climate change can affect monarchs both directly and indirectly (Nail and Oberhauser 2015). Increasing storm frequency in the Mexican overwintering colonies can lead to catastrophic mortality of up to 80% due to the freezing temperatures that accompany these storms (Anderson and Brower 1996, Brower et al. 2004). Severe storms may become more frequent and precipitation may increase during the winter when monarchs are present in Mexico (Oberhauser and Peterson 2003). Moreover, the hazards faced by monarchs during their fall migration (e.g., roadkill – see above) could increase if their breeding grounds moved further north, as is predicted due to climate change (Lemoine 2015).

Predation of eggs and early larval stages may have a significant effect on the viability of monarch populations (Myers 2019). Predation is the main source of mortality for monarch eggs (Myers 2019). Monarchs lay eggs on, and larvae feed only on plants in the milkweed family (Asclepiadaceae), primarily those in the genus, *Asclepias* (Zalucki and Brower 1992). The density of monarch eggs and larvae in an area may increase with milkweed density up to about 0.6 milkweed stems per m² ($\approx$ 2,428 stems per acre) (Kasten et al. 2016). Several authors have pointed to the decline of milkweed on agricultural lands as a primary factor in the decline of the ENA monarch population (Brower et al. 2012, Pleasants and Oberhauser 2013, Waterbury and Potter 2018). Although milkweed conservation alone may not be sufficient to preserve the ENA population and its migration to Mexico (Inamine et al. 2016), the loss of milkweed has been substantial. In the Midwest, milkweed declined by about 40% between 1999 and 2014 (Pleasants

2017). Most of the milkweed decline has taken place on agricultural lands due to changes in farming practices – most notably the use of herbicide tolerant (HT) crop varieties (Thogmartin et al. 2017, USDA 2019). The loss of milkweed from agricultural lands has likely had a disproportionate effect on monarch numbers in the ENA (Pitman 2017, Myers 2019). Egg densities per milkweed stem in agricultural fields can be four times greater than in other habitat types (Pleasants and Oberhauser 2013). In addition, predation rates on eggs are typically low in agricultural fields (Haan and Landis 2019, Myers 2019). A 40% decline of milkweed stems in the Midwest between 1999 and 2014, with the majority of that occurring in agricultural lands, may have reduced overall productivity for monarchs in the region by about 70% (Pleasants 2017). Agricultural lands hold significant potential for monarch production in the Midwest, but that is not being realized due to the general lack of milkweed in fields sown to HT-crops. Development and conversion of grasslands has also caused a reduction in the extent and abundance of monarch habitat in the action area. Between 2008 and 2012, 5.7 million acres of grassland were converted to new cropland, including up to 3 million acres of Conservation Reserve Program (CRP) land (Lark et al. 2015). In the western monarch breeding range, conversion of grasslands for agriculture has been the largest source of land cover change in California's Central Valley, with a loss of approximately 1,054 km² (~260,450 acres) between 1980 and 2000 (Sleeter 2016). The Central Valley dominates the center of the state. A loss of milkweed or nectar resources in this area could reduce the number of monarchs that reach overwintering sites on the coast. Availability of nectar resources in breeding and migration habitats is a primary factor influencing viability of the WNA population.

Habitat required for eggs, larvae, and breeding adults includes healthy and abundant milkweed for oviposition and larval consumption (Service 2024f). Breeding and migrating adults require sufficient quality and quantity of flowers that provide nectar (adult food). The size and spatial arrangement of habitat patches are generally thought to be important, but are currently unknown (Service 2024f). Overwintering adults require roosting habitat with a microclimate that provides protection from the elements and moderates temperatures. These microclimates need to be warm enough to prevent freezing yet cool enough to prevent fat depletion. Roosting sites also need to include nearby nectar and clean water sources (Service 2024g).

During the breeding season, monarchs lay their eggs on their obligate milkweed host plant (primarily *Asclepias* spp.), and larvae emerge after two to five days (Zalucki 1982, Service 2024g). Larvae develop and molt through five larval instars (caterpillar stages between molts) over a period of 9 to 18 days as they feed on the milkweed (larval host plant). They derive toxic compounds (cardenolides) from the milkweed and sequester the toxins in their tissues as a defense against predators (Parsons 1965, Service 2024g). The larva then pupates into a chrysalis before emerging as an adult butterfly (eclosing) 6 to 14 days later (Service 2024g). There are multiple generations of monarchs produced during the breeding season, with most adult butterflies living approximately two to five weeks. In migratory populations adults enter into reproductive diapause (suspended reproduction) for overwintering, and live six to nine months overall (Herman and Tatar 2001, Service 2024f). During breeding and migration, adult monarch butterflies require a diversity of blooming nectar resources to feed (Service 2024g).

Monarchs in temperate climates such as in eastern and western North America undergo long-distance migration, where the migratory generation of adults enters reproductive diapause and

lives for an extended period of time (Herman and Tatar 2001; Service 2024g). In the fall, in both eastern and western North America, monarchs begin migrating to their respective overwintering sites (Service 2024g). This migration can take monarchs distances of over 3,000 km (Urquhart and Urquhart 1978) and last for over two months (Brower 1996; Service 2024g). Migratory monarchs in the western population primarily overwinter in groves along the coast of California and Baja California (Jepsen and Black 2015, Service 2024g).

The 4(d) provisions outlined in the proposed rule ([89 FR 100662](#)) include (1) Activities that may maintain, enhance, remove, or establish milkweed and nectar plants within the breeding and migratory range that do not result in conversion of native or naturalized grassland, shrubland, or forested habitats. These activities include the following: (a) Habitat restoration and management activities, such as mowing and haying native rangeland, that sustain monarch butterfly habitat, including activities to eliminate plant communities that contain invasive plants or noxious weeds as part of site preparations or habitat enhancement activities. (b) Livestock grazing and routine ranching activities, including rotational grazing, patch-burn grazing, vegetation and invasive species management, other grazing practices implemented to make pasture and rangelands productive, construction and maintenance of fences, the gathering and management of livestock, and the development and maintenance of watering facilities for livestock. (c) Routine agricultural activities, including plowing, drilling, disking, mowing, and other mechanical manipulation and management of lands already in use for agricultural production (e.g., conventional row crops, pasture, hay fields, orchards, and vineyards). This also includes other mechanical manipulation and land management activities in direct support of cultivated agriculture, such as replacement, upgrades, maintenance, and operation of existing infrastructure (e.g., buildings, irrigation conveyance structures, fences, and roads), and routine implementation and maintenance of agricultural conservation practices, such as terraces, dikes, grassed waterways, and conservation tillage. (d) Fire management actions (e.g., prescribed burns, cultural burns, hazardous fuel reduction activities, vegetation management, maintenance of fuel breaks and minimum clearance requirements, and other fuels reduction activities). (e) Silviculture practices and forest management activities that use State- approved best management practices. (f) Maintenance, enhancement, removal, and establishment of milkweed and nectar plants on residential and other developed properties. (g) Vegetation management activities, such as mowing, ground disturbance, and other management activities, that remove milkweed and/or nectar plants when conducted at times of year when monarchs are not likely present. It is intended for this proposed exception to encourage numerous small- and large- scale projects that will increase the quality and quantity of breeding habitat on the landscape in the long term. It is expected that localized removal of milkweed and nectar plants will be outweighed by an overall addition of these resources across the landscape, making broadscale public support for monarch conservation vitally important. For example, landscape-scale habitat restoration and management activities that provide for the habitat needs of monarch butterflies (e.g., mowing, haying native rangeland, prescribed and cultural burning, and control of invasive plants or noxious weeds) may remove milkweed and could result in take of monarchs in the short term but would also increase the overall quality and quantity of breeding habitat, which is likely to benefit monarch populations in the long term. Similarly, forest, fuels and wildland management activities, and rangeland management may have some minimal level of take of monarch butterflies but are not expected to rise to the level that would have a negative impact (i.e., would have only de minimis impacts) on the species' conservation. These activities can

help maintain and manage native, naturalized, and restored grassland, shrubland, and forested habitats, which is a conservation benefit to the species. Routine agricultural activities on lands already in use for agricultural production, not including conversion of native or naturalized grassland, shrubland, and forested habitats, would result in loss of milkweed and nectar plants that we consider inconsequential to the conservation of the species. Monarchs are impacted by the ongoing effects of past habitat loss and degradation; therefore, routine agricultural activities on lands already in use for agricultural production will not result in significant additional habitat loss and degradation. This is also true for maintenance, enhancement, removal, or establishment of milkweed and nectar plants on residential and other developed properties. Vegetation management activities that remove milkweed and/or nectar plants when conducted at times of year when monarchs are not likely present and that do not result in conversion of native or naturalized grassland, shrubland, or forested habitats would also result in a level of take considered inconsequential to the conservation of the species. In addition, some activities may provide both conservation benefits to the species while also contributing to an inconsequential level of take (e.g., livestock grazing). While the goal of substantially increasing the breeding habitat available to monarchs and reducing fragmentation of their habitat will require working with people in many different sectors, a high priority needs to be placed on working with farmers as well as the Natural Resources Conservation Service, Farm Service Agency, and other partners who work with private landowners. Particular focus will be on the key monarch breeding and migratory areas to encourage support for voluntary efforts to create suitable habitat and improve connectivity of these habitat patches to increase the productivity of monarchs and increase the carrying capacity of monarch habitat on the landscape in important parts of the species' range.

(2) Implementation of comprehensive conservation plans and programs. When making a determination as to whether incidental take from implementation of a conservation plan or program would be excepted pursuant to this 4(d) rule, the following would be considered: whether the plan comprehensively addresses the threats affecting the monarch within the plan area; whether the plan establishes objective, measurable biological goals and objectives for population and habitat necessary to ensure a net conservation benefit, and provides the mechanisms by which those goals and objectives will be achieved; whether the plan administrators demonstrate the capability and funding mechanisms for effectively implementing all elements of the plan, including enrollment of participating landowners, monitoring of activities, and enforcement of plan requirements, as applicable; whether the plan employs an adaptive management strategy to ensure future program adaptation as necessary and appropriate; and whether the plan includes appropriate monitoring of effectiveness and compliance. To achieve a significant increase in the availability of monarch breeding areas that is required for improvement in the status of the species, breeding habitat needs to be returned to large portions of the landscape where it is now nonexistent or where what remains is highly fragmented. Given that so much milkweed has been lost historically and that monarchs are impacted by the ongoing effects of this past habitat loss and degradation, an approach is needed that encourages landowners to add milkweeds and nectar plants and implement actions to maintain them, and comprehensive plans and projects to conserve the monarch butterfly could be important sources of that conservation across the broader landscape. State-wide plans developed by or in coordination with States and implemented by State agents and enrolled participants (e.g., private landowners, local governments) are opportunities for large-scale conservation. Likewise, programs developed by Federal agencies in fulfillment of their section 7(a)(1) responsibilities are also opportunities for large-scale conservation. Therefore, we intend for this proposed exception

to encourage implementation of conservation plans and programs that comprehensively address threats affecting the monarch within the plan area. (3) Maintenance or improvement of overwintering habitat. Overwintering habitat is defined as habitat that provides overwintering monarch butterflies with the abiotic and biotic conditions necessary for clustering, aggregating, and feeding (nectaring). An overwintering site is defined as an area where migratory monarch butterflies cluster on trees during the fall and/or winter. Unlike breeding habitat, which is widely dispersed across the continental United States and can be quickly created in a variety of locations, overwintering habitat in Mexico (for the eastern migratory population) and California (for the western migratory population) is usually restricted to specific areas and consists of tree groves that are not easily created in new locations. Migratory monarchs require a very specific microclimate at overwintering sites. Maintenance and improvement of overwintering habitat will aid conservation and recovery of the species by maintaining and enhancing those specific conditions at existing groves. We do not regulate take in foreign countries; therefore, we do not prohibit incidental take resulting from management, including logging, of monarch overwintering habitat in Mexico. Our proposed 4(d) exceptions apply only to incidental take resulting from maintenance or improvement of monarch overwintering habitat in California or elsewhere in the United States. Under this proposed 4(d) rule, incidental take resulting from maintenance or improvement of monarch overwintering habitat in the United States that is consistent with the goals and objectives of a site-specific Service-approved overwintering site land management plan at the site would not be prohibited. Our current Overwintering Site Land Management Plan template and an example plan are available on <https://www.regulations.gov> under Docket No. FWS-R3-ES-2024-0137. (4) Vehicle strikes. It is common for monarchs to be struck by vehicles and killed in the course of normal driving activities. Research suggests there may be roadkill hotspots where monarch vehicle mortality is particularly high, especially during periods of migration (Kantola et al. 2019). The best available information shows that mortality due to vehicle strikes is not one of the primary drivers of changes in monarch populations, and it was not identified as a primary driver by monarch experts (Service 2024f). At this time the impacts from monarch deaths due to vehicle strikes are considered minimal and not affecting the monarch butterfly at a population or species level. Furthermore, research suggests that roadside monarch habitat can still provide a net benefit to the species, despite losses due to collisions, through strategic improvements to roadside vegetation management (Kasten et al. 2016, Phillips et al. 2019). Habitat along roadsides may provide milkweed and nectar resources in otherwise heavily developed and agricultural regions, as well as provide needed habitat connectivity across the landscape (Wu- Smart and Schacht 2019, Ding and Eldridge 2022). We conclude that the overall impact of vehicle strikes is not expected to negatively affect conservation and recovery efforts for the monarch butterfly. Therefore, we propose that take due to vehicle strikes not be prohibited under this 4(d) rule. (5) Non-lethal collection, possession, captive-rearing, and release of a limited number of monarchs. Monarch butterflies are collected non-lethally, held in captivity (and in some cases sold), and released for a variety of purposes, including educational purposes. Collecting (defined in this rulemaking as the non-lethal capture and holding of live monarchs at any life stage), captively rearing (defined in this rulemaking as the holding of caterpillars, pupae, or adults and raising them in captivity long enough for them to move to the next life stage or to reproduce), and releasing monarchs has inspirational and educational value and can foster lifelong connections to nature. Collection of monarchs at any life stage from the wild has the potential to pose a risk to population numbers. After evaluating the threat of collection, we determined there is no evidence that the current rate of collection, in

combination with the current rate of release, is affecting monarch populations (Service 2024f). However, we assume that the collection of clustering monarchs could have greater impacts to the populations and species' viability, as the migratory populations are at their smallest when monarchs are clustering and overwintering clusters contain concentrated numbers of individuals; thus, wild clustering monarchs may not be collected as part of this exception. Captive-rearing can also pose risks to wild monarch populations, such as through the spread of diseases and loss of genetic diversity (Altizer et al. 2015), and potential negative effects to the fitness of individuals and their migratory capabilities (Altizer et al. 2015). The negative effects can greatly impact wild monarch populations when rearing is conducted on a large scale (Altizer et al. 2015). However, captive-rearing on a small scale can achieve all the inspirational and educational benefits while reducing the risk of negatively affecting populations, particularly if protocols are followed to minimize disease and genetic impacts. For the purposes of this proposed rule, we describe small-scale captive-rearing as collection, raising, and releasing 250 or fewer monarchs in a given year. We consider the collection, raising, and releasing of more than 250 monarchs per year to be a large-scale endeavor, for which a permit would be required through section 10(a)(1)(A) of the Act. We conclude that the overall impact of collecting, possessing, captively rearing, and releasing 250 or fewer individual monarchs at one location or facility (e.g., home, botanical garden, school, or business) is not expected to negatively affect conservation and recovery efforts for the monarch butterfly. Therefore, take due to these activities would not be prohibited under this proposed 4(d) rule. However, collection of clustered monarchs would be prohibited. Clustered monarchs are typically the individuals that will produce the next year's first migratory generation. The migratory populations are at their smallest during the overwintering time period when monarchs cluster (typically September through March), and it is especially important that these individuals survive the winter to breed in the spring. Therefore, our proposed exception does not include take resulting from handling or collection of clustered monarchs; a permit to do so would be required through section 10(a)(1)(A) of the Act.

(6) Non-lethal scientific research and educational activities involving a limited number of monarchs. Future scientific research on monarch butterflies and their use in educational activities in the contiguous United States will aid conservation and recovery by leading to a better understanding and appreciation of the biology and ecology of the species. Activities associated with scientific research and education may include non-lethal collection for purposes of handling, netting, sampling for disease, tagging of monarchs, and conducting life cycle and specimen observations of captive monarchs. The same restrictions related to possession and release of monarchs (i.e., limiting activities to 250 or fewer monarchs per year) would apply to scientific research and educational activities. To encourage continued and further scientific research and educational activities, we are proposing to include exceptions in the 4(d) rule that allow these activities without requiring additional permits; however, we do not include take of clustered monarchs in the exception. As discussed in the previous section, it is especially important that clustered overwintering monarchs survive the winter to breed in the spring. Therefore, we do not include handling or collection of clustered monarchs for scientific research from this exception; a permit to do so would be required through section 10(a)(1)(A) of the Act.

(7) Possession of dead monarchs. Though overwintering monarchs can live longer, the average life expectancy of monarchs during the breeding season is 2 to 5 weeks. It is common for people to find and collect dead adult monarchs or pieces of wing. Collection and possession of this type is not currently a threat to the species. In some cases, with other species, we might be concerned about collection becoming a threat due to collectors capturing live butterflies and preserving

them because the species is listed and likely to become more rare. However, the monarch has historically occurred in such large numbers and across such a large range that the species is already a common specimen in butterfly collections. The potential impacts from collection and possession of dead monarchs are considered minimal and not likely to affect the monarch butterfly at a population or species level. Collection of live wild adult monarchs and intentionally killing them for preservation purposes would be prohibited. We are proposing in this 4(d) rule that possession of dead monarchs collected in a lawful manner would not be prohibited. (8) Sale of captively reared monarchs. We propose to limit the sale of captively reared monarchs to 250 or fewer individuals per year from a single location or facility. It is common for individuals and organizations such as garden groups, schools, and small businesses to sell captively reared monarchs during the breeding season. These activities provide inspirational and educational value for the public but have the same risks as discussed above. We find that if these activities are conducted on a small scale (limited to 250 or fewer monarchs in a given year), the potential for negative impacts would be minimal. We conclude that the overall impact of selling 250 or fewer individual monarchs at one location or facility (e.g., home, botanical garden, school, or business) is not expected to negatively affect conservation and recovery efforts for the monarch butterfly. Therefore, take due to these activities would not be prohibited under this proposed 4(d) rule.

Monarch Butterfly Proposed Critical Habitat

The Monarch butterfly was proposed for listing as threatened in 2024 ([89 FR 100662](#)) with critical habitat. The PBFs for proposed critical habitat essential to the conservation of monarchs are as follows:

1. Groves of trees (e.g., blue gum eucalyptus, Monterey pine, Monterey cypress, Coast redwood, coast live oak, Douglas fir, Torrey pine, western sycamore, bishop pine) that serve as sites for overwintering monarchs to cluster along the coast of California.
2. Trees, herbaceous or shrubby vegetation, and/or topography surrounding overwintering groves that contribute to the following microclimate conditions:
 - a. Indirect or dappled sunlight,
 - b. Water sources (e.g., stream, pond, moist soil) for hydration,
 - c. Defense against freezing temperatures, and d. Protection from strong winds.
3. Supportive features nearby (i.e., within 152 m (500 ft) of) overwintering groves, including the following:
 - a. Flowering plants for nectar,
 - b. Water sources (e.g., stream, pond, moist soil) for hydration, and
 - c. Protective landscape features (e.g., topography and vegetation that lessen the impacts of prevailing winds on groves of trees.

Critical habitat has been proposed in a total of 4,395 ha (1,778 ac) in 7 units in California. No critical habitat is proposed in the state of New Mexico.

4.9.2 Sacramento Mountains Checkerspot Butterfly, *Euphydryas anicia cloudercrofti*

The Sacramento Mountains checkerspot butterfly was listed as endangered in January 2023 ([88 FR 6177](#)). It has a blackish body with dark brown or black bands separating a checkered pattern of orange and cream on the wings (Service 2022f). It is endemic to a very small area in the

Sacramento Mountains, an isolated mountain range in south-central New Mexico (Ferris and Holland 1980; Service 2022f).

The butterfly inhabits high-altitude meadows in the upper-montane and subalpine zone at elevations between 2,380 and 2,750 m (7,800 and 9,000 ft, Service et al. 2005, Service 2022f). The Sacramento Mountains checkerspot butterfly appears to have a stronger affinity for the highest elevation areas in its range, gentle or angled slopes, and south-eastern aspect orientations (Pittinger and Yori 2003, McIntyre 2010, Service 2022f). The ecosystem is usually cool and wet, supporting diverse and robust plant life, including the butterfly's preferred host plant: New Mexico beardtongue (Service 2022f). Each life stage has different microhabitat, resources, and seasonal specializations different from the other life stages (Service 2022f). Adult checkerspots shelter beneath flowers or at the base of plants during evening hours, thunderstorms, rain showers, and periods of high winds (Service 2022f). Adults crawl up onto flowers or upper leaves of plants in the early morning and bask before becoming active (Service 2022f). Larvae seem to move toward thermally warmer areas, such as south-facing slopes and sunny areas (Pittinger and Yori 2003, Service 2022f). Pupae were found at an herbaceous plant's base, surrounded by fine webbing (Pittinger and Yori 2003, Service 2022f).

The Sacramento Mountains checkerspot butterfly has one generation per year (Service 2022f). The butterfly's life cycle is synchronized with the development of host and nectar plants (Service 2022f). The adult butterflies stagger their emergence from pupation, with numbers peaking around the second week of the flight season (Service 2022f). Females deposit a cluster of eggs on the underside of New Mexico beardtongue leaves (Service 2022f). The eggs hatch within two weeks, and larvae collectively create a protective silken shelter, known as a tent, over the host plant feeding upon it until winter diapause (suspended development) or the plant is defoliated (Service 2022f). After the third or fourth instar, the larvae enter diapause between late September and early October (Service 2022f). In early spring (March–April), post-diapause larvae emerge and begin to feed again. In the spring, larvae are more mobile than in the fall, moving on average 2.6 meters (m) (8.5 ft) from their natal tents (Service 2022f). They grow through three or four more instars before pupating (form a chrysalis; Service 2022f). The larval host plant for the Sacramento Mountains checkerspot butterfly is the New Mexico beardtongue, and the preferred adult nectar source is orange sneezeweed, a native perennial forb (Ferris and Holland 1980; Service et al. 2005; Service 2022f).

The adult flight season can start as early as mid-May, but late June into early August appears typical, with peak adult densities occurring about early- to mid-July (Service 2022f). Pre-diapause caterpillars are relatively immobile and rely on host plant health and abundance to complete the first stages of their life cycle (Service 2022f). The Sacramento Mountains checkerspot butterfly has an extremely low dispersal rate. Pittinger and Yori (2003) found that no marked adult butterflies moved between canyon sites during their study.

Incompatible grazing (from domestic cattle, feral horses, and abundant elk), human recreation, drought and climate change, collection, non-native vegetation, habitat management, insecticides, and parasites are factors that influence or could influence species viability for the Sacramento Mountains checkerspot (Service 2022f; Walker et al 2025).

Sacramento Mountains Checkerspot Butterfly Critical Habitat

Sacramento Mountains checkerspot butterfly critical habitat was proposed in August 2023 ([88 FR 82817](#)) and petitioned for reconsideration in November 2023 ([88 FR 54263](#)). The PBFs for proposed critical habitat are as follows:

1. Open meadow, grassland habitat within the larger mixed-conifer forest in high-altitude areas within the upper-montane and subalpine zones at elevations between 2,380 and 2,750 meters (m) (7,800 and 9,000 feet (ft)) within the Sacramento Mountains of southern New Mexico.
2. The larval food plant (host plant), primarily New Mexico beardtongue (*Penstemon neomexicanus*), or other potential host plants such as other *Penstemon* species and tobacco root (*Valeriana edulis*), is present as:
 - a. Patches of plants clustered together;
 - b. Large, robust individual plants; and/or
 - c. Stands of plants adjacent to other tobacco root plants.
3. Access to nectar sources, primarily orange sneezeweed (*Hymenoxys hoopesii*), native Asteraceae species, and other native flowering plants.
4. Habitat connectivity consisting of up to 890 m (2,920 ft) between populations or areas of suitable habitat to allow for dispersal and gene flow.
5. Less than 5 percent canopy cover.

A total of 1,636.9 ac (662.4 ha) are proposed in 9 units in in the Sacramento Mountains of Otero County, New Mexico. These units are Bailey Canyon; Pines Meadow Campground; Spud Patch Canyon; Silver Springs Canyon; Horse Pasture Meadow; Sleepygrass Canyon; Pumphouse Canyon; Deerhead Canyon; and Cox Canyon. 1,093.9 ac (442.7 ha) are on federally owned land, 22.4 ac (9.1 ac) are on tribal land, and 520.5 ac (210.6 ha) are on privately owned land. For actions that may adversely modify proposed critical habitat, agencies can confer, and such conferences can follow the procedures for a consultation and be adopted as such if and when the proposed critical habitat is designated.

4.9.3 Silverspot butterfly, *Speyeria nokomis nokomis*

The silverspot butterfly was listed as threatened in 2024 ([89 FR 11750](#)), designation of critical habitat was determined to be not prudent. Adults have wingspans from 6.3 to 7.9 cm, with orange-brown wings on males and yellow-brown wings on females (Service 2023g). Historically known colonies were in Unaweep Seep Colorado, Ouray Population in Colorado, the La Plata Population in Colorado, and Beulah townsite in New Mexico. The current distribution includes scattered populations in Colorado, New Mexico, and Utah (Service 2023g).

The Silverspot butterfly occurs in permanent spring-fed meadows, seeps, marshes, and streamside meadows (Scott 1986, Selby 2007, Service 2023g). The only known larval host plant is bog violet (Scott 1986, Service 2023g). Microhabitat for the bog violet is soggy soil in open meadows or under willows or other shrubs that are typically at the margins of the habitat or sparsely mixed in with herbaceous habitat (Selby 2007, Service 2023g). The violet is widely distributed, both latitudinally and elevationally, in the western U.S. but occurs in naturally scarce habitats, subjecting it to threats from development, excessive grazing, or hydrological alteration (Hovanitz 1969, Hammond and McCorkle 1983, Selby 2007, Service 2023g). Elevation of the bog violet in Utah, Colorado, and New Mexico ranges from 2,750 feet to 11,500 feet (Service

2023g). The known elevational distribution of the silverspot butterfly is not as broad as the bog violet, occurring from roughly 5,200 feet to just over 8,300 feet in elevation (Service 2023g).

The Silverspot butterfly have one brood of offspring per year (Mattoon et al. 1971; Service 2023g). Eggs are typically laid in mid-September and take 10-18 days to hatch (Scott and Mattoon 1981, Selby 2007, Service 2023g). Eggs are laid singly on a violet leaf (Arnold 1989, Service 2023g). Six larval stages follow (Service 2023g). First instar larvae typically hatch in early October and soon seek shelter for winter diapause. The 1st instar larvae are in diapause for approximately 225 days (Service 2023g). Although wintering sites have not been observed in nature, larvae are thought to diapause under the shelter of leaves and debris, possibly at the base of violet plants or woody vegetation such as willows (Service 2023g). In approximately mid-May, when fresh violet leaves are present, the 1st instar larvae emerge from winter diapause and start feeding on the violets until about mid-July (Service 2023g). Over that approximately two and a half month period, the larvae also shelter on the violets and adjacent debris (Service 2023g) and grow and molt into a 6th instar (Scott and Mattoon 1981, Service 2023g). The mature larvae will then form a chrysalis and enter pupation where they metamorphose into adults (Service 2023g). Pupation takes approximately 17 days (Selby 2007, Service 2023g). At the end of July to mid-August adult butterflies emerge from the pupal case and live approximately 45 days (Selby 2007, Service 2023g). Males emerge at the end of July or beginning of August and last until about mid-September (Service 2023g). Females emerge the first to second week of August and last until about the end of the third week of September (Selby 2007, Service 2023g). During this time the adults will nectar on native and introduced thistles, horsemint, joe-pye weed, and milkweed (Scott 1986, Ellis 1989, Selby 2007, Service 2023g).

Factors that influence or could influence species viability include habitat loss and fragmentation; livestock grazing; human-caused hydrologic alteration; genetic isolation; climate change; climate events; incursions of non-native plants; larval desiccation; disease; predation; fire, and pesticides (Service 2023g).

4.9.4 Suckley's cuckoo bumblebee, *Bombus suckleyi*

The Suckley's cuckoo bumblebee has been proposed for listing as endangered in December, 2024 ([89 FR 102074](#)) with insufficient information to determine critical habitat. For actions that may affect a proposed species, agencies cannot consult, but they can confer under the authority of section 7(a)(4) of the ESA. Such conferences can follow the procedures for a consultation and be adopted as such if and when the proposed species is listed. Should the species be listed, agencies must review projects that are not yet complete, or projects with ongoing effects within the range of the species that previously received a determination from a Dkey to confirm that the determination is still accurate.

The species is a medium sized bee grouped with the “long faced” clade (Cameron et al. 2007, Williams et al. 2014). They can be identified from hair coloration, females can be identified by their recurved abdomen, and males can be identified from their genitalia structure (COSEWIC 2019). Cuckoo bumble bees differ morphologically from other *Bombus* subgenera because their hind legs do not have apparatus to collect or carry pollen, they do not produce a worker caste, and they do not produce enough wax to construct nests. They are also not eusocial, there is no division of labor, and all individuals reproduce (Service 2024h). Female cuckoos emerge in late

spring shortly after their hosts and feed on nectar and pollen before invading and usurping host nests (Lhomme and Hines 2019). They use strategies such as hiding and chemical camouflage to infiltrate the colony, eliminate the host queen, destroy host eggs, and eject host larvae from the nest. This creates space and increases the incubation effort of the host workers towards her parasitic eggs (Lhomme and Hines 2019, Goulson 2010). Larval development takes approximately five weeks, young are reared on pollen collected by the social bee hosts, and offspring typically emerge in summer and mate through the fall, although specific timing differs by location and latitude (COSEWIC 2019, Lhomme and Hines 2019). Mated females are the only adults to overwinter, in underground sites separate from nesting habitat (Service 2024h). Host bumble bee nests are often located in abandoned underground holes such as rodent burrows, in a variety of habitat types that include meadows, fallow fields, croplands, urban areas, and forests (Hobbs 1968, Macfarlane et al. 1994, Richards 1978). Only Western bumblebee and Nevada bumblebee are confirmed host species, however given the Suckley's distribution and observed presence within nests there are at least 7 potential additional host species. Suckley's are generalist nectar foragers and feed on the nectar and pollen of flowering plants found in meadows, grasslands, and developed areas. Resource needs specific to the species include thermal suitability, diapause site availability, floral resource abundance and diversity, habitat connectivity, and availability of suitable host colonies (Service 2024h).

There is some uncertainty as to the species range, as there is no population level information available, and it is often misidentified with the gypsy cuckoo bumblebee. Cuckoo bumblebees are naturally lower in abundance than eusocial bumble bees and they do not have a worker caste, so they are inherently more difficult to detect. Suckley's cuckoo is only known from approximately 2,317 occurrence records across North America, where the average number of occurrence records for other North American bumble bee species is more than 18,750. The last record in the US was made in 2016, and in Canada in 2022. All the Suckley's cuckoo records in the eastern portion of the continent are in Canada, and there are no current records indicating connectivity between the eastern and western portions of their range, however their presence in the boreal region may indicate potential connectivity via a northern route. The western portion of their range includes observations extending south to Arizona, east to Nebraska and Minnesota, and north through the Canadian Yukon. The western bumblebee is their most widely known host and occurs throughout much of the core of the Suckley's cuckoo's range (Service 2024h).

Threats specific to Suckley's and other cuckoo bumble bees include declines in host species, and stressors common to all to bubble bees are competition and disease from commercially managed and introduced bees, pathogen prevalence including fungus, viruses, bacteria, protozoa, tracheal mites, and nematodes; impacts from activities such livestock grazing, conversion and fragmentation of habitat, and pesticide applications with multiple exposure routes and lethal and sublethal effects to eggs, larvae, and adults and impacting habitat for hosts nests, overwintering, mating, and foraging areas that connect, overlap, and are in relative proximity to one another. Changes in ambient temperatures and heat waves impact timing of diapause, emergence, foraging, and colony maintenance, and bumble bees have low resistance to heat stress resistance that can reduce survival, increase energy expenditure, reduce flight and foraging, and reduce reproduction. Like temperature increases, increases in wildfire and drought frequency and intensity reduce soil moisture, surface and groundwaters, and snowpack levels that can reduce the timing and abundance of floral resources essential to pollinators. Climate influences resulting

in early spring frosts damage floral resources and impact queen establishment of new colonies, and are of particular concern for host colony queens, workers, and overall host colony size and its ability to support cuckoos (Service 2024h).

Current conservation efforts in the United States include management as a sensitive species by the Forest Service and Bureau of Land Management, and inclusion in the State Wildlife Action Plans of Idaho, Washington, Colorado, and California (Service 2024h). In May, 2026, the Service authorized a nationwide conservation benefit agreement under an enhancement of survival permit for 11 species of at-risk bumblebees that includes the Suckley’s cuckoo and four additional species with ranges in New Mexico. The agreement has been developed with the University of Illinois Chicago in partnership with the Wisconsin Department of Natural Resources (WDNR) and representatives from the energy and transportation sectors. Enrolled partners commit to selecting and implementing conservation actions that support bumble bee habitat recovery in transportation rights-of-way to provide a network of linear tracts that intersect varieties of habitats, connects remnant habitats to more favorable ones, and are generally safe from major disturbances of future development. Terms of the agreements include the implementation of conservation measures to sustain, enhance, and restore habitat, annual reporting to track and report compliance and document conservation acres, and habitat monitoring to verify suitability and inform adaptive management. The bumblebee CBA mirrors and builds on a similar agreement for the monarch butterfly and allows for dual enrolment to benefit monarchs and bumblebees. These agreement-specific commitments simplify implementation, enhance conservation and regulatory benefits, and reduce administrative costs (University of Illinois Chicago and WDNR 2026).

4.10 PLANTS

Species	ESA Status	Focus Page	Profile Page
Cochise pincushion cactus	Threatened	Focus Page	Profile Page
Gypsum wild-buckwheat	Threatened	Focus Page	Profile Page
Holy ghost ipomopsis	Endangered	Focus Page	Profile Page
Huachuca water-umbel	Endangered	Focus Page	Profile Page
Knowlton’s cactus	Endangered	Focus Page	Profile Page
Kuenzler hedgehog cactus	Threatened	Focus Page	Profile Page
Lee pincushion cactus	Threatened	Focus Page	Profile Page
Mancos milk-vetch	Endangered	Focus Page	Profile Page
Mesa Verde cactus	Threatened	Focus Page	Profile Page
Pecos sunflower	Threatened	Focus Page	Profile Page
Sacramento Mountains thistle	Threatened	Focus Page	Profile Page
Sacramento prickly poppy	Endangered	Focus Page	Profile Page
Sneed pincushion cactus	Endangered	Focus Page	Profile Page
Swale paintbrush	Endangered	Focus Page	Profile Page
Todsen’s pennyroyal	Endangered	Focus Page	Profile Page
Wright’s marsh thistle	Threatened	Focus Page	Profile Page
Zuni fleabane	Threatened	Focus Page	Profile Page

4.10.1 Cochise pincushion cactus, *Escobaria robbinsorum*

Cochise pincushion cactus (*Escobaria robbinsorum*) was listed as threatened without designation of critical habitat in 1986 ([51 FR 952](#)). Originally attributed to the genus *Cochiseia*, it has subsequently been attributed to the genus *Coryphantha* (most frequently) or *Escobaria* (Service 1993a). It is a spiny, diminutive cactus with a solitary round stem (globular and unbranched), only about 3-5 cm tall and 1.4-6 centimeters (cm) (0.6-2.4 inches) in diameter when mature. Flowers are pale green-yellow and fruits are orange-red (Service 1993a). Flowering begins in mid-March and extends into mid- to late-April. Fruits ripen in July and August, when temperatures commonly reach 100 degrees Fahrenheit (38 degrees Celsius) in the mid-afternoon (Service 1993a).

The Cochise pincushion cactus is known from several Permian limestone hills in Cochise County, Arizona, in the San Bernardino Valley. Once thought to have occurred in northern Sonora, Mexico, it appears that the species has never been found in that country (Service 1993a, 2020d). The Cochise County habitats occur in the Mexican Highland Section of the Basin and Range Province. The species occurs at an elevation of 1,280-1,433 meters (4,200-4,650 feet). The general vegetation is a transition between Chihuahuan Desert Scrub and Semi-desert Grassland. Soils are composed of thin, gravelly loam over the Permian limestone rock, usually with limestone cobble strewn about (Service 1993a). Dense colonies of this cactus appear to occur on bedrock or where bedrock is very close to the surface. In these microsites, very little or no soil is present (Service 1993a).

A variety of bee species have been observed on the flowers of Cochise pincushion cactus (Service 2020d). If moisture conditions are favorable, an individual Cochise pincushion cactus is capable of producing multiple flowers (Radke and Minckley 2014). The Cochise pincushion is an obligate out-crosser (requiring pollen from a separate plant to propagate offspring) in terms of sexual reproduction (Radke and Minckley 2012). It may also reproduce vegetatively; while Cochise pincushion cactus is a single-stemmed plant, damage to a plant may cause the formation of auxiliary stems, which can fall to the ground (as “pups”) and take root (Keil 1976). Seed is also distributed by gravity, falling from dried up fruits to the base of the plant where they can germinate (Keil 1976).

Threats include insect and small mammal herbivory, livestock grazing, border activity, and drought (Service 1993a, 2020d). Climate projections for the Southwestern United States indicate temperature increase and less certain precipitation patterns, with drier conditions overall. These changes in climate will likely affect flowering, seed development, and seedling establishment (Service 2020d). These cacti are vulnerable to disturbance due to slow growth and a low frequency of successful germination and establishment that offers limited capacity to recover from disturbance (Portilla-Alonso and Martorell 2011). Small mammal herbivory or habitat disturbance from livestock grazing or other causes could more severely affect Cochise pincushion cactus when coupled with the impacts of drought stress (Service 2020d).

4.10.2 Holy Ghost Ipomopsis, *Ipomopsis sancti-spiritus*

The Holy Ghost ipomopsis was listed as endangered in 1994 without designated critical habitat ([59 FR 13836](#)). It has one or a few erect stems, is (12 - 32 in) tall, and the flowers are pink, tubular, and terminate in five spreading lobes (Service 2002c). Currently it is known only from Holy Ghost Canyon in the Sangre de Cristo Mountains of the Santa Fe National Forest in north-central New Mexico (Service 2002c). There are also three transplanted populations on land administered by the U.S. Forest Service Santa Fe District (Service 2020e).

The single known population of Holy Ghost ipomopsis grows in open mixed conifer forest (Service 2002c). It usually grows in open areas relatively free of dense grass cover (Service 2002c). Occasionally, plants are in the understory of trees and shrubs (Service 2002c). Holy Ghost ipomopsis grows on relatively dry, steep, west to southwest-facing slopes on about the lower one third of the canyon side (excluding the creek riparian margin; Service 2002c). Holy Ghost ipomopsis appears to grow best in bare mineral soils with its highest densities on disturbed sites such as road cuts (Service 2002c). The occupied habitat in Holy Ghost Canyon ranges in elevation from 2,350 - 2,500 m (7,730 - 8,220 ft; Service 2002c). Plants are relatively continuous in scattered patches for about 3.5 kilometers (km) (2.2 miles (mi)) of Holy Ghost Canyon beginning 1.6 km (1.0 mi) above the confluence with the Pecos River then up Holy Ghost Creek to the confluence with Doctor Creek (Service 2002c).

Holy Ghost ipomopsis is often a biennial, but it can live for several years as a nonreproductive rosette before producing a flowering stem (Service 2002c). Average maturation time is 1.86 years (Maschinski 2001). It flowers only once then the entire plant dies (Service 2002c). Holy Ghost ipomopsis must have pollinators for either self- or outcross-fertilization and it must have fertilization to produce fruits (Service 2002c). Three species, the Snow's skipper (*Paratrytone snowi*), the golden skipper (*Poanes taxiles*), and the sphinx moth (*Hyles lineata*) appeared to be the primary pollinators (Service 2002c). Fruits of Holy Ghost ipomopsis develop in the late summer and early autumn (Service 2002c). Seed germination most likely occurs during the spring and early summer months after the winter cold period (Maschinski 1996; Service 2002c).

Impacts from road maintenance, recreation, and high severity forest fire are immediate management concerns (Service 2002c). The potential indirect effects of spruce budworm control also need management consideration (Service 2002c). There is heavy recreational use in the single canyon where the plant is found (Service 2002c).

4.10.3 Huachuca Water-Umbel, *Lilaeopsis schaffneriana* var. *recurva*

The Huachuca water-umbel was listed as endangered in 1997 ([62 FR 665](#)). It is a semi-aquatic perennial with hollow linear leaves produced singly or in clusters at the top of short rhizomes and five white to maroon flowers (Service 2017c). Their historical distribution included the Santa Cruz Valley of southern Arizona, the San Pedro River, Sonoita Creek, and Garden Canyon in the Huachuca Mountains, the San Rafael Valley and Canelo Hills, San Bernardino National Wildlife Refuge, Bingham Cienega, Babocomari Ranch, Empire Gulch, and northern Sonora, Mexico (Service 2017c). It currently occurs in five watersheds in southeastern Arizona and adjacent portions of Sonora, Mexico (Service 2017c), and known or believed to occur in Hidalgo county New Mexico (species profile page, accessed July 2026).

Huachuca water-umbel occurs in aquatic habitats such as ciénegas, rivers, streams, and springs in shallow and slow-flowing waters that are relatively stable, or in active stream channels ([62 FR 665](#); [64 FR 37441](#), Service 2017c). They are found between 610 and 2,170 m (2,001 and 7,060 ft) elevation in the United States (Titus and Titus 2008a, Vernadero Group and the Desert Botanical Garden 2012, Service 2017c). It is found in riparian soils such as Glendale silt-loam. It is generally found along the margins of these habitats in 0-15 cm of water. The taxon depends on the availability of permanently wet (or nearly so), muddy, or silty substrates with some organic content (Service 2017c). The Huachuca Water-Umbel appears to be adapted to broad, shallow waterways in valley bottoms that gradually collected overland flow from large watersheds (Service 2017c).

Flowering can begin within three months after germination (Titus and Titus 2008b). The length of time a flower persists in the wild is unknown, but has been relatively short (two to five days) in experiments (Service 2017c). Flowering has been observed episodically between March and October, peaking in July and occurring with abundance irregularly (Warren et al. 1991, Service 2017c). The pollination biology of the taxon is unknown but presumed to be insect pollinated due to floral features and the predominance of insect pollination in the *Apiaceae* (Service 2017c). As the fruits mature, the peduncles and pedicels re-curve and are pressed directly against the soil allowing fruits to go underwater or cause them to be buried in the mud or sand (Affolter 1985, Service 2017c). Germination occurs one to two weeks after seeds disperse (Gori 1995, Service 2017c). The taxon reproduces both sexually via seed and asexually through rhizome spread and fragmentation (Service 2017c). Clonal establishment following flooding events is thought to be important for maintaining diversity in the taxon (Vernadero Group and the Desert Botanical Garden 2012; Service 2017c). During larger flood events, small, weakly rooted clumps of the plant may tear off, float, and deposit downstream in the drainage (Service 2017c).

The decision to list the taxon was based upon the limited number of wetland habitats suitable for this plant in southern Arizona and northern Sonora, Mexico, and threats including the degradation and destruction of habitat resulting from poorly managed livestock grazing, non-native plant invasion, water diversions, dredging, and groundwater pumping (Service 2017c). Other threats include catastrophic flooding, post-fire erosion and sedimentation, and drought exacerbated by climate change (Service 2017c).

Huachuca Water-Umbel Critical Habitat

Huachuca Water-Umbel Critical Habitat was designated in 1999 ([64 FR 37441](#)). PCEs, now PBFs for designated critical habitat are as follows, but not limited to:

1. Sufficient perennial base flows to provide a permanently or nearly permanently wetted substrate for growth and reproduction of *Lilaeopsis*;
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 *Lilaeopsis* expansion;
3. A riparian plant community that is relatively stable over time and in which nonnative species do not exist or are at a density that has little or no adverse effect on resources available for *Lilaeopsis* 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 population to survive catastrophic floods and recolonize larger areas.

The majority of the 17.3 acres of designated critical habitat is under Federal administration through the Coronado National Forest (Forest Service), the San Pedro Riparian National Conservation Area (Bureau of Land Management), and Fort Huachuca Military Reservation (Fort Huachuca); a small portion is in private ownership. All critical habitat units are in the state of Arizona.

4.10.4 *Knowlton's Cactus, Pediocactus knowltonii*

Knowlton's cactus was listed as endangered in 1979, and designation of critical habitat was determined to not be prudent ([44 FR 62244](#)). It was historically found in very localized areas in the Navajo Section of the Colorado Plateau Province, in southwest Colorado and northwest New Mexico ([44 FR 62244](#), Service 1985a). In New Mexico, it occurs in a very limited area in San Juan County, in pinyon-juniper woodland (Service 1985b). It is a very small plant, solitary or clustered, globular, ranging in size from 0.7-5.5 cm tall and 1-3 cm in diameter, and light gray-green (Service 1985b).

Knowlton's cactus grows on Tertiary alluvial deposits overlying the San Jose Formation (Service 1985b). These deposits form rolling, gravelly hills covered with pinyon pine, Rocky Mountain juniper, and sagebrush. The La Boca (Colorado) population grows on the slopes and top of a single hill at 2,075-2,095 meters. The cactus grows at about 2,300 meters (Service 1985b).

Most individuals bloom at 3-4 years of age. Knowlton's cactus buds in early to mid-April and flowers from mid-April to early May. The flowers open by mid-morning and close in late afternoon, and generally last 2-3 days (Service 1985b). Fruit forms in late May to early June (Service 1985b). The fruit dehisces from mid-to-late July by a vertical slit along one side of the ovary wall (Service 1985b). The seeds fall to the base of the parent plant. Running water (i.e., sheet-flow) appears to facilitate seed dispersal away from the parent plants. The seeds are carried downslope and are trapped among cobbles and pebbles, or by duff under a sagebrush, pinyon, or juniper plant (Service 1985b). The amount of time required for seed germination in the natural habitat is unknown. The major pollinator of Knowlton's cactus has not been determined; however it is most likely pollinated by insect vectors (Service 1985b).

Presently known populations are threatened by illegal collection, energy exploration and development, and various other human activities (Service 1985a). Indirect effects from oil and gas development may present challenges to the long-term persistence of the species (Service 2021b). Wild populations have been subject to illegal collections and trade (Service 2021b). Rabbit and rodent predation have been a major source of mortality for outplanted individuals (Roth 2020a; Service 2021b).

4.10.5 *Kuenzler Hedgehog Cactus, Echinocereus fendleri var. kuenzleri*

Kuenzler Hedgehog cactus was listed as endangered in 1979 ([44 FR 61924](#)) and downlisted to threatened in 2018 ([83 FR 21928](#)), designation of critical habitat determined to be not prudent. It grows as solitary stems or 1 to 4 in a cluster, 10–15 centimeters (cm) (4–6 inches [in]) tall, with

spines sharply pointed, and flowers with magenta tepals and bands of green near the center (Castetter et al. 1976, Service 2017d). It is currently found on the northwest side of the Sacramento and Capitan Mountains in Lincoln County, to the middle of the Guadalupe Mountains in Eddy County, New Mexico (Service 2017d).

Typical Kuenzler hedgehog cactus habitat includes the lower fringes of pinyon-juniper woodland from about 1,524 to 2,229 m (5,000 to 7,312 ft) elevation, with an average of 180 frost-free days and annual precipitation of about 41 centimeters (16 inches) (NMEMNRD 1989, BEEC 2002; Service 2021c). The associated vegetation community is more specifically described as a shrubby grassland and juniper savanna with tree cover varying from 2 to 25 percent, and grasses being the dominant vegetative cover from 25 to 40 percent (Sivinski 1999, Service 2021c). Occupied habitat consists of gentle slopes (0.3 – 30.6 degrees) or benches with gravelly to rocky soils and southern, eastern, and western exposures (NMEMNRD 1989, Service 2021c).

Kuenzler's hedgehog cactus is a perennial and reproduction is sexual (NMEMNRD 1989; Service 2017d). There is no evidence of reproduction by bulbils, tubers, stolons or rhizomes and it does not appear to reproduce by vegetative fragmentation (BEEC 2002, Service 2017d). They begin reproducing when they reach 4 to 5 years of age (Sivinski 2007b., Service 2017d). Budding occurs in April and flowering normally occurs during the first half of May into early June (Service 2017d). Fruits form in August and average 3-6 per plant (NMEMNRD 1989, Service 2017d). It requires 21°C (70°F) soil temperature and sufficient moisture for germination. There is no known dormancy requirement (NMEMNRD 1989; Service 2017d). Seed dispersal occurs during September and October by rodents, wind, and water (BEEC 2002, Service 2017d). Only seeds that are not consumed are likely to survive to germinate (BEEC 2002, Service 2017d). Little is known about the mode of pollination. Similar southwestern cactus species are pollinated by medium sized bees (Grant and Grant 1979, Service 2017d).

Fires, whether wild or prescribed, within the grassland habitats of *E. fendleri* var. *kuenzleri* are suspected to have serious immediate impacts to small populations (Service 2023f). Livestock grazing has had a significant effect on the frequency of natural fire within cactus habitats (Service 2023f). Growing seasons are becoming longer and warmer in many regions including the southwest (Cayan et al. 2001, Service 2023f). Earlier soil moisture stress would result in decreased flowering and reproduction, and because this cactus has a limited distribution, we would predict a substantial population reduction with a long-term warming trend (Service 2023h).

4.10.6 *Lee Pincushion Cactus, Escobaria sneedii* var. *leei*

Lee pincushion cactus was listed as threatened in 1979, designation of critical habitat was determined not to be prudent ([44 FR 61554](#)). It is many branched, forming tight clumps of up to 100 or more stems, and the central spines are acicular, white, tipped with pink and brown, 3-14 cm long (1.2-5.5 inches) (Benson, 1982, Service 1986). Lee pincushion cactus is known only from the Guadalupe Mountains within, and immediately adjacent to, Carlsbad Caverns National Park (CCNP) (Service 1986, Service 2023g). The historic distribution of the Lee pincushion cactus was considered CCNP only (Service 1986). As of 2019, this subspecies was known from six canyons scattered over approximately 22 kilometers (14 miles) of the Guadalupe Mountains

on CCNP and adjacent BLM lands and grouped into two populations based on proximity (Service 2023i).

Plants are multi-stemmed with stems of two types, one type of stem remains small and probably serves to start new plants when they break off, and the other is larger, more rigidly attached and produces flowers, fruits, and seeds (Service 1986). Most cacti bloom after 3-4 years (Service 1986). Plants bud in late March or early April (Service 1986). Winter and spring moisture is important for bud set (Service 1986). Buds mature quickly and in favorable weather flowers are produced in 2-4 weeks (Service 1986). Flowers generally last 3-4 days, less if fertilized earlier (Service 1986). Fruit formation is from August to November (Service 1986). Most fruits are eaten by insects or by rodents that probably scatter a few seeds in the process (Service 1986). If a fruit is not eaten, weathering breaks down the fruit wall causing the seeds to be dispersed by wind and rain (Service 1986). The best germination and survival occurs when seeds fall onto a layer of fine limestone pebbles over a large flat stone slab which traps soil moisture above the impermeable rock (Service 1986).

Lee pincushion cacti grow in semi-desert grassland (Brown 1982; Service 1986). It is restricted to the Tansil Limestone Formation (Service 1986). The limestones are generally hard, resistant to erosion, and support a sparse vegetation of low shrubs, some rosette-forming perennials, many cacti, and both annual and perennial herbs (Service 1986). Their edaphic requirements are poorly known (Service 1986). It grows at an elevation of 1,200-1,500 m (3,900-4,900 feet) in an area where the precipitation averages 30 cm/year (11.8 inches/year; Service 1986). Plants favor north-facing slopes or ledges where the soil is cooler and moister (Service 1986). While there appears to be suitable habitat in and around known locations, the presence of the Lee pincushion cactus drops out abruptly in habitat that appears to be continuous. This makes it difficult to infer where suitable habitat might exist beyond known colonies. We lack understanding as to why this cactus does not occur more frequently when suitable habitat appears relatively common (Service 2023i). The current known distribution for the species is in the state of Texas in Coblentz and Hudspeth counties, and in the state of New Mexico in Chaves, Eddy, and Otero counties (Ecos species profile page, accessed July 2026).

In the Recovery Plan (Service 1986) for Lee (and also Sneed) pincushion cacti, threats were listed as direct collection, destruction or modification of habitat, and natural limiting factors and threats such as seed predation, grazing, competition for space, or special edaphic requirement. For Lee pincushion cactus, wildland fires are discussed as having both positive and negative effects. However, the Recovery Plan also indicated that the species are too poorly understood to identify specific natural threats. Pressure from collectors is seemingly alleviated by availability of captively propagated individuals on the market. Plants are now available for purchase through distributors mainly in California. Construction, use, and maintenance of recreation attractant features (such as roads, trails, picnic areas, and campsites) and ungulate trampling are potential threats to habitat (Service 1986). Fire suppression activities, range improvement construction, use and maintenance, pesticide applications, and, potentially, decreases in air quality are documented habitat threats (NMRPTC 1999b, Service 2023i). Currently, the main threats are wildfires and climate change (Service 2015, Service 2023i).

4.10.7 *Mancos Milk-vetch, Astragalus humillimus*

Mancos milk-vetch was listed as endangered in 1985, designation of critical habitat was determined not to be prudent ([50 FR 26568](#)). It is a diminutive, tufted perennial forming clumps up to 30 cm (12 inches) across, that are crowned with a dense aggregation of persistent, spiny leaf stalks and lavender flowers (Service 1989). The species' association with highly localized sandstone outcrops in the Four Corners area suggests that its present and historic range may be similar (Service 1989). It is currently known from northwestern New Mexico and southwestern Colorado, occurring in scattered populations between Towaoc, Colorado and the Chaco River of New Mexico (Service 1989).

The Mancos milkvetch is restricted to small, poorly defined tan colored units of the Point Lookout sandstone (Service 1989). The high degree of specificity of the Mancos milkvetch to this substrate suggests the presence of some component in the rock that the plant requires for normal growth (Service 1989). It is usually found on large, nearly flat sheets of sandstone, and is clustered along the margins of bowl-like depressions that dot the bedrock (Service 1989). Its roots spread out into the basin of the depression and proliferate about 7 cm (2-3 inches) below the surface (Service 1989). The mean elevation for known populations is approximately 1,854 meters (5,650 feet), in an area that receives between 20-23 cm (8-9 inches) of rainfall a year (Service 1989).

The Mancos milkvetch flowers in late April through early May (Service 1989). In a normal year, the peak of flowering occurs between April 26 and May 10 (Service 1989). The flowers are visited by bees and other potential pollinators (Service 1989). Larger plants may produce over 100 flowers in a growing season, with the fruits setting rapidly and maturing by mid-June (Service 1989).

The Mancos milkvetch is threatened by modification of its habitat due to oil, gas, mineral, and energy development, general mineral exploration in the San Juan Basin, and collecting (Service 1989). Various rights-of-way such as access roads to abandoned and plugged wells and existing leases of gas lines and transmission lines are factors impacting the survival of Mancos milkvetch (Service 2023j). Such features and associated activities have contributed to significant presence of invasive species in the immediate vicinity of Mancos milkvetch habitat (Service 2023j).

4.10.8 *Mesa Verde Cactus, Sclerocactus mesae-verdae*

Mesa Verde cactus was listed as threatened in 1979 without critical habitat ([44 FR 62471](#)). Mesa Verde cactus currently occurs in Montezuma County, Colorado, and San Juan County, New Mexico (Service 1984). Approximately 95% of Mesa Verde cactus populations are on tribal lands (predominantly Navajo Nation lands in New Mexico, but also Ute Mountain Ute lands in Colorado) the other 5% occurs on adjacent BLM, state lands, and private lands (Roth 2020b). Stems are usually singular, globose, 3.2-6.5 cm tall (1.5-3 inches), with white, tan, straw or gray radial spines, flowers that are cream to yellow, and green fruit that becomes brown with age and split open horizontally (Service 1984).

Principle vegetation types associated with Mesa Verde cactus are those of the Great Basin Desert Scrub (Saltbush Series) and Desert Grassland Ecotone communities (Dick-Peddie 1993). The Southwest Regional Gap Analysis Mapping Project identified this community type as the Inter-mountain Basins Mat Saltbush Shrubland (Lowry et al. 2005). The Nature Conservancy and Bailey's both classify this ecoregion as the Colorado Plateau Semidesert Province (Lowry et al. 2005). Mesa Verde cactus is restricted to the Mancos and Fruitland Shale Formations (Service 1984). These formations have high alkalinity, are gypsiferous, and have shrink-swell properties that make them harsh sites for plant growth (Service 1984). They appear to grow on tops of hills and mesa slopes, and the roots are anchored in the Mancos Shale Formation while the base of the plant rests on the Menefee Formation which comprises a very thin surface layer (Service 1984). It is most frequently found growing on the tops of hills or benches (Service 1984). This cactus grows at 1,400-2,000 meters elevation in areas where annual precipitation varies from 8-20 cm (Heil and Porter 1994, Coles et al. 2012).

Stems begin producing flowers when they are about 2 cm (0.8 in) in diameter or about 8 years old and begin to flower each year after reaching 4 cm (1.6 in) in diameter (New Mexico State Forestry Division 2007). Flowers are diurnal, and bloom from late April into early May, and open daily for up to five days (Heil and Porter 1994). The fruit matures and splits in mid-June with the seeds falling to the base of the plant (Service 1984). Often seeds will germinate adjacent to the parent plant (Service 1984). Fruit dehiscence occurs from mid to late June (Service 1984). Running water (sheetflow) seems to be a major factor in carrying the seeds away from the parent plants where they fall into cracks in the dry adobe soil (Service 1984a). A dry period might be required for the anchoring of the seeds in the cracks of the soil (Service 1984). Animals possibly help in the dispersal of the seeds (Service 1984). Dormancy and other environmental requirements for seed germination is unknown (Service 1984).

Mesa Verde cactus is threatened by energy and mineral development, urbanization and associated impacts (particularly off-highway vehicle use), illegal collection, livestock grazing (trampling, soil compaction, and consumption), predation (by longhorn cactus beetle, army cutworm, rodents, etc.), and prolonged droughts (Coles et al. 2012, Roth 2008, Roth 2020, Service 2023k).

4.10.9 *Pecos Sunflower, Helianthus paradoxus*

The Pecos sunflower was listed as threatened in 1999 ([64 FR 56583](#)). Pecos sunflower is an annual, herbaceous plant that grows 1-3 m (3.3 - 9.9 ft) tall and is branched at the top, with flower heads that are bright yellow and a dark purplish brown center (Service 2005b). Little is known about the historic distribution of Pecos sunflower (Service 2005b). It is known to occur in widely separated areas in the Pecos River valley in eastern New Mexico, locations on the Rio San Jose and the Rio Grande in west-central New Mexico, desert springs in west Texas (Service 2005b), and a potential subpopulation in the Cuatro Ciénegas basin of Coahuila, Mexico (Sivinski, 2016).

Pecos sunflower is a wetland plant that grows in areas with permanently saturated soils in the root zone (Service 2005b). The plant is associated with spring seeps and desert ciénegas (Poole 1992, Sivinski 1996a, Service 2005b). Most Pecos sunflower habitats are limited to less than two

ha (five ac) of wetland (Service 2005b). This sunflower is completely dependent on water-saturated soil conditions within the soil root zone (Service 2005b). If a wetland habitat dries out permanently, even a large population of Pecos sunflower would no longer persist (Service 2005b). The soils of these desert wetlands are typically saline or alkaline because they occur where waters are high in dissolved solids, and high rates of evaporation leave deposits of salts, including carbonates, at the soil surface (Service 2005b). Soils in these habitats are predominantly silty clays or fine sands with high organic matter content (Service 2005b). This species also requires open areas that are not shaded by taller vegetation (Service 2005b).

Pecos sunflower is an annual species that must re-establish populations of adult plants each year from the seedbed of seeds produced during the previous year or years' reproductive efforts (Service 2005b). Aggregations of live individuals may occur in areas that are adjacent to (separate from) patches of dead stalks from the population of the previous year (Sivinski 1992, Service 2005b). This suggests seed dispersal or the presence of a persistent soil seed bank (Coteff 2000, Service 2005b). Pecos sunflowers typically bloom in the months of September and October, flowering peaks in the second week of September in the northern-most New Mexico populations, whereas the peak flowering time for the southern-most population in West Texas is typically later in October, seeds fill and mature during October and November then require two to three months after-ripening period before germination (Van Auken 2001, Service 2005b). Pecos sunflower are likely generalists in attracting a variety of insect pollinators (Service 2005b).

Pecos Sunflower habitats have historically, and are presently, being reduced or eliminated by aquifer depletion, or severely impacted by agricultural activities and encroachment by nonnative and invasive plants (Poole 1992, Sivinski 1996a, Service 2005b). The primary threat to Pecos sunflower is destruction or modification of wetland habitats from filling, groundwater pumping, contamination, aquifer depletion, and surface water diversion (Service 2023l). Other threats include competition from non-native plant species, excessive livestock grazing, mowing, and highway maintenance (Service 2023l).

Pecos Sunflower Critical Habitat

Pecos Sunflower Critical Habitat was designated in 2008 ([73 FR 17762](#)). PCEs, now PBFs for designated critical habitat are as follows:

1. Silty clay or fine sand soils that contain high organic content, are saline or alkaline, are permanently saturated within the root zone (top 50 cm of the soil profile), and have salinity levels ranging from 10 to 40 parts per thousand; and
2. Low proportion (less than 10 percent) of woody shrub or canopy cover directly around the plant.

Approximately 1,305 ac (528.11 ha) of critical habitat has been designated for Pecos sunflower in the states of Texas and New Mexico. Areas of critical habitat include the Diamond Y Spring in Pecos County, Texas; Dexter Ciénega, Lea Lake, Oasis Dairy, and Bitter Lake National Wildlife Refuge with adjacent City of Roswell land in Chaves County, New Mexico; Blue Hole Ciénega and fishing ponds, and West Side Spring in Guadalupe County, New Mexico; and the Grants salt flat and Rancho del Padre Spring in Cibola County, New Mexico. The west-central

New Mexico Pecos sunflower populations at Pueblo of Laguna and La Joya Waterfowl Management area were excluded from critical habitat designation.

4.10.10 Sacramento Mountains Thistle, *Cirsium vinaceum*

The Sacramento Mountains thistle was listed as threatened in 1987, designation of critical habitat was determined to not be prudent ([54 FR 35302](#)). It is a stout biennial, 1-1.8 meters (3.3-5.9 feet) tall, with many ascending, brown-purple branches, pink-purple flowers, and brown fruits (Service 1993b). The Sacramento Mountains thistle currently occurs on the Lincoln National Forest, in the Sacramento Mountains of south-central New Mexico (Service 1993b).

The Sacramento Mountains thistle is a riparian plant that requires saturated soils at springs, seeps, and streams (Service 1993b). These occupied wetlands are unique in their calcium carbonate content (Service 1993b). As the groundwater reaches the surface, the change in pressure and temperature precipitates the calcium carbonate onto organic materials (Service 1993b). Over time, large areas of those travertine deposits are created at the spring sources that occasionally become large bluffs or hills (up to 0.8 hectares or 2 acres) (Service 1993b). The continuously wet travertine deposits are the most common habitats of the Sacramento Mountains thistle (Thomson and Huenneke 1990, Service 1993b). Wet areas downstream from these features are often sparsely inhabited by this thistle (Service 1993b). Occupied Sacramento Mountains thistle habitats occur between 7,500 and 9,500 feet in elevation and are typically meadows and streams with steep slopes, few other plant species, and little grass cover (Service 1993b).

Sacramento Mountains thistle initially forms robust rosettes of spiny leaves that live for one or more years as juvenile plants (Burks 1994, Service 2010e). Each rosette eventually bolts a flowering stem, spends a single growing season as a reproductive adult, and dies upon seed set (Service 2010e). Individuals may produce multiple rosettes along rhizomes or rooting rosette leaves and be able to produce more than one flowering stem during the same, or a different, year (Huenneke 1996, Service 2010e). Pollen vectors include hummingbirds and numerous species of bees, beetles, flies, and moths (Service 1993b). The seed is heavy but fairly wind dispersible (Service 1993b).

The Sacramento Mountains thistle is threatened by water diversion at spring habitats, direct and indirect impacts from grazing, competition with exotic plant species, logging, and recreation (Service 1993b). Four native and one introduced insect predators were documented in the Silver Springs thistle population, and pose a threat to viability (Sivinski 2007a, Service 2010e).

4.10.11 Sacramento Prickly Poppy, *Argemone pleiacantha* ssp. *pinnatisecta*

The Sacramento Prickly Poppy was listed as endangered in 1989, designation of critical habitat was determined to be not prudent ([54 FR 35302](#)). Sacramento prickly poppy is a robust, short-lived perennial, 0.5-1.5 m (1.5-5.0 ft) tall with 3-12 branching stems, striking blue-green colored leaves, and large white flowers with 6 petals (Service 1994). It is currently known from 10 canyons in 7 different canyon systems in the Sacramento Mountains of south~~eastern~~ New Mexico (Service 1994).

Sacramento prickly poppy appears to favor early successional stages within desert shrub and pinyon-juniper vegetation types, and occurs in rocky canyons on the western slope of the Sacramento Mountains (Wood 1990, Service 1994). Forest surveys indicate young plants occur primarily on open, disturbed sites and that their recruitment is tied to moisture conditions (Service 1994). It ranges from 4,200 feet elevation in the lower Dog Canyon area to 7,120 feet elevation in upper Alamo Canyon area (Malaby 1987, Service 1994). The Sacramento prickly poppy occurs on open, disturbed sites (Service 1994). Its primary habitat includes stream banks and seeps, limestone canyon bottoms and side drainages. It is also found [at springs along roadsides and water pipeline rights-of-way, on north slopes, arid canyon bottoms, old fields and dry terraces above riparian areas, which range](#) from xeric upland to mesic sites (Malaby 1987, Service 1994).

Flowering begins in May and continues throughout the fall depending on elevation and moisture conditions (Wood 1990, Service 1994). Seed output for mid-sized plants in Alamo and Dog canyons averaged about 2,000 seeds per plant (Malaby 1988, Service 1994). However seed germination is low and seedling mortality is high (Malaby 1988, Service 1994). Seedlings may require more moisture for germination and establishment because the young roots are easily desiccated (Service 1994). Recruitment is typically limited (Service 1994). Little is known about the life history and ecology of Sacramento prickly poppy (Service 1994). Honey bees and carpenter bees are the most frequent pollinators of Sacramento prickly poppy (Malaby 1987) (Service 1994). Dispersal occurs from surface water runoff (Ownbey 1958, Service 1994). The majority of Sacramento prickly poppy seeds do not travel far from the parent plant and would remain there if flash floods did not move these large and heavy seeds downslope through the canyon drainage channels (Service 1994).

Major threats to the Sacramento prickly poppy include surface-disturbing activities from water pipeline projects (repair, replacement, and maintenance), road construction and maintenance (including mowing and herbicide use), flash floods, trampling and grazing from livestock, and off-road vehicles (Service 1994). Collectively, drought may not only reduce the area, availability, and quality of habitat for the poppy but may also compound the effects of other potential threats such as non-native plant competition, insect predation, and pollinator availability, threatening the viability of the species into the future and across its range (Service 2022h).

4.10.12 *Sneed Pincushion Cactus*, *Escobaria sneedii* var. *sneedii*

Sneed pincushion cactus was listed as endangered in 1979 ([44 FR 64741](#)), designation of critical habitat was determined to be not prudent. It is many branched, forming tight clumps of up to 100 or more stems, and the central spines are acicular, white, tipped with pink and brown, 3-14 cm long (1.2-5.5 inches) (Benson, 1982, Service 1986). It was initially known only from the Anthony Gap area of the Frankling Mountains in Doña Ana County, New Mexico, but has since been found from the Franklin Mountains of El Paso County, Texas and Doña Ana County, New Mexico to the southern end of the Organ Mountains of New Mexico, and in the Guadalupe Mountains of Texas and New Mexico (Service 1986b).

The Sneed pincushion cacti grow in semi-desert grassland (Brown 1982, Service 1986). It is restricted to limestone and grows in cracks on vertical cliffs or ledges (Service 1986). The limestones are generally hard, resistant to erosion, and support a sparse vegetation of low shrubs, some rosette-forming perennials, many cacti, and both annual and perennial herbs (Service 1986). Their edaphic requirements are poorly known (Service 1986). It grows at an elevation of 1,200-2,350 m (3,900-7,700 feet) in areas where the average precipitation varies from 19.7-40.0 cm/year (7.8-15.7 inches/year) (Service 1986).

Plants are multi-stemmed with stems of two types, one type of stem remains small and probably serves to start new plants when they break off, and the other is larger, more rigidly attached and produces flowers, fruits, and seeds (Service 1986). Most cacti bloom after 3-4 years (Service 1986). Plants bud from March to April with the principal blooming period in April (Service 1986). Fruit formation is from August to November (Service 1986). The fruits have a prune-like odor when ripe and attract rodents which are likely dispersal agents (Service 1986). Birds have been noted to feed on the fruits, and some fruits crumble with age, and water disperses the seeds (Service 1986). The best seedling survival is under rocks or deep in the cracks of rocks where seedlings are protected (Service 1986).

Sneed pincushion cacti are threatened by collection, destruction of habitat, and natural threats (Service 1986). Private land use, residential, commercial, and transportation system development, and military artillery impacts are potential threats to habitat (Service 1986). Recreational trail construction, use, and maintenance, ungulate trampling, and mineral materials development are documented habitat threats (Service 2015, Service 2019b, Service 2023m).

4.10.13 Swale Paintbrush, *Castilleja ornata*

The Swale paintbrush was listed endangered in 2025, critical habitat designation was determined to be not prudent (89 FR 96602). Swale paintbrush (*Castilleja ornata*), also known as the glowing Indian paintbrush and the ornate paintbrush, is a hemiparasitic plant that belongs to the broomrape (*Orobanchaceae*) family. This annual flowering plant is native to the grasslands of Hidalgo County, New Mexico in the United States and to the eastern Sierra Madre Occidental Mountains in Chihuahua and Durango, Mexico. It was historically documented at 13 sites throughout its range. Currently, swale paintbrush is only known to occur at one site in Hidalgo County, New Mexico (Service 2023n).

Swale paintbrush has been recorded in mesic sites (areas with moderate moisture) such as seasonally wet grasslands and savannahs at high-elevation basins and valleys above 4,000 ft (1,500 m). Additionally, the plant has been found at elevations ranging from approximately 4,920 to 7,550 ft (1,500 to 2,300 m). The species is an herbaceous annual that starts as a basal rosette, or a circle of leaves at ground level. Mature plants have a single or small number of erect or ascending stems with clasping leaves and bracts. The stems often branch from near the base of the plant. Both the leaves and bracts (modified leaves) are distinctively wavy-margined. Swale paintbrush grows to about 6.5 to 14 in (17 to 35 cm) tall and has a thin taproot or fibrous root system that is relatively shallow, typically only a few inches long documented in specimen records. Leaves range in size from 0.8 to 1.6 in (2 to 4 cm) in length. Swale paintbrush has green to purple-tinged leaves, and its bracts look like flowers. Its floral bract tips have an unusual color, typically pale to greenish-white, that fades to rosy to purple color as they age. Some plants

have yellow, orange or red bracts. The plant's actual flowers are inconspicuous, hidden within its showy bracts. The outermost part of the flower (calyx) contains cuts (clefts). The calyx is green and may have a white edge that turns pink as it ages (Service 2023n).

Plants sprout from late May to early June, although some may germinate as late as June. The peak flowering period occurs in mid to late August. While the phenology (timing and pattern of biological events) of swale paintbrush seems to occur with monsoon season precipitation, direct correlations between its population abundance and monsoon season precipitation amounts are elusive. Since juvenile swale paintbrush have not been observed in early spring, it is hypothesized that nondormant seeds need high temperatures and sufficient moisture to trigger germination after overcoming dormancy (Service 2023n).

Although swale paintbrush photosynthesizes, it needs carbon, nitrogen and other nutrients from the roots of host plants to achieve optimum growth and reproductive potential. Native grasses, including alkali sacaton (*Sporobolus airoides*) and blue grama (*Bouteloua gracilis*), are thought to be the primary host plants within the Animas Valley population. Young swale paintbrush plants establish connections with host plant roots via structures called haustoria. The species is an annual plant, and the longevity of its seeds is unknown. Surrogate *Castilleja* species have seed longevity of up to five years in storage and up to two years in the wild. Because of this, the plant likely requires frequent resupply of the seed bank for a population to continue (Service 2023n).

The plant likely cannot self-fertilize because its stigma is physically separated from its anthers, and wind pollination is unlikely because stamens are protected from wind by floral tubes. Healthy populations of local native pollinators support successful reproduction of swale paintbrush. The pollinators of swale paintbrush are unknown, and potential pollinators include bumblebees (*Bombus* spp.), sweat bees (family Halictidae), hummingbirds (family Trochilidae), and thrips (order Thysanoptera). Hummingbirds primarily pollinate *Castilleja* species with red floral bracts, while insects are presumed to be the primary pollinators for *Castilleja* species with yellow floral bracts (Service 2023n).

Most seeds are likely shaken from seed capsules by wind and settle to the ground within a short distance of the parent plant. However, these seeds are lightweight and surrounded by an aerodynamic, honeycombed shell that could be carried further by wind. Additionally, insects and small mammals likely contribute to local seed dispersal. While rare, long-distance dispersal events are possible, natural colonization of new sites primarily occurs through a series of short dispersals over time (Service 2023m). Stressors on the species and its habitat include habitat loss and fragmentation, hydrological alteration, altered fire regimes, the effects of intensive grazing pressure, exotic plant invasion, and climate change (Service 2023n).

4.10.14 Todsen's Pennyroyal, *Hedeoma todsenii*

Todsen's pennyroyal was listed as endangered in 1981 ([46 FR 5730](#)). Todsen's pennyroyal is a perennial, rhizomatous herb 10- 20 centimeters (cm) (4 - 8 inches (in)) tall and somewhat woody at the base (Service 2001). Todsen's pennyroyal flowers are usually an orange-red color, but yellow flowers have been observed in the Sacramento Mountains populations. The insides of the flowers are streaked. Nutlets are dark brown in color. The stems and leaves of Todsen's

pennyroyal are a dark green color. Its historical and recent distribution includes portions of the San Andres Mountains and the Sacramento Mountains in south-central New Mexico (Service 2001, 2022i).

Hedeoma todsenii is an edaphic specialist which grows on gypseous soils on north facing slopes within piñon-juniper communities in the San Andres Mountains and Sacramento Mountains (Service 2001; Service 2022i). The species grows on elevations between 1,875 - 2,250 m (6,200 - 7,400 ft). All sites occur where there are loose gypseous-limestone soil (Service 2001).

Todsens pennyroyal occurs where piñon pine (*Pinus edulis*) and one seed juniper (*Juniperus monosperma*) are the dominant woody species (Service 2001). It grows and flowers in the shade of piñon pines and junipers, and in woodland openings with thin grasses (mostly *Muhlenbergia* sp.; Service 2001). The average annual precipitation is 35.5 cm (14 in) per year (NOAA 1991, Service 2001). As of 2022, 47 Todsens pennyroyal populations have been documented: 32 populations in the Sacramento Mountains and 15 populations in the San Andres Mountains. Nearly all known populations occur on Federal lands, with 19 populations on Bureau of Land Management lands; 5 populations on both Bureau of Land Management and the Lincoln National Forest lands; 7 populations on the Lincoln National Forest; and 15 populations on White Sands Missile Range. One population occurs on land administered by the New Mexico State Land Office, and one population occurs on Bureau of Land Management land that crosses over into private land (Service 2022i).

Hedeoma todsenii exhibit two periods of reproduction, both in the summer, and both are influenced by precipitation (Britt 2017, Service 2022i). The first reproductive period occurs in late spring/early summer (May–June), especially in years with favorable winter and spring precipitation, and the second occurs in late summer (August–September), coinciding with summer monsoons (Service 2022i). Most reproduction is asexual through underground rhizomes (Service 2001). There is some evidence that most seeds produced by Todsens pennyroyal are not viable (Irving 1980, Sivinski 2001), which also indicates a genetic basis for most sexual reproduction failures. The nutlets of Todsens pennyroyal appear to be dispersed as a unit with the calyx (Service 2001). The surface of the nutlets becomes mucilaginous when moistened, which may cause the nutlets to adhere to soil and rocks and prevent surface runoff from removing them from suitable habitat (Service 1985c, NMFRCD 1992, Service 2001).

Nearly all known populations of Todsens pennyroyal are within federal jurisdictions where few known threats currently exist. Additionally, Todsens pennyroyal populations occur in rugged and remote areas, providing it some protection from human presence and other habitat disturbances. The foreseeable threats to all Todsens pennyroyal populations fall into three categories: 1) a changing climate; 2) increasing piñon-juniper woodland densities within the habitats of this species, and the related increasing threat of wildfire; and 3) apparently inherent genomic constraints to sexual reproductive success and dispersal. It is foreseeable that wildfire could threaten a significant number of Todsens pennyroyal populations, and if that happens the reproductive constraints may further endanger the continued existence of Todsens pennyroyal in a significant portion of its range (Service 2022i).

Todsens Pennyroyal Critical Habitat

Todsens Pennyroyal critical habitat was designated in 1981 ([46 FR 5730](#)). Critical habitat for Todsens pennyroyal was determined to include the entire area in New Mexico where the species

was known to occur at the time. This area encompassed 2 km² of the White Sands Missile Range, administered by the Department of the Army.

4.10.15 *Wright's Marsh Thistle, Cirsium wrightii*

Wright's marsh thistle was listed as threatened in 2023 ([88 FR 25208](#)). It produces a 3- to 8-foot (ft.) (0.9- to 2.4-meter (m)) single stalk covered with succulent leaves with flowers that are white to pale pink to vivid pink (Sivinski 1996b, Service 2023o). It was historically known to occur in Arizona, New Mexico, and Texas (2003 museum specimens from Presidio County) in the United States, and Chihuahua and Sonora in Mexico (Sivinski 2012, Service 2023o). It is currently known from Chihuahua (one site on a private property), and eight general confirmed locations covering an area of approximately 43 hectares (ha) in New Mexico (NMRPTC 2009, Sivinski 1996b, 2005, Worthington 2002, Service 2023o).

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 1996b, 2005, Service 2023o). It is usually associated with alkaline springs and seeps ranging from low desert up to ponderosa pine forest (Sivinski 2005, Service 2023o). *Cirsium wrightii* is an obligate of seeps, springs, and wetlands that have saturated soils with surface or subsurface water flow (Sivinski 1996b, Worthington 2002, NMRPTC 2009, Service 2023o). Most of the areas occupied are open ciénega or boggy margins of open water, or along excavated drains (Service 2023o).

Wright's marsh thistle does not reproduce vegetatively (asexually from parent plant; Service 2023o). It produces basal rosettes that persist through the first year or more (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, Service 2023o). 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, seed set, and dying (Service 2023o). Cross pollination is achieved by insect pollinators, primarily bees (Service 2023o). The mature plant requires direct sunlight to set seeds, and then it dies (Service 2023o). Seeds germinate best in well-lit conditions (Service 2023o). Seed banks may be reduced annually due to predation from insects and birds, by seed moving to non-habitat via wind or water dispersal, or by the germination of many seeds (Sivinski 2012, Service 2023o). 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 (Service 2023o).

Wright's marsh thistle faces a variety of threats that influence the viability of the species, including ground and surface water depletion, drought and climate change, impacts of livestock and native ungulate grazing, nonnative species invasion through nonnative grass planting and trees becoming established (creating competition for nutrients and water and reducing available sunlight and water availability), and oil and gas development and mining (Service 2023o). The species occupies relatively small areas of seeps, springs, and wetland habitat in an arid region experiencing long-term drought and ongoing and future water withdrawals (Service 2023o). The species' highly specific requirements of saturated soils with surface or subsurface water flow make it particularly vulnerable (Service 2023o).

Wright's Marsh Thistle Critical Habitat

Wright's marsh thistle Critical Habitat was designated in 2023 ([88 FR 25208](#)). The PBFs for designated critical habitat are as follows:

1. Water-saturated soils with surface or subsurface water flow that allows permanent root saturation and seed germination;
2. Alkaline soils;
3. Full sunlight; and
4. Diverse floral communities to attract pollinators.

There are eight critical habitat units totaling 63.4 ha (156.8 ac), all in the state of New Mexico. Approximately 21.5 ha (53.18 ac) are on private land, 19.45 ha (48 ac) are on federally owned land, 12.65 ha (31.2 ac) are on land owned by the state of New Mexico, 9.88 ha (24.4 ac) are on land owned by a City in New Mexico, and Tribal lands were excluded. These units include the Santa Rosa, Alamosa Springs, Bitter Lake, Tularosa Creek, La Luz Canyon, Silver Springs, Karr/Haynes Canyon, and the Blue Springs units.

4.10.16 Zuni Fleabane, *Erigeron rhizomatus*

The Zuni fleabane was listed as threatened in 1985, designation of critical habitat was determined to be not prudent ([50 FR 16680](#)). It is currently known from west-central New Mexico and northeastern Arizona. The southernmost metapopulation occurs in the Datil/Sawtooth Mountains of northern Catron County, New Mexico, and consists (in 2020) of 39 known local subpopulations ranging in size from 4 to over 700 individuals. This portion of the range was further extended in 2023 following habitat model field validation and subsequent exploration of modeled habitats (Jarnevich et al. 2025) to include the Escondido Mountain area, containing a population of at least 1,541 counted individuals from 5 sites. The Zuni Mountains metapopulation in McKinley County, New Mexico is smaller, with only two isolated local subpopulations where 115 plants were counted in 2026. The Chuska Mountains metapopulation in McKinley and San Juan counties, New Mexico and adjacent Apache County, Arizona was discovered in 1999. A 2004 survey of the Chuska Range documented a total of 15 local subpopulations ranging in size from 25 to greater than 2,500 individuals, and surveys in 2019 expanded the total to 18 known subpopulations (Service 2020g).

Zuni fleabane is a perennial herb that forms clumps of erect stems. The stems arise from rhizomes (underground stems) and have straight, stiff hairs. Propagation of Zuni fleabane occurs asexually by rhizomes and sexually by dispersal of seed (Knight 1988, Knight and Cully 1988). Seed production is evident in all populations, but can sometimes be depressed, possibly by abortion or lack of pollination (Knight and Cully 1988, Service 2020g).

Zuni fleabane occupies steep, easily erodable outcrops of coarse-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 sometimes support species of seleniphytic (selenium adapted) plants (Fletcher 1978, Sabo 1982, Sivinski and Lightfoot 1991). Much of the population occurs on coarse particulate material that is little degraded from the parent rock (Fletcher 1978, Knight 1988). The shaley outcrops constituting suitable habitat are often nearly barren, but occur within and contain scattered vegetation from

piñon-juniper woodland to lower transitional forest of ponderosa pine and Douglas-fir (Service 2020). Occupied habitats range in elevation from about 7,300 to 8,400 feet, and in size from less than 1 acre to about 260 acres (Service 2020g).

Most known populations of Zuni fleabane are within federal or tribal jurisdictions where few threats currently exist. The most significant threats to Zuni fleabane are climate change currently, and mineral (particularly uranium) exploration and development. Zuni fleabane substrates are geologically associated with the distribution of uranium deposits. Mining could potentially occur across most of the non-tribal portions of the species range, including the Datil and Sawtooth Mountains, where the majority of known Zuni fleabane populations occur (Service 2020g). Localized threats are present for at least 6 subpopulations within the Chuska Mountains in areas of residential housing development, and from associated off-highway vehicle use and recreation impacts on nearby habitats (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, Service 2020g).

4.11 FERNS AND ALLIES

American Hart's-tongue fern	Threatened	Focus Page	Profile Page
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American Hart's-tongue Fern, Asplenium scolopendrium var. americanum

American hart's-tongue fern (Family: Aspleniaceae [Spleenworts]) was listed as threatened in 1989, designation of critical habitat was determined to be not prudent (54 FR 29726). It is a variety of a widespread species that is most abundant in Europe and Eurasia. American hart's-tongue fern is distributed from central New York, through south central Ontario (most populations), and northern Michigan on glacially modified escarpments in areas of heavy lake-effect snowfall. Disjunct populations occur in sinkhole environments in eastern Tennessee, northeastern Alabama and northwestern Georgia. It also occurs in New Mexico (Cibola County, from a single location at the El Malpais National Monument), Mexico and Hispaniola (NMRPTC 1999a). As of 2019, there were 144 known extant populations/ environmental occurrences, with 32 in the U.S. and 112 in Canada. Overall, there have been 177-recorded populations or environmental occurrences, including 33 populations that have been extirpated. Recent losses consist of three small populations in New York, Michigan, and Alabama, extirpated since the mid-2000s (Service 2019e).

American hart's-tongue fern is perennial and evergreen, with life stages consistent with a typical fern life cycle—the leafy plant typically observed is the sporophyte phase. The sporophytes have a crown of evergreen, strap-shaped fronds with entire margins up to 35 to 40 centimeters (cm) (14 to 16 in) long and up to 2 to 4.5 cm (0.8 to 1.8 in) wide. The fronds taper to an acute tip and are auriculate at their base. They arise from a vertical rhizome covered with cinnamon-colored scales. The brownish petiole is 3 to 12 cm (1.2 to 4.7 in) long and has cinnamon-colored scales. The species is known to reproduce primarily by sexual means, however, asexual reproduction is also known to occur (Service 2019e).

American hart's-tongue fern is closely associated with cool, moist refugia on limestone bedrock under intact deciduous hardwood canopies with shallow soils and an open understory. The specialized habitats in which the American hart's-tongue fern occurs is buffered against climatic extremes. Its life history is closely tied to the calcium-rich bedrock and shaded moist, cool microclimates that provide habitat and nutritional requirements of all life stages. In general, American hart's-tongue fern occurs in areas of low herbaceous cover, in shallow soils in close association with bryophytes and limestone bedrock, and in relatively low light conditions. In the southeast, American hart's-tongue fern is associated with Mississippian limestone exposed in sinkholes and cave entrances, generally known as karst features. These karst features exclusively provide the cool, moist microclimate on which the fern depends (Service 2019e). In New Mexico, it found in deep shade on calcareous rocks at a cave entrance, and potentially in sinkholes and cool, moist talus (New Mexico Rare Plant Technical Council 1999).

Sources of threats and related stressors include development, logging, quarrying and climate change (forest loss, invasives, reduced snowpack, drought, increases thermal stress), illegal collection, and recreation impacts including recreational cave access (trampling, removal). Logging, development, and quarrying have historically been the predominant issues associated with most known extirpations in the eastern United States. Inappropriate collecting remains a threat to these populations. The small populations likely could not withstand any extent of poaching (Service 2019e). For the species overall, climate change and invasive species may be the most important factors to evaluate into the future, as they are most likely to impact the majority of populations and individuals across the range (Service 2019e, 2020h).

5 EFFECTS OF PROPOSED ACTIONS

This section covers the effects of the proposed actions 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 will affect listed species or critical habitat. Action agencies may incorporate this information by reference when they make an NE determination.

Effects of the action refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration (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 Ineligible Actions and Activities](#).

Secondly, other activities 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 assessments demonstrate that the habitat is not suitable, and/or surveys demonstrate the habitat is not occupied. Therefore, there is no pathway for effects to suitable habitat or individuals.
- Work will not occur in critical habitat unless field surveys demonstrate that one or more PBFs are not present or functioning and cannot be restored in the future. Therefore, the work will not affect or adversely modify PBFs of critical habitat.

6 SUMMARY AND CONCLUSION

After considering the relevant information pertaining to the species and critical habitat and evaluating the anticipated effects of a proposed action, we conclude that the actions subject to this SA and associated DKey will be consistent with a federal action agency determination of “No Effect” or “May Effect” for the subject species and critical habitat as described above. This SA is based on the information cited.

We will review and revise this SA, as needed, with 1) new scientific and commercially available data relevant to the status of the species and/or covered actions, when 2) a covered species becomes delisted or covered critical habitat is no longer designated, and when 3) a new species is proposed or listed and/or critical habitat is proposed or designated.

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APPENDIX A - STRUCTURED QUESTIONS

Appendix A – Structured Questions for screening a project via the New Mexico No Effect Determination Key for applicability under this standing analysis.

Potential questions in this key

The following is a comprehensive list of all questions that are part of this determination key. **Based on the answers you provide, only appropriate follow-up questions will be asked.**

1. This determination key is intended to assist the user in evaluating the incidental effects of their actions on federally listed species. It does not cover other prohibited activities under the Endangered Species Act (e.g., for wildlife: import/export, Interstate or foreign commerce, possession of illegally taken wildlife, etc.; for plants: import/export, reduce to possession, malicious destruction on Federal lands, commercial sale, etc.) or other statutes. Click 'yes' to acknowledge that you must consider other prohibitions of the ESA or other statutes outside of this determination key.
2. Does the proposed project involve research or other actions that include the pursuit, collection, capture, handling, or harassment of any individual federally listed threatened, endangered or proposed species?
3. Does the project involve, or is it reasonably certain to cause, purposeful, intentional take of federally listed species?
4. Is the proposed action entirely beneficial for all ESA-listed species and designated critical habitat that may be affected, meaning it will result only in positive effects?
5. Is the action authorized, funded, or being carried out by a Federal agency?
6. Are you the Federal agency or designated non-federal representative?
7. Are you reinitiating a consultation?
8. Are you requesting to extend the timeline on an existing consultation?
9. Are you including in this analysis all impacts to federally listed species that may result from the entirety of the project (not just the activities under federal jurisdiction)?

Note: If there are project activities that will impact listed species that are outside of the jurisdiction of the federal action agency submitting this key, or if the action area has upstream, downstream, or adjacent effects that extend beyond the state boundaries of NM and into a neighboring state, contact New Mexico Ecological Services Field Office to determine whether it is appropriate to use this key. If New Mexico Ecological Services Field Office has agreed a separate process will address those impacts to listed species that are outside the federal action agency's jurisdiction, you can answer yes to this question and continue through the key.

10. Does the action have the potential to affect riparian zone function or to have indirect effects to 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.

11. Will the action affect local hydrology (including applicable stream restoration projects)?
12. Will these activities overlap suitable habitat within the range(s) of the species, including upstream and downstream effects, and suitable areas that are outside of critical habitat?
13. Does the project require ground disturbance or vegetation removal, including the use of ANY chemical, including pesticides (insecticide, herbicide, fungicide, rodenticide, etc) and/or fertilizers?
14. Will these activities overlap suitable habitat within the range(s) of the species that cannot be avoided?
15. Will the action require vegetation reclamation activities such as reseeding or revegetating?
16. Does the proposed action intersect designated critical habitat?

This question will be answered automatically based on previous questions.

17. Did a critical habitat assessment for the presence of physical and biological features (PBFs) within the action area find the occurrence of one or more PBFs, or one or more PBFs that could be restored in the future that cannot be avoided?
18. Do you have additional supporting documents you would like to upload to support your project review (e.g., Biological Evaluation, Habitat Assessment, Environmental Report, photos, maps, etc.)?
19. Does the action area contain suitable habitat that cannot be avoided for any species (as defined in listing documents) found on your official species list, whether inside or outside of designated critical habitat?
20. Was a species survey conducted according to FWS (Service) protocol to assess the presence of listed species and their suitable habitat within the action area?
21. Were listed species found within the action area?
22. Do you have additional supporting documents you would like to upload to support your project review (e.g., Biological Evaluation, Habitat Assessment, Environmental Report, photos, maps, etc.)?
23. Is the action the approval of a long-term (i.e., in effect greater than 10 years) permit, plan, or other action?
24. Does the action involve permitting of livestock (e.g., cattle, horses, sheep, etc.) grazing?
25. Does the action involve remediation of orphaned wells?
26. Is this a wind energy project?
27. Does the project involve new construction or the installation of new above ground structures such as poles or towers?
28. Have Tiers 1 through 3 been completed in accordance to the USFWS (Service) Land-Based Wind Energy Guidelines (<https://www.fws.gov/sites/default/files/documents/land-based-wind-energy-guidelines.pdf>)?
29. Does the project involve routine maintenance or repair or replacement of equipment and parts of existing tower sites?

30. Is this a Tier 4 or 5 project that will be completed in accordance to the USFWS (Service) Land- Based Wind Energy Guidelines (<https://www.fws.gov/sites/default/files/documents/land-based-wind-energy-guidelines.pdf>)?
31. Has a "may affect" determination been made based on field and other studies for migratory birds, bald or golden eagles, or any other of the species on your species list? If yes, please upload supporting documentation.
32. Is this a solar energy project?
33. Does the project involve routine maintenance of existing solar sites?
34. Does the project involve repair or replacement of existing equipment?
35. Does the project involve new construction or the installation of new above ground structures such as poles or towers?
36. Has a "may affect" determination been made based on field and other studies for migratory birds, bald or golden eagles, or any other of the species on your species list? If yes, please upload supporting documentation.
37. Does the proposed action involve the use of crewed or uncrewed aircraft (e.g., airplanes, helicopters, drones, balloons)?
38. Does the action involve a communications tower licensed or regulated by the Federal Communications Commission (FCC)?
39. Will the proposed action only involve routine maintenance of existing tower sites or the repair or replacement of existing towers and/or equipment?
40. Will the repair or replacement activities result in increased tower mass, height, or the addition of guy-wires?
41. Will the tower lighting system be designed and operated using avian-friendly configurations described in the Recommended Best Practices for Communication Towers?
42. Does this project fall under Federal Communications Commission rules implementing NEPA found at 47 CFR 1.1301 ?
43. Does the action area occur within incorporated city limits?
44. Does your project consist solely of work done within an existing structure?
45. Is it reasonably certain that none of the species on your species list are occurring or will occur in or near the project area in the future (this timeframe should consider applicable project maintenance and decommissioning activities)?
46. Will implementing the project have potential adverse effects to listed species?
47. Does the proposed action include conservation measures or design criteria that minimize the adverse effects to where they are insignificant or discountable?