## U.S. Fish & Wildlife Service

# **RECOVERY OUTLINE FOR THE PEÑASCO LEAST CHIPMUNK**

(Neotamias minimus atristriatus)



Photo credit: Mark Horner, U.S. Fish and Wildlife Service



Species Common Name: Peñasco least chipmunk Species Scientific Name: Neotamias minimus atristriatus Species Current Range: White Mountains, Lincoln County, New Mexico Recovery Priority Number: 3 ESA Listing Status: Endangered; effective date January 9, 2025 (89 FR 99656) Lead Region: Southwest Region Cooperating Region: N/A Lead Office: New Mexico Ecological Services Field Office 2105 Osuna Rd NE Albuquerque, NM 87113 (505) 346-2525

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#### 1) Background

This recovery outline is a succinct document that provides an interim strategy to guide the conservation and recovery of the Peñasco least chipmunk, a newly listed subspecies under the Endangered Species Act (ESA) of 1973, as amended. A subsequent recovery plan will be a far more extensive evaluation and planning process whereby federal, tribal, state, and local partners are encouraged to participate; however, the U.S. Fish and Wildlife Service (USFWS) is always open to additional information regarding the conservation and recovery of the Peñasco least chipmunk. For more information, or to provide relevant comments, interested parties may contact the lead field office at the above address and telephone number.

The following sections include a brief summary of the known biology, life history, and ecology of the Peñasco least chipmunk. A more detailed analysis of the subspecies' morphology, phenology, reproduction, demographic trends and habitat characteristics can be found in Chapter 2 of the Species Status Assessment (SSA; USFWS Version 1.1, July 2024). An electronic copy of the SSA is available the <u>ECOS species webpage</u>. Also included in this outline are a brief account of known threats and some interim conservation/recovery efforts either planned for in the near term or currently underway.

#### **Important Information Gaps and Treatment of Uncertainties**

Our greatest information gap and overall uncertainty is a comprehensive account of the Peñasco least chipmunk's distribution and status. While historical records do exist on adjacent Tribal lands (1930s, 1960s and 1982), contemporary survey efforts have been limited to select areas on the Lincoln National Forest. As a result, our understanding of factors such as habitat selection and variability, vital rates, interspecific competition with the grey-footed chipmunk (*Neotamias canipes*), effects of invasive species (e.g., feral hogs), and genetic integrity are lacking. Another

pressing question is the cause(s) of extirpation in Sacramento Mountains (see also Current Biological Status of the Species) in Otero County, New Mexico. This population was geographically distinct from the currently known distribution, at a significantly lower elevation, and within a montane ponderosa pine savannah community – a very different habitat type when compared to the subalpine meadow/spruce forest of the known population. Other information gaps include the prevalence and effects of disease on population dynamics, dietary specificity or variability, the role of fire and fire suppression on Peñasco least chipmunk habitat, and our ability to effectively restore disturbed/degraded habitat or establish suitable habitat in historical locations.

Currently, our treatment of uncertainties is to take a proactive approach and conserve the existing population and its habitat to the best of our ability. The majority of known habitat on the Lincoln National Forest is within a designated wilderness area; nonetheless, vulnerabilities from fire and ecological changes over time do exist and remain largely out of our control. An optimal approach to address these uncertainties includes additional survey efforts within the White Mountains, on lands owned by our Mescalero Apache and USDA Forest Service partners. We are hopeful that one or more additional populations can be identified that will 1) add to our knowledge and understanding of the subspecies, its life history requirements, and potential recovery actions and 2) improve the conservation status by adding some degree of population redundancy, representation, and resiliency (Wolf et al. 2015 entire; Smith et al. 2018 entire).

## **Brief Life History**

Across their broad North American distribution, least chipmunks (*N. minimus*) occur in a wide variety of habitats that include tundra, shrub-steppes, hot arid sagebrush, sand dunes, pinon-juniper woodlands, ponderosa pine and spruce-fir forests, as well as arid valleys and alpine zones (Sullivan and Nagorsen 1998, p. 54; Verts and Carraway 2001, entire). Although this represents a diverse distribution and measure of habitat use, some subspecies (or given populations) are locally specialized, occurring as disjunct populations that have evolved morphological, physiological, or behavioral adaptations to local environments (Sullivan and Nagorsen 1998, pp. 54-55; Frey and Boykin 2007, p. 10). The southernmost extent of *N. minimus* distribution includes the Peñasco least chipmunk (*N. m. atristriatus*) located in remote areas of the White Mountains of southern New Mexico (Sullivan and Petersen 1988, entire; Verts and Carraway 2001, p. 3). These sky islands are home to many endemic plant and animal species found nowhere else.

The Peñasco least chipmunk requires a number of constituent habitat features which support foraging, cover from predators, and substrates that allow for sentinel perching, nesting, and overwintering. Food sources include a variety of shrub, forb, and some conifer seeds as well as other plant parts and fungi which they will cache for winter consumption. They will also feed on arthropods, carrion, and bird eggs (Bailey 1931, p. 91; Vaughn 1974, pp. 770–772; Reid 2006, p. 212). Least chipmunks do not develop additional fat stores in the fall but rely primarily on brief periods of activity to consume cached food for survival in winter (Verts and Carraway 2001, p.7), hibernating (more specifically, overwintering with periods of both torpor and activity) in special

underground chambers (Reid 2006 p. 212). Like other least chipmunks, the Peñasco least chipmunk likely has relatively low water requirements, which may allow it to exploit the drier conditions of the open subalpine meadows of its current known distribution (Frey and Hays 2017, p. 34). Winter survival rates for the Peñasco least chipmunk are not generally known; however, in other least chipmunks, it is estimated that fewer than one-third of individuals survive the winter (Bergstrom and Hoffmann 1991, p. 11).

Least chipmunk breeding takes place soon after emergence from the hibernation chambers (Reid 2006, p. 212). In spring, females typically produce one litter of 4-5 pups (Skryja 1974, p. 223), but the size of the litter can range from 3-8, with young being born in May or June (Reid 2006, p. 212). For Peñasco least chipmunks, young are thought to be born in mid- to late-summer, as half-grown juveniles were observed historically in early September in the Sacramento Mountains (Bailey 1931, p. 91). The average life span of least chipmunks overall is 0.7 years (Erlien and Tester 1984, p. 2), but individuals have been seen to live up to 6 years (Reid 2006, p. 212).

## **Limiting Life History Characteristics**

Again, the Peñasco least chipmunk does not store adequate fat reserves to last the winter but rather alternates between torpor and periods of feeding activity. In addition to providing for the energy demands of breeding and rearing young, an adult Peñasco least chipmunk must therefore cache adequate food resources throughout the warm season (approximately April through September/October). Both short- and long-term drought and fundamental changes in precipitation patterns can significantly alter the vegetation community and thus 1) compromise the ability to store ample food caches; 2) reduce the overall quality of food sources; and 3) force individuals to forage over greater distances, requiring a greater energy demand and subjecting chipmunks to an increased predation risk.

Recent research (McKibben and Frey 2025, entire) has also shown that the White Mountain population is a habitat specialist – showing a clear affinity to certain forest structure/cover-types and plant species. Although other shrub species have recently been noted, gooseberry current (*Ribes montigenum*), which is also a potential food source, is a key habitat component. Another potentially important cover-type is the skirt-like structure formed from the lower boughs of medium- to large-diameter Engelman spruce (*Picea engelmannii*). Shifts in climate patterns and wildfire could significantly affect the abundance and distribution of these species and perhaps a central element of Peñasco least chipmunk habitat.

## **Primary Threats**

Historical changes in forest composition and decades of wildfire suppression have resulted in altered fire regimes throughout the White Mountains of southern New Mexico. While episodic fire is a natural process in forest ecosystems, these altered regimes have resulted in more catastrophic fires that tend to eliminate and replace entire forest stands. Further, fire suppression has also resulted in forest encroachment and a reduction in grassland-shrubland meadows which are a central habitat feature for the Peñasco least chipmunk. Intense and prolonged drought patterns have exacerbated these impacts and are projected to continue for the foreseeable future.

Feral horse and elk grazing may also be a threat through its impact on fescue meadows (Frey and Hays 2017, p. 42). In addition, feral hogs are well established in both the Sacramento and White Mountains (USDA Wildlife Services New Mexico 2010, entire) and can directly impact chipmunks through predation and indirectly through extensive habitat alteration (USDA Wildlife Services New Mexico 2010, p. 6, 7).

The role of sylvatic plague (*Yersinia pestis*) is unclear but of growing concern to both researchers and management agencies. Given the small population size of Peñasco least chipmunk, which is a fundamental risk factor by itself, even a low level of plague incidence represents a significant threat to the subspecies.

One other chipmunk species, the gray-footed chipmunk, is congeneric with the Peñasco least chipmunk. The role of interspecific competition needs further research including whether such interactions are, or have been, a factor in the decline of the Peñasco least chipmunk. Such interactions may also have been contributory factor to the extirpation of the subspecies in formerly occupied habitat at lower elevations.

## **Current Biological Status of the Species**

#### Overview – Historical and Current Distribution

The Peñasco least chipmunk historically occupied meadows and grasslands interspersed within old-growth ponderosa pine forests between 2,103 to 2,438 m (6,900 to 8,000 ft) in the Sacramento Mountains of Otero County New Mexico. Unfortunately, the subspecies has been considered extirpated from this location since the 1960s which limits our understanding of this habitat association. It currently occupies high-elevation (>3,109 m (10,200 ft)) subalpine Thurber's fescue (*Festuca thurberi*) grassland/meadow communities in the White Mountains with a significant shrub component. Also prevalent are rocky outcrops and old-growth Engelman spruce (*Picea engelmannii*) with low-hanging boughs that form a sheltering skirt around the base of the tree. The apparent dichotomy of historical and current habitat associations is puzzling and a subject of future research.

#### The 3Rs

The current total population estimate for the Peñasco least chipmunk is roughly 40-50 individuals; however, this estimate is based on limited survey data and we are hopeful that future survey efforts on tribal and USDA Forest Service lands will identify additional populations. In terms of the 3Rs, the following summarizes the current status of the species:

*Resiliency* – The subspecies occurs at a very low population density in the White Mountains and is likely extirpated in the Sacramento Mountains. No verifiable populations occur on adjacent tribal or USDA Forest Service lands; future survey efforts may add to the known current distribution. Habitat and food sources appear adequate in the White Mountains (designated critical habitat) but may be lacking or absent in the Sacramento Mountains. Predation rates are not known but significant predation may occur in areas with feral hog overlap. Vital rates (fecundity, survivorship, etc.) are poorly understood. Disease prevalence is unknown but plague is thought to pose a risk; as of 2022 plague has been identified in deer mice and vole populations in the White Mountains, suggesting that plague is circulating in the area within potential reservoir taxa (Goldberg et al. 2022, entire).

*Representation* – Few individuals have been observed since 2000 in the White Mountains (current population is estimated at 40-50 individuals) and the Sacramento Mountains population is assumed to have been extirpated since 1966. Genetic variation within extant populations is likely limited based on the small population size. Given the strong likelihood that the Sacramento Mountains population is extirpated, both genetic and ecological diversity are represented only by the White Mountain population.

*Redundancy* – Historically two populations were located in two discrete mountain ranges with diverse habitat associations. Currently, only one known population occurs within a more limited habitat type.

#### **Conservation Actions to Date**

The New Mexico Department of Game and Fish first listed the Peñasco least chipmunk as endangered in 1983. Under state protection, it has been illegal to directly kill a Peñasco least chipmunk and the direct take control has added significant conservation value. No state-level habitat protection is in place for this species. Since state listing, the New Mexico Department of Game and Fish has funded several surveys and habitat assessments on the Lincoln National Forest.

Research on the subspecies has been largely conducted by New Mexico State University professor, Jennifer Frey, Ph.D. The New Mexico Department of Game and Fish has primarily funded this research through the Share with Wildlife program and has focused on the distribution, population trends, habitat requirements/associations, and movement within habitat types. Graduate students in Dr. Frey's laboratory have completed an occupancy model that identified particular habitat characteristics that may be modeled in other areas to better reflect current knowledge (McKibbon and Frey 2025, entire). Contemporary monitoring is now conducted with less invasive survey methods that utilize specialized trail cameras instead of live trapping. This methodology has less potential for disturbing/injuring individuals or causing direct or indirect mortality. Current efforts are underway to extend funding for continued monitoring and research.

In September 2024, a team consisting of biologists from the U.S. Fish and Wildlife Service, Mescalero Apache Tribe, New Mexico Department Game and Fish, USDA Forest Service, and New Mexico State University were able to collect ear clips from two individuals in an effort to establish cryogenically preserved cell lines. This biobanking effort was partially successful, resulting in a single male viable cell line stored at the San Diego Zoo (frozen zoo); unfortunately, the second sample failed to grow in vitro. Partnerships with the Mescalero Apache Tribe have begun to work towards establishing a conservation and recovery effort on Tribal lands and several funding opportunities are also being explored. In addition, preliminary discussions have begun to establish a captive breeding program at the El Paso Zoo. The Lincoln National Forest is also beginning some early trials on gooseberry current cultivation that can be used in future habitat restorations efforts.

## **Recovery Priority Number**

The Recovery Priority Number is *3*. This is based the following criteria (48 FR 43098; 48 FR 51908):

• The Peñasco least chipmunk is currently recognized as a valid *subspecies* (Verts and Carraway 2001, entire; Wilson and Reeder, 2005, p. 815):

Class: Mammalia Order: Rodentia Family: Sciuridae Genus: Neotamias Species: *Neotamias minimus* Subspecies: *Neotamias minimus atristriatus* 

- The subspecies is under a *High Degree of Threat* from 1) effect of small population size; 2) habitat alteration (e.g., fire/fuels management, catastrophic fire, forest encroachment on grasslands and shrub meadows); 3) grazing from feral horses, large elk populations, and feral pig disturbances; 4) prolonged and exacerbating drought patterns; and 5) possibly sylvatic plague.
- The recovery potential is *High* for the subspecies as 1) there is a notable possibility of locating additional populations on unsurveyed, adjacent lands (Mescalero Apache and USDA Forest Service) that will add to the subspecies status under the 3Rs; 2) much of the known distribution is located in designated wilderness which is not subject to development pressure; 3) there appears to be adequate habitat availability on adjacent public and tribal lands; and 4) there are concerted efforts to establish a captive breeding program currently underway at the El Paso, TX City Zoo.

## 2) Interim Recovery Program

#### Interim Recovery Strategy

The Peñasco least chipmunk is an endemic habitat specialist with a current distribution limited to certain areas of the White Mountains of southern New Mexico. It is an accepted subspecies of least chipmunk (*N. minimus*) with a population estimate of 40-50 individuals which are limited to 2 or 3 known locales. Nonetheless, due to limited surveys over time, these locales should not be considered discrete but rather known sites of occupancy within the greater White Mountain

population. It is therefore a subspecies with very low resiliency, redundancy, and representation (the 3Rs). In short, the Peñasco least chipmunk is at significant risk of extinction from even a relatively mild occurrence of synergistic circumstances (e.g., small population, drought, disease) or a singular catastrophic event (e.g., wildfire).

Recovery of the Peñasco least chipmunk will be contingent on several factors. The most immediate need, which will help inform and guide future recovery actions, is a better understanding of the overall distribution of the subspecies, including adjacent Mescalero Apache Tribal lands and unsurveyed/under-surveyed areas of the Lincoln National Forest. Although the Peñasco least chipmunk it thought to be extirpated from the known ponderosa pine habitat in the Sacramento Mountains (James Canyon), there is a possibility that they may still be present in such areas on tribal land. There is also a remote chance that the subspecies may persist in nondegraded, ponderosa pine habitat in the Sacramento Mountains outside of James Canyon location. Whether additional occupancy locales are identified or not, this information should clarify questions on the breadth of contemporary environmental and genetic representation and more firmly establish a better understanding of redundancy and overall resiliency. Additional surveys should also better define the degree and nature of congeneric overlap with the greyfooted chipmunk and provide valuable insight into interspecific competitive relationships.

There is also a need to study post-wildfire recolonization/habitat utilization. Some managed wildfire regimes, fuel management approaches, and post-fire restoration efforts may provide opportunities for the conservation and expansion, of sub-alpine grassland/shrubland meadows, which is a central habitat type for the subspecies. While such interventions can be problematic in USDA Forest Service wilderness areas, the need is nevertheless an important aspect of Peñasco least chipmunk conservation.

Grazing by elk and invasive species likely represent some degree of adverse impacts to Peñasco least chipmunk habitat. Grazing by feral horses and a rapidly growing elk population can impact areas of meadow grassland; however, there are some efforts by the Mescalero Apache to remove horses on their lands. The high-elevation habitat may mitigate some of the grazing pressure by horses but elk herds that have greatly increased in size since the Little Bear Fire (2012) represent a pronounced impact to habitat. Unfortunately, there is not a current remedy for the elk issue but the Lincoln National Forest has discussed the problem with the New Mexico Department of Game and Fish and is exploring some options such as an extended elk hunting season. Rooting by feral hogs is also a potential problem in the area and there are currently organized efforts, beyond hunting, to control the feral hog population.

Recent evidence of enzootic plague in small mammals within the White Mountains was positively identified (Goldberg et al. 2022, entire) and there are a number of reasons to suspect it may be a larger concern:

• There seems to be suitable habitat that is not presently occupied by the Peñasco least chipmunk or its presumed competitor (grey-footed chipmunk), suggesting that we look

beyond habitat explanations for population declines.

- Chipmunks are known to be susceptible to plague, and the least chipmunk was especially susceptible in laboratory challenge studies (Holdenreid and Quan 1956, Marchette et al. 1962, entire).
- Plague has caused large-scale "decimation" of free-ranging chipmunks (Murray 1967, entire).
- The Peñasco least chipmunk's likely extirpation from the Sacramento Mountains was roughly coincident with the period when plague was thought to be invading New Mexico.
- Recent carnivore serology data from Lincoln and Otero Counties show plague-positives are abundant and surround the White Mountains; samples from wilderness areas inhabited by Peñasco least chipmunk were not collected or at least tested in this study, but the commonality of plague-positive samples just outside these areas suggest the disease is perhaps prevalent in occupied areas (unpublished APHIS data), a supposition supported by Goldberg et al. (2022, p. 12).
- The Peñasco least chipmunk's present distribution at high elevations in the White Mountains is consistent with the expectation that plague will be less active on average at very high elevations than at more moderate elevations. Although plague is absent in arctic climates, we should not regard the subalpine zone as a true Peñasco least chipmunk refugium because plague likely can move upslope and downslope with climate cycles.
- As noted above, plague is present and impacting the small mammal community in the Lincoln National Forest, including mice and voles, which are thought to be potential plague maintenance hosts (Gage and Kosoy 2005; Goldberg et al. 2022, entire). Persistent active transmission of the disease in populations of maintenance hosts can increase the vulnerability of associated species, like the Peñasco least chipmunk.

Lastly, early discussions have begun between the USFWS, researchers at New Mexico State University, and the El Paso, TX City Zoo on establishing a refugial and captive breeding program. Zoo officials are modifying an existing building that is expected to be completed in 2025. The current plan is to establish a pilot program with a non-listed least chipmunk in order to understand and establish appropriate care and breeding protocols. The goal is to have roughly 4-6 breeding pairs that can produce offspring for release into the wild in areas of 1) existing suitable, unoccupied habitat and 2) habitat restoration areas, including fuels management and postwildfire treatments. Other aspects of the captive program are genetic and disease screening on wild-caught animals. The facility and rearing program would be structured to mimic the natural setting as much as possible in order to best prepare animals for survival in the wild. The captive population is envisioned to be a long-term program that would provide animals for release and serve as a permanent refugial population.

Action Plan

Preliminary Recovery Actions		
Recovery Actions	Data Gaps or Threats Addressed	Contributions to Recovery
1. Additional camera surveys/ Sherman trapping on Mescalero Apache and USDA Forest Service lands	<ul> <li>Lack of comprehensive population estimate</li> <li>Lack of knowledge of overall distribution and habitat variability</li> <li>Post-wildfire recolonization/habitat use</li> </ul>	<ul> <li>Increased understanding of habitat variability and number of populations</li> <li>Increase of genetic integrity for future captive breeding efforts</li> <li>Provide guidance for potential restoration efforts (treatment, location, etc.)</li> <li>Improve status of 3Rs</li> </ul>
2. Assessment and surveys of post- wildfire habitat use/fire and fuels management	<ul> <li>If/when post-wildfire habitat becomes suitable and is potentially occupied</li> <li>Removal of lower boughs of Engelman spruce within occupied habitat (i.e., ladder fire reduction)</li> <li>Risk of catastrophic fire</li> <li>Reduce forest encroachment on alpine meadow habitat</li> </ul>	<ul> <li>Alternative methods of fuels management to preserve skirts of Engelman spruce</li> <li>Expand/enhance grassland meadow habitat through fuel reduction/controlled burns</li> </ul>
3. Habitat restoration	<ul> <li>Limited to a known single habitat type</li> <li>Post wildfire recolonization</li> <li>Not historically limited to a single type</li> </ul>	<ul> <li>Expand habitat into historical area and habitat types</li> <li>Expand habitat in existing habitat types</li> <li>Improve status of 3Rs</li> </ul>
4. Invasive species control (feral horses and hogs)	<ul> <li>Grazing by feral horses of meadow/grassland habitat</li> <li>Predation and rooting disturbance of habitat by feral hogs</li> </ul>	<ul> <li>Reduce predation</li> <li>Reduce habitat degradation in grassland meadows</li> </ul>
5. Elk population control	Grazing impacts by large elk     population	<ul> <li>Reduce habitat degradation in grassland meadows</li> </ul>
6. Sylvatic plague assessment	<ul> <li>Incidence/risk of plague in the Peñasco least chipmunk population(s)</li> <li>Incidence of plague in other mammals</li> </ul>	<ul> <li>Help define need and approach to vaccinate animals</li> <li>Potentially dust certain areas for fleas – limit transmission</li> <li>Provide treated bait food for mammal species (mice, voles, chipmunks, etc.) – limit transmission</li> </ul>
7. Captive population and breeding program	<ul> <li>Lack of any broodstock for future reintroductions</li> <li>Lack of any established refugial population</li> </ul>	<ul> <li>Captive breeding program for release</li> <li>Refugial population</li> <li>Biobanking of cell lines to inform research and genetics</li> </ul>

Signed:

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Southwest Region

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