Environmental Assessment

for the Amendment of a Scientific Collecting Permit
for Barred Owl Research

California

November 2024

U.S. Fish and Wildlife Service
U.S. Department of Interior
2800 Cottage Way, Suite W-2606, Sacramento, CA 95825
Contact: Amy Walsh | amy_walsh@fws.gov

Table of Contents

List of Figures

List of Tables

Abbreviations

AR	Anticoagulant rodenticide
BLM	Bureau of Land Management
CatEx	Categorical Exclusion
C.F.R	Code of Federal Regulations
DPS	Distinct Population Segment
EA	Environmental Assessment
ESA	Endangered Species Act
FR	Federal Register
Forest Service	United States Forest Service
Hybrids	Barred owl x spotted owl hybrids
MBTA	Migratory Bird Treaty Act
NEPA	National Environmental Policy Act
Permittee	University of Wisconsin - Madison
SCCL	Scientific collecting
Service	United States Fish and Wildlife Service
SP	Special Purpose
U.S.C.	United States Code
USFWS	United States Fish and Wildlife Service

1. Introduction

The United States Forest Service, Pacific Southwest Region requested the U.S. Fish and Wildlife Service (Service) process an amendment to the Scientific Collecting (SCCL) permit (permit MB24592D) (Permit) to conduct research on non-native northern barred owls (*Strix varia varia)* (barred owl) and barred owl-spotted owl hybrids (hybrids) in California. The amendment would increase the authorized lethal take of barred owls and hybrids from 1,000 individuals to 3,000 individuals for the three-year tenure of the current permit.

Under the Migratory Bird Treaty Act (MBTA), it is unlawful to pursue, hunt, take, capture, kill, or attempt to take, capture, or kill any such bird or any part, nest, or egg thereof (16 U.S.C. § 703(a)). This applies to migratory bird species that are native to the United States or its territories (16 U.S.C. § 703(b)). The list of protected species can be found in 50 C.F.R. § 10.13. No person may take any migratory bird protected under the MBTA except as may be authorized under a valid permit (50 C.F.R. § 21.10). Barred owls and spotted owls, including their hybrids as defined in 50 C.F.R. § 21.6, are protected under the MBTA. Therefore, lethal collection of barred owls and hybrids requires the issuance of a permit under the MBTA.

The initial SCCL permit was effective on March 1, 2019. The SCCL permit was renewed in 2021. The most recent version of the permit was renewed, effective April 1, 2024, and will expire on March 31, 2027. The Service received a request from the Permittee to amend the SCCL permit on August 14, 2024.

Permit issuance is a federal action, and as such, requires evaluation under the National Environmental Policy Act (NEPA) (42 U.S.C. § 4321). A Categorical Exclusion (CatEx) was prepared for the initial issuance and subsequent renewals of the SCCL permit. Given the requested increase in authorized lethal take, a more in-depth analysis of potential environmental impacts is warranted.

This Environmental Assessment (EA) was prepared in accordance with NEPA to analyze the reasonably foreseeable environmental impacts resulting from an amendment to the Permit, including a No Action alternative. This EA evaluates whether an amendment to the Permit will have significant impacts on the existing potentially affected environment and the degree of the effects of the action, beyond those previously analyzed in the CatEx. In considering this, 40 CFR § 1501.3 directs an agency to consider the affected area (national, regional, or local) and its resources. In evaluating the degree of the effects, we must also consider short-term, long-term, beneficial, and adverse effects; impacts to public health and safety; and compliance with other environmental protection laws.

1.1 Background

Barred owls are native to eastern North America. They began to expand their range around 1900, concurrent with European settlement and facilitated by the subsequent human-caused changes to the northern Great Plains and southern boreal forest. Barred owls arrived in the Pacific Northwest in the early 1970s, establishing populations in northern Washington in the early 1980s. They continued to spread southward in the Cascades and coastal mountains, building dense barred owl populations behind the invasion front (Service 2024).

Spotted owls (*Strix occidentalis*) are native to western North America. Of the three identified subspecies, two are the subject of this action, the northern spotted owl (*Strix occidentalis caurina*) and the California spotted owl (*Strix occidentalis occidentalis*). Both subspecies select structurally diverse forests with larger trees and moderate to dense canopy closure for nesting, with more variable habitat acceptable for foraging.

Northern spotted owls were historically found in the western forests of southwest British Columbia through Washington and Oregon to northwestern California south to Marin County. Northern spotted owls still occupy most of this range, though in very low densities in some areas. The California spotted owl is found in the Sierra Nevada Mountains, the mountains of central coastal California, and the peninsular and transverse ranges of southern California, with a distinct geographic separation between the Sierra Nevada and Coastal-Southern California populations (Verner et al. 1992) (Figure 1).

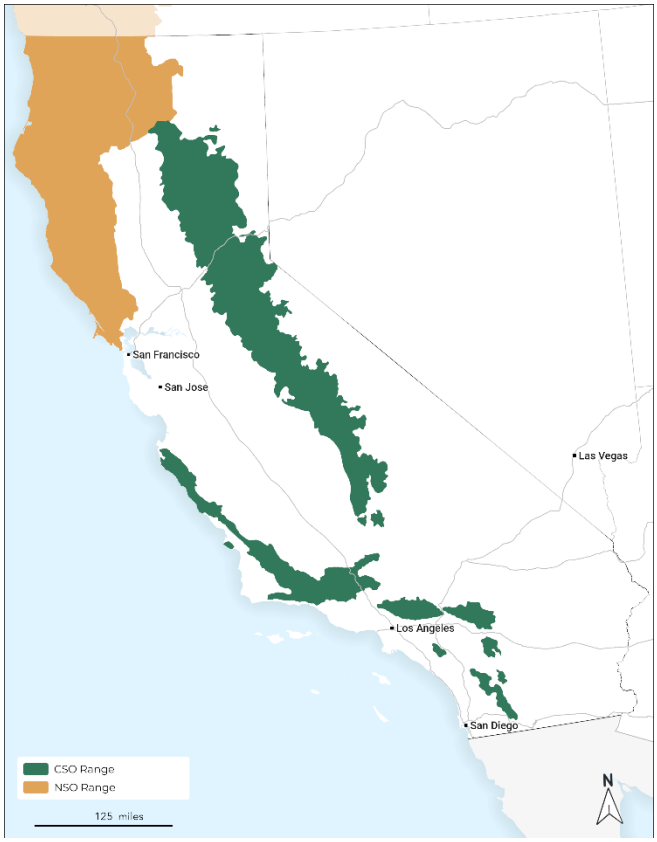

Figure 1. Range of the northern spotted owl (NSO) and California spotted owl (CSO) in California

The Service listed the northern spotted owl as a threatened species under the Endangered Species Act (ESA) on June 26, 1990 (55 FR 26114). The primary reason for listing the northern spotted owl was the widespread loss of subspecies' habitat across its range and the inadequacy of existing regulatory mechanisms to conserve the northern spotted owl. In the Service's 2011 Revised Recovery Plan for the Northern Spotted Owl, barred owl competition was identified as one of the two primary threats to the spotted owl (Service 2011). On December 15, 2020, the Service published a 12-month finding (85 FR 81144), which announced that reclassification of the northern spotted owl from a threatened species to an endangered species was warranted but precluded by higher-priority actions. On June 27, 2023, the Service affirmed that reclassification of the northern spotted owl to endangered is warranted but

precluded; proposed rules to reclassify threatened species to endangered are a lower priority than listing currently unprotected species (i.e., candidate species), since species like the northern spotted owl currently listed as threatened are already afforded the protection of the ESA and implementing regulations. (88 FR 41560, 41578). The primary stressors affecting the northern spotted owl's current biological status include lag effects of past habitat loss, continued timber harvest, wildfire, and competition from barred owl, which is currently the stressor with the largest negative impact on northern spotted owls (88 FR 41578). The Revised Northern Spotted Owl Recovery Plan identified competition from barred owls as one of the two predominant threats to the survival and recovery of northern spotted owls: increasing competition from barred owls, and habitat loss from timber harvest and fire (Service 2011).

The Service proposed the California spotted owl for listing on February 23, 2023 (88 FR 11600). The Sierra Nevada Distinct Population Segment (DPS) of the California spotted owl was proposed for listing as threatened due to the impact of high-severity fire, tree mortality, drought, and barred owls. The Coastal-Southern California DPS was proposed for listing as endangered due to continuing population declines, fragmented habitat, risk of high severity fire, tree mortality, and drought.

While barred owls prefer the same older, structurally diverse forest type selected by spotted owls, barred owls can utilize a wider range of forested habitat types than spotted owls, including wooded urban areas and large tracts of second-growth forests. In addition, barred owls are generalist predators, utilizing a much wider variety of prey items than the specialist spotted owls. Barred owls consume the same nocturnal arboreal rodents that are the focus of the spotted owls' diet, and in large quantities given their dense populations (Baumbusch 2023; Kryshak et al. 2022; Wood et al. 2020). They also consume numerous other species, including other mammals, amphibians, insects, crayfish, and mollusks. Because of their larger size, adaptability to a wide variety of forested habitats, and ability to eat a wide variety of prey, barred owls often occur in denser populations, outcompeting and excluding spotted owls from the latter's preferred habitats.

1.2 Research Projects

The research projects, in collaboration with the University of Wisconsin, consist of genetic-based diet assessments and screening for anti-coagulant rodenticides in barred owls and hybrids throughout California. Substantial increases in funding allocated through various channels (Bureau of Land Management (BLM), California Department of Fish and Wildlife, U.S. Fish and Wildlife Service, National Fish and Wildlife Foundation) has allowed the Permittee to allocate more resources to intensifying these efforts and expanding the study areas, given increased landowner permission.

1.2.1 Project 1

The first project aims to assess the diet of barred owls in their invasive range throughout California. In their novel range in northern California, barred owls now greatly outnumber and pose a major extinction threat to native and congeneric northern spotted owls (Kelly et al., 2003, Franklin et al., 2021), and threaten California spotted owls (Hofstadter et al. 2022). Additionally, owing to their exceptionally high densities and generalist diet, barred owls are believed to have substantial impacts on California forest ecosystems beyond just replacing spotted owls and potentially pose a threat to numerous at-risk species, including salamanders, frogs, and anadromous fish – many of which are naïve to owl predation (Wiens et al., 2014, Holm et al., 2016, Kryshak et al. 2021).

Range-expanding barred owls preferentially select old growth or mature forests that many species are adapted to, and their predatory and competitive effects on native fauna have the potential to substantially alter these rare forest ecosystems (Cooperrider et al., 2000, Hamer et al., 2001, Holm et al., 2016). Indeed, barred owl predation could be already cryptically yet substantially harming forest ecosystems. Developing genetic tools for determining the extent to which barred owls consume or compete with at-risk species is critical for assessing barred owl impacts on the biodiversity in California's forests. With landowner permission, the University of Wisconsin study proposes to expand barred owl and hybrid removals on public lands in California (both in Northwest California and the Sierra Nevada) including BLM-managed lands, National Forests, state and national parks (e.g., Redwood National Park, Prairie Creek Redwoods State Park), and many private lands to genetically screen intestinal contents for prey they are consuming; several National Forests will contribute to the study (Figure 2). Determining the extent to which barred owls consume or compete with other species is critical for assessing the impacts of this invasive, and ubiquitous apex predator on federally and State listed species, and Species of Greatest Conservation Need in California's forests.

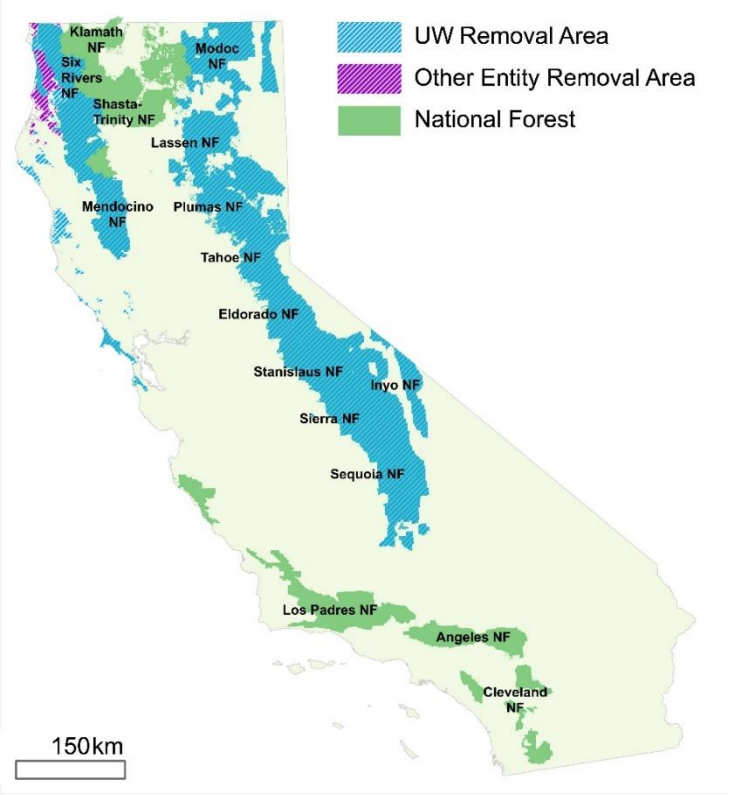

Figure 1. Project 1 Current Study Area

1.2.2 Project 2

The second project focuses on the recovery of northern spotted owls by understanding threats to the species from cannabis-associated and residential rodenticides in wildland urban interfaces, using barred owl as a proxy. This project has two elements; 1.) focused collection in the Six Rivers National Forest and Prairie Creek Redwoods State Park, and 2.) a large sample of barred owls and hybrids from a broad geographic area to explore rodenticide screening methods and the identification of infectious pathogens and parasites. The project expands on existing efforts (Figure 3) to include increased state park and National Forest land in northern California (Figure 4).

Figure 2. Project 2 Current Study Area

Figure 3. Project 2 Expanded Study Area

Northern spotted owls are at high risk of extinction from both anticoagulant rodenticide (AR) exposure associated with cannabis cultivation and competition from invasive barred owls. The original study proposed to conduct lethal barred owl and hybrid collections across the entire Six Rivers National Forest and Prairie Creek Redwoods State Park and screen collected specimens for AR exposure, treating them as proxies for exposure in northern spotted owl. With these data, the project will identify local areas with low AR exposure rates where more intensive barred owl collections could create northern spotted owl refuges from both AR exposure and barred owl competition. Finally, the project will conduct dietary analyses on the stomach contents from a large sample of removed barred owls and hybrids from a broad geographic area to characterize AR exposure pathways and identify other threatened species affected by barred owls and AR.

Barred owl collection provides valuable opportunities for understanding patterns of rodenticide exposure in spotted owls. Given the threatened status of northern spotted owl, testing spotted owls for rodenticide exposure with large sample sizes of invasively obtained tissue (e.g., liver) is not practical. However, previous work indicates that barred owls are a reasonable, if not conservative, indicator species for rodenticide exposure in spotted owls (Wiens et al. 2019, Gabriel et al. 2018) due to their overlap in diet and habitat (Wiens et al. 2014). Thus, lethal barred owl collection and tissue sampling opens a suite of otherwise unanswerable questions related to the effects, and potentially the management, of cannabis-associated rodenticide poisoning. A large sample of barred owls from a broad geographic area would allow exploring several related concerns important for northern spotted owl management, including (a) the development and validation of rodenticide screening methods using non-

invasively collected tissues such as feathers or blood based on exposure in tissues (e.g., liver) for which methods are more established, (b) screening for infection by pathogens (such as Highly Pathogenic Avian Influenza (HPAI)), and (c) testing for links between disease and AR exposure to evaluate this potential indirect threat of cannabis cultivation (i.e., are AR-exposed owls immunocompromised?). Thus, lethal barred owl collections hold substantial promise for contributing to the recovery of the northern spotted owl and mitigating effects of AR exposure on this species, as well as addressing a host of questions that could facilitate management and policies intended to reduce AR exposure from cannabis cultivation in native wildlife.

1.3 Purpose and Need

The Service's purpose for this Federal action is to evaluate and respond to the Permittee's permit application for an amendment to a SCCL permit in a manner that is in accordance with applicable laws, regulations, and policies. The need for this Federal action is established by the Service's responsibility and authority under the MBTA (16 U.S.C. § 703-712) and its regulations (50 CFR § 21) to ensure that permit decisions are consistent with the MBTA, its underlying treaties, and implementing regulations. Permit decisions must comply with all other federal laws and regulations. The MBTA gives the Service broad authority to protect birds, but also to regulate their taking as long as their conservation is assured; the issuance of this permit must ensure that authorized take will not potentially threaten barred owls or other wildlife populations (50 CFR 13.21(b)(4)).

1.4 Decision to be Made

The barred owl, spotted owl, and their hybrids are protected under the MBTA (see 50 CFR 10.13 (list of MBTA species) and 50 CFR 21.6). The MBTA prohibits take (as defined at 50 CFR 10.12) of protected migratory bird species unless authorized by the Service in accordance with the MBTA and implementing regulations. Implementation of the proposed Strategy would require a permit or other authorization under the MBTA.

A SCCL permit is required before any person may take, transport, or possess migratory birds, their parts, nests, or eggs for scientific research or educational purposes (50 C.F.R. § 21.73). To amend a SCCL permit, such permittee must submit a full written justification and supporting information in conformity with 50 C.F.R. § 13 and 50 C.F.R. § 21.73. The Service reserves the right to amend any permit for just cause at any time during its term, upon written finding of necessity (50 C.F.R. § 13.23(b)). This EA evaluates two alternatives regarding amendment of such permit to conduct research on barred owls and hybrids in California.

2. Alternatives

This EA evaluates the effects of the Proposed Action and a No Action alternative (Alternative 1).

2.1 Proposed Action

Under the Proposed Action, the Service would approve the requested amendment to the SCCL permit. The total lethal take authorization would increase to 3,000 barred owls and hybrids over the three-year tenure of the permit. The increase would allow the Permittee to expand the scope and geography of their efforts in response to increased project funding.

2.2 Alternative 1: No Action

Under the No Action alternative, the Service would deny the requested amendment to the SCCL permit. The total lethal take authorization would remain at 1,000 barred owls and hybrids over the three-year tenure of the permit.

2.3 Other Alternatives Considered but Not Evaluated in this Environmental Assessment

The Service considered an additional alternative to the Proposed Action but concluded that this alternative did not meet the purpose and need underlying the action because it was not consistent with the MBTA and its regulations. Therefore, the Service did not assess the potential environmental impacts of this alternative.

2.3.1 Alternative 2

Under Alternative 2, the Service would approve the initially requested amendment to the SCCL permit. The total lethal take authorization would increase to 4,500 barred owls and hybrids over the three-year tenure of the permit.

The Permittee proposed a potential increase to the lethal take authorization of up to 4,500 barred owls and hybrids over the three-year tenure of the permit. However, after conversations with the Permittee regarding the project scope and objectives, the Service determined that an authorization of 4,500 would be higher than necessary to achieve project goals. Therefore, this Alternative was eliminated from further consideration.

3. Affected Environment and Environmental Consequences

This section describes the current status of the environmental resources and values that may be affected, and the effects on the environment of implementing the Proposed Action or No Action alternative. The cumulative effects analysis applies a qualitative approach because effects from the Proposed Action and No Action alternative, added to the effects of past, present, and reasonably foreseeable actions, could occur in different timeframes or locations within the analysis area, making quantification of impacts infeasible.

3.1 Barred Owls

Barred owls are native to eastern North America and were historically found east of the Great Plains, with a subspecies in central Mexico. Barred owl populations began to expand westward in the early 1900s, reaching the range of the northern spotted owl in the 1960s in British Columbia, Canada. Barred owls established breeding populations and continued to expand southward. The first reports of individual barred owls in the range of the northern spotted owl in the U.S. were in western Washington in 1973 (Hamer et al. 1989; Taylor and Forsman 1976), Oregon in 1974 (Taylor and Forsman 1976), and California in 1976 (Livezey 2009a). Barred owls are now found throughout the northern spotted owl range (Wiens et al. 2021) and occur in high densities in the northern portion of the range. Individuals and small populations of barred owls have been found in the Sierra Nevada within the range of the California spotted owl (Keane et al. 2018).

3.1.1 Proposed Action

Under the Proposed Action, barred owl and barred owl hybrid collection would result in the removal of up to 3,000 barred owls and hybrids from the population in California over the three-year tenure of the permit.

We extrapolated the population of barred owls across each physiographic province in the northern spotted owl range in California using the density from the study areas with the most similar forest conditions and historical presence of barred owls, adjusting where necessary due to substantially different conditions or history. Using these densities and the acres of forest land in each province, we estimated the potential current barred owl population in each province in the northern spotted owl range in California (Table 1). Given that these data are limited and are extrapolated across large landscapes, these should be considered general estimates. For the California Coast, we utilized local information and expertise to estimate the number of barred owls present at the start of implementation.

Table 1. Estimate of potential baseline barred owl populations by physiographic province in the northern spotted owl range in California as of 2023.

Physiographic Province	Study Area Data Applied	Estimated Number of Barred Owls Detected per 1,000 Acres	Acres of Forest Lands	Estimated Initial Population of Barred Owls
California Coast	Willow Creek	1.19	3,915,313	4,659
California Klamath	Willow Creek	1.19	5,531,309	6,582
California Cascades	Local Information	Local Information[1]	1,976,883	200
TOTAL			11,423,505	11,441

[1]*Local Information refers to six years of data obtained from barred owl removal experiments, including experiments conducted under the Sierra Pacific Industries Habitat Conservation Plan (SPI 2021). This province is also one of the leading potential pathways of barred owl invasion into the California spotted owl range. Thus, the focus for barred owl management is on the location and removal of all barred owls in this province.*

As barred owls continued to expand south, they reached the range of the California spotted owl as early as 1989. Between 1989 to 2013, a total of 51 barred owls and 27 hybrids had been detected in the Sierra Nevada (Gutiérrez et al. 2017). By 2017, the cumulative number of barred owl and hybrid detections in the Sierra Nevada increased to approximately 145 (Keane et al. 2018), with another 2.6-fold increase

between 2017 and 2018 (Wood et al. 2020). Note, this is the cumulative number of barred owl and hybrid detections reported over time; this does not represent the current barred owl population and many of these sites are no longer occupied by barred owls. Between 2018 and 2020, 76 barred owls or hybrids were removed from the Sierra Nevada, including 65 from the northern portion, 10 from the central, and one in the southern Sierra Nevada. Collection of detected barred owls continues as part of ongoing research in the Sierra Nevada at a rate of 10 to 15 barred owls per year (2020-2022).

There is insufficient information to allow for an accurate estimate of the barred owl density or population in the Sierra Nevada portion of the California spotted owl range at this time. The 10 to 15 barred owls removed each year since 2020 represent a minimum estimate of the current territorial barred owl population in the Sierra Nevada each year. To date, no barred owls have been detected in the Coastal-Southern California portion of the range, though this may be partly due to limited survey efforts. Still, we anticipate that birders, landowners, land managers conducting California spotted owl surveys, and other interested parties would be reporting sightings if there were more than a very few individuals in the area as territorial barred owls are very vocal and easily identified. Thus, the total population of barred owls is currently estimated at 11,456 in the entire state of California.

Barred owls can hybridize with both northern and California spotted owls. The presence of hybrids represents the same impact to spotted owls as the presence of barred owls, by displacing spotted owls from their territories and preventing their use of habitat. In addition, allowing hybrids to remain in areas could lead to an increase in hybrids, and the introgression of barred owl genes into the spotted owl genome, potentially resulting in loss of genetic identity. In the northern Sierra Nevada, a small but rapidly expanding population of barred owl and hybrids was established by 2017. Experimental removal in this area resulted in the removal of 13 hybrids, representing 17 percent of the total 76 barred and hybrid owls removed (Hofstadter et al. 2022).

The potential effect of hybrid presence on the results of barred owl research will vary depending on the situation. In situations where hybrids are a substantial proportion of the population, failure to remove these individuals would greatly reduce the potential response by spotted owls and reduce the information available for AR analysis. Where hybrids are very rare, failure to collect these individuals would have limited impact on the studies.

3.1.2 Alternative 1: No Action

Under the No Action alternative, barred owl and hybrid collection would result in a smaller impact on the barred owl population in the West. At maximum implementation, 1,000 barred owls and hybrids would be collected over the three-year tenure of the permit, which could still result in significant effects on local barred owl populations within study areas. However, this level of barred owl and hybrid collection would not have a significant effect on the global barred owl population because it represents such a small portion of the global barred owl population.

3.1.3 Cumulative Effects

Under the Proposed Action and No Action alternative, barred owl and hybrid collection would continue under issued SCCL permits in California (Table 2). Under the No Action alternative, the total authorized lethal take of barred owls and hybrids under SCCL permits in California would be approximately 990 owls

per year. Under the Proposed Action, the total authorized lethal take of barred owls and hybrids under SCCL permits in California would be approximately 1,657 owls per year.

In 2022, the total reported lethal take of barred owls and hybrids under SCCL permits in California was 503 (Table 3). In 2023, the total reported lethal take of barred owls and hybrids under SCCL permits in California was 624 (Table 3).

Table 2. Current Scientific Collecting permits authorizing barred owl and hybrid collection in California. Effective dates on permits may be modified due to amendments.

Permittee	Initial Permit Issuance Date	Current Permit Tenure	Current Authorized Lethal Take
U.S. Forest Service – Pacific Southwest Region	03/01/2019	04/01/2024 – 03/31/2027	1,000 over three years
Green Diamond Resource Company	06/17/2019	05/02/2024 – 03/31/2025	300 per year
Sierra Pacific Industries	10/19/2015	10/12/2022 – 03/31/2025	150 per year
Hoopa Valley Tribal Council	02/07/2022	04/01/2024 – 03/31/2027	330 over three years
Yurok Tribe Wildlife Department	02/22/2022	11/28/2023 – 03/31/2025	200 over three years
John Dumbacher	11/22/2022	11/22/2022 – 03/31/2025	90 over three years

Table 3. Recent Scientific Collecting permit reported take of barred owl and hybrid collections in California.

Permittee	Reported Lethal Take 2022	Reported Lethal Take 2023	Reported Lethal Take 2024
U.S. Forest Service – Pacific Southwest Region	168	331	TBD
Green Diamond Resource Company	199	179	TBD
Sierra Pacific Industries	41	52	TBD
Hoopa Valley Tribal Council	95	40	TBD
Yurok Tribe Wildlife Department	0	22	TBD
John Dumbacher	0	0	TBD

The SCCL permits in Table 2 may be renewed if the research efforts are ongoing and continued collection is justified. Activities under the SCCL permits listed in Table 2, aside from the Permittee's SCCL permit, would not likely be affected by the Proposed Action, and barred owl and hybrid collection would continue. Additional research and management efforts may be initiated in the future that involve collection of barred owls and require an MBTA permit. However, research is, by its nature, relatively short-term and we have no way to estimate the number, extent, location, or duration of those future decisions as permits are processed as they come in from outside requesters.

Barred owl and hybrid collection under this permit may coincide with barred owl management efforts conducted under a MBTA Special Purpose (SP) permit issued by the U.S. Fish and Wildlife Service. The SP permit allows for the implementation of the Barred Owl Management Strategy to protect northern spotted owl and California spotted owl. The Service's SP permit authorizes barred owl management in large portions of northern California, the entire California spotted owl range, and potential invasion pathways into the California spotted owl range. Potential collection areas under the Barred Owl Management Strategy overlap extensively with the proposed action in this EA. Therefore, the total number of barred owls collected under SCCL permit would be compensatory rather than additive in many cases. That is, barred owls collected under the Alternative 1 SCCL permit would reduce the number that would be removed under the SP permit if actions occurred in the same area.

The proposed collection of 3,000 barred owls from the estimated population of 11,456 represents removal of 26% of the non-native barred owls in California. However, the population of barred owls in California is contiguous with the population in Washington and Oregon. Within the U.S. range of the northern spotted owl, the Service estimated the current barred owl population at just over 100,000 (Service 2024). The collection of 3,000 barred owls would represent 3 percent of the estimated barred owl population in the range of the northern and California spotted owls. The Partners in Flight Population Estimate Database[1] estimates the global population of barred owls at 3.5 million (95 percent confidence limits of 3.0 to 3.9 million), all of which occurs within North America. Barred owls are fairly numerous, and their populations increased 1.1% per year between 1966 and 2019, according to the North American Breeding Bird Survey[2]. Therefore, the collection of 3,000 barred owls over three years in California represents less than 0.1 percent of the global populations and would not have a significant impact on the global population of barred owls.

The cumulative effects from the current issued SCCL permits described in Table 2 and Table 3, combined with the incremental impacts of the Proposed Action, will be negative locally, but with limited population-scale impacts.

3.2 Northern spotted owl/California spotted owl

Spotted owls are a species that is adapted to relatively stable environments with stable carrying capacities, which results in naturally slow population growth. They are slow to reproduce, with generally fewer than two young per breeding attempt; they do not breed every year; and young spotted owls have a very low survival rate during their first year.

The carrying capacity of forests within the range of the species has declined significantly over time due to the loss of habitat to human caused and natural events such as suburban development, timber harvest, and large wildfires. Most recently, competition from barred owls has further limited the accessibility of habitat for spotted owls in the northern spotted owl range and threatens to do so in the California spotted owl range.

[1] Partners in Flight Databases, https://pif.birdconservancy.org/population-estimate-database-scores/ - accessed October 7, 2024

[2] Cornell Lab of Ornithology, All About Birds https://www.allaboutbirds.org/guide/Barred_Owl/lifehistory - accessed October 7, 2024

3.2.1 Proposed Action

The projects covered under the SCCL permit are consistent with recommendations within the Revised Recovery Plan for Northern Spotted Owl (Service 2011). This is partly due to the barred owl expanding its breeding range and competing with the northern spotted owl for resources in northern California (Service 2019a; Weins et al. 2014). Barred owls continue to be detected during northern spotted owl surveys, with detections increasing exponentially in recent years, which may threaten northern spotted owls (Service 2019a).

Northern spotted owls occur within the study areas and are expected to benefit from the Proposed Action based on the results of other studies conducted in California (Diller et al., 2016; Service, 2019a). Under controlled studies, northern spotted owl occupancy and reproduction rates increased in response to barred owl and hybrid collection (Diller et al. 2016; Service 2019a). Based on these results, we anticipate some of the spotted owl territories currently occupied by barred owls will be re-occupied by spotted owls and the associated spotted owl populations will experience improved demographic parameters as a result of barred owl and hybrid collection. If collection ceases, barred owls from adjacent areas would be expected to reoccupy territories within the treatment areas over time. Where barred owl populations are dense, the benefits of barred owl and hybrid collection will likely be short-term, extending for only 3 to 5 years from the cessation of barred owl and hybrid collection efforts (Service 2013b). In areas where barred owls are at lower densities, as in some parts of northern California, or where barred owls are in the initial stages of invasion, collection can have longer term effects (Hofstadter et al. 2022).

Barred owl surveys will continue to be conducted within the action area, including passive acoustic and other survey methods (e.g., call-based surveys) conducted by cooperators such as private forest products companies and the National Park Service. During the collection process, barred owl vocalizations are broadcast to attract the barred owls. Spotted owls are likely to be accustomed to barred owl calls in many areas covered by this permit, as spotted owls and barred owls have been occupying the same landscapes for over a decade and regularly hear each other's vocalizations. Some spotted owls may be displaced in response to hearing barred owl vocalizations. However, due to the low frequency and duration, the limited additional barred owl vocalizations involved in conducting nighttime barred owl surveys at each survey location or to attract barred owls for collection would not change the baseline soundscape for the spotted owls (USFWS 2024 [BO]).

Barred owl and hybrid collection may occur during the critical nesting period for spotted owls (February 1 through July 15 in California (Service, 2013b)), but collections will be planned to occur at distances ≥ 0.25 mile from known spotted owl nest sites. Collections may only occur closer to known spotted owl nests sites if a topographic buffer, such as a ridge or hill, exists between the collection site and the spotted owl nest site. Young northern spotted owls are increasingly more capable of movement as the nesting season progresses. Once capable of sustained flight, young owls are presumably able to distance themselves from disturbance along with their parents.

The potential for disturbance or disruption of spotted owls from barred owl and hybrid collection is mainly associated with noise impacts to spotted owl breeding behavior at an active nest site during the critical nesting period. The discharge of a standard 12-gauge shotgun is approximately 130-160 decibels and is of short duration. The project may use a shotgun of 20-gauge or larger. For analysis purposes, we analyzed the potential effect of the larger, louder gun. The proposed action includes collection of barred owls and hybrids using a shotgun which may generate noise above local ambient levels. Shotgun noise may be audibly detected and may disturb spotted owls out to 0.5 mile (USFWS 2024 [BO]). However,

barred owl and hybrid collection will be avoided within 0.25 mile from known active spotted owl nests unless a topographic buffer exists. The distance or the presence of a topographic buffer will reduce shotgun noise to a level that is unlikely to adversely affect spotted owls at their nests due to the attenuation of noise across the forested landscape. Disturbance from shotgun firing as part of this project will also have limited repetition (two shots at most collection sites in one day, with an occasional third shot in any one day, and a maximum of two to three visits during the nesting season at any particular spot).

Comprehensive surveys for spotted owls will be conducted during the spring to locate territorial spotted owls on the study area. Since the locations of breeding spotted owls will be known and will be avoided by at least 0.25 mile or a topographic buffer, and because of the attenuation of noise through the forested environment and the limited repetition of shotgun use at each site, we anticipate the noise from shotguns will have a negligible effect on spotted owls (USFWS 2024 [BO]).

The existing permit conditions have multiple requirements to avoid potentially shooting a non-target species, including spotted owls. Skilled biologists will employ the techniques described below during these studies. Implementation of the permit conditions by trained biologists will avoid and minimize potential adverse effects to the spotted owl. We anticipate no accidental injury or death of a spotted owl during barred owl and hybrid collection efforts will occur. Collection of barred owls and hybrids from the study areas is anticipated to have a largely positive effect on spotted owl survival and reproduction as barred owls often outcompete spotted owls for territories and prey.

Standards Specific to Avoiding Impacts to the Northern Spotted Owl/California Spotted Owl

Measures listed below are included in the permit conditions of the SCCL permit.

1. Priority shall be to collect barred owls and hybrids during the non-breeding season in order to avoid impacting young/juveniles. For the purposes of this permit, the breeding season is defined as when barred owls have dependent young. The following exceptions apply: i) non-breeding season collections are not possible due to limited access (e.g. snow) or ii) other constraints exist that could compromise study objectives.
2. In order to minimize stranding dependent young as a result of taking adult barred owls during the breeding season, affected owlets may either be permanently placed with a licensed wildlife educator for educational use, or they may be humanely euthanized when their nests are accessible.
3. All authorized activities shall be accomplished without unduly disturbing eggs, nestlings, adult, sub-adult, or fledged non-target species, particularly any species listed under the Endangered Species Act.
4. All reasonable precautions shall be taken to avoid causing nest abandonment, nest failure, nest predation, predation of non-target species, and to avoid attracting people or potential nest predators to nest sites.
5. Barred owl and hybrid collection locations must be a minimum of 0.25 mile from known active spotted owl nests, and in a direction such that calls used to attract barred owls or hybrids would not pull them towards these nests.
6. Persons participating in collection activities must be able to accurately identify spotted owls, barred owls, and hybrids using both visual and auditory means, and confidently distinguish between the species. Only hybrids that have some aspects of barred owl plumage and deliver an atypical call may be collected. Trained individuals must confirm the identity of the species prior

to collecting any birds. Two trained individuals are required to confirm the identity of hybrids before collection can occur. Species identification is required immediately preceding collection. After confirming species identification, barred owls or their hybrids may be lethally collected. If visual contact with the target is lost at any point before a shot can be taken, confirmation of the species must be obtained again.
    a. Visual confirmation must include an unobstructed frontal view of the owl. Shots through obscuring brush or branches are not authorized.
    b. Shots shall not be taken if the area behind the target bird is not clearly visible; the shooter must be confident that no non-target bird or other wildlife is in the field of fire.
    c. Shots may only be taken when the target is perched. In-flight shots are not authorized.
7. You must postpone barred owl/hybrid collection activities to a later date or try to "pull" barred owls/hybrids outside of planned collection locations if:
    a. An active spotted owl nest is within 0.25 mile,
    b. There is any situation that makes the shooter concerned about their safety such that they are not able to concentrate on a careful collection, carcass retrieval, and subsequent examination.
8. Reasonable effort must be made to retrieve barred owl/hybrid carcasses immediately after the shot while allowing for safety considerations, particularly at night in rough terrain. If the carcass cannot be located at the time of shooting, the shooter should return to the site as early as feasible the next day to resume the search. If the carcass cannot be located within a reasonable time, the shooter will describe the situation in an incident report, including any information regarding the likelihood that the shot may have missed, or that the bird was injured and escaped.
9. All retrieved specimens must be examined **carefully** and **immediately** after collection to verify species. Appropriate equipment and proper lighting must be available to conduct a thorough examination and verify the species upon specimen retrieval. All specimens must be submitted to authorized laboratories a minimum of once per month (see permit condition Q).
10. Prior to conducting barred owl/hybrid collection activities, persons responsible for collection must identify wildlife rehabilitation facilities within reasonable transport distance of the collection sites. Those involved in collection must have rehabilitation facility contact information available during field work. Collection specialists must be aware of appropriate handling techniques for safe and humane transport of injured animals to rehabilitation facilities and have appropriate transport carriers. Any injured non-target species shall be transferred to a licensed rehabilitator.
11. All personnel involved in barred owl collection must be trained in effective, humane methods of field euthanasia and have all the necessary materials available at all times during collection activities. Humane methods of euthanasia for birds in the hand may include but are not limited to a .22 gun or a captive bolt appropriately sized for barred owls (a captive bolt sized for rabbits is acceptable).

For hybrid collection, the Permittee will also follow the “Interim Protocol for Identification of Barred and Hybrid Barred/Spotted Owls Prior to Removal Distinguishing Barred and Hybrid Owls from Spotted Owls” (Appendix A).

3.2.2 Alternative 1: No Action

Under the No Action alternative, the potential beneficial impacts to northern spotted owl and California spotted owl as a result of barred owl collection would be less than under the Proposed Action due to a

lower lethal take authorization.

3.2.3 Cumulative Effects

Habitat loss and competition from barred owls are the primary factors in the continuing decline of northern spotted owls. The northern spotted owl was listed as threatened throughout its range "due to loss and adverse modification of spotted owl habitat as a result of timber harvesting and exacerbated by catastrophic events such as fire, volcanic eruption, and windstorms" (55 FR 26114). In the Service's 2011 Revised Recovery Plan for the Northern Spotted Owl, barred owl competition was identified as one of the two primary threats to the spotted owl (USFWS 2011). Our 2019 status review noted trends toward increasing loss of habitat to wildfire, and continued loss of habitat to timber harvest on non-federal lands, though the Northwest Forest Plan, and BLM Resource Management Plans slowed habitat loss and allowed for habitat growth on Federal lands (USFWS 2020). These trends continue under the actions described above.

California spotted owls are currently found throughout their known historical range, although there is evidence of a decrease in abundance in parts of the range including both the Sierra Nevada and Coastal-Southern California. Threats currently impacting the Sierra Nevada population include large-scale, high-severity fire; tree mortality; drought; climate change; various impacts from fuels reductions and forest management; competition from barred owls; and rodenticides. Threats currently impacting the Coastal-Southern California population include large-scale, high-severity fire; tree mortality; drought; climate change; various impacts from fuels reductions and forest management; urban development; and rodenticides.

In recent years, barred owls have penetrated into the range of the California spotted owl in the Sierra Nevada Mountains, although the barred owl population generally remains low and scattered in most of the California spotted owl range at this time. A small but rapidly expanding population of barred owls was established in the northern Sierra Nevada by 2017 (Wood et al 2020), which was subsequently removed under an SCCL permit (Hofstadter et al. 2022). While barred owls have not substantially impacted California spotted owl populations to date, the establishment of the barred owl population in the northern Sierra Nevada, and the history of the invasion and impacts of barred owls on northern spotted owls following such expansion, supports the assumption that, unless the barred owl populations are managed, barred owls will continue to invade southward until barred owls impact California spotted owl populations.

Both the Proposed Action and No Action alternative would include the potential collection of hybrids. The presence of hybrids represents the same impact to spotted owls as the presence of barred owls, by displacing spotted owls from their territories and preventing their use of habitat. In addition, allowing hybrids to remain in areas could lead to an increase in hybrids, and the introgression of barred owl genes into the spotted owl genome, potentially resulting in loss of genetic identity. In situations where hybrids are a substantial proportion of the population, failure to remove these individuals would greatly reduce the potential response by spotted owls. The "Interim Protocol for Identification of Barred and Hybrid Barred/Spotted Owls Prior to Removal Distinguishing Barred and Hybrid Owls from Spotted Owls" (Appendix A) will be used to ensure risks to northern spotted owl and California spotted owl are minimized.

The cumulative effects from the current issued SCCL permits described in Table 2 and Table 3, combined with the beneficial effect of the collection of barred owls and hybrids under the Proposed Action, would likely have positive impacts on spotted owl populations.

3.3 Other Wildlife Species

Barred owls are generalist predators and opportunistic hunters. While considered primarily nocturnal, they also hunt during the day (Mazur and James 2000). Barred owls often hunt from perches, waiting to pounce on potential prey. They have been known to perch over water to catch fish, or wade in shallow water for crayfish or fish. They can hunt from the ground, running and pouncing on prey such as amphibians, and probably plunge into snow for small animals (Mazur and James 2000).

Barred owls eat almost any species they encounter, including small mammals, birds, reptiles, amphibians, fish, earthworms, snails, slugs, insects, and crayfish (Baumbusch 2023; Kryshak et al. 2022; Hamer et al. 2001). They consume a wide variety of birds, including ducks, hawks, other owls, grouse, woodpeckers, and songbirds. The barred owl diet varies across the seasons, taking seasonal advantage of changes in available prey, with amphibians, reptiles, and invertebrates representing a large portion of their summer diet in some areas. A more detailed discussion of prey items can be found in Baumbusch (2023) Kryshak et al. (2022) and Wiens et al. (2014).

Because the impact of this new predator or competitor is likely to be more serious for species that are already reduced in abundance or are otherwise at risk, we were particularly interested in any direct evidence of endangered, threatened, candidate, or sensitive species in the barred owl diet. Project 1 will provide data to support this effort.

Wildlife Species Considered in this Analysis:

For rare or endemic species, or species with already depressed or declining populations, added competition with, or predation by, non-native barred owls may have significant effects. Therefore, our species-specific analysis is concentrated on the effect of barred owl collection to species listed as threatened or endangered under State or Federal law, and those identified as State or Federal candidate, proposed, species of concern, special status species, or sensitive species. We have limited this list to species that live in or pass through forest habitat (since species that do not use forests are less likely to be barred owl prey or competitors) and species that barred owls are likely to prey on or compete directly with (eliminating large mammals and eliminating all plants). These effects may be negative (disturbance) or positive (removal of predation or competition from barred owls in treatment areas).

Not all of these species within the range of the northern and California spotted owls are likely to encounter barred owls. For example, benthic dwellers or species found in large open spaces are not likely to come into contact with barred owl. We limited our analysis to species that occur in the forest environment and whose range overlaps our analysis area. This resulted in the analysis of 41 species, including mammals, birds, amphibians and reptiles, fish, and invertebrates (Appendix B).

Barred owls are a generalist predator that exerts pressure on species not adapted to this new source of predation, leading to negative effects on species that may be preyed upon by barred owl, and species which would compete with barred owl for prey. Barred owl collection in the northern spotted owl range

would have a beneficial effect on some species by reducing this novel source of predation and on others by reducing competitive pressure. Barred owl collection in the California spotted owl range would prevent negative effects of barred owl predation and competition by preventing the establishment of barred owl populations there. However, if barred owls do establish populations, we expect barred owl collection focused in this area to reduce the negative effects of interspecific competition on CSO for both habitat and prey.

Surveys would not likely increase the background level of barred owl calling significantly, and we anticipate no significant effect of barred owl calling surveys on other wildlife species under all alternatives. The act of removing barred owls involves discharge of shotguns and the noise associated with that discharge. We do not anticipate any significant effect or response from the limited disturbance of one to three shotgun reports at dusk or night for most species, due to the limited duration and scope of the disturbance and the infrequency of collection efforts, with the possible exception of marbled murrelets. Marbled murrelets are addressed separately.

3.3.1 Proposed Action

Marbled Murrelet

Marbled murrelets are a seabird species found in old-growth forests characterized by large trees, multiple canopy layers and moderate to high canopy closure. Marbled murrelets do not build nests but lay a single egg on a mat of moss, lichen or debris accumulations on these branches or deformities. The Service listed the marbled murrelet as a threatened species under the ESA on October 1, 1992 (57 FR 45328).

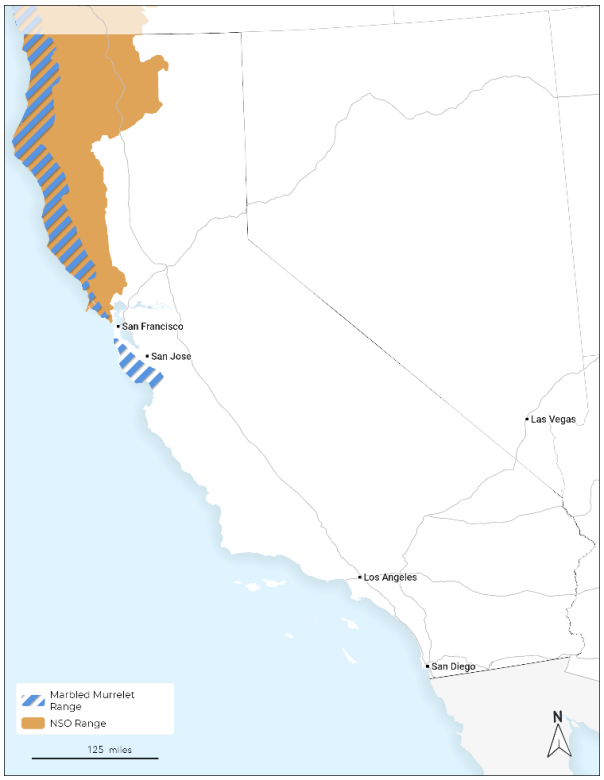

Figure 4. Marbled murrelet and northern spotted owl (NSO) ranges in California

There is a potential for disturbance to marbled murrelets from shotgun discharge under certain conditions, where the range of the marbled murrelet overlaps with potential barred owl and hybrid collection activity (Figure 5), collection occurs near known or potentially occupied marbled murrelet nesting habitat, and collection activities occur during the marbled murrelet nesting season (generally late March through late September, depending on the location).

Under both the Proposed Action and No Action alternative, barred owl and hybrid collection could occur during the murrelet nesting season and in nesting habitat. Most barred owl and hybrid collection would occur in the early spring and summer during barred owl nesting season, and again in the fall when barred owls become more responsive. The spring and summer collection periods overlap marbled murrelet nesting season; the fall collections do not. Barred owls use a wide variety of forest conditions. While some of these do not contain murrelet nesting habitat, most murrelet nesting habitat is potential barred owl habitat.

Adult marbled murrelets typically feed young around dawn and dusk, although fewer feedings take place at dusk and during the day. Barred owl and hybrid collection often happens at dusk or in the early evening. If the gunshots are in the immediate vicinity of an active nest and happen when murrelet adults are returning to the nest, this could potentially delay or interrupt the feeding of young. Most would be exposed while the adult is already on the nest branch and therefore less likely to abort the feeding attempt. However, we expect that the gunshot may sometimes coincide with the adult's approach to the nest, and furthermore that the adult could still be startled and drop or swallow the fish after it is already present at the nest branch. Therefore, it is possible that some nestlings will experience delayed or missed feedings (USFWS 2024 [BO]). In most cases, if feeding is delayed or interrupted only once during the period when the chick is on the nest, the effect to the chick would be minimal (USFWS 2024 [BO]). A well-fed, healthy chick to not likely to experience adverse effects from one missed feeding due to it being in a well-fed, healthy condition and therefore able to withstand one missed feeding (i.e. not meeting its full metabolic needs for the day) without negative consequences to its growth or survival (USFWS 2024 [BO]). Furthermore, summary studies on the effects of disturbance have not documented any nest failure, abandonment, or chick mortality directly attributed to noise disturbance (Singer et al. 1995; Hamer and Nelson 1998; Golightly et al. 2002).

Noise from the discharge of the shotgun is loud (about 150 dB at the site of the shot), but of very limited duration. Under the barred owl and hybrid collection protocol, one to three discharges of a shotgun would occur at a location adjacent to or within forested areas for each collection attempt separated by a few minutes to a few days. Collection on adjacent sites would likely be at least one-half mile away, reducing the potential for additional disturbance. Barred owls may reoccupy these sites within a single season, therefore one to two additional collections may occur within a single year on some sites.

In areas where murrelet breeding populations are low, the likelihood that an individual collection effort would occur within the vicinity of an active nest at the exact time that the adults are delivering food is low, but not zero. With increased barred owl and hybrid collection, the potential that such an event would occur at least once would increase. The higher the murrelet nesting population density, the more likely an interaction with barred owl and hybrid collection.

Barred owl research activities in the Proposed Action that overlap the marbled murrelet range would have a potential small effect on individual marbled murrelets. Based on the low likelihood of disturbance

of marbled murrelets in most areas and the short duration of the disturbance, disturbance from barred owl and hybrid collections would be minimal.

Non-Target Species

The Permit includes robust requirements to ensure the identity of barred owls and hybrids before collection, using vocal and visual characteristics. The presence of vocal barred owls likely reduces the potential that other species would occur in the immediate vicinity of the shot during the collection process and therefore be vulnerable to stray pellets. The shots are taken in forest conditions, so pellets do not travel far before being stopped or slowed by contact with vegetation. Based on the protections included in the collection protocol, there is very little potential for injury or death of non-target species during barred owl and hybrid collection.

General Standards to Avoid and Minimize Harm to Non-Target Species

The following avoidance and minimization measures are included within the existing permit conditions in the SCCL permit. These permit conditions will be implemented to minimize the risk of injury, death, and other impacts to non-target species during lethal collection of barred owls and hybrids, including spotted owls. These permit conditions will be implemented throughout the duration of the proposed action.

1. All authorized activities shall be accomplished without unduly disturbing eggs, nestlings, adult, sub-adult, or fledged non-target species, particularly any species listed under the Endangered Species Act.
2. All reasonable precautions shall be taken to avoid causing nest abandonment, nest failure, nest predation, predation of non-target species, and to avoid attracting people and potential nest predators to nest sites.
3. The use of lead shot is not authorized, thereby removing the potential for lead poisoning of non-target species.
4. Shotguns must be equipped with an attached night scope or other gunsight designed specifically for night use for accurate and precise aiming in dark or low light conditions.
5. Shots must be taken within 27 meters (30 yards) of barred owls or their hybrids. Collection may be accomplished by luring barred owls/hybrids into close range (less than 30 meters), using recorded calls or lures.
6. All equipment/materials needed to conduct barred owl and hybrid collection must be on-hand and immediately available during species identification and subsequent collection.
7. You must stop collecting and notify the Migratory Bird Permit Office within 24 hours of injuring or killing a non-target species.
    a. You must immediately cease and desist all barred owl collection activities if a non-target species is injured or killed, or if there is any uncertainty about the identity of an owl that was removed. You are not authorized to resume collection activities until you receive authorization from the Migratory Bird Permit Office.
    b. The Migratory Bird Permit Office may revoke or amend this permit if analysis of the circumstances of injury or mortality indicates that the research methods put non-target species at risk not anticipated by this permit.
    c. A written report shall be emailed to the Migratory Bird Permit Office within 3 days of the non-target species injury/mortality event. In the report, you shall describe the circumstances that led to the injury or mortality, if known. A description of

recommended changes in methods that will be implemented to reduce the likelihood of such injury or mortality from happening again should be included, if appropriate.

8. Prior to conducting barred owl and hybrid collection activities, persons responsible for collection must identify wildlife rehabilitation facilities within reasonable transport distance of the collection sites. Those involved in collection must have rehabilitation facility contact information available during field work. Collection specialists must be aware of appropriate handling techniques for safe and humane transport of injured animals to rehabilitation facilities and have appropriate transport carriers. Any injured non-target species shall be transferred to a licensed rehabilitator.

Based on the protections included in the permit conditions, there is very little potential for injury or death of non-target species during barred owl and hybrid collection, and we do not anticipate any significant effect to non-target species from incidental death or injury under any action alternative.

3.3.2 Alternative 1: No Action

Under the No Action alternative, the impacts would be less than under the Proposed Action due to a lower lethal take authorization. Therefore, the benefits and risks to other wildlife species, including marbled murrelet, would be lower under this alternative.

3.3.3 Cumulative Effects

Barred owls are generalist predators that prey on a very wide variety of species including, but not limited to, mammals, birds, amphibians, reptiles, mollusks, crustaceans, and insects. Because barred owls are not native to the ecosystems within the analysis area, these potential prey species are not adapted to this additional and novel source of predation. Barred owls have developed dense populations in some areas and are likely to do so in other areas as they expand, further impacting potential prey, and competing with native predators.

The cumulative effects from the current issued SCCL permits described in Table 2 and Table 3, combined with the incremental impacts of the Proposed Action, would vary by location, habitat needs, and the potential for these species to be affected by the ongoing forest management. Removal of this new predator/competitor would reduce the cumulative negative effects for species negatively affected by forest management. For species that benefit from forest management, barred owl and hybrid collection would result in increased beneficial effects wherever collection overlaps with the species' range.

<u>Marbled Murrelet</u>

Marbled murrelets are threatened by loss of forest nesting habitat, including fragmentation, via harvest and disturbance events (e.g., wildfire and insect and forest disease outbreaks) as well as climate change that includes offshore climate change effects that could diminish prey availability. Marbled murrelets can be disturbed by loud noise close to forest nest sites, which can lead to flushing adults or juveniles or preclude adults from feeding young. Given the overlap of barred owl and marbled murrelet nesting habitats, barred owls are likely to prey on murrelet chicks or adults.

The cumulative impacts on marbled murrelets from the actions discussed above, combined with those impacts occurring under the Proposed Action and No Action alternative, are both positive and negative. Under the Proposed Action and No Action alternative, where barred owl and hybrid collection overlap marbled murrelet habitat during the marbled murrelet nesting season and the collection site is close to

a marbled murrelet nest, the resulting disturbance of the shotgun discharge could lead to flushing of the adult or disruption of a feeding effort. Given that collection at a particular location is dispersed over time, the potential impact at any given nest would be unlikely, but possible, and could have negative effects on some individual marbled murrelets. Collection of barred owls and hybrids in the fall after the marbled murrelet breeding season and in the late winter/early spring before murrelet nesting begins would not result in potential disturbance. If collection must occur during murrelet breeding season, no collection will occur two hours before and after dawn to minimize noise disturbance during morning feeding hours. The collection of barred owls and hybrids would have a positive effect on individual marbled murrelets by reducing the potential for predation of marbled murrelets on their nests.

Given the above, we anticipate a low likelihood of a measurable negative impact to marbled murrelet populations by collection events due to the limited potential for, and short duration of, exposure to shotgun noise. However, when considered over the expanse of potential barred owl study areas, some individual murrelets would likely be exposed to collection activity and may be affected by short-term disturbance associated with the discharged of a firearm. At the population level, the effects of barred owl and hybrid collection efforts could have a small but potentially positive effect by reducing the potential for murrelet predation by barred owls.

Based on the low likelihood of disturbance of marbled murrelets in most areas, the short duration of the disturbance, and the occasional nature of that disturbance in time and space, and the limitation on collection activities during the morning feeding hours, disturbance from barred owl and hybrid collection under the Proposed Action would not have a significant effect on marbled murrelet populations.

3.4 Recreation and Visitor Use

Barred owl and hybrid collection could occur on National Park or Monument units managed by the National Park Service in the range of the northern spotted owl and California spotted owl. Additionally, the Forest Service, BLM, and the State of California manage similar areas including National Forests and State Parks. We anticipate that barred owl and hybrid collection activities involving firearms would be excluded from populated areas (e.g., NPS housing, developed areas, and open established campgrounds).

3.4.1 Proposed Action

Given the proposed collection of barred owls and hybrids throughout areas in California, we anticipate that at least some activities associated with the Proposed Action and No Action alternative would occur within, or adjacent to, designated recreational areas or areas heavily used by visitors. The primary mechanism for effects to recreation and visitor use includes the presence of small crews on the ground and the sound of firing the shotgun at barred owl sites, the latter having the most potential for disruption. The presence of small crews (one to three people) involved in surveying and collection are within the normal size of groups using all lands under consideration for barred owl and hybrid collection and we do not anticipate any substantial effect from their presence.

We anticipate that the sound of gunshots is more apt to disturb visitors and recreationists. Visitor expectations and responses to these mechanisms are dependent on their expectations of land management within an area. Impacts from sounds or activities that are unexpected in one area may be unremarkable and not cause disturbance to visitors or recreationists in another setting. For example, the

sound of gunshots in a National Park where hunting is not allowed would be notable, while gunshots on National Forest and BLM managed public lands during the hunting season would not. Even in National Parks, gunshots may be heard near the borders of the parks where the neighboring lands are open for hunting.

The sound of gunfire is sharp, loud, but short. The project may use a shotgun of 20-gauge or larger. For analysis purposes, we analyzed the potential effect of the larger, louder gun. A 12-gauge shotgun has a momentary noise level of about 150 dB at the site of the shot. For comparison, this is equivalent to firecrackers or a close lightning strike. This sound attenuates with distance, and can be further affected by steep slopes, ridges, and dense vegetation, all of which increase the rate of attenuation. Most barred owl and hybrid collection would be conducted from roads or trails in heavily forested landscapes within the northern spotted owl range, leading to greater attenuation of the sound of the shot. Within the range of the California spotted owl, barred owl and hybrid collection would also be conducted primarily from roads and trails, but in a variety of forested and woodland landscapes. A gunshot may be audible to humans as much as a mile away, depending on the topography, ground cover, forest density, and background ambient noise levels.

The intensity of barred owl collection would vary across management areas in the northern and California spotted owl ranges. With the exception of the far southern end, barred owl populations are well established in the northern spotted owl range. In these areas, barred owl and hybrid collection, with associated gunshots, would occur approximately one to three times a year, as new barred owls replace the ones removed. In the southern portion of the northern spotted owl range, and the California spotted owl range, collections would be very scattered and intermittent, and would not likely recur in the same area within a year or even between years.

We anticipate that the primary effect of the Proposed Action and No Action alternative on recreational resources and visitor use is the short-term elevated sound levels resulting from the discharge of a firearm one or two times per collection effort with one to three removal efforts a year. In areas where hunting or target shooting is not otherwise allowed, this may change the soundscape for recreationists or visitors in the area.

3.4.2 Alternative 1: No Action

Under the No Action alternative, the impacts on recreation and visitor use would be less than under the Proposed Action due to a lower lethal take authorization.

3.4.3 Cumulative Effects

In lands managed by the National Park Service, Bureau of Land Management, United States Forest Service, and California State Parks, recreation and visitor use are a primary focus or important component of the land management and anticipated to continue under the current plans. Recreational visitors to these lands expect to encounter forest management activities and their effects, so the presence of crews surveying for or monitoring barred owls would be within the expected activity. Therefore, we do not anticipate changes in recreation from the actions listed above.

Both the Proposed Action and No Action alternative could result in minor adverse effects to the soundscapes of forest environments, particularly in areas closed to hunting or target shooting where such noise is unexpected. Increased sounds of shotgun discharge, particularly outside of the hunting

season, could temporarily affect visitor experience on any landscape, even though these are dispersed and occasional.

The cumulative effects from the current issued SCCL permits described in Table 2 and Table 3, combined with the incremental impacts of the Proposed Action, could impact the recreational experience for some visitors, depending on the location and timing of the collection activity, but would not have a significant effect on overall recreation or visitor use.

3.5 Wilderness Areas

Given the proposed collection of barred owls and hybrids throughout areas in California, it is likely that at least some activities associated with the proposed action could occur within designated Wilderness Areas. Wilderness administering agencies must preserve wilderness character, a mandate found in the declaration of policy in the act (16 U.S.C. § 1131(a)) and the direction for use of wilderness areas (16 U.S.C. § 1133(b)). Roads, motor vehicles, motorized equipment or motorboats, aircraft landing, mechanical transport, or structures or installations are generally prohibited (16 U.S.C. § 1133(c)). By policy, Federal land management agencies generally take no actions to diminish wilderness character of study areas and recommended, proposed, or eligible lands to the extent that action would preclude future wilderness designation (Forest Service Manual 1900, National Park Service Management Policies Chapter 6, Bureau of Land Management Manual 6330).

Five qualities of wilderness character have been defined to monitor how stewardship actions, impacts from modernization, and other changes occurring inside or outside of a given wilderness area affect the wilderness area over time (Landres et al. 2015). These are:

- Untrammeled: Wilderness is essentially unhindered and free from modern human actions that control or manipulate the community of life.
- Natural: Wilderness maintains ecological systems that are substantially free from the effects of modern civilization.
- Undeveloped: Wilderness retains its primeval character and influence and is essentially without permanent improvements or modern human occupation.
- Solitude or Primitive and Unconfined Recreation: Wilderness provides outstanding opportunities for solitude or primitive and unconfined recreation.
- Other Features of Value: Wilderness may also contain other features of scientific, educational, scenic, or historical value.

These wilderness-administering agencies are also charged with varying conservation mandates, including the ESA direction for Federal agencies to use their legal authorities in the recovery of threatened and endangered species. Therefore, it is reasonable to assume that some barred owl management could occur within designated wilderness and wilderness study areas.

3.5.1 Proposed Action

The primary mechanism for effects of the Proposed Action and No Action alternative to wilderness include surveying for and collection of barred owls and hybrids and post-collection monitoring. Both actions generally involve small crews of one to three individuals operating from trails in the wilderness area.

Surveys and barred owl and hybrid collection would involve the presence of one to three people at specific sites along trails in the forest for 15 minutes to a few hours, primarily at dusk or during the night. This could occur at any time of the year, though it is usually concentrated in the spring and early summer, and again in the fall, as barred owls are more responsive at these times. Weather and access may limit activity in higher elevation areas in the spring. Most collection would be from trails. Off-trail collection would be very limited due to the danger of traveling off trail in remote areas at night. Lethal collection would involve attracting barred owls and hybrids with recorded calls and shooting birds that respond and approach closely. This method would result in one to three shots fired during a collection visit. If all birds are not removed in a single visit or new barred owls reoccupy the site after collection, additional visits and shots may be required, though these would be separated by days or weeks from the initial collection. Collection locations are based on the presence of a territorial barred owl and are likely at least 0.5 mile or more apart. Barred owls may reoccupy these sites within a single season, therefore one to two additional collections may occur within a single year on some sites.

Monitoring would involve small crews placing Autonomous Recording Units (ARUs) along or near trails. These small units are placed off trail and out of site of the trail. They would be placed, serviced, and retrieved each year, resulting in three or more visits to the area by the crews.

The intentional manipulation of wildlife populations would result in negative impacts to untrammeled quality. Monitoring installations would negatively impact the undeveloped quality. The sights and sounds of modern human activity needed to implement all alternatives, include gunfire, which would negatively impact solitude or primitive and unconfined recreation. Gunfire, particularly outside of hunting season where wilderness is open for hunting, could also affect natural soundscapes, negatively impacting the natural quality. All of these impacts are limited in time and scale, so any negative impacts would be short term and limited to active removal areas. This would have no long-term impact on visitor experience in the wilderness. Collection of barred owls and hybrids is expected to allow for increasing or stable populations of native northern and California spotted owls, as well as other potential prey species and competitors, which would preserve or improve the natural quality of wilderness (see Section 3.4 Spotted Owls).

The California spotted owl range, and Sonoma and Marin Counties in the southern end of the northern spotted owl range, are at the front of the barred owl invasion and barred owls are found in very low numbers. While surveying would occur across the years, collection efforts would be low intensity and intermittent.

3.5.2 Alternative 1: No Action

Under the No Action alternative, the effect on the untrammeled, undeveloped, solitude or primitive and unconfined recreation, and other features of value qualities of wilderness would be less than under the Proposed Action.

3.5.3 Cumulative Effects

Human activities in wilderness areas include hiking, camping, fishing, and hunting. Hunting and fishing are regulated by the States in most areas. The land management plans for specific areas provide some direction on management of specific wilderness areas, as do the Wilderness Act and associated regulations. We anticipate management of wilderness will continue as described in these plans.

Under the Proposed Action and No Action alternative, barred owl and hybrid collection could occur within wilderness areas. Most collection activity would occur along trails and would be less frequent and cover smaller areas than that occurring in well-roaded areas outside of wilderness. The primary, though minor, adverse effect would be from the occasional and dispersed use of shotguns, and the noise they create, on the soundscape. Most collection would occur in the spring through fall. In the fall, this activity may coincide with hunting season and may not be discernable in wilderness areas already open to hunting. The primary beneficial effects would be from the reduction in the presence and population of a non-native generalist predator, releasing this additional pressure from native species, including the spotted owl.

The cumulative effects from the current issued SCCL permits described in Table 2 and Table 3, combined with the incremental impacts of the Proposed Action, may have both positive and negative effects on wilderness areas. While wilderness areas are ideally managed to leave ecosystems unaffected by human manipulation, Federal agencies also have a responsibility to aid in the recovery of Federally listed species and address the impacts of invasive species. Therefore, barred owl and hybrid collection under this permit would not have a significant effect on wilderness areas.

3.6 Cultural and Socio-economic Interests

3.6.1 Proposed Action

For the Proposed Action and No Action alternative, barred owl collection would only occur on lands of willing landowners or land managers. The Proposed Action and No Action alternative assume ongoing management of lands within barred owl study areas, and do not require landowners or managers to take any specific action. We would not anticipate that any landowner or manager would change their current land management as a result of this action.

Under the Proposed Action, the Permittee would need to obtain authorization from any new landowners or land managers as a result of the expansion of the study area. We assume that landowners would evaluate the potential impact on their operations, including timber harvest, as part of their decision to engage in or allow barred owl and hybrid collection. If there are potential economic impacts of concern to a non-federal landowner or land manager, including effects on timber harvest, resulting from the potential increase in occupied spotted owl sites in barred owl study areas, they could choose not to have collection on their lands or apply to the Service for incidental take authorization under section 10 of the ESA (e.g. an incidental take permit/Habitat Conservation Plan (HCP) or enhancement of survival permit/CBA). In areas of mixed ownership, the actions of one landowner may affect neighboring landowners, at least those within the vicinity of the reoccupied spotted owl site.

In northern California, a substantially higher percentage of spotted owl habitat is found on private timberlands. On lands included in HCPs with coverage for spotted owls, we anticipate no change in timber harvest levels due to barred owl collection. All potential habitat on State and private timberlands is surveyed for at least two years prior to timber harvest and any spotted owl sites are protected according to the California Forest Practices Rules (California Code of Regulations Title 14). Once sites are established, site-specific management continues, even if the site becomes unoccupied.

While we anticipate that most spotted owl recolonization resulting from barred owl and hybrid collection would occur on historical activity centers and therefore be covered by California Forest Practices Rules,

some new sites could be established in areas where spotted owls had not been previously documented. These sites would be covered by California Forest Practices Rules which would likely result in changes to timber harvest plans around these sites. Therefore, there would be a potential for small impact on forest management on private lands in California, but this potential would be limited to situations where spotted owls occupied sites where they were never previously documented.

3.6.2 Alternative 1: No Action

Under the No Action alternative, the effect of northern spotted owl protections on commercial timber harvest, forest management, and associated socioeconomic impacts to communities through loss of revenue and employment may increase, decrease, or remain the same depending on the location of the remaining spotted owl sites. We would not anticipate that any landowner or manager would change existing land management as a result of the No Action alternative.

3.6.3 Cumulative Effects

The cumulative effects from the current issued SCCL permits described in Table 2 and Table 3, combined with the incremental impacts of the Proposed Action, would not have a significant effect on cultural or socioeconomic interests.

3.7 Climate Change

Scientific measurements spanning several decades demonstrate that changes in climate are occurring and that the rate of change has been faster since the 1950s. There is strong scientific support for projections that warming will continue through the 21st century, and that the magnitude and rate of change will be influenced substantially by the extent of greenhouse gas emissions. A recent comprehensive assessment (Domke et al. 2023) indicate that climate change will have long-term and variable impacts on forest habitat at local and regional scales.

Climate change is occurring within the northern and California spotted owls' entire range in California, the analysis area of this EA. Given the wide geographic range and the sensitivity of climate change to local conditions, projected changes in climate vary across the analysis area, and the effects those changes on species and habitats, the effect of the action will vary. However, there are underlying trends that apply across the area. Projected continuing changes in climate in the West would result in increasing temperatures over time and changes in precipitation amount, timing, and distribution. Regional warming and consequent drought stress appear to be the most likely drivers of an increase in the mortality rate of trees in recent decades in the western United States. This, in turn, leads to increased fire risk and high severity fires; increased risks from forest pathogens; and changes in forest structure, extent, and species composition. While the rate and impact of these changes may differ between forest types and with local microclimates, the overall potential for these effects throughout the range remains.

Climate change has affected, or is starting to affect, spotted owls through change in habitat throughout their range (USFWS 2020, section 4.3.2; USFWS 2023b, Section 4.4). Climate change forecasts indicate continuing and significant future effects on western forests over the next century, with long-term implications for the composition and structure of those forests for spotted owl habitat. These changes in the climate and forest ecosystems in the West are likely to cause additional direct and indirect stressors

for northern and California spotted owls. Changing climatic conditions may have direct impacts on spotted owl physiology, survival, reproduction, recruitment, or population growth through heat stress from extended high temperatures and indirect impacts including changes in habitat and prey distribution, abundance, and quality. Several northern spotted owl demographic study analyses noted associations between northern spotted owl demographic rates and climate suggesting predicted climate change is likely to have negative consequences for northern spotted owls, although the magnitude of these potential impacts is unknown (Franklin et al. 2021, Dugger et al. 2016). Habitat loss (Dugger et al. 2016), competition with barred owls (Wiens et al. 2014), and changes in weather patterns predicted to occur in future decades (Glenn et al. 2010) have independently been demonstrated to have negative effects on northern spotted owl populations. In combination, these factors are likely to interact and have even greater negative consequences for this subspecies. For more detail on climate change and spotted owls, see USFWS 2023b, Section 4.4; USFWS 2020, Section 4.3.2

3.7.1 Proposed Action

Under the Proposed Action and No Action alternative, the primary potential effect on climate change is greenhouse gas (GHG) emissions associated with the use of motorized vehicles for the survey and collection of barred owls and hybrids. Vehicle use for barred owl and hybrid collection is relatively low intensity. Barred owl and hybrid collection in well-roaded areas would involve use of a vehicle to access multiple barred owl sites per night, covering as much as 3,000 acres per night and repeating this effort three or four times per year per area. Collection in unroaded areas would require vehicle use to access trailheads. Collection would likely occur over six to eight months each year. The addition of barred owl collection is not anticipated to significantly increase the vehicle use in management areas beyond the normal variation associated with forest management, and thus increases in vehicle emissions would be low. Overall, any effects on regional greenhouse gas emissions or global climate change resulting from the proposed alternatives would be negligibly small. Thus, the Service has not attempted to conduct an in-depth or quantitative analysis of effects of the action alternatives on global climate change.

3.7.2 Alternative 1: No Action

Under the No Action alternative, the GHG emissions associated with the survey and collection of barred owls and hybrids would be less than under the Proposed Action.

3.7.3 Cumulative Effects

The cumulative effects from the current issued SCCL permits described in Table 2 and Table 3, combined with the incremental impacts of the Proposed Action, would not have a significant effect on climate change.

4. List of Preparers

Amy Walsh, U.S. Fish and Wildlife Service, Biologist

5. References

16 United States Code (U.S.C.) §§ 703-712 et seq. Title 16 - Conservation; Chapter 7 – Protection of Migratory Game and Insectivorous Birds; Subchapters II Migratory Bird Treaty; Sections (§§) 703-712 et seq. Available online: http://uscode.house.gov

16 United States Code (U.S.C.) § 1133 et seq. Title 16 - Conservation; Chapter 23 – National Wilderness Preservation System; Section (§) 1133 – Use of Wilderness Areas. Available online: http://uscode.house.gov

40 Code of Federal Regulations (CFR) § 1501.3. Title 40 - Protection of Environment; Chapter V - Council on Environmental Quality; Subchapter A – National Environmental Policy Act Implementing Regulations; Part 1501 – NEPA and Agency Planning; Section (§) 1501.3 – Determine the appropriate level of NEPA review. Available online: https://www.ecfr.gov 16 U.S.C. § 1131

42 United States Code (U.S.C.) §§ 4321 et seq. Title 42 - the Public Health and Welfare; Chapter 55 - National Environmental Policy; Subchapters I (Policies and Goals) and II (Council on Environmental Quality); Sections (§§) 4321 et seq. Available online: http://uscode.house.gov

50 Code of Federal Regulations (CFR) § 10.12. Title 50 - Wildlife and Fisheries; Chapter I - United States Fish and Wildlife Service, Department of the Interior; Subchapter B - Taking, Possession, Transportation, Sale, Purchase, Barter, Exportation, and Importation of Wildlife and Plants; Part 10 – General Provisions; Subpart B – Definitions; Section (§) 10.12 - Definitions. Available online: https://www.ecfr.gov

50 Code of Federal Regulations (CFR) § 10.13. Title 50 - Wildlife and Fisheries; Chapter I - United States Fish and Wildlife Service, Department of the Interior; Subchapter B - Taking, Possession, Transportation, Sale, Purchase, Barter, Exportation, and Importation of Wildlife and Plants; Part 10 – General Provisions; Subpart B – Definitions; Section (§) 10.13 - List of Birds Protected by the Migratory Bird Treaty Act. Available online: https://www.ecfr.gov

50 Code of Federal Regulations (CFR) § 21. Title 50 - Wildlife and Fisheries; Chapter I - United States Fish and Wildlife Service, Department of the Interior; Subchapter B - Taking, Possession, Transportation, Sale, Purchase, Barter, Exportation, and Importation of Wildlife and Plants; Part 21 – Migratory Bird Permits. Available online: https://www.ecfr.gov

50 Code of Federal Regulations (CFR) § 13.21. Title 50 - Wildlife and Fisheries; Chapter I - United States Fish and Wildlife Service, Department of the Interior; Subchapter B - Taking, Possession, Transportation, Sale, Purchase, Barter, Exportation, and Importation of Wildlife and Plants; Part 13 - General Permit Procedures; Section (§) 13.21 – Issuance of permits. Available online: https://www.ecfr.gov

55 Federal Register (FR) 26114. 1990. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Northern Spotted Owl. Vol. 55, No. 123. June 26, 1990. pp 26114-26194. Available online: https://www.federalregister.gov/

57 Federal Register (FR) 45328. 1992. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Washington, Oregon, and California Population of the Marbled Murrelet.

Vol. 57, No. 191. October 1, 1992. pp 45328-45337. Available online: https://www.federalregister.gov/

85 Federal Register (FR) 81144. 1990. Endangered and Threatened Wildlife and Plants; 12-Month Finding for the Northern Spotted Owl. Vol. 85, No. 241. December 14, 2020. pp 81144 - 81152. Available online: https://www.federalregister.gov/

88 Federal Register (FR) 11600. 2023. Endangered and Threatened Wildlife and Plants; California Spotted Owl; Endangered Status for the Coastal-Southern California Distinct Population Segment and Threatened Status with Section 4(d) Rule for the Sierra Nevada Distinct Population Segment. Vol. 88, No. 36. February 22, 2023. pp 11600 - 11639. Available online: https://www.federalregister.gov/

Baumbusch, R.C., K.M. Dugger, and J.W. Wiens. 2023. Estimating fat content in barred owls (Strix varia) with predictive models developed from direct measures of proximate body composition, Conservation Physiology, 11(1), coad069, https://doi.org/10.1093/conphys/coad069

Cooperrider, A., R.F. Noss, H.H. Welsh Jr., C. Carroll, W. Zielinski, D. Olson, S.K. Nelson, and B.G. Marcot (2000). Terrestrial fauna of redwood forests. Pages 119-164 in Noss, R.F. (Editor). The Redwood Forests: History, Ecology, and Conservation of the Coast Redwoods. Island Press, Washington, D.C., USA.

Diller, L.V., K.A. Hamm, D.A. Early, D.W. Lamphear, K.M. Dugger, C.B. Yackulic, C.J. Schwarz, P.C. Carlson, and T.L. McDonald (2016). Demographic response of northern spotted owls to barred owl removal. Journal of Wildlife Management, 80:691–707.

Domke, G.M., C.J. Fettig, A.S. Marsh, M. Baumflek, W.A. Gould, J.E. Halofsky, L.A. Joyce, S.D. LeDuc, D.H. LeviNorthern spotted owln, J.S. Littell, C.F. Miniat, M.H. Mockrin, D.L. Peterson, J. Prestemon, B.M. Sleeter, and C. Swanston. 2023. Ch. 7. Forests. In: Fifth National Climate Assessment. Crimmins, A.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, B.C. Stewart, and T.K. Maycock, Eds. U.S. Global Change Research Program, Washington, DC. USA. https://doi.org/10.7930/NCA5.2023.CH7

Dugger, K.M., E.D Forsman, A.B. Franklin, R.J. Davis, G.C. White, C.J. Schwarz, K.P. Burnham, J.D. Nichols, J.E. Hines, C.B. Yackulic, P.F., Jr., Doherty, et al. (2016). The effects of habitat, climate and Barred Owls on long-term demography of Northern Spotted Owls. The Condor: Ornithological Applications, 118:57–116.

Franklin, A.B., K.M. Dugger, D.B. Lesmeister, R.J. Davis, J.D. Wiens, G.C. White, J.D. Nichols, J.E. Hines, C.B. Yackulic, C.J. Schwarz, et al. (2021). Range-wide declines of northern spotted owl populations in the Pacific Northwest: A meta-analysis. Biological Conservation, 259:109168.

Gabriel M.W., L.V. Diller, J.P. Dumbacher, G.M. Wengert, J.M. Higley, R.H. Poppenga, and S. Mendia (2018). Exposure to rodenticides in Northern Spotted and Barred Owls on remote forest lands in northwestern California: evidence of food web contamination. Avian Conservation and Ecology, 13:2.

Glenn, E.M., R.G. Anthony and E.D. Forsman. 2010. Population trends in northern spotted owls: Associations with climate in the Pacific Northwest. Biological Conservation 143:2543-255

Golightly, R. T., P. N. Hebert, and D. L. Orthmeyer. 2002. Evaluation of Human-Caused Disturbance on the Breeding Success of Marbled Murrelets in Redwood National and State Parks, California. Monitoring report submitted by Humboldt State University and USGS to U.S. Fish and Wildlife Service on March 27, 2022.

Gutiérrez, R.J., P.N. Manley, and P.A Stine. 2017. The California spotted owl: current state of knowledge. U.S. Department of Agriculture, Albany, CA.

Hamer, T.E., S.G. Seim, and K.R. Dixon. 1989. Northern spotted owl and northern barred owl habitat use and home range size in Washington: preliminary report. Washington Department of Wildlife, Olympia.

Hamer, T., and S.K. Nelson. 1998. Effects of disturbance on nesting marbled murrelets: Summary of Preliminary Results. Report prepared for USFWS, Office of Technical Support, 24 pp.

Hamer, T.E., D.L. Hays, C.M. Senger, and E.D. Forsman (2001). Diets of northern barred owls and northern spotted owls in an area of sympatry. Journal of Raptor Research, 35:221–227.

Hofstadter, D.F., N.F. Kryshak, C.M. Wood, B.P. Dotters, K.N. Roberts, K.G. Kelly, J.J. Keane, S.C. Sawyer, P.A. Shaklee, H.A. Kramer, R.J. Gutiérrez, and M.Z. Peery (2022). Arresting the spread of invasive species in continental systems. Frontiers in Ecology and the Environment, 20:278–284.

Holm, S.R., B.R. Noon, J.D. Wiens, and W.J. Ripple (2016). Potential trophic cascades triggered by the barred owl range expansion. The Wildlife Society Bulletin, 40:615–624.

Keane, J. et al. 2018. Range expansion of the barred owl in the Sierra Nevada, California. Symposium abstract, 2018 annual meeting of the Western Section of the Wildlife Society, Santa Rosa, California.

Kelly, E.G., Forsman, E.D., and Anthony, R.G. 2003. Are barred owls displacing spotted owls? The Condor 105:45–53.

Kryshak, N.F., D.F. Hofstadter, B.P. Dotters, K.N. Roberts, K.G. Kelly, C.M. Wood, E.D. Fountain, A.K. Wray, I.F. Papraniku, P.J. Kulzer, J.J. Keane, P.A. Shaklee, and M.Z. Peery (2021). Diet of barred owls in California elucidated with high-throughput sequencing. The Wildlife Society – Western Section Annual Meeting. 1 February, 2021, Virtual.

Kryshak, N.F., E.D. Fountain, D.F. Hofstadter, B.P. Dotters, K.N. Roberts, C.M. Wood, K.G. Kelly, I.F. Schwarcz, P.J. Kulzer, A.K. Wray, H.A. Kramer, J.P. Dumbacher, J.J. Keane, P.A. Shaklee, R.J. Gutiérrez, and M.Z. Peery (2022). DNA metabarcoding reveals the threat of rapidly expanding barred owl populations to native wildlife in western North America, 273:109678.

Landres, P.B., Barns, C., Boutcher, S., Devine, T., Dratch, P., Lindholm, A., Merigliano, L., Roeper, N.J. and Simpson, E., 2015. Keeping it wild 2: An updated interagency strategy to monitor trends in wilderness character across the National Wilderness Preservation System. United States, Department of Agriculture, Forest Service, General Technical Report. Rocky Mountain Research Station, Fort Collins, CO. 114 p.

Livezey, K.B. (2009). Range expansion of barred owls, Part I: Chronology and distribution. The American Midland Naturalist, 161:49–56.

Mazur, K.M. and James, P.C. (2020). Barred owl (Strix varia), version 1.1. In Birds of the World (A.F. Poole and F.B. Gill, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.brdowl.01.1

Sierra Pacific Industries (SPI). 2021. Habitat Conservation Plan for Northern and California Spotted Owl. Anderson, California.

Singer, S.W., D.L. Suddjan, and S.a. Singer. 1995. Fledgling behavior, flight patterns, and forest characteristics at marbled murrelet tree nests in California. Northwest Naturalist, 76:54-62.

Taylor, A.L., and E.D. Forsman. 1976. Recent range extension of the barred owl in western North America, including the first records for Oregon. Condor 78:560-561.

USDA Forest Service. 2019. Conservation Strategy for the California Spotted Owl in the Sierra Nevada. R5-TP043. 181 pp.

U.S. Fish and Wildlife Service [USFWS] (2011). Revised recovery plan for the northern spotted owl (*Strix occidentalis caurina*). U.S. Department of Interior, Portland, Oregon, USA.

U.S. Fish and Wildlife Service. 2013. Experimental removal of barred owls to benefit threatened northern spotted owls. Final Environmental Impact Statement, U.S. Department of Interior, Portland, Oregon, USA.

USFWS (U.S. Fish and Wildlife Service). 2020. The Northern Spotted Owl Species Status Report (as of August 2019). Oregon Fish and Wildlife Office, Portland, Oregon. 127 pp.

U.S. Fish and Wildlife Service. 2020. Endangered and Threatened Wildlife and Plants; Endangered Species Status for Southern Sierra Nevada Distinct Population Segment of Fisher; final rule. Federal Register 85(95); 29532-29589.

USFWS (U.S. Fish and Wildlife Service). 2023. Draft Barred Owl Management Strategy. Oregon Fish and Wildlife Office, Portland, Oregon.

USFWS (U.S. Fish and Wildlife Service). 2024. Biological Opinion [BO], Barred Owl Management Strategy. Department of the Interior, Portland, Oregon.

USFWS (U.S. Fish and Wildlife Service). 2024. Implementation of the Proposed Barred Owl Management Strategy in Washington, Oregon, and California. Final Environmental Impact Statement. Department of the Interior, Portland, Oregon, USA.

Verner, J., K.S. McKelvey, B.R. Noon, R.J. Gutiérrez, G.I. Gould Jr., and T.W. Beck. 1992. The California spotted owl: a technical assessment of its current status. U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station, Albany, CA.

Wiens, J.D., R.G. Anthony, and E.D. Forsman (2014). Competitive interactions and resource partitioning between northern spotted owls and barred owls in western Oregon. Wildlife Monographs, 185:1–50.

Wiens, J.D., K.M. Dugger, J.M. Higley, D.B. Lesmeister, A.B. Franklin, K.A. Hamm, G.C. White, K.E. Dilione, D.C. Simon, R.R. Bown, P.C. Carlson, C.B. Yackulic, J.D. Nichols, J.E. Hines, R.J. Davis, D.W. Lamphear, C. McCafferty, T.L. McDonald, and S.G. Sovern (2021). Invader removal triggers competitive release in a threatened avian predator. Proceedings of the National Academy of Sciences, 118:e2102859118

Wood, C.M., R.J. Gutiérrez, J.J. Keane, and M.Z. Peery (2020). Early detection of rapid Barred Owl population growth within the range of the California Spotted Owl advises the Precautionary Principle. The Condor: Ornithological Applications, 122:1–10.

6. Appendix A: Interim Protocol for Identification of Barred and Hybrid Barred/Spotted Owls Prior to Removal Distinguishing Barred and Hybrid Owls from Spotted Owls

Developed by the Barred Owl Science Team
17 April 2019

The following is intended to be part of a larger barred owl removal protocol, and therefore is not specific on removal methods or barred owl identification.

The following identification protocol is specific to studies that include the removal of suspected hybrid owls. It is focused on insuring that spotted owls are not removed by accident but accepts a higher risk for barred owls to be removed, even if initially identified as hybrids.

Identification of hybrid owls requires both visual and auditory observations. If there is any doubt that it could be a spotted owl, do not remove the bird.

1. Visual identification of hybrids in the field can be very difficult, particularly at night when most removal occurs, so visual identification alone is not adequate for removal of suspected hybrid owls. The defining visual features for hybrids vary across specimens and are understandably more subtle in nature than the difference between the two species. The focus of this identification is to ensure that spotted owls are not identified as hybrids.

Visual identification alone of a free ranging owl is often insufficient to positively verify a hybrid individual but is still an important part of the identification protocol. Before removal, the shooters must observe a frontal view of the bird to eliminate the possibility that the targeted bird may be a spotted owl. In general, barred and hybrid owls have the following characteristics that distinguish them from spotted owls:

1) vertical barring on the belly

2) horizontal barring on the breast, nape, or back (where visible)

3) Lighter facial disk

4) Wide and distinct light bars on the tails (spotted owls generally have less distinct, broken, or fainter bars on their tails, with the exception of the tail tip on juvenile spotted owls).

If a bird is identified as a barred owl and removed but appears it may be a hybrid once it is in hand, it should be tagged and processed as a hybrid.

If a bird is identified as a barred or hybrid and removed, but once in hand appears to be a spotted owl, follow the requirements of the barred owl removal protocol concerning ceasing removals and reporting the errant removal.

2. Owl vocalizations provide the best identification of hybrids, although even these can be problematic. Observations to date of known hybrids reveal that their vocalizations are unusual. In particular, the

territorial defense song is often somewhat intermediate between spotted and barred owls. Therefore, this protocol is centered on primary identification by territorial defense song. It is important to note that there is no single call that defines a hybrid and, in addition, not all hybrid calls are alike. To gain information for future hybrid removal protocols, birds should be recorded prior to removal, as long as doing so does not interfere with positive identification of targeted owls in the field.

To ensure the suspected hybrid owls are correctly identified, the observers must hear the bird use a territorial defense song (e.g. 8-note hoot or descending hoot of the barred owl)) numerous times (at least 6). The observer must hear multiple complete calls before making a decision.

a. If a suspected hybrid uses a standard barred owl territorial defense song eight-note hoot (sometimes called two-phrase-hoot = who-cooks-for-you who-cooks-for-you-too) and shows some definitive evidence of barred owl plumage characteristics, it can be removed per the barred owl removal protocol. Examine specimen in hand and if there is any question, any chance it is a hybrid, mark and process it as such. Barred owl calls are generally more resonant and more tremulous than spotted owl.

b. If a bird at any time uses a typical spotted owl territorial defense song (4-note - hoot, hoot-hoot hoooooot) in its repertoire, then it may be a spotted owl. It is critical to realize that individual spotted owls do not always use the complete standard hoot. For example, individuals have been known to consistently drop the first note or add a tag note at the end, and different parts of the call attenuate at different rates over distance. Do not remove the owl if there is any question if it being a spotted owl.

You can always return to a site, and you may bring experts out into the field to help identify questionable calling owls on a later visit, but you cannot bring a dead bird back to life.

c. If a bird gives multiple complete territorial defense song calls while visible, none of which can be clearly classified as typical barred owl or spotted owl calls, and the calls sound like a mix of barred and spotted owl characteristics and shows some definitive evidence of barred owl plumage characteristics, the bird may be removed. Examine the bird in hand for the characteristics described below. Follow the post-removal procedure.

All suspected hybrids should be recorded prior to removal, if it can be done without interfering with the positive identification of targeted owls in the field. We recommend recording barred owls as well for future reference. This will help us to develop locational specific samples for future work and allow us to examine how calls relate to species and hybrid parentage.

Because this is an interim protocol and we are seeking to gather the information necessary to refine it, there are some requirements that are not specific to simply identification and removal -- for example, recording the bird prior to removal.

3. If a suspected hybrid cannot be identified as described above, the researcher has the option to capture and examine the bird in hand to identify the characteristics. If the bird is then confirmed as a barred owl or hybrid, it may be euthanized as described under the permit.

4. We recommend that all suspected hybrids be submitted for genetic testing to confirm their hybrid status. This is critical information for testing this interim protocol.

7. Appendix B. List of Federal and State listed forest species that may be affected by barred owl and hybrid collection

The below table displays the Federal and State listed species that occur within the action area and may interact with barred owls. The status of the species provides some indication of its level of risk. That is, endangered species are likely at more risk than sensitive species. These effects may be negative (disturbance) or positive (removal of predation or competition from barred owls in treatment areas).

Species	**Listing Status[1]**		**Potential Interaction with Barred Owl**	
Common Name	**Federal**	**State (CA)**	**Prey**	**Competitor**
Mammals				
Canada Lynx *Lynx canadensis*	T	-		Yes
Fisher *Pekania pennanti*	E	T/S		Yes
Pacific (Humboldt) Marten *Martes caurina humboldtensis*	T	E		Yes
Point Arena Mountain Beaver *Aplodontia rufa nigra*	E	S	Yes	
Riparian Brush Rabbit *Sylvilagus bachmani riparius*	E	E	Yes	
Riparian Woodrat *Neotoma fuscipes riparia*	E	S	Yes	
Sierra Nevada Red Fox *Vulpes vulpes necator*	E	T		Yes
Birds				
Belding's Savannah Sparrow *Passerculus sandwichensis beldingi*	-	E	Yes	
Great Gray Owl *Strix nebulosa Yosemitensis*	-	E		Yes
Little Willow Flycatcher *Empidonax traillii brewsteri*	-	E	Yes	
Marbled Murrelet *Brachyramphus marmoratus*	T	E	Yes	
Spotted Owl *Strix occidentalis*	T	T/S		Yes
Southwestern Willow Flycatcher *Empidonax traillii extimus*	E	E	Yes	
Western Yellow-billed Cuckoo *Coccyzus americanus*	T	E	Yes	
Amphibians and Reptiles				
California Red-legged Frog *Rana draytonii*	T	S	Yes	

California Tiger Salamander *Ambystoma californiense*	E/T	T	Yes	
Foothill Yellow-legged Frog *Rana boylii*	E/T	E/T/S	Yes	
Kern Canyon Slender Salamander *Batrachoseps simatus*	PT	T	Yes	
Limestone Salamander *Hydromantes brunus*	-	T	Yes	
Mountain Yellow-legged Frog *Rana muscosa*	E	E	Yes	
Oregon Spotted Frog *Rana pretiosa*	T	S	Yes	
Relictual Slender Salamander *Batrachoseps relictus*	PE	S	Yes	
San Francisco Garter Snake *Thamnophis sirtalis tetrataenia*	E	E	Yes	
Southern Rubber Boa *Charina umbratical*	-	T	Yes	
Santa Cruz Long-toed Salamander *Ambystoma macrodactylum croceum*	E	E	Yes	
Scott Bar Salamander *Plethodon asupak*	-	T	Yes	
Shasta Salamander *Hydromantes shastae, H. samweli, H. wintu*	-	T	Yes	
Sierra Nevada Yellow-legged Frog *Rana sierrae*	E	T	Yes	
Siskiyou Mountains Salamander *Plethodon stormi*	-	T	Yes	
Western Pond Turtle *Actinemys marmorata*	PT	S	Yes	
Yosemite Toad *Anaxyrus canorus*	T	S	Yes	
Fish				
Bull Trout DPSs *Salvelinus confluentus*	T	E	Yes	
Chinnok Salmon DPSs *Oncorhynchus tshawytscha*	E/T/C	E/T/S	Yes	
Coho Salmon DPSs *Oncorhynchus kisutch*	E/T	E/T	Yes	
Eulachon *Thaleichthys pacificus*	T	S	Yes	
Lahontan Cutthroat Trout *Oncorhynchus clarkii henshawi*	T	S	Yes	
Little Kern Golden Trout *Oncorhyncus aguabonita whitei*	T	S	Yes	
Paiute Cutthroat Trout *Oncorhynchus clarkii seleniris*	T	S	Yes	

Steelhead DPSs *Oncorhynchus mykiss irideus*	E/T	E/CE	Yes	
Invertebrates				
California Freshwater Shrimp *Syncaris pacifica*	E	E	Yes	
Trinity Bristle Snail *Monadenia infumata setosa*	-	T	Yes	

[1] List of Federal and State listed forest species that may be affected by barred owl management actions. Listing status E = endangered, T = threatened, C = candidate, PT = proposed threatened, PE = proposed endangered. For State status, S = species of special concern.