Mexican Spotted Owl
(Strix occidentalis lucida)

5-Year Status Review:
Summary and Evaluation

Photo by S. Hedwall, U.S. Fish and Wildlife Service

U.S. Fish and Wildlife Service
Arizona Ecological Services Office
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5-YEAR REVIEW

Mexican Spotted Owl (Strix occidentalis lucida)

1.0 GENERAL INFORMATION

1.1 Listing History

Species: Mexican spotted owl (*Strix occidentalis lucida*)
Date listed: April 15, 1993
FR citation(s): 58 FR 14248
Classification: Threatened

Critical habitat/4(d) rule/Experimental population designation/Similarity of appearance listing: The U.S. Fish and Wildlife Service (Service) designated critical habitat for the Mexican spotted owl (hereafter, owl) on August 31, 2004 (69 FR 53182).

1.2 Methodology used to complete the review:

The Service most recently evaluated the biology and status of the owl as part of a status review conducted on August 16, 2013. We examined whether new information was available and whether that new information would alter or affect analyses and conclusions made in the previous status review. Data for this current review were solicited from interested parties through a Federal Register notice announcing the review on February 2, 2022 (87 FR 5834). We also contacted tribes and our partners to request any data or information we should consider in our review. Additionally, we conducted a literature search and a review of information in our files.

1.3 FR Notice citation announcing the species is under active review:

Endangered and Threatened Species: Initiation of 5-Year Status Reviews of 35 Species in the Southwest; February 2, 2022 (87 FR 5834 5838).

2.0 REVIEW ANALYSIS

Section 4 of the Act (16 U.S.C. 1533) and its implementing regulations (50 CFR part 424) set forth the procedures for determining whether a species meets the definition of “endangered species” or “threatened species.” The Act defines an “endangered species” as a species that is “in danger of extinction throughout all or a significant portion of its range,” and a “threatened species” as a species that is “likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.” The Act requires that we determine whether a species meets the definition of "endangered species" or "threatened species" due to any of the five factors described below.

Section 4(a) of the Act describes five factors that may lead to endangered or threatened status for a species. These include: A) the present or threatened destruction, modification, or curtailment of its habitat or range; B) overutilization for commercial, recreational, scientific,

or educational purposes; C) disease or predation; D) the inadequacy of existing regulatory mechanisms; or E) other natural or manmade factors affecting its continued existence.

The identification of any threat(s) does not necessarily mean that the species meets the statutory definition of an "endangered species" or a "threatened species." In assessing whether a species meets either definition, we must evaluate all identified threats by considering the expected response of the species, and the effects of the threats—in light of those actions and conditions that will ameliorate the threats—on an individual, population, and species level. We evaluate each threat and its expected effects on the species, then analyze the cumulative effect of all of the threats on the species as a whole. We also consider the cumulative effect of the threats in light of those actions and conditions that will have positive effects on the species—such as any existing regulatory mechanisms or conservation efforts. The Service recommends whether the species meets the definition of an "endangered species" or a "threatened species" only after conducting this cumulative analysis and describing the expected effect on the species now and in the foreseeable future.

2.1 Distinct Population Segment (DPS) policy (1996):

The DPS Policy does not apply to the owl.

2.2 Updated Information and Current Species Status

2.2.1 Biology and Habitat:

The owl is one of three subspecies of spotted owl that include the northern spotted owl (*S. o. caurina*) and the California spotted owl (*S. o. occidentalis*). The owl is geographically isolated from the other two subspecies of spotted owl and occurs in forested mountains and canyonlands throughout the southwestern United States (U.S.) and México. The owl ranges from Utah, Colorado, Arizona, New Mexico, and the western portions of Texas, south into several states of México (USFWS 2012). Whereas this owl occupies a broad geographic area, it does not occur uniformly throughout its range. Instead, the owl occurs in disjunct areas that correspond with isolated mountain ranges and canyon systems. The current distribution of owls follows its 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 no longer provide nest/roost owl habitat; USFWS 2012).

Please refer to the Mexican Spotted Owl Recovery Plan, First Revision (Recovery Plan; USFWS 2012) for a complete review of the species' status (including biology, population trends, and habitat), threats, and recovery actions.

The Recovery Plan (USFWS 2012) subdivided the owl's range within the U.S. into five Ecological Management Units (EMUs): Colorado Plateau (CP), Southern Rocky Mountains (SRM), Upper Gila Mountains (UGM), Basin and Range-East (BRE), and Basin and Range-West (BRW), which we provide current information on below (Figure 1). The Recovery Plan also identified five EMUs in Mexico; however, we will not

discuss these EMUs specifically in this document, but rather more broadly based upon the information we have.

CP EMU: This EMU includes most of eastern and southern Utah plus portions of northern Arizona, northwestern New Mexico, and western Colorado (Figure 1). Most owls within the CP EMU occur in disjunct canyon systems or on isolated mountain ranges in wilderness and roadless areas, but they use forest habitat as well. Surveys continue to find owls within known owl sites, as well as new owl sites. Surveys occur infrequently in most owl sites in the canyons of Utah and Arizona because these areas are remote and difficult to access. Difficult access also means that repeat surveys are rare and surveys may not have occurred in a very long time at previously known owl sites. There is also suitable habitat in this EMU that has never or rarely had surveys. The largest increase in occupancy in the CP EMU is at Grand Canyon National Park where they have found 15 new owl sites over the last 10+ years, which is an increase of 37.5 percent. This EMU contains approximately 16 percent of owl sites in the U.S.

Threats to owls in this EMU include dispersed recreation and climate change. This is the one EMU where, currently, wildland fire has not affected habitat as much as in the other EMUs, due to the habitat occurring mostly in canyons with dispersed patches of vegetation. Recreation, including hiking, camping, canyoneering, and off-highway vehicle use, ranks as a primary land use within the EMU and recreation pressure on public lands has increased in recent years. Trends of use at six popular parks in the CP EMU show much greater increases than overall national trends: a range of increases of 47 to 120 percent in visitation from 2009 to 2018 (Monz 2021). Owls use narrow canyons where they have less opportunity to move away from human activity, which compounds the potential for recreation to negatively affect owl presence and recovery.

SRM EMU: This EMU includes the area from Santa Fe, New Mexico in north central New Mexico, north through Colorado, nearly extending to the Wyoming-Colorado state line (Figure 1). Although the owl occurs primarily in canyons in this EMU, it also occupies forest habitat types. This EMU contains the fewest known owl sites (approximately 6 percent of known owl sites) in the U.S. and the number of sites has not increased since our last status review. However, this EMU is also the one for which we have the least information regarding owl and habitat distribution.

High-intensity, landscape-scale wildland fire is affecting owl forested habitat within this EMU. In 2022, the Calf Canyon-Hermits Peak Fire became the largest and most destructive fire in the history of New Mexico. The fire burned 341,471 acres between early April and late June in the southern Sangre de Cristo Mountains in northern New Mexico and included known owl sites as well as suitable, unsurveyed owl habitat.

UGM EMU: This EMU encompasses the forested and canyon drainages from the Williams/Flagstaff, Arizona area, east across the Mogollon Rim into New Mexico to Interstate 25 (Figure 1). In the UGM EMU, owls are most common in mixed-conifer forests and canyons with varying degrees of forest cover. The UGM EMU continues to support the largest number of owls in the U.S., with over 50 percent of known owl sites.

High-intensity, landscape-scale wildland fire continues to affect owls and their habitat within this EMU with multiple fires each season occurring across the EMU. Some of these fires result in effects that maintain and/or improve owl habitat and some are more destructive. The Service intends to work with our partners to assess the effects of these many fires on owl habitat through habitat monitoring (see Living Map discussion below). Without landscape-level monitoring tools that track habitat through time, it is difficult to assess the long-term effects of high-intensity fire within this EMU, particularly to nest/roost habitat, connectivity, and the long-term persistence of key habitat components 10 years or more post-fire, especially with the synergistic effects of climate change.

BRE EMU: This EMU includes the area south of Santa Fe, New Mexico to the border with México and mountains of west Texas (Figure 1). Most of the BRE EMU owl sites are clustered in the Sacramento Mountains, New Mexico, but as we noted in the Recovery Plan (USFWS 2012), we also have owl sites in Texas. The Service and partners are currently working with partners in southern New Mexico and Texas to conduct passive acoustic surveys for owls in these areas. At this time, known owl sites in this EMU have not changed substantially since our last 5-year review (USFWS 2013). The EMU contains approximately 13 percent of owl sites in the U.S.

Owls in this EMU occur in forested habitat; therefore, high-intensity, landscape-scale fire is a threat to the long-term persistence of owls. Since the Service's last 5-year review (USFWS 2013), there has not been a landscape-level fire in the Sacramento Mountains, but there are large areas burned in the late 1990s and early 2000s that removed large areas of owl habitat and affect habitat connectivity within the Sacramento Mountains.

BRW EMU: This EMU encompasses a wide range of habitat types and includes the area from west-central Arizona, southeast to Phoenix, Arizona, and the entire southeastern corner of Arizona and into New Mexico (Figure 1). Most owls in the BRW EMU occur in isolated mountain ranges where they inhabit Encinal oak woodlands: mixed conifer, pine-oak, riparian forests; and rocky canyons. As with the CP EMU, surveys continue to find owls within known owl sites, as well as new owl sites, particularly on the Coronado National Forest where the current number of owl sites now is the same as what we knew of for the entire EMU when we published the Recovery Plan (USFWS 2012).

As with the other forested EMUs, the BRW EMU high-intensity, landscape-scale wildland fire is a stressor. Although all the EMUs have naturally fragmented habitat, this EMU consists of isolated mountain ranges, which posed dispersal challenges for owls prior to large fires, such as the 2017 Burro Fire (27,238 acres in the Santa Catalina Mountains), 2017 Frye Fire (48,443 acres on Mount Graham), and 2020 Bighorn Fire (120,000 acres in the Santa Cataline Mountains). Following these fires, the forested habitat on the mountains is now more fragmented because these fires burned at high intensity through multiple known owl sites and created large areas devoid of trees.

México: The physiographic province with the most owls in México is the Sierra Madre Occidental, followed by the Sierra Madre Oriental, and the Transverse Neovolcanic Belt (Palma-Cancino *et al.* 2020; Salazar-Borunda *et al.* 2021, 2022a). Current modeling indicates that the distribution range of the owl in México is consistent with the information we provided in the Recovery Plan (USFWS 2012). Modeling also indicates that the areas of highest habitat suitability are in the biogeographic provinces of the states of Durango, Zacatecas, Jalisco, Aguascalientes, and Chihuahua (Salazar-Borunda *et al.* 2022a). Climatic conditions that best explain owl distribution in México are annual mean temperatures of 5 to 10°Celsius (C; 41–50° Fahrenheit [F]); maximum temperatures of the warmest month of 17.5 to 20°C (63.5–68°F); mean temperatures of the coldest quarter of year of -7.5 to 5°C (18.5–41°F) with 150 to 200 millimeters (mm; 5.9–7.9 inches [in]) of precipitation in the wettest month and 90 to 100 mm (3.5–3.9 in) in the driest quarter (Salazar-Borunda *et al.* 2022b).

Habitat loss, particularly within forest habitat, and fragmentation are the main threats to the owl's persistence rangewide (Wan *et al.* 2018a; see "Threats Analysis" below) and most research continues to focus on owl habitat and its distribution (Salazar-Borunda *et al.* 2020). Below is a summary of research since our last 5-year review (USFWS 2013) regarding owl habitat rangewide.

- New models indicate that owl habitat varies by geographic location and larger patches of habitat provide genetic refuge for the owl, but the degree of continuity or fragmentation may be more important than patch size for gene flow (Timm *et al.* 2016, Wan *et al.* 2017, 2018a); therefore, managers should plan for connectivity among habitat patches to facilitate owl gene flow (Wan *et al.* 2018a). Because owl habitat varies across the landscape, a single model designed to predict whether an area has the resources owls need for a given activity may not work for all areas owls occupy (Wan *et al.* 2017).

- Scientists from the Rocky Mountain Research Station along with experts from the Service and the U.S. Forest Service (hereafter, Team) convened to produce an estimation of habitat trends spanning the last 35 years across all National Forests within the Southwestern Region (Arizona and New Mexico). From this effort, the Team developed annual maps of owl forest habitat across the Southwestern Region from 1986-2020 using Landsat imagery, climate data, topography, and known owl nest/roost locations (Jones *et al.* 2023). The primary purpose of these maps is to identify where owls are most likely to nest and roost, and to identify broad-scale and long-term trends in potential owl forest habitat. The Team intends to refine the "Living Map" product with new data and to include canyon habitat within Arizona and New Mexico, and expand the map to include Colorado, Utah, and Texas.

  Initial findings from the Living Map indicate that across most National Forests in Arizona and New Mexico, there is less owl habitat overall in 2020 than there was in the mid-1980s; however, the trends in habitat are not uniform across the

National Forests as owl nest/roost habitat is increasing in some areas and decreasing in others.

- Lewis (2014) developed a species distribution model using current and historical nest/roost sites that predicts owl distribution in Utah and the Colorado Plateau region. She found that canyon width and density of vegetation greater than 2.5 meters (8.2 feet) tall are positively correlated with owl presence. Land managers in Utah are using this model to identify potential owl nest/roost habitat.

- Salazar-Borunda *et al.* (2022b) developed a rangewide model (U.S. and México) to determine the potential historical (1970-2000) and future (2021-2040, 2041-2060, and 2061-2080) distribution of owls under two climate change scenarios. This study is the first to show the potential effects of climate change on future owl distribution. The model included the five U.S. EMUs and three regions in México. Future scenarios include gradual and steady loss of bioclimatic suitability for the owls, beginning in 2030. The modeled distribution of the owl varied among the climate change scenarios, but the SRM EMU is the only EMU that gained suitable bioclimatic space (the interrelation of climate and the activities and distribution of owls).

- In the Sacramento Mountains, New Mexico, Ganey *et al.* (2020) found that water relationships may become increasingly important for owls with climate change and that retaining patches of older forest with high canopy cover in cool, mesic sites are likely to benefit owls under climate change.

- The Recovery Team developed and recommended a methodology for conducting owl population monitoring, using an occupancy (presence/absence) model to determine the rangewide owl population trend (stable, increasing, decreasing) (USFWS 2012 [Appendix E]). The Service is currently working with the Southwestern Region of the Forest Service and Bird Conservancy of the Rockies (BCR) to conduct 10 years of the population monitoring recommended in the Recovery Plan (USFWS 2012 [Appendix E]) on National Forest System (NFS) lands in Arizona and New Mexico. BCR conducted the occupancy monitoring beginning in 2014 and conducted monitoring 2014-2019 and 2021-2023. BCR analyzed owl occupancy trends using a multi-state occupancy model implemented in a Bayesian framework (Clément *et al.* 2023). Although their analysis did not provide conclusive evidence for owl trends in site occupancy, pair occupancy estimates exhibited an apparent decline over the monitoring completed to date.

- Habitat studies within the U.S. range of the owl have provided additional information regarding owl use of nesting habitat, protected activity centers (PACs) and more information on how to describe nesting habitat (Ganey *et al.* 2013, 2014, 2016). Management recommendations supported those in the Recovery Plan and included retaining forest patches with high canopy cover and large trees with cavities or large dwarf mistletoe-induced witches' brooms.

Additionally, studies indicated that locating forest management treatments on ridgetops or the upper third of slopes, and/or south- or west-facing slopes would protect forested owl nest/roost habitat.

- Willey (2013) provided data regarding owls' diets in canyon habitats in southern Utah and northern Arizona and in mixed-conifer forest in the Rincon Mountains in southeast Arizona. Willey (2013) confirmed that woodrats (*Neotoma* spp.) are an important prey item for owls in both canyon and forest habitats, but owls in canyon sites primarily consumed woodrats. Owls in both habitat types consumed a wide variety of prey species.

- The Service and the Forest Service are conducting a management experiment to examine the effects of prescribed burning and mechanical thinning followed by prescribed burning on owls within the Four Forest Restoration Initiative (4FRI), first analysis area. We began the pre-monitoring for the treatments in 2013, conducted the prescribed burning treatments in 2017, and are working to finish the mechanical thinning treatments this year. This monitoring is ongoing, but we anticipate finalizing a report on the effects of the prescribed burning treatments on the owls in the study site in the fall/winter 2023. The mechanical thinning will take longer to complete due to the complexities associated with mechanical thinning contracts and operators and the need for post-treatment monitoring following the mechanical thinning as well as time to conduct the prescribed burning.

- The Service and the Southwestern Region of the Forest Service, Rocky Mountain Research Station, and University of New Mexico are conducting a study on owl movements and habitat use across the 4FRI Rim Country Project and South Sacramento Restoration Project areas. The purpose of the study is to examine how GPS-tagged owls: (1) use different vegetation features (*e.g.*, canopy cover, tree size, landscape configuration) across the landscape; and (2) change their space use in response to forest thinning and fire treatments. Results from this study will help managers refine treatments to be more compatible with owl recovery efforts and inform mapping of nest/roost habitat to guide optimal spatial location of treatments.

2.2.2 Threats Analysis (threats, conservation measures, and regulatory mechanisms):

Since the Service listed the owl (58 FR 14248), the primary threat to the owl and its habitat in the U.S. has transitioned from timber harvest to an increased risk of stand-replacing wildland fire (USFWS 2012, Wan *et al.* 2018b, Jones *et al*. 2023). Past forest management and fire suppression have created elevated fuel levels (Hurteau *et al.* 2014), but the more recent accelerating and compounding effects of climate change have left owl habitat extremely vulnerable to landscape-scale, stand-replacing wildfire (Wan *et al.* 2019). It is difficult to assess effects to owls and their habitat from high-intensity wildland fires until at least five to 10 years post-fire. The reason for this is that

owls have high site-fidelity and tend to stay in their territories even when the habitat is not suitable for nesting and/or roosting. In many cases, wildland fire burns heterogeneously across the landscape and suitable nest/roost habitat fire refugia may sustain nest/roost habitat. Fire refugia are landscape elements that remain unburned or minimally affected by fire, thereby supporting postfire ecosystem function (*e.g.*, a north-facing drainage that maintains sufficient moisture that it less available to burn at high intensity). What the initial analysis of forested habitat on NFS lands in Arizona and New Mexico shows, however, is that we have lost more owl nest/roost habitat across the landscape than we have gained since the late 1980s (Jones *et al*. 2023). Therefore, the most substantial current and potential future threats to the owl include habitat alteration and destruction due to high-intensity, landscape-scale wildland fire and long-term drought and habitat changes resulting from climate change (Factors A and E).

Southwestern forests have experienced larger and more severe wildland fires from 1995 to the present than prior to 1995 (Westerling 2016). Climate variability combined with unhealthy forest conditions (*i.e*., too many trees; high levels of insects and disease; excessive fuel loads; etc.) also synergistically result in increased negative effects to habitat from fire (Fulé *et al.* 2004, Littell *et al.* 2009). The intensification of natural drought cycles and the ensuing stress placed upon overstocked forested habitats could result in even larger and more severe fires in owl habitat (Ganey *et al.* 2017) and by the 2080s, there may be a 13-fold increase in area burned within the owl's range (Wan *et al.* 2019). As long-term drought persists, wildland fires are increasing in intensity and patch sizes of high-intensity fire within fire perimeters are also increasing (Wan *et al.* 2018a, 2019). Although owls forage in severely burned areas, nest/roost habitat is the most limiting factor for the owl so maintaining nest/roost habitat is critical to owl recovery (USFWS 2012).

Climate change is also likely to reduce owl distribution rangewide by increasing the prevalence of high-intensity wildland fire and through environmental changes (*e.g*., increased temperature, changes in timing and amounts of precipitation and related changes in vegetation community over time) that reduce the ability of owls to persist in some areas (Wan *et al.* 2019, Salazar-Borunda *et al.* 2022b).

Land management agencies are working with the Service to reduce the risk of landscape-level, high-intensity wildland fire to forested nest/roost habitat and to improve habitat resiliency to climate change by implementing management recommendations in the Recovery Plan (USFWS 2012). Fuels reduction activities, which may include mechanical vegetation and/or prescribed burn treatments, can and do result in short-term negative effects to owls through habitat disturbance and modification. However, if land managers follow the recommendations in the Recovery Plan (USFWS 2012), we expect long-term effects of mechanical vegetation and prescribed fire to be beneficial to the persistence of owls and their habitat. Managers should also follow guidance in the Recovery Plan (USFWS 2012) for recreation, livestock management, and other actions that can degrade owl and prey habitat to improve and/or maintain habitat resiliency.

2.3 Synthesis:

The owl has a widespread, but highly fragmented distribution, making it extremely vulnerable to high-intensity landscape-scale wildland fires and climate change. Uncertainties and data gaps that may impede recovery progress include climate change and the effects of extended drought in exacerbating high-intensity landscape-scale wildland fire; the lack of knowledge regarding connectivity between metapopulations and all EMUs in the U.S. and México; and how land management actions, especially forest and vegetation management to reduce the potential for high-intensity landscape-scale wildland fire, will affect owl nest/roost and recovery habitat in the short-term as the owl also experiences climate-driven bioclimatic changes.

Overall, the distribution of the owl and its designated critical habitat has not changed since listing range-wide in the U.S. (which includes Utah, Colorado, Arizona, New Mexico, and extreme southwestern Texas). This means that owls continue to occur within the same areas, and critical habitat is continuing to provide for the life history needs of the owl throughout the EMUs located in the U.S. We know this because project-level surveys continue to find owls in the same locations across the range, and we continue to conduct section 7 consultations on federal agency actions and receive section 10(a)(1)(b) recovery reports that provide rangewide updates regarding owl and habitat status. We do not have detailed information regarding owl occupancy and distribution in México, but current research indicates owls and potential owl habitat persist there as well.

Habitat loss is occurring and may speed up with climate change (Jones *et al.* 2023, Salazar-Borunda *et al.* 2022b). This is more likely because of high-intensity, landscape-scale wildland fire relative to other actions (*e.g.*, forest management, livestock grazing, recreation, *etc.*), but other land management actions should follow Recovery Plan (USFWS 2012) recommendations to ensure that synergistic effects of these other actions do not intensify wildland fire and climatic effects on the owl.

After reviewing the best available scientific information, we conclude that the owl remains a threatened species. The evaluation of threats affecting the species under the factors in 4(a)(1) of the Act and analysis of the status of the species in our Recovery Plan (USFWS 2012) and 2013 5-year review (USFWS 2013) remain an accurate reflection of the species status. Habitat alteration and removal via high-intensity landscape scale wildland fire that continues to increase in pace and scale because of climate change is a substantial stressor to owl recovery within forested habitat. Within canyon habitat, climate change and extended drought that affect habitat suitability and prey availability is likely to continue to be a substantial stressor to owl distribution.

3.0 RESULTS

3.1 Recommended Classification:

No change needed.

3.2 New Recovery Priority Number:

No change recommended.

Brief Rationale:

Not applicable.

3.3 Listing and Reclassification Priority Number:

The current listing and reclassification number for the Mexican spotted owl is a 9C (moderate degree of threat/high potential for recovery). No change recommended.

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

We will work with our partners to implement the following recommended actions during the next five-year review period:

- We will continue to work with the Forest Service, National Park Service, Bureau of Land Management, states, tribes, and other partners to develop and implement forest management actions (*e.g*., thinning, prescribed fire) that reduce the risk of high-intensity, landscape-level wildland fire that can degrade or remove owl nest/roost habitat. In development of these actions, we need to ensure that the actions follow the Recovery Plan, to the best of managers abilities. Current information indicates that the implementation of the Recovery Plan management recommendations for mechanical thinning and burning in PAC and recovery habitat will meet recovery and forest management objectives. We advise that agencies continue to follow those recommendations when conducting these activities in owl PACs and recovery habitat.

- We recommend revising the desired conditions in the Sacramento Mountains on the Lincoln National Forest (BRE EMU) to emphasize canopy cover and some attribute measuring the large tree component (Ganey *et al.* 2016). We also recommend repeating the Ganey *et al.* (2016) assessment (or other method as appropriate) in other EMUs to determine how well the desired conditions for those areas in the Recovery Plan describe nesting habitat for the owl (USFWS 2012). This information would improve our ability to conserve the key habitat components of owl habitat, particularly nest/roost habitat, which is a limiting factor for the owl (USFWS 2012).

- We recommend working with our partners to improve our ability to identify and monitor the status of owl PAC and recovery habitat, particularly in Colorado within the SRM EMU and Utah within the CP EMU. The use of the Living Map using data beyond that from NFS lands in Arizona and New Mexico will better inform where to conduct surveys, progress towards recovery, and allow us to monitor habitat trends through time.

- We recommend working with our partners to collect new information regarding the effects of climate change on the owl, the abundance and distribution of the owl and its prey, and the owl's space requirements (*e.g.*, nest core area, foraging habitat needs), particularly within different habitat types and EMUs (*e.g.*, forested habitat within the UGM EMU versus sky islands in the BRW EMU).

- We recommend working with the Recovery Team and our partners to develop a strategy for modifying the existing population trend monitoring method (USFWS 2012, Appendix E) or developing a new methodology, potentially using acoustic recording devices to detect owls to improve our ability to monitor owls in canyon as well as forest habitat.

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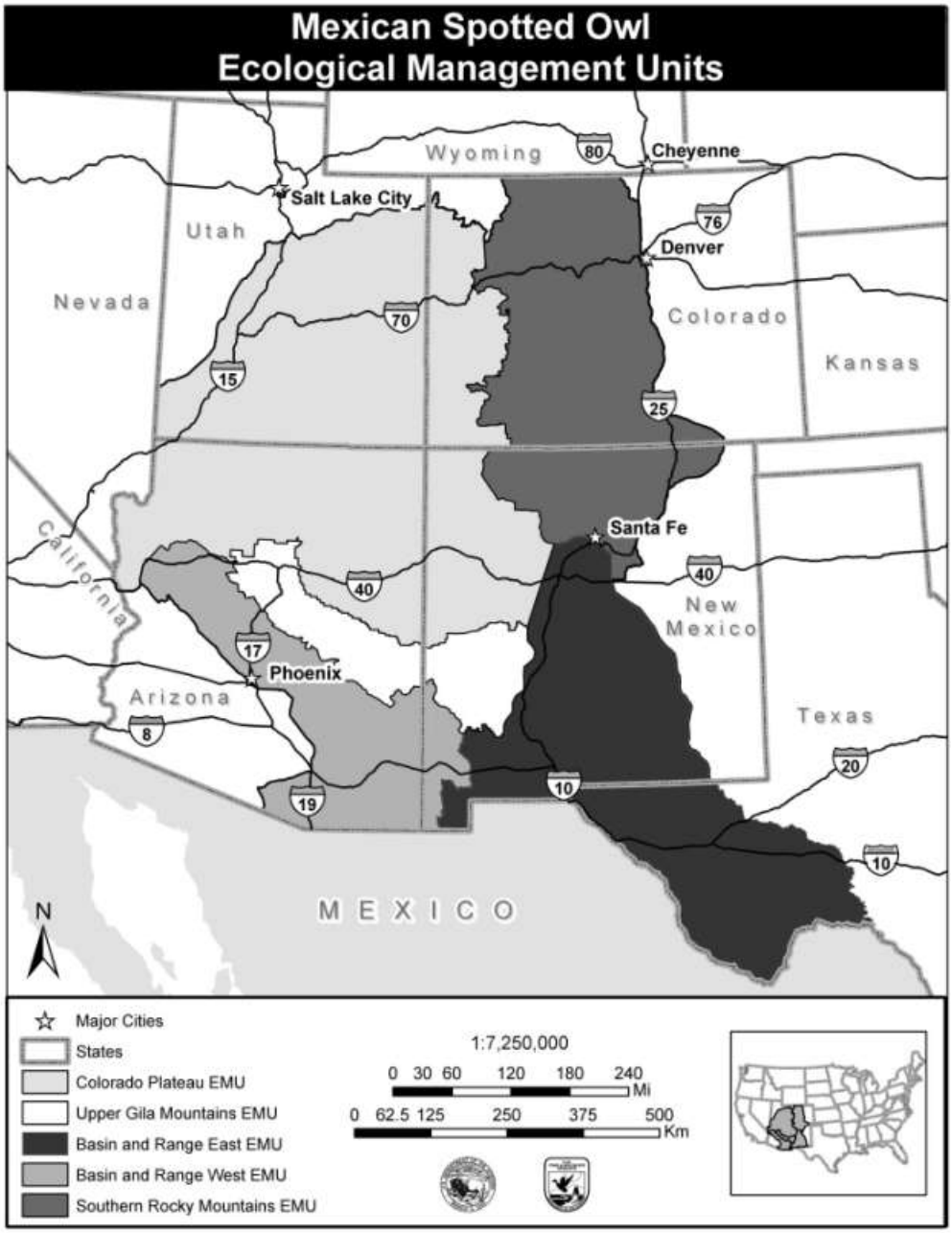

Figure 1. Mexican spotted owl Ecological Management Units in the southwestern United States (USFWS 2012).

U.S. FISH AND WILDLIFE SERVICE

5-YEAR REVIEW of Mexican Spotted Owl (*Strix occidentalis lucida*)

Current Classification: Threatened

Recommendation resulting from the 5-Year Review:

No change needed.

Appropriate Listing/Reclassification Priority Number, if applicable: Not applicable.

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service, Arizona Ecological Services Office

Approve HEATHER WHITLAW Digitally signed by HEATHER WHITLAW Date: 2023.07.28 07:44:24 -07'00'