HABITAT CONSERVATION PLAN FOR NORTHERN AND CALIFORNIA SPOTTED OWL

SIERRA PACIFIC INDUSTRIES FORESTLAND MANAGEMENT PROGRAM IN THE KLAMATH, CASCADE, AND SIERRA NEVADA MOUNTAINS, CALIFORNIA

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Action Area	All areas to be affected directly or indirectly by the Covered Activities. The Action Area includes the Plan Area and extends 1.3 miles outward from the Plan Area within the NSO range and 1.0 mile outward from the Plan Area within the CSO range.
Activity Center (AC)	A location where a single or pair of owls is regularly detected and can be found in the daytime. This location is determined by surveys and/or nest detection. Across multiple years single or pairs have many ACs. SPI biologists review all recent ACs reported in the SPI, USFS and CDFW data bases to designate the best single Occupied AC in each year representing clusters of past ACs.
Additionally Retained Trees	Conifers at least 10 inches dbh or hardwoods at least 6 inches dbh when a unit is harvested.
Conservation Measure	The full suite of minimization and mitigation measures.
Core Use Area (Core Area)	The area around the Activity Center that receives the most concentrated use within the home range is referred to as the core use area.
Covered Activities	Most timber operations as defined under the CFPRs, such as timber harvest, processing, transport, and salvage; construction and management of roads and watercourse crossings; water drafting; and site preparation.
Covered Species	Species for which incidental take is authorized in an incidental take permit and is adequately covered in a habitat conservation plan.
Green Cull	A green cull is a live tree which contains less than 25 percent sound merchantable wood in its bole.
Habitat Form (HF)	Forest types on SPI land based on forest stand characteristics and habitat elements used by wildlife species. (See Table 4.3 for definitions of the Habitat Form types.)
Habitat Retention Area	A representative sample of the species and diameter classes present among co-dominant and dominant trees prior to harvest, retained at a rate of 2 percent of the total harvest unit area, excluding acres within WLPZs.

Harass	An intentional or negligent act or omission that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns, which include, but are not limited to, breeding, feeding, or sheltering.
Harm	An act that actually kills or injures wildlife. Such acts may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.
Home Range	That area traversed by the individual in its normal activities of food gathering, mating and caring for young
Incidental Take	Any taking otherwise prohibited, if such taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.
Legacy Tree	Any hardwood tree ≥36 inches dbh or non-merchantable, live, green conifer ≥30 inches dbh.
Nest Hexagon	A hexagon containing at least one contiguous nest stand of at least 50 acres comprising at least 30 acres of HF4 and 20 acres of HF2H on SPI managed lands (Plan Area), and the hexagon must have at least 30 percent HF4 and a combined HF4 and HF2H for a total of at least 50 percent of the SPI land within the hexagon.
Occupied AC	The site where a diurnal detection (visual or audio) of a spotted owl occurs. (Appendix 5.4)
Occupied Hexagon	Hexagon containing one or more spotted owl Occupied Activity Centers (ACs). For SPI modeling they were those ACs that were occupied as of January 1, 2018
Permit Area	Same as Plan Area
Plan Area	All SPI lands (SPL&T and affiliates) in 16 counties listed in Table 1.2 where covered activities will occur within the range of the northern and California spotted owl.
Potential Habitat Area	At least one Nest hexagon with a contiguous Nest or Support hexagon (1,000 acres combined) that includes a minimum of 250 acres of SPI land (Plan Area lands).

Protected Activity Center (PAC)	A USFS term for the 300 acres of the best nesting and roosting habitat centered around California spotted owl locations.
Protection Zone (PZ)	A 72- to 100-acre area surrounding an Occupied AC (see Appendix 5.2)
Quadratic Mean Diameter	The measure of average tree diameter in a stand conventionally used in forestry, calculated as the square root of the average squared diameter.
Snag	A snag is a dead tree that contains less than 25 percent sound merchantable wood in its bole.
Substantially Damaged Timberlands	The result of unpredictable events, such as fire and pest infestation, that kill trees.
Support Hexagon	A hexagon containing a minimum of 50 percent HF2H or better of the SPI land (Plan Area) within the hexagon.
Take	To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.
Territory	The area within the home range that it defends from other members of the same species.
Wildlife Tree	A hardwood ≥22 inches dbh or a non-merchantable, live, green conifer ≥30 inches dbh. Wildlife characteristics include: age, diameter, longevity/persistence, signs of previous use by wildlife (e.g., excavated cavities), indication of current or incipient heart rot (conks, natural cavities), species (hardwoods preferred), presence of large mistletoe brooms, crooks, reformed tops, forks or large lateral limbs, etc. Known past nest trees outside retained nest stands will be included as Wildlife Trees.
Yearly Activity Center (YAC[s])	Based on survey data, activity centers (AC) are determined on a yearly basis. This yearly AC (termed, "YAC") is the location of the nest site or the day roost site of the owl(s) in each territory in the year of detection. A 500-foot-radius circle around the location of the nest site or the day roost site of the spotted owl(s) is used in the PZ designation process

LIST OF ABBREVIATIONS

AC	Activity Center
AR	anti-coagulant rodenticides
BDOW	barred owl
BLM	Bureau of Land Management
BMP	best management practice
CAL FIRE	California Department of Forestry and Fire Protection
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife (formerly known as California Department of Fish and Game)
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFPA	California Forest Practices Act
CFPRs	California Forest Practice Rules
CFR	Code of Federal Regulations
CI	confidence interval
CNDDB	California Natural Diversity Program Databases
CSO	California spotted owl
dbh	diameter at breast height
EA	environmental assessment
EIS	environmental impact statement
ESA	Endangered Species Act of 1973 (16 U.S.C. § 1531 *et seq*.)
ESU	Evolutionarily Significant Unit
F&GC	California Fish and Game Code
FR	Federal Register
GNN	gradient nearest neighbor
HCP	Habitat Conservation Plan
HF	Habitat Form
HF1	Habitat Form 1
HF2H	Habitat Form 2 Heavy

HF2L	Habitat Form 2 Light
HF4	Habitat Form 4
HRA	Habitat Retention Area
ITP	Incidental Take Permit
LSR	late successional reserve
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act of 1969 (42 U.S.C. § 4321 *et seq*.)
NFWF	National Fish and Wildlife Foundation
NHPA	National Historic Preservation Act of 1966 (16 U.S.C. 470)
NRF	nesting/roosting and foraging
NSO	northern spotted owl
NWFP	Northwest Forest Plan
PAC	protected Activity Center
PCT	pre-commercial thin
PHA	Potential Habitat Area
PRC	California Public Resources Code
PZ	Protection Zone
QMD	quadratic mean diameter
RPF	registered professional forester
SD	standard deviation
Service	The United States Fish and Wildlife Service
SMARA	Surface Mining and Reclamation Act of 1975 (California)
SPI	Sierra Pacific Industries
SPL&T	Sierra Pacific Land & Timber
SPOWDB	Spotted Owl Observation Database (CNDDB Program Databases)
THP	timber harvest plan
U.S.C.	United States Code
USDA	United States Department of Agriculture
USDI	Unites States Department of the Interior
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service

WLPZ	watercourse and lake protection zone
WSA	watershed study area
YAC	yearly activity center

1. INTRODUCTION

Sierra Pacific Industries (SPI) has prepared this Habitat Conservation Plan (HCP) to address the effects of its forestland management on the northern spotted owl (NSO; *Strix occidentalis caurina*) and California spotted owl (CSO; *Strix occidentalis occidentalis*) under the jurisdiction of the US Fish and Wildlife Service (USFWS, Service). This HCP was developed in consultation with the Service and the California Department of Fish and Wildlife (CDFW), with the U.S. Forest Service (USFS) as a coordinating agency to the Service. The content of this document follows the most recent guidance in the *Habitat Conservation Planning and Incidental Take Permit Processing Handbook* (USDI 2016). Throughout this document, the term Sierra Pacific Industries (SPI) is used because SPI is the sole managing entity for the land owners, Sierra Pacific Land & Timber Company (SPL&T) and affiliates. In this HCP, the term "SPI lands" refers to lands owned by SPL&T and affiliates.

1.1. OVERVIEW AND BACKGROUND

SPI is the largest private forest land manager in the state of California, with approximately 1.85 million acres of timberland in the northern part of the state. Land management activities on SPI managed lands have the potential to "take" spotted owls, as that term is defined under the Endangered Species Act (ESA; 16 United States Code [U.S.C.] § 1531 *et seq*. SPI has developed this HCP to support its application for an Incidental Take Permit (ITP) under Section 10(a)(1)(B) of the ESA.

This HCP covers the NSO and the CSO. The NSO is listed as threatened under the federal ESA (55 Federal Register [FR] 26114; June 26, 1990). The Service completed its thorough review and determined the CSO listing under the ESA is not warranted (84 FR 60371; November 8, 2019). The regulatory status of these owl subspecies is summarized in Table 1.1. For the purposes of this HCP, both owl subspecies are treated as if they are listed under the ESA. This HCP will continue to use the existing regulatory distinction between the two subspecies (i.e., the NSO listing boundary will be used to differentiate between the two subspecies).

Table 1.1. Spotted Owl Subspecies Covered Under the Habitat Conservation Plan.

Species	Scientific name	Federal Status	State Status
Northern spotted owl	*Strix occidentalis caurina*	Threatened	Threatened
California spotted owl	*Strix occidentalis*	None	None

1.2. PURPOSE AND NEED

This HCP contains the conservation plan SPI proposes pursuant to 50 Code of Federal Regulations (CFR) §17.32(b)(1)(iii) to support issuance of an ITP by the Service for two covered

spotted owl subspecies that may occur on SPI's ownership. The HCP establishes the methods and measures of success required to meet the conservation needs of covered owl subspecies that could be affected by SPI's land management activities. It also provides a stable and predictable operating and regulatory environment for SPI's management activities.

1.3. Plan Area and Action Area

The HCP applies to all areas on SPI-managed property where Covered Activities described in Section 2 will occur within the ranges of the NSO and CSO. These lands comprise the Plan Area and include all SPI-managed lands in the 16 counties described below, totaling approximately 1,565,707 acres as shown in Figure 1.1 and Table 1.2. The Plan Area for the NSO includes 377,442 acres in the Trinity and Cascade Mountains of northern California. The Plan Area for the CSO includes 1,188,265 acres in the Modoc Plateau, Cascade Mountains, and Sierra Nevada Mountains in the northern and eastern portions of the state (Figure 1.1).

Table 1.2. HCP Action Area and Plan Area.

Species	County[a]	Acres	
		Action Area	Plan Area
Northern spotted owl	Siskiyou	175,843	43,891
	Trinity	588,279	193,230
	Shasta	498,686	140,321
	Total for northern spotted owl	**1,262,808**	**377,442**
California spotted owl	Siskiyou	34,520	17,601
	Modoc	205,833	98,740
	Shasta	339,844	117,659
	Lassen	446,150	172,800
	Tehama	207,388	116,760
	Mariposa	1,643	-
	Plumas	348,469	95,745
	Butte	275,979	136,649
	Yuba	28,103	3,892
	Sierra	181,383	51,086
	Nevada	200,874	43,412
	Placer	146,862	27,264
	Eldorado	389,200	134,668
	Amador	58,455	26,282
	Calaveras	154,473	73,302
	Washoe (Nevada)	1,643	-
	Tuolumne	224,365	72,405
	Total for California spotted owl	**3,245,184**	**1,188,265**
Grand Total		**4,507,992**	**1,565,707**

[a] Counties are in California unless indicated otherwise.

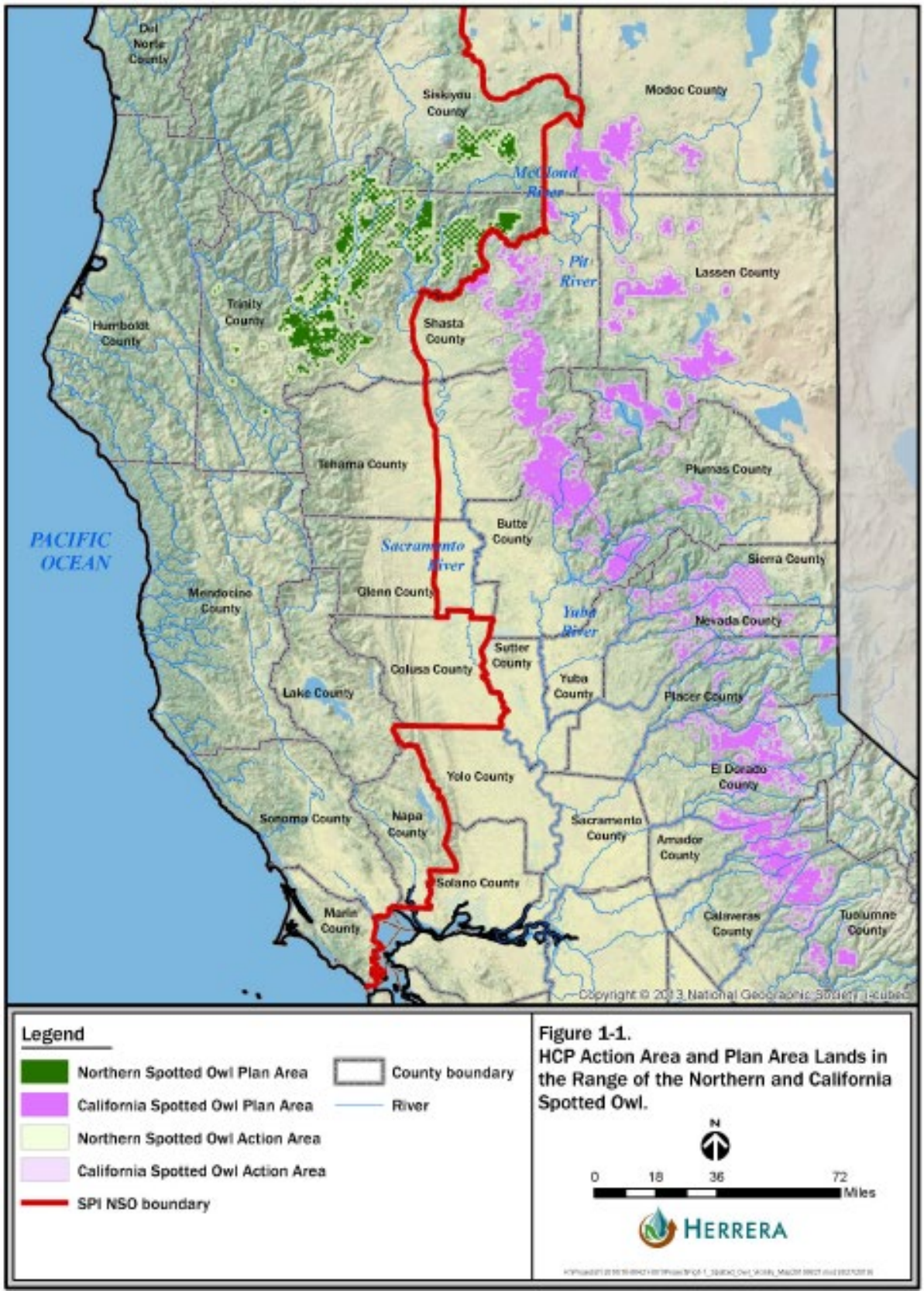

Figure 1.1. HCP Action Area and Plan Area Lands in the Range of the Northern and California Spotted Owl.

The Plan Area may increase or decrease over time due to the sale, purchase, or exchange of SPI lands as described in the HCP Section 8 (Plan Implementation). SPI will implement the minimization and mitigation measures described in this HCP (collectively referred to as conservation measures), on all newly-acquired properties that it elects to add to the Plan Area. Changes in the Plan Area will be addressed as described in HCP Sections 8.3. Changes to the Plan Area will be provided to the Service as part of the annual report.

Spotted owls that occupy sites on other nearby properties may be impacted by Covered Activities conducted by SPI. Therefore, this HCP identifies an Action Area that incorporates all areas to be affected directly or indirectly by the Covered Activities. The Action Area includes the Plan Area and extends 1.3 miles outward from SPI property within the NSO range and 1.0 mile outward from SPI property within the CSO range. These distances are based on radii of representative home ranges and are described further below. The Action Area encompasses 4,507,992 acres (NSO: 1,262,808 acres and CSO: 3,245,184 acres) within 16 California counties and 1 Nevada county (Table 1.2).

1.4. Permit Duration

The term of the proposed ITP is 50 years. Permit renewal and amendments are addressed in Section 8 of this HCP.

1.5. Alternatives to the Taking

Section 10 of the ESA and its implementing regulations require that an HCP describe actions the applicant considered as alternatives to the take that would result from the proposed action, and the reasons why the applicant is not using any of those alternatives. SPI considered a number of alternatives for its forestland management activities with respect to the NSO and CSO. Those alternatives are identified below. They were rejected because they did not provide the desired conservation benefit for the NSO and CSO or a reasonable level of regulatory certainty for SPI over the proposed term of the ITP.

1.5.1. No Permits/No Plan

Under the No Permits/No Plan alternative, SPI would continue to engage in forestland management activities without developing an HCP and would not receive incidental take coverage for timber management activities. SPI's forestland management activities would continue in accordance with existing state and federal regulations, several of which prohibit the take of listed species. SPI would operate to avoid take of the NSO, and the CSO should it become listed, but may not implement many of the proposed conservation measures described in Section 5.3 of this HCP. The No Permits/No Plan alternative was not pursued because it would not provide the level of regulatory certainty that SPI is seeking for its long-term forestland

management activities. This alternative would not require conservation actions for CSO in advance of listing.

1.5.2. Shorter Permit Duration

Under the Shorter Permit Duration alternative, SPI would develop an HCP with an ITP duration of 25 years. SPI rejected this alternative because its relatively short permit duration is inconsistent with other SPI planning efforts and would not provide the long-term regulatory stability sought by SPI. More importantly, the 25-year ITP duration would not reflect the amount of time needed to fully realize some of the conservation benefits from implementing the proposed conservation measures in the Plan Area.

1.5.3. Listed Species Only

SPI considered preparing an HCP that only addresses the federally and state-listed NSO. SPI did not pursue this alternative because if the CSO became listed, SPI may need to develop a second conservation strategy for SPI lands, resulting in a less efficient use of SPI and agency resources. In addition, omitting the CSO from the conservation planning process would result in fewer conservation benefits for this subspecies and would not provide long-term assurances to SPI that Covered Activities could continue if the CSO were to be listed under the ESA in the future.

1.6. Coordination with Federal and State Agencies

SPI began meeting with the Service in August 2016 to discuss developing this HCP and the proposed conservation strategy. The parties continued to meet on a monthly basis to discuss HCP development and various technical issues concerning the SPI conservation plan.

In April 2017, the USFS began participating in the HCP development process as a cooperating agency under the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. § 4321 *et seq*.). Representatives from the USFS commented on HCP drafts as they were developed to help ensure the plan considered all available relevant scientific information.

In July 2017, SPI and the Service began meeting with the CDFW to coordinate HCP development because the NSO is listed under the California Endangered Species Act (CESA). SPI expressed an interest in coordinating HCP development with CDFW to enable the State to provide input early in the process, and to help inform an eventual CDFW CESA Consistency Determination for the NSO pursuant to California Fish and Game Code (F&GC) Section 2080.1. Representatives from CDFW commented on HCP drafts as they were developed to help ensure the plan considered all available relevant scientific information.

Beginning in 2016, as a part of this HCP development, SPI voluntarily led an effort to include the USFS, the National Fish and Wildlife Foundation (NFWF), and the California Department of Forestry and Fire Protection (CAL FIRE) in discussions regarding landscape wildfire fuel reduction

needs. With a sense of urgency resulting from recent large wildfires, SPI authored the initial draft of a Memorandum of Understanding (MOU). In August 2017, these parties entered into a MOU to coordinate the protection of spotted owl habitat on the SPI Action Area and surrounding Federal and State responsibility areas (USFS Agreement #17-MU-11052007-096). With respect to California spotted owls, the purpose of that MOU is to help identify areas near owl Activity Centers (ACs) in need of fuel treatments to lessen potential impacts on owl habitat from large-scale, high-severity wildfire and to coordinate fire suppression planning and response efforts on Federal, State, and SPI lands with an emphasis on preserving habitat. The MOU and its related actions are intended to augment conservation measures contained in this HCP by helping reduce the risks of wildfire that may diminish conservation plan goals and objectives. No statutory or regulatory authority requires SPI to undertake such measures. SPI's implementation of the MOU is a Conservation Measure of this HCP (see Section 5.2.4). SPI has begun construction of fuel breaks detailed in the MOU; the remaining approximately 85 percent of the construction will be accomplished after the HCP is signed.

Using this MOU as a template, SPI created a second expanded MOU. In June of 2019, these parties and eleven other commercial land owners in northern California signed this new MOU to coordinate the protection of spotted owl habitat on the commercial forest lands and surrounding Federal and State responsibility areas. This agreement expanded the coverage of these activities to most of the NSO range in California.

1.7. Permit Structure

The ESA and its implementing regulations governing ITPs allow for flexibility in how the HCP and ITP are structured. This HCP is for a single applicant, SPI, applying for one permit.

1.8. Summary of Relevant Laws and/or Regulations

This HCP was prepared to comply with the ESA, NEPA, and CESA. SPI's forestland management activities will also comply with the California Forest Practices Act (CFPA) and the associated California Forest Practice Rules (CFPRs), which regulate timber harvest on private lands. The following sections summarize the processes and requirements for each of these laws.

1.8.1. Federal Endangered Species Act

The purpose of the ESA is to conserve threatened and endangered species and the ecosystems upon which they depend (Section 2(b)). The US Congress has amended the ESA several times over the years, including adding the authority to allow incidental take in 1982. Sections 9, 10, and 7 of the ESA are most relevant to HCPs and are briefly summarized below.

1.8.1.1. ESA Sections 9 and 10

Section 9 of the ESA prohibits the "take" of any fish or wildlife species listed under the ESA as endangered. Under federal regulation, take of fish or wildlife species listed as threatened is also prohibited unless otherwise specifically authorized by regulation. "Take," as defined by the ESA, means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect a listed species, or attempt to engage in any such conduct" [ESA §3(19)].

Section 9 of the ESA also prohibits the removal and reduction to possession of any listed plant species "under federal jurisdiction," as well as the removal, damage, or destruction of such plants on any other areas in knowing violation of any state law or regulation or in violation of state trespass law.

The 1982 amendments to the ESA established a provision in Section 10 of the ESA that allows for "incidental take" of endangered and threatened species of wildlife by non-federal entities. Incidental take is defined by the ESA as take that is "incidental to, and not the purpose of, the carrying out of an otherwise lawful activity" [50 CFR §402.02]. Under that provision, the Secretary of the Interior and Secretary of Commerce may, where appropriate, authorize the taking of federally listed fish or wildlife if such taking occurs incidentally to otherwise legal activities. The Service was charged with regulating the incidental taking of listed species under its jurisdiction.

Section 10 of the ESA establishes a program whereby persons seeking to pursue activities that otherwise could give rise to liability for unlawful "take" of federally protected species, as defined in Section 9 of the ESA, may receive an ITP, which exempts them from such liability. Under Section 10 of the ESA, applicants may be authorized, through issuance of an ITP, to conduct activities that may result in take of a listed species, as long as the take is incidental to, and not the purpose of, otherwise lawful activities.

The submission of an ESA Section 10(a)(1)(B) permit application requires the development of a conservation plan. Regulations pertaining to the development and issuance of an ITP are found at 50 CFR § 17.22 and 50 CFR § 17.32.

1.8.1.2. ESA Section 7

Section 7 of the ESA requires federal agencies conducting actions that may affect ESA-listed species to consult with the Service. Because issuance of an ITP under Section 10 is a federal action, the Service conducts an internal consultation under Section 7. The primary criteria under Section 7 of the ESA is that permitted actions must not jeopardize the continued existence of the species or adversely modify designated critical habitat. Definitions and criteria for Section 7 consultation are found in 50 CFR Part 402, Subpart B.

1.8.2. National Environmental Policy Act

NEPA, as amended, requires federal agencies to evaluate and disclose the effects of their proposed actions on the natural and human environment. The NEPA process is intended to help federal agencies make decisions that are based on an understanding of potential environmental consequences and to take actions that protect, restore, and enhance the environment. NEPA regulations provide the direction to achieve that purpose. The issuance of an ITP by the Service constitutes a federal action subject to NEPA compliance and review.

To evaluate the environmental effects of a proposed action, the Service typically prepares and provides for public review an environmental assessment (EA). If the Service's EA finds that significant impacts to the natural and human environment are not expected as a result of the proposed action, a Finding of No Significant Impact (FONSI) is issued. If significant impacts are anticipated, a comprehensive environmental impact statement (EIS) is prepared and distributed for public review. After the Service completes its review of an EIS, it issues a Record of Decision of its findings. The Service can issue an ITP only after the NEPA review process has been completed.

In the present case, the Service issued a Notice of Intent to prepare an EIS for SPI's proposed ITP (82 FR 40015; August 23, 2017). During the scoping period for the EIS, three public meetings were held to solicit comments and information concerning the proposed HCP. A total of three oral comments and eight written letters were received during the scoping period. SPI considered these scoping comments during the development of this HCP.

1.8.3. National Historic Preservation Act (NHPA)

The National Historic Preservation Act of 1966 (NHPA; 16 U.S.C. 470) authorizes the Secretary of the Interior to maintain a National Register of Historic Places and to approve state historic preservation programs that provide for a State Historic Preservation Officer with adequate qualified professional staff, a state historic preservation review board, and public participation in the state program.

Section 106 of the NHPA requires federal agencies to consider the effects of their undertakings on historic properties. The procedures in Section 106 define how federal agencies meet these statutory responsibilities. The Section 106 process seeks to accommodate historic preservation concerns with the needs of federal undertakings through consultation among the agency official and other parties with an interest in the effects of the undertaking on historic properties.

SPI complies with NHPA by following the CFPRs' functional equivalent process that includes archeology surveys and training for timber harvest plan (THP) approval, as well as notification to potentially affected Native Americans via the CAL FIRE Native American contact list.

1.8.4. California Forest Practices Act

Timber harvest on private lands in California is regulated by the CFPA and its implementing regulations, the CFPRs. Those legal authorities require that landowners develop THPs for all commercial timber harvests (although some activities are exempt from this requirement). A THP is an environmental review document outlining what timber the landowner intends to harvest, how it will be harvested, and the steps that will be taken to reduce or prevent environmental damage. THPs are prepared by registered professional foresters (RPFs) licensed by the California Board of Forestry and Fire Protection. THPs are submitted to CAL FIRE for review and approval and must comply with all applicable state and federal regulations. The CFPRs act as best management practices (BMPs) that, when properly implemented, enable the THP to be certified as having no potential for significant adverse impacts.

Prior to THP approval, CAL FIRE leads a multi-disciplinary review involving, at minimum, CDFW and Regional Water Quality Control Board staff. If special circumstances arise, the review can include the California Department of Mines and Geology, CAL FIRE Archeologist, the California Department of Parks and Recreation, and potentially other agencies. CAL FIRE periodically inspects timber operations to ensure compliance with the approved THP and has the authority to shut down operations and to cite or fine RPFs, licensed timber operators, and landowners if forestry practices are out of compliance with the THP.

In 2014, the California Board of Forestry and Fire Protection also established the Effectiveness Monitoring Committee to develop and implement a monitoring program to address both watershed and wildlife concerns and to provide a better active feedback loop to policymakers, managers, agencies, and the public. In combination, the entire CFPA and CFPRs, THP, multi-disciplinary review, public comment, and official response have been certified by the California Resources Secretary as a functional equivalent of an Environmental Impact Report (EIR) under the California Environmental Quality Act (CEQA).

Under CFPR Section 898.2(d), the Director of CAL FIRE may not approve a THP if "Implementation of the plan as proposed would result in either a "taking" or finding of jeopardy of wildlife species listed as rare, threatened or endangered by the Fish and Game Commission, the National Marine Fisheries Service, or Fish and Wildlife Service, or would cause significant, long-term damage to listed species.

However, under the same section, the Director of CAL FIRE "is not required to disapprove a plan that would result in a 'taking' if the 'taking' is incidental and is authorized by a wildlife agency acting within its authority under state or federal endangered species acts."

The CFPRs (Sections 919.9/939.9 and 919.10/939.10) contain specific measures intended to avoid take of NSOs. Included in these Sections is Section 919.9(d)/939.9(d) for operations that will be conducted pursuant to a federal incidental take permit. No corresponding guidance is available for CSOs because the subspecies is not listed and, to date, has not been subject to regulatory restrictions relative to habitat modification. The Service (USDI 2009) provided

additional guidance regarding take avoidance for use in CAL FIRE's NSO review process under these CFPR sections.

1.8.5. California Fish and Game Code (F&GC)

The F&GC establishes several processes relevant to the CFPRs and implementation of CESA that are relevant to this HCP. The most prominent is the Consistency Determination process in F&GC Section 2080.1, which allows an applicant who has obtained a federal incidental take statement (federal ESA Section 7 consultation) or a federal incidental take permit (federal ESA Section 10(a)(1)(B)) to request that the Director of CDFW find the federal documents consistent with CESA.

Additional aquatic and riparian protections related to timber harvest are provided by the process set forth in F&GC § 1600 *et seq*, which provides for protection and conservation of the fish and wildlife resources of California. SPI is required to notify CDFW under Section 1600 for any activity that proposes to substantially divert or obstruct the natural flow of a river, stream, or lake; substantially change or use material from the bed, channel, or bank of any river, stream, or lake; or deposit debris, waste, or other materials that could pass into any river, stream, or lake. CDFW can recommend additional minimization measures that may be incorporated into the F&GC Section 1600 Agreement and become enforceable requirements if agreed to by the applicant. Such measures may include timing restrictions, erosion control BMPs, and design criteria for water crossing structures, to protect water quality and fish life. For emergency projects that require immediate repair, the landowner is required to submit a notification for a F&GC Section 1610 permit from CDFW within 14 days of emergency repairs.

2. COVERED ACTIVITIES

This section describes activities that are covered under this HCP (Covered Activities). They include the timber operations as defined under the CFPA and other activities.

Timber operations as defined under the CFPA include timber harvest, processing, transport, and salvage; construction and management of roads and watercourse crossings; water drafting; and site preparation. Such timber operations are included in an approved THP or Emergency or Exemption Notification in accordance with the CFPRs and their accompanying CEQA analyses.

Other activities covered by this HCP are not timber operations per the CFPA, but they may be conducted as part of THP activities that are covered by a CEQA analysis or other statutes; they are specified in Section 2.1, below. Several other Covered Activities do not require THPs, notifications under the CFPRs, or specific CEQA analysis. Those activities are described in Section 2.2.

The description of Covered Activities in this section does not include the potential effects on spotted owls or measures to avoid or minimize potential impacts. The avoidance and minimization measures are discussed in Section 5 of this HCP. Most Covered Activities are unlikely to affect NSOs and CSOs but are proposed for ITP coverage in the unlikely event of unanticipated impacts. Where specific activities have the potential to affect NSOs or CSOs, SPI has proposed numerous avoidance and minimization measures to reduce the potential impacts from such activities. These and other measures are described in Section 5.2 (Conservation Measures) of this HCP.

In carrying out this HCP, SPI will follow all applicable requirements of the CFPRs. As noted above, the CFPRs (14 California Code of Regulations [CCR] 898.2(d)) provide that a THP that may result in incidental take of ESA-listed species may be approved by CAL FIRE if the taking is permitted under the authority of other agencies.

2.1. MANAGEMENT ACTIVITIES COVERED BY CEQA ANALYSIS

In the following subsections, Covered Activities are categorized with respect to their coverage under CEQA. The categorization is intended to reduce redundancy in analysis of impacts of this HCP by identifying those actions that have been or will be analyzed under other authorities.

Forest practices under CFPRs are conducted under a "functional equivalent CEQA program" (CEQA 2017) and require significant adverse impacts to be mitigated to a level of insignificance. Timber operations and certain other management actions are conducted as part of this

functional equivalent program, as described in Section 2.1.1, below. Other management actions that are not defined as timber operations and that do not require a THP or notifications under the CFPRs are covered by CEQA analysis under other statutes as described in Section 2.1.2.

2.1.1. Activities Conducted Under the CFPRs

Timber operations and other management activities are conducted under a THP. Timber operations are defined by the CFPA (Division 4, Chapter 8 of the Public Resources Code). Operations are described in detail when they occur as part of an approved THP or Emergency or Exemption Notification, which satisfies CEQA analysis requirements. Activities conducted under a THP include:

- Timber felling and bucking
- Timber yarding
- Loading and landing operations
- Transportation of forest products and equipment
- Chipping
- Timber salvage
- Road and landing construction, reconstruction, maintenance, decommissioning, and abandonment
- Water drafting
- Watercourse crossing facility placement, installation, and maintenance
- Site preparation
- Machinery maintenance, fueling, and fuel storage

2.1.1.1. Timber Felling and Bucking

Timber felling under THPs occurs while harvesting stands of commercial-sized trees. Felling timber involves cutting a standing tree and dropping it in a desired location. Bucking is the process of cutting a tree into desired log lengths. Such activities are typically performed using handheld chainsaws. On low to moderate slopes, felling may be accomplished using machines such as feller-bunchers or harvesters. Such machines can be tracked or wheeled and have an articulated boom capable of grabbing, cutting, and stacking a tree for yarding.

2.1.1.2. Timber Yarding

Yarding, or skidding, is the movement of logs from the point of felling and/or bucking to the log landing, which is the area where forest products are concentrated prior to loading for transportation to a different location for further processing. Yarding can be done via ground-based, cable, or aerial techniques.

Ground-based yarding is usually done with tracked or rubber-tired tractors to skid or drag logs to the landing. The tractors have powered grapple attachments or winch lines to grasp the logs and require temporary logging roads or skid trails (also known as tractor roads), on which to operate.

Cable yarding uses steel cables or wire ropes to skid logs to a road or landing using a yarder (an engine-powered system of winches and cables suspended from spars and/or towers used to haul logs). There are two classes of cable yarding: high lead and skyline. In high lead logging systems, a cable runs from a yarder through pulley blocks anchored to stumps at the far end or just beyond the timber harvest unit. Skyline logging uses a carriage that runs along a skyline cable that is anchored across a valley, providing vertical lift to the logs, increasing yarding speed and minimizing ground disturbance.

Aerial logging is a logging system that fully suspends the logs such as done by helicopters. This logging system uses a utility-size or larger heavy-lift helicopter to lift logs, or whole trees, from the stump to the roadside landing drop site. The helicopter flies the logs/trees far off the ground, while suspended from a longline cable.

2.1.1.3. Loading and Landing Operations

Additional processing of logs may occur after they have been yarded to a landing or roadside. Logs are typically de-limbed, bucked into shorter segments, or cut to remove breakage. This work is usually done with handheld chain saws or a mechanical de-limber (a machine similar to an excavator mounted with a long boom and cutting head). Logs are then loaded onto trucks using a shovel (also known as a heel-boom loader) or front-end loader.

2.1.1.4. Transport of Forest Products and Equipment

Logs and rock are usually transported along roads by trucks and trailers. Logs are hauled from landings over private and public roads *en route* to mill sites. Rock is hauled from rock pits on SPI lands to road construction and maintenance sites. Rock may also be hauled into SPI property from commercial quarries outside the ownership. Equipment is hauled between SPI sites and onto SPI property from other areas. Water trucks may apply water to road systems for dust suppression and public safety.

2.1.1.5. Chipping

Branches and tops of trees may be chipped to reduce the volume of post-harvest residue. Chipping takes place almost exclusively on landings but may also occur within harvest units. Chips may be hauled off site or left in place.

2.1.1.6. Timber Salvage

Timber salvage is the removal of trees that are dead, dying, or deteriorating due to damage from fire, wind, insects, disease, flood, or another injurious agent. Most salvaged timber comes from trees damaged by fire (by either prescribed burns or wildfire), drought, insects, or age. Salvage provides for economic recovery of trees. Any sized area may be salvaged as long as that work is conducted under a CAL FIRE process that conforms to the CFPRs.

2.1.1.7. Road and Landing Construction, Reconstruction, Maintenance

SPI constructs and maintains roads and landings in the Plan Area to provide site access and to transport logs and harvesting equipment. Roads and landings (including those portions of co-op roads[1] on SPI lands) are designed, constructed, and maintained according to the CFPRs or other local ordinances to reduce environmental impacts, specifically adverse impacts on:

- Fish and wildlife habitat and listed species of fish and wildlife
- Water quality and the beneficial uses of water
- Soil resources
- Significant archaeological and historic sites
- Air quality
- Visual resources
- Conditions increasing fire hazard
- Local communities and traffic impacts

The typical order of work for road construction is as follows:

- Site preparation, entailing equipment mobilization, installation of temporary erosion and sediment control measures, and establishing limits for clearing and grading.

[1] Cooperative (co-op) roads are roads cooperatively managed by SPI and the USFS.

- Construction access and staging, which involves clearing and grubbing of vegetation for new access roads and staging areas. The footprint for construction access and staging areas is kept as small as possible, and no equipment is staged in watercourse and lake protection zones (WLPZs).

- Road construction, entailing clearing and grading the areas within the new road footprint. Timber along the road alignment is felled and yarded. Hillslope areas are excavated and/or filled as necessary to create the desired road width and grade. Roads also include vehicle turnouts and log landings. Roads and landings may be surfaced with rock, lignin, or other surface treatments to reduce maintenance needs and to limit dust and/or sediment dispersal.

Roads and landings are designed to limit riparian impacts and sediment transport. Where feasible, roads and landings are out-sloped (sloped away from the upper hillside toward the downslope edge of the road) to disperse water evenly from the road surface and reduce erosion. Rolling dips (constructed breaks in the road grade designed to drain water from the road surface) are constructed at regular intervals. Stabilization measures, as stipulated in the CFPRs, are incorporated into road and landing design and construction.

Road and landing maintenance refer to activities that do not require substantial changes to the road prism to maintain stable operating surfaces, functioning drainage conditions, and stable cut banks and fill slopes. Roads and landings are maintained throughout their useful life to provide site access and to reduce environmental impacts. Maintenance commonly includes adding rock or other material to the road surface, surface grading, localized shaping or out-sloping, clearing rockslides and bank slumps, repairing slumping or sliding fills, restoring the functional capacity of ditches and cross drains, repairing or replacing culverts and bridges, installing or replacing rolling dips or other surface drainage structures, and dust abatement. Dust is controlled by spraying with water collected from nearby waterbodies (see *Water Drafting*, below). Road and landing maintenance also include control of vegetation growth, which may be accomplished by hand cutting or pulling, burning, steaming, or other mechanical control methods. Maintenance work is typically performed using graders, rock crushers, compactors, chip spreaders, backhoes, excavators, and dump trucks.

2.1.1.8. Water Drafting

Water drafting involves pumping water directly from a stream or other water body to fill tank trucks or trailers. The water is then used for minimizing road dust, road maintenance, road construction, surfacing, managing prescribed burning, and/or wildfire suppression. Water may also be obtained using gravity-fed systems that convey water directly to storage reservoirs or tanks. Existing drafting locations within or adjacent to watercourses are occasionally excavated and cleaned of debris to increase the in-channel storage area for drafting purposes. SPI typically uses 4,000-gallon water trucks for drafting operations. Most drafting occurs in summer and early fall. Measures to minimize impacts to the water body are described in the THP and the F&GC Section 1600 Agreement and are implemented by the licensed timber operator.

2.1.1.9. Watercourse Crossing Facility Placement and Maintenance

Roads on SPI's lands often cross watercourses, requiring the installation of culverts, bridges, and/or fords. In most instances, such crossings are included in a THP; crossings not covered by a THP are discussed in Section 2.1.2.2, below. The number of such crossings is kept to a minimum to reduce environmental impacts. Any in-water work necessary to construct road crossings is conducted during permitted in-water work periods specified in applicable CFPRs or F&GC Section 1600 Agreements.

2.1.1.10. Site Preparation

Site preparation refers to activities following timber harvest or salvage that improve site conditions for regeneration of planted tree seedlings. These activities help maximize timber productivity, reduce fire hazards, prevent substantial adverse effects on soil resources and fish and wildlife habitat, and prevent degradation of water quality. Site preparation activities are conducted as soon as possible after a site has been logged so that planting will not be delayed.

Site preparation activities consist of slash management; control of weeds, brush, and undesirable tree species; and mechanical soil treatments. Note that site preparation is included as a timber operation under the CFPRs and is covered by the THP prepared for a specific harvest. Site preparation activities are subject to WLPZs and other resource protections defined in the CFPRs.

Slash is residue such as branches, needles, and small logs remaining at a site after trees have been harvested and transported. Slash may be retained on site without treatment; treated by chipping, mastication (i.e., grinding or chopping slash or vegetation into small chunks), prescribed burning; or removed from the site for utilization as biomass. The CFPRs require that accidental deposits of slash within Class I and Class II watercourses be removed. Slash deposited into Class III watercourses must also be removed unless it is stable within the channel. Slash management may be required when accumulations of slash following timber harvesting constitute a fire hazard or present a physical barrier to effective planting. Insects can also breed in slash, increasing the risk of forest disease outbreaks.

Prescribed fire may be used in site preparation to eliminate slash and to help control weeds, brush, and non-merchantable tree species that might outcompete planted seedlings. Burning for site preparation is usually conducted in the first spring or fall following a timber harvest when fuel and weather conditions meet the requirements of the prescribed burn plan. Timing of the burn is dependent on temperature, wind, humidity, and fuel moisture conditions that are conducive to low-intensity burns. Low-intensity fires allow for retention of large woody debris and organic material in the soil. Burns are designed and controlled to prevent fires from encroaching into WLPZs.

Weeds, brush, and non-merchantable species can also be controlled using mechanical means. Vegetation removal methods include root raking (using a specialized bulldozer blade with

widely spaced teeth along the bottom edge to push logging debris into piles) and mulching (shredding or tearing vegetation with teeth on a roller attached to a bulldozer, skidder, bobcat, or mulching machine). Mechanical soil treatment uses machinery to loosen the soil to improve root penetration and water infiltration. Soil treatment methods include ripping or subsoiling (pulling a set of shanks through the soil at a depth of between 12 and 40 inches).

This HCP does not include herbicide use as a Covered Activity nor does SPI seek authorization of incidental take for the use of herbicides. SPI will comply with all federal and State laws and regulations for the application of herbicides.

2.1.1.11. Machinery Maintenance, Fueling, and Fuel Storage

Per standards in the CFPRs, machinery may be maintained and fueled within the THP area, and fuel may be stored in the covered area. Maintenance, fueling, and fuel storage must be conducted outside WLPZs. Petroleum products and cleaning agents must be disposed of in permitted dumps or water treatment facilities.

2.1.2. Management Actions Covered by Other CEQA Analyses

Management actions covered by other CEQA analyses include: rock pit development and rock processing, watercourse crossing installations not covered by THPs, and construction of communication sites. CEQA analysis occurs under applicable regulatory frameworks relating to the Surface Mining and Reclamation Act of 1975 (SMARA; Public Resources Code, Sections 2710–2796), California Department of Pesticide Regulation, Regional Water Quality Control Board Waste Discharge permits or waivers, or F&GC Section 1600 Agreements. Government oversight of the implementation of those regulations is provided through the California Department of Conservation's Office of Mine Reclamation, the State Mining and Geology Board, CAL FIRE, CDFW, and regional water quality control boards. SPI personnel and their contractors who are responsible for such management actions have the appropriate licenses from the State of California. An RPF must consult with other resource professionals in cases where additional expertise is required. Violations of the applicable regulations can result in civil and criminal penalties for the responsible party.

2.1.2.1. Rock Pit Development and Rock Processing

Rock pit development generates aggregate for use on SPI's forest roads. SPI implements activities related to rock pit development and rock processing in compliance with CFPRs. If rock extracted on SPI lands is sold or used outside SPI forestland, a SMARA plan is required. Most of SPI's rock pits are adjacent to existing roads. Rock pit development rarely requires tree removal because the depth of the soil over the rock layer being accessed is usually shallow and, thus, large, mature trees rarely grow in suitable rock pit sites. Rock pit development involves removing vegetation (if present), excavation of the overburden (soil), and then excavation of the

aggregate. The average rock pit excavation generally disturbs less than 1 acre of land. SPI's rock pits may gradually increase in size over time but generally do not exceed 5 acres.

Aggregate excavation may require ripping and pushing with a tractor crawler and/or digging with an excavator. Depending on the rock formation, aggregate extraction may require drilling and blasting. Mechanical crushing of extracted aggregate may also be necessary to achieve the desired size and uniformity. SPI uses rock aggregate of various sizes to strengthen road prisms, road surfaces, and crossing facilities. Rock pit development and reuse is intermittent.

2.1.2.2. Watercourse Crossing Installations Not Covered by THPs

In addition to watercourse crossings described previously, some crossings are installed and maintained (as needed) on SPI forestlands outside a THP. Activities that substantially alter the bed, bank, or stream channel of a watercourse require a Section 1600 notification to CDFW. As noted above, CEQA analysis occurs through the process for an F&GC Section 1600 Agreement.

2.1.2.3. Communication Site Construction, Operation, and Maintenance

Communication sites are built and maintained on SPI lands for various forms of electronic communication. The communication sites have one or more metal lattice or pole towers, multiple antennae, and one or more equipment shelters with a typical footprint area of 16 feet by 20 feet (each). Each communication site is equipped with one or more diesel-powered, electrical generators. Site perimeters typically have 8-foot-high cyclone fencing to control access.

Communication sites are usually situated on high-elevation ridges or peaks that provide the desired coverage for a communications company. The sites are generally accessed by existing roads; however, new road construction may be necessary in some instances. Appropriate measures defined in the CFPRs address tree harvest at communication sites. Vegetation removal may be necessary to accommodate the construction and maintenance of a communication site, including overhead or underground electrical power distribution lines. Communication site maintenance includes vegetation management for clear access and for fire prevention.

There are 32 communication sites (approximately a total of 8 acres, or 0.0005% of the Plan Area) on the Plan Area. Site construction requires a county-issued discretionary use permit, which triggers CEQA review.

2.2. MANAGEMENT ACTIVITIES COVERED BY THE CFPR PROCESS CEQA ANALYSIS

Some Covered Activities are among activities that have been considered over time in the California Board of Forestry and Fire Protection's CEQA rule-making process and have been determined to not require additional permitting or approval by CAL FIRE. They include timber harvest preparation, pre-commercial thinning, conversion of brush fields to timber plantations, fuel break construction and maintenance, fire suppression, routine road maintenance, mastication of vegetation within road rights-of-way, transport of materials and heavy equipment, placement and use of water tanks, research and data collection activities, and harvest of minor forest products. These activities may be conducted by SPI employees, contractors, agents, or other assigns, and are described in the following subsections.

2.2.1. Timber Harvest Plan Preparation

Timber harvest plan preparation in the field consists of foresters driving to the THP area and then traversing the area on foot, flagging watercourse buffers, road alignments, and unit boundaries; performing archaeological reconnaissance and watercourse assessments; and marking timber. Virtually no impacts on the physical environment result from timber cruising or THP preparation activities.

2.2.2. Conversion of Brush Fields to Timber Plantations

Very few existing brush fields on SPI property are able to support commercial tree species, but, where appropriate, SPI may convert existing brush fields to timber plantations. In such instances, brush is treated and the ground is prepared for planting with combined mechanical methods and prescribed fire. The CFPRs do not govern such activities, and no THP filing is necessary unless commercial timber is removed. In conducting such activities, SPI will apply appropriate standard THP methods such as WLPZs, watercourse crossing standards, road and landing construction standards, and equipment management BMPs.

2.2.3. Fuel Break Construction and Maintenance

Fuel breaks that remove timber for commercial purposes must be covered by THPs. Other construction and maintenance of fuel breaks do not require a THP and, thus, do not include CEQA analyses. These activities include hand-cutting, mechanical methods, and prescribed fire. Some prescribed burning is done outside areas covered by THP site preparation standards. In conducting such activities, SPI will apply appropriate CFPR requirements such as WLPZs and standards for watercourse crossings, road and landing construction, and equipment management BMPs. Fuel break locations are based on numerous factors, including topography, natural and human resources at risk, ownership etc. For more information about fuel break

construction and maintenance, refer to Section 5.2.3 and the Fuel Reduction Strategy MOU in Appendix 5.6

2.2.4. Pre-Commercial Thinning

Pre-commercial thinning of conifer plantations occurs generally when the planted conifer trees are approximately 10 years old. Pre-commercial thinning involves felling of unwanted, small-diameter (<5 inches diameter at breast height [dbh]) trees in the plantation to achieve a desired crop tree density, typically using chainsaws. Pre-commercially thinned trees are sawn into chunks (lopping) to prevent that material from becoming infested with pine beetles. Pre-commercial thinning does not require approval of a THP because the operations are non-commercial. Pre-commercial thinning on SPI lands occurs in either restored timberland that was substantially damaged in the past or in regenerating clearcuts. Clearcuts on SPI land average approximately 17 acres in size and are scattered across the landscape. In every case, pre-commercial thinning targets trees that are too small to serve as spotted owl nest trees.

2.2.5. Fire Suppression

SPI hires contractors to control wildfires during an emergency to limit fire impacts within and adjacent to the property. Fire suppression actions seek to either directly or indirectly limit or stop the spread of fire across the landscape. Activities include building fire lines by hand or mechanically with crawler dozers, water drafting, spraying water or fire retardant, and lighting backfires. Fire suppression activities on SPI lands are coordinated with and most often carried out by state and federal agencies. Such activities by state and federal agencies are not covered by permits issued to SPI under this HCP.

2.2.6. Road Maintenance

Road maintenance is required under the CFPRs, both within active THPs and on other lands. Within THP areas, road maintenance is covered by the THP. Outside of THPs, the CFPRs do not require a specific permit or CEQA analysis for road maintenance because impacts are minimal. General maintenance is done by SPI on an as-needed basis to ensure the integrity of the road prism, road drainage, and associated watercourse crossing facilities and does not require substantial changes to the road prism. With exception of mastication for fuel breaks covered in Section 2.2.7, road maintenance does not require removing substantial amounts of vegetation, only small brush and tree seedlings, branches, or grass that has grown in the travel-way.

2.2.7. Mastication of Roadway Rights-of-Way

Mechanical mastication of vegetation along SPI roads reduces the flammability of fuels adjacent to the road and is done so the road can function more effectively as a fuel break. The operation uses a tractor with a masticator head, which extends roughly 25 to 30 feet from the edge of the

road. Mastication of road rights-of-way targets limbs of larger trees, brush, and trees up to 6 inches dbh. Such work usually does not require CEQA analyses, but a THP is required if masticated timber is to be sold commercially.

2.2.8. Transportation of Materials and Heavy Equipment

Except for activities governed by THPs, no CEQA analysis is required for general transportation of materials and equipment within the covered area. Transportation of rock pit aggregate and heavy equipment involves semi-trucks traveling to and across the road network on the Plan Area. Vehicles used for hauling materials and equipment include water trucks, end-dump trucks, low beds, and belly-dump trucks. Due to the alignments and grades of the roads typically used for such activities, hauling operations generally occur at speeds less than 25 miles per hour.

2.2.9. Research and Data Collection Activities

Research conducted on SPI land covers many topics and is done at varying scales, ranging from landscape-wide meso-carnivore inventories and water quality assessments to localized investigations of plant populations or wildlife use of a particular structure or site. The activities described below typically involve a crew driving to the Plan Area and, if necessary, walking to the point of interest to perform data collection.

SPI Fire Weather Monitoring and Research includes a network of weather stations located strategically throughout the Plan Area. Weather stations include both permanent structures and temporary installations. Permanent weather stations have a small footprint (typically 10 feet by 10 feet) and are designed to operate using solar panels for power. Tree removal may be necessary to improve the footprint of the facility and antennae effectiveness; clearings are generally smaller than one-half acre. Site perimeters typically have 8-foot-high cyclone fencing in place to control access. Temporary weather station installations require minimal removal of understory (brush and sapling) vegetation.

Botanical surveys occur in areas where special interest plant habitat is located within a THP boundary. Botanical surveys are conducted throughout the spring and summer months, depending on the flowering or fruiting characteristics of the plant of interest. Botanical surveys involve a visual inspection of plant habitat and are conducted on foot.

Wildlife surveys are conducted where THPs are within the range and habitat of special interest, threatened, or endangered species. Wildlife surveys require vehicle travel on existing roads and may include visual encounter surveys for amphibians, the placement of photo-stations or attractant/bait, or broadcasting calls to elicit response from the target species. If species of interest are detected, surveys also often involve site-specific efforts to find their reproductive locations in order to provide necessary protection for them. Whenever SPI works with animal species, all required permits are first obtained from CDFW and/or the Service. Because of limited

area and intensity, other research activities conducted on SPI forestlands are unlikely to impact spotted owls.

Timber cruising involves crews driving to a particular road location within the Plan Area and then walking transects that traverse the ownership, stopping every 264 feet (4 chains; 1 chain = 66 feet) and taking measurements of the forest vegetation using handheld equipment. Timber cruising does not require a permit. Typically, timber cruising activities are not likely to disturb spotted owls because the work is done in the daytime, generally generates very little noise, and disturbs virtually no vegetation.

2.2.10. Harvest of Minor Forest Products

SPI permits harvest of minor forest products on its timberlands. Minor forest products include burls, stumps, greenery (such as boughs, shrubs, and ferns), cones, firewood, Christmas trees, and mushrooms. Permits issued by SPI are conditioned to ensure that harvesting is conducted in a way that protects sensitive habitats and avoids and minimizes incidental take of covered species. Harvesting is allowed only in pre-designated areas and is generally subject to permit constraints such as WLPZs, slope limitations, weather conditions, and use of designated access roads. Firewood collection is primarily limited to firewood generated in otherwise authorized commercial harvests, which have met all required retention standards for wildlife and snags. SPI patrols its property to control firewood collection and to protect retained snags and live wildlife trees.

3. COVERED SPECIES

This section provides an overview of the status, distribution, and habitat use of the NSO and CSO, particularly in relation to the Action Area. In 2018, there were 809 spotted owl ACs (see Glossary for definition) on or near (i.e., within 1 mile for CSO and 1.3 miles for NSO) SPI property (Figure 3.1). This estimated number of ACs is the result of 1) surveys for ACs on or within 0.25 mile of the Plan Area and, 2) for those further away in the Action Area, SPI biologists' review of all recent ACs reported in the SPI, USFS, and the CDFW Databases to designate the best single AC representing clusters of past ACs.

Spotted owl management has been an element of SPI forest management activities since 1989. SPI initiated NSO surveys in 1989 and began CSO surveys in 1990. Management guidelines around ACs were implemented in 1990. More formal owl research, which is described in this section, began with the 2003 field season.

In response to increasing regulatory and scientific interest in forest wildlife during the 1990s, SPI developed a classification system for forest wildlife habitat on its timberlands. The system was based on observations of key habitat features used by wildlife species on SPI lands, including the NSO and CSO. Called the Habitat Form system, it is similar to but more refined than the California Wildlife Habitat Relationships system (Mayer and Laudenslayer 1988). The basic Habitat Form system is described in Table 4.1, and the development and justification for the system is described in Appendix 4.1. In the following sections on the Covered Species, the Habitat Form system is used to describe habitat for the NSO and CSO.

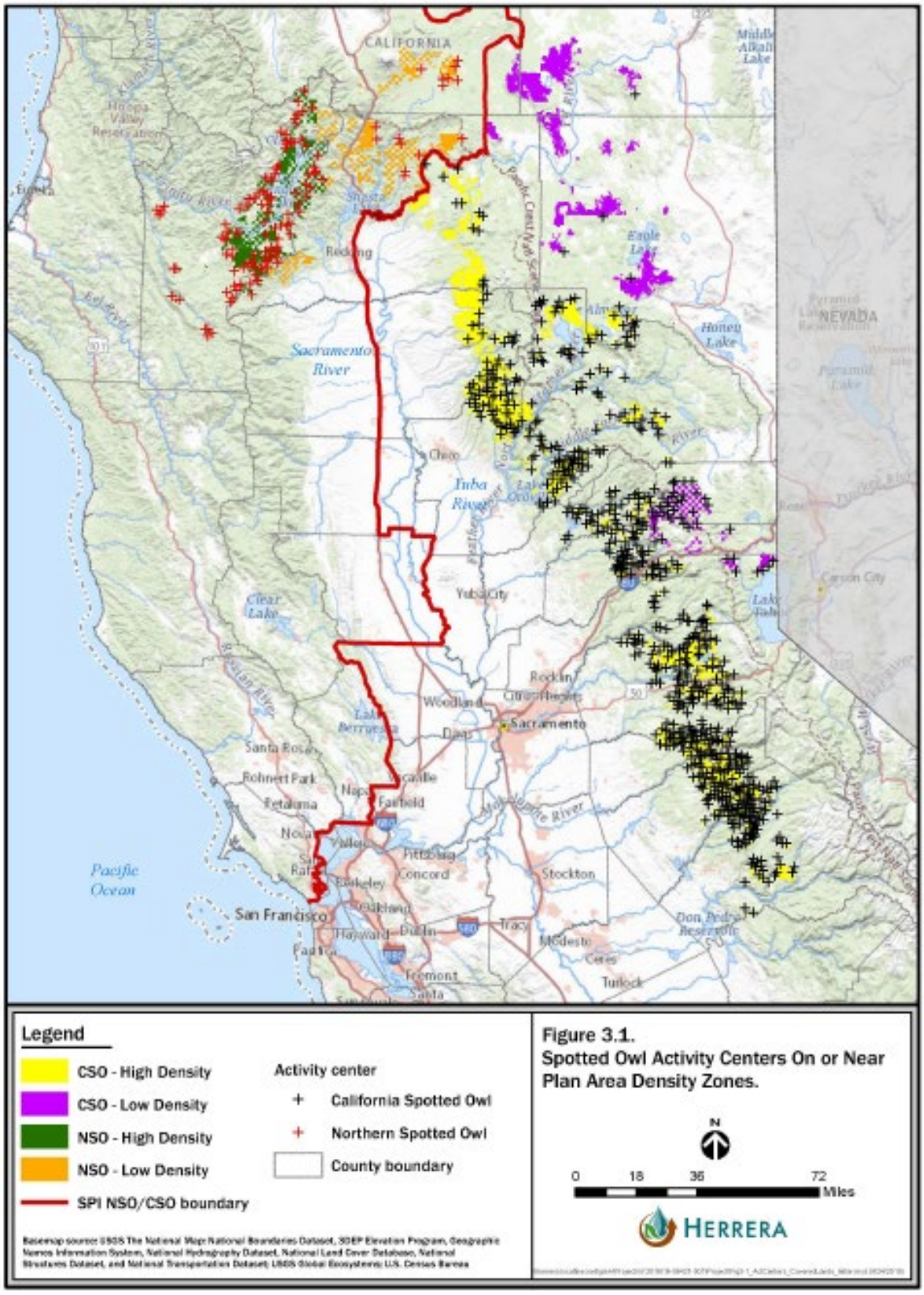

Figure 3.1. Spotted Owl Activity Centers On or Near the Plan Area by Density Zones.

3.1. NORTHERN SPOTTED OWL

3.1.1. Status, Distribution, and Habitat

This section summarizes and cites relevant existing literature regarding NSOs across their three-state range, which includes northwestern California. Information specific to SPI lands in California is presented in Section 3.1.2.

NSOs are nocturnal, forest-dwelling birds that nest in mature and old-growth forests from southwestern British Columbia, Canada, southward through Washington and Oregon into northwestern California (55 FR 26114). The 1990 ESA listing of the NSO established the "Pit River area in Shasta County" as the dividing line between the subspecies' ranges (55 FR 26114). This HCP uses the boundary shown in Figure 3.2 (derived from the boundary established by the Service and the Northwest Forest Plan (NWFP; USDA and USDI 1994) for the purpose of delineating the NSO and CSO ranges. The range of the NSO is divided into 12 physiographic provinces that reflect the physical, biological, and environmental factors of the broad-scale landscape features and natural plant communities in their range (Thomas et al. 1990).

The physiographic provinces are the basis for the recovery units designated in the Revised Recovery Plan for the Northern Spotted Owl (USDI 2011). The HCP Plan Area occurs within two of those provinces: California Klamath and California Cascades. In 2017, the CDFW Natural Diversity Database included 3,128 NSO ACs within the NSO range in California, of which about 46 percent and 5 percent occurred within the California Klamath and the California Cascades Provinces, respectively. It is understood that the CDFW Databases AC count is not a precise estimate of the existing number of ACs. Recently discovered ACs may not be in the database and older sites may no longer be occupied. Some areas of the range may not have been surveyed or surveyed recently. Regardless, this remains the best available estimate of AC numbers and the best proxy for a population estimate.

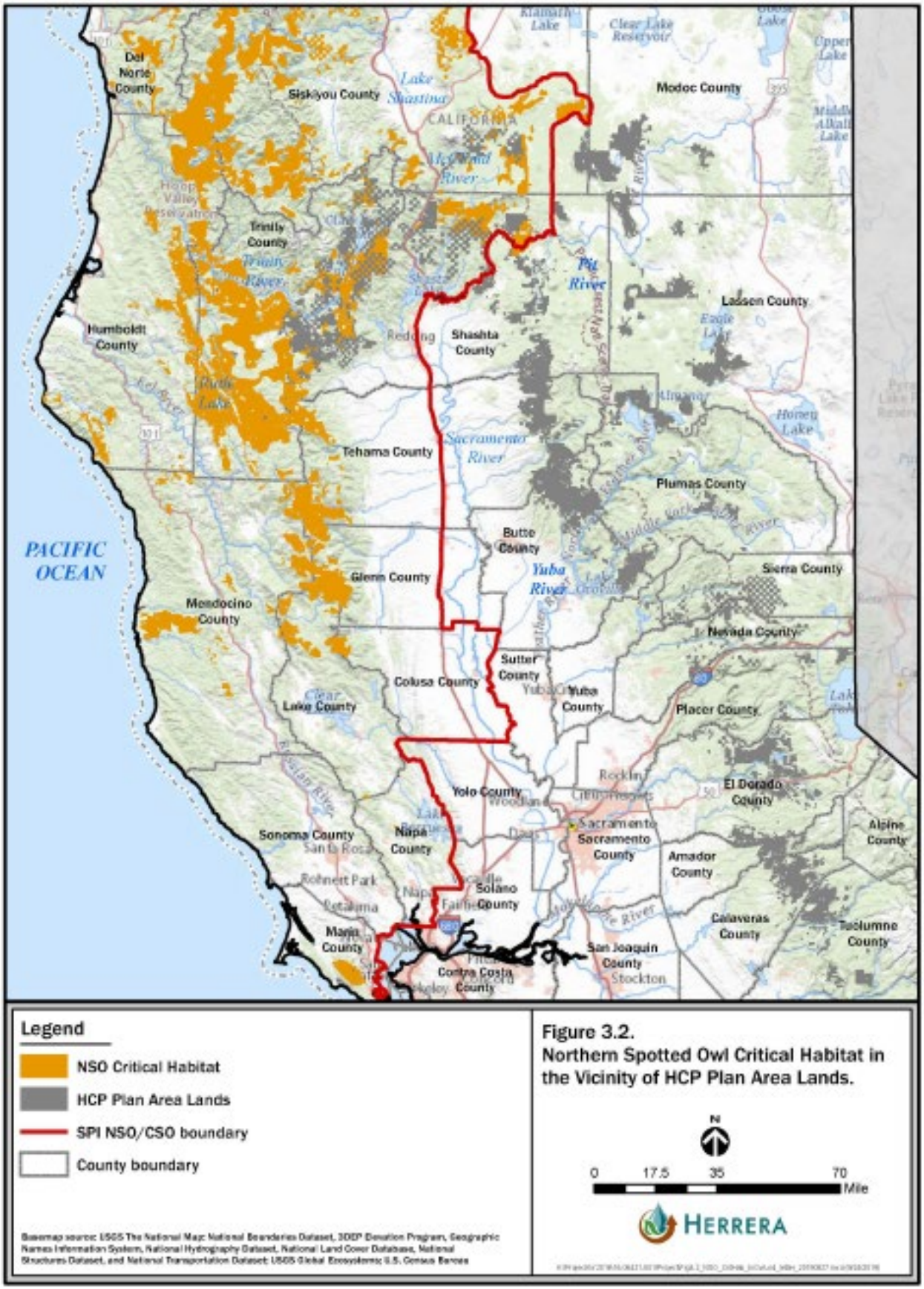

Figure 3.2. Northern Spotted Owl Critical Habitat in the Vicinity of HCP Plan Area Lands.

Threats to the NSO include habitat loss and degradation from wildfire, timber harvest, and other forms of disturbance; competition with barred owls (BDOW; *Strix varia*); effects of climate change on vegetation; habitat fragmentation; isolation of populations; and loss of genetic variation (USDI 2011).

Recent demographic studies and meta-analyses indicated that NSO populations continued to decline across their three-state range from 1985 through 2003 (Anthony et al. 2006) and 1985 through 2013 (Dugger et al. 2016) with a range-wide annual rate of decline of 3.8 percent. All three of the California study areas (Northwest California, Hoopa, and Green Diamond) showed declines from early 1990s through 2012. However, where BDOW were removed (further discussed below) from a portion of the Green Diamond study area in coastal northwestern California, conclusions about local declines were uncertain. The study area nearest to SPI lands (Northwest California, about 50 miles west of SPI's lands in Trinity County) showed an estimated average annual decline of 3 percent (Dugger et al. 2016). In a separate NSO study in managed forests in interior northern California, Farber and Kroll (2012) reported a decline in occupancy rates from 1995 through 2009, with the rate of decline slowing during the final 5 years of the study.

Barred Owls

Originally native to eastern North America, BDOWs have occupied the entire range of the NSO during the past 40 years (USDI 2013), and now outnumber NSO throughout the Northwest Forest Plan area (Lesmeister et al. 2018). Details of the competitive interactions between BDOWs and NSO are thoroughly described in the Service's Recovery Plan for NSO (USDI 2011). Basically, BDOW aggressively drive spotted owls from preferred habitat, occupy NSO breeding sites, and compete for prey resources. Numerous studies are underway regarding BDOW habitat use and efficacy of removal of BDOW in the NSO range (Wiens et al. 2017).

As was the case elsewhere in the NSO's range, presence of BDOWs was an important factor in declines at all three California NSO study areas described above (Dugger et al. 2016). However, the NSO showed rapidly improving rates of survival and population change in a portion of the Green Diamond study area where 73 of 81 (90 percent) detected BDOWs were removed from 2009 through 2012 (Dugger et al. 2016; Diller et al. 2014, 2016).

Habitat Characteristics and Use

The following descriptions of NSO nesting, roosting, and foraging habitat are quoted from the Service's Critical Habitat designation (77 FR 71884–71885).

> "(1) **Nesting.**
>
> Nesting habitat is essential to provide structural features for nesting, protection from adverse weather conditions, and cover to reduce predation risks. Habitat requirements for nesting and roosting are nearly identical. However, nesting habitat is specifically associated with a high incidence of large trees with various deformities (large cavities, broken tops, mistletoe (*Arceuthobium* spp.) infections, and other evidence of decadence)

or large snags suitable for nest placement. Additional features that support nesting and roosting typically include a moderate to high canopy cover; a multilayered, multispecies canopy with large overstory trees; large accumulations of fallen trees and other woody debris on the ground; and sufficient open space below the canopy for northern spotted owls to fly (Thomas et al. 1990, p. 164). Forested stands with high canopy cover also provide thermal cover (Weathers et al. 2001, p. 686) and protection from predators. Patches of nesting habitat, in combination with roosting habitat, must be sufficiently large and contiguous to maintain northern spotted owl core areas and home ranges, and must be proximate to foraging habitat. Ideally, nesting habitat also functions as roosting, foraging, and dispersal habitat.

(2) **Roosting.**

Roosting habitat is essential to provide for thermoregulation, shelter, and cover to reduce predation risk while resting or foraging. As noted above, the same habitat generally serves for both nesting and roosting functions; technically "roosting habitat" differs from nesting habitat only in that it need not contain those specific structural features used for nesting (cavities, broken tops, and mistletoe platforms), but does contain moderate to high canopy cover; a multilayered, multispecies canopy; large accumulations of fallen trees and other woody debris on the ground; and open space below the canopy for northern spotted owls to fly. In practice, however, roosting habitat is not segregated from nesting habitat. Nesting and roosting habitat will also function as foraging and dispersal habitat.

(3) **Foraging.**

Foraging habitat is essential to provide a food supply for survival and reproduction. Foraging habitat is the most variable of all habitats used by territorial northern spotted owls, and is closely tied to the prey base, as described below. Nesting and roosting habitat always provides for foraging, but in some cases, owls also use more open and fragmented forests, especially in the southern portion of the range where some younger stands may have high prey abundance and structural attributes similar to those of older forests, such as moderate tree density, subcanopy perches at multiple levels, multilayered vegetation, or residual older trees. Foraging habitat generally has attributes similar to those of nesting and roosting habitat, but foraging habitat may not always support successfully nesting pairs (USDI 1992, pp. 22–25). Foraging habitat can also function as dispersal habitat. The primary function of foraging habitat is to provide a food supply for survival and reproduction. Because northern spotted owls show a clear geographical pattern in diet, and different prey species prefer different habitat types, prey distribution contributes to differences in northern spotted owl foraging habitat selection across the range. In the northern portion of their range, northern spotted owls forage heavily in older forests or forests with similar complex structure that support northern flying squirrels (*Glaucomys sabrinus*) (Carey et al. 1992, p. 233; Rosenberg and Anthony 1992, p. 165). In the southern portion of their range, where woodrats are a

major component of their diet, northern spotted owls are more likely to use a variety of stands, including younger stands, brushy openings in older stands, and edges between forest types in response to higher prey density in some of these areas (Solis 1983, pp. 89–90; Sakai and Noon 1993, pp. 376–378; Sakai and Noon 1997, p. 347; Carey et al. 1999, p. 73; Franklin et al. 2000, p. 579). Both the amount and distribution of foraging habitat within the home range influence the survival and reproduction of northern spotted owls.

Dispersal Habitat

Regarding dispersal habitat, USDI (2012) stated: "Northern spotted owls can utilize forests with the characteristics needed for nesting, roosting, foraging, and dispersal, and likely experience greater survivorship under such conditions. However, dispersing or nonresident individuals may also make use of other forested areas that do not meet the requirements of nesting or roosting habitat on a short-term basis. Such short-term dispersal habitats must, at minimum, consist of stands with adequate tree size and canopy cover to provide protection from avian predators and at least minimal foraging opportunities." USDI (2011) stated "Although spotted owls can disperse through highly fragmented forested areas, the stand-level and landscape-level attributes of forests needed to facilitate successful dispersal have not been thoroughly evaluated or described." Thomas et al. (1990) described dispersal habitat as conifer and mixed mature conifer-deciduous stands with a canopy cover greater than or equal to 40 percent and conifer trees greater than or equal to 11 inches average dbh.

Territorial NSOs forage over a wide area, referred to as the home range, and return to a central location, referred to as the core use area (USDI 2012). An Activity Center (AC) is located centrally within the core use area. An AC is a nest site, a roost site, or an area routinely used by a single NSO over 1 or more years. The NSO Recovery Plan (USDI 2011) defines the representative size of the home range within the various physiographic provinces. In the California Klamath and California Cascades Provinces, where the Action Area for this HCP is located, the NSO home range is defined as a 1.3-mile radius circle around the AC (approximately 3,400 acres) within which a 500-acre circle (0.5-mile radius circle centered on the AC) represents the core use area. The 1.3-mile radius circle is also the distance designated in the CFPRs (14 CCR 919.9, 939.9). The 1.3-mile and 0.5-mile distances are representative of areas used by individual pairs or resident single NSOs and include areas of overlap between home ranges of neighboring pairs.

Dugger et al. (2016) summarized mean nearest neighbor distances from several NSO studies as follows: Northwest California: 0.75 km (0.47 mile); Hoopa: 1.00 km (0.62 mile); Green Diamond (Coastal Northwest California) 0.6 km (0.37 mile). Circles based on these radii comprise areas of 437 acres, 776 acres, and 279 acres, respectively. Circles based on nearest-neighbor distance radii may represent central areas with concentrated use by territorial NSO pairs (Dugger et al. 2016).

Within an NSO home range, the area around the AC that receives the most concentrated use is referred to as the core use area, which is described above (USDI 2012; Bingham and Noon 1997). NSO home ranges generally have a greater proportion of older forest within their core use areas

and more diverse forest conditions on the periphery of their ranges (Swindle et al. 1999). Franklin et al. (2000) reported that, in California, where woodrats make up a high proportion of NSO prey, "fitness" (combined survival and reproductive output) was maximized where NSO territories contained a mosaic of older forest for nesting and shelter from weather and predation, along with edge habitat for foraging.

The NWFP, which directs policies for NSO management on federal lands, established a network of late successional reserves (LSRs) where most nesting/roosting and foraging (NRF) habitat was protected. In "matrix" lands outside LSRs, the NWFP required protection of a 100-acre core use area around NSO ACs (USDA and USDI 1994). To provide avoidance of take due to timber harvest operations on private forest lands in California, the CFPRs require a 1,000-foot buffer around an AC during the breeding season for forest operations. Under the CFPRs, functional nesting habitat must be retained within a 500-foot radius (18 acres) around an AC year-round, and roosting habitat must be retained within a 1,000-foot radius (72 acres) around an AC, although vegetation management can occur within the 1,000-foot radius outside of the breeding season as long as roosting habitat is maintained. In addition, 500 acres of "owl habitat" must be retained within a 0.7-mile radius of an AC (i.e., 50 percent of the area) and 1,336 acres of functional spotted owl habitat must be retained within 1.3 miles of each AC (CFPR Section 919.9(g)/939.9(g)).

NSO Habitat Trend

Davis et al. (2016) estimated changes as of 2012 in NSO nesting/roosting habitat across the subspecies' range since implementation of the NWFP in 1994. They stated: "Results showed a net decrease from 9,089,700 acres to 8,954,000 acres (-1.5 percent) of nesting/roosting habitat on NWFP federal lands. This occurred despite gross losses from wildfire of 5.2 percent (474,300 acres), 1.3 percent from timber harvest (116,100 acres), and 0.7 percent from insects or other causes (59,800 acres), indicating that processes of forest succession have compensated for some of the losses resulting from disturbance. Dispersal habitat on NWFP federal lands increased by 2.2 percent (net change), but dispersal-capable landscapes experienced a 5 percent net decrease owing to habitat losses on the surrounding nonfederal lands. Large wildfires continue to be the leading cause for loss of NSO habitat on federal lands. Most of these losses occurred within the network of large reserves designed for NSO conservation."

In the Klamath and Cascades provinces of California, in which portions of SPI lands within the range of the NSO are located, Davis et al. (2016) used the "LandTrendr analysis" to estimate a combined loss of about 325,200 acres (12.9 percent) of NSO nesting/roosting habitat on the combined federal and non-federal landscape during the period 1993 through 2012 (derived from Davis et al. 2016, Table 7). In order of importance, the causes of the loss were wildfire on federal land (63.6 percent of the total loss), non-federal land timber harvest (23.7 percent of the total loss), federal land timber harvest (5.4 percent of total loss), and non-federal land wildfire (3.6 percent of the total loss) (derived from Davis et al. 2016, Tables 4 and 7).

Using a separate analysis (the "bookend maps"), Davis et al. (2016) estimated that net loss of NSO nesting/roosting habitat (91,100 acres, about 3.6 percent) across the Klamath and Cascade

provinces of California between 1993 and 2012 (derived from Davis et al. 2016, Table 7) was substantially less than the losses attributed to various causes under the LandTrendr analysis. Unlike the LandTrendr analysis, the "book-end maps" recognized ingrowth of habitat.

These various analyses are indicative of a general declining trend in NSO habitat, although there is some uncertainty regarding the exact amount of habitat loss. Since 1990, all non-federal timber harvest under THPs in California has been subject to Service Technical Assistance, or CDFW or CAL FIRE no-take determinations for NSO, and all federal timber harvest that may affect NSO has been conducted under Service ESA Biological Opinions.

3.1.2. Presence and Habitat Use in the Plan Area and Action Area

SPI's HCP Plan Area includes 377,442 acres within the range of the NSO (Table 1.2 and Figure 3.3). Including the Plan Area, the Action Area contains 1,262,808 acres within the range of the NSO (Table 1.2 and Figure 3.3). This section summarizes and cites relevant existing literature and data regarding NSOs across their three-state range, including northwestern California. The data are further analyzed in Sections 4 and 5 of this HCP.

The ownership pattern of SPI lands in California is generally discontinuous, with large areas of checkerboard ownership or irregular parcel configurations, which leads to NSO home ranges overlapping multiple landowners. As of 2017, there were 121 documented NSO ACs located either within the Plan Area or within a 1.3-mile-radius home range circle overlapping the Plan Area (Figure 3.3). Of those ACs, 17 were on SPI land, 88 were on USFS land, 10 were on USDI Bureau of Land Management (BLM) land, and 6 were on other private land ownership.

Landscape Survey Strategy

Since prior to the 1990 ESA listing, SPI has conducted NSO surveys and inventories using protocols recommended by federal and state agencies. All SPI THPs implemented since the listing were conducted under the Service's take avoidance guidance (up through USDI 2009) in place at the time of each THP. SPI also has conducted more intensive survey efforts (the Landscape Survey Strategy), especially in mixed ownership areas of Trinity County, California. The purpose of the landscape surveys was to gain a more comprehensive understanding of NSO ACs in relation to forest management activities. The survey area includes 307,408 acres in Trinity County, of which 142,279 acres (46 percent) are SPI lands (Figure 3.4). Most of the neighboring lands are within the Shasta-Trinity National Forest.

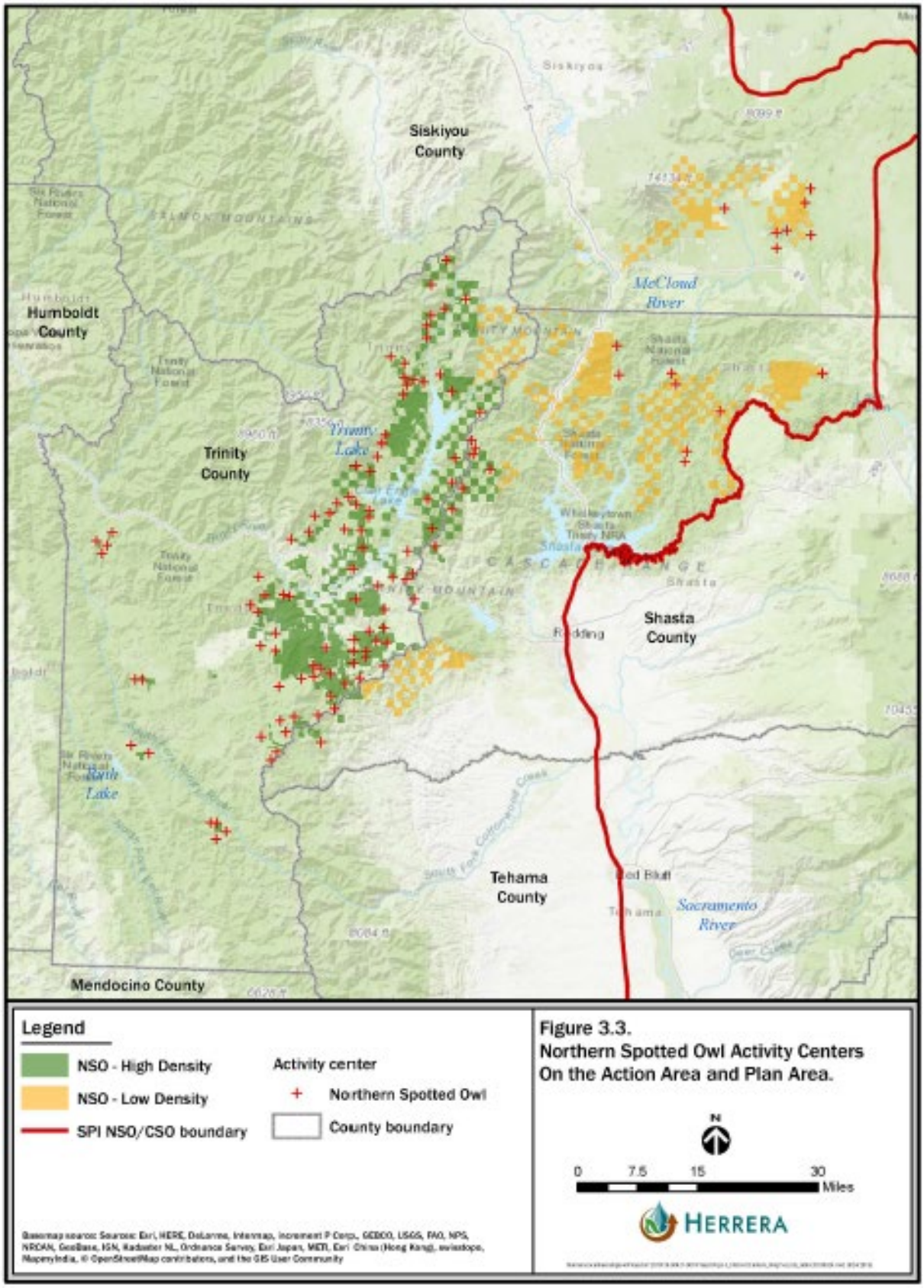

Figure 3.3. Northern Spotted Owl Activity Centers on the Action Area and Plan Area.

Figure 3.4. SPI Study Areas for the Northern Spotted Owl and California Spotted Owl.

During 2003 through 2007, SPI found 47 NSO ACs in the survey area, which usually included neighboring lands out to 1.3 miles from SPI boundaries. Intensive surveys were resumed in 2011, using more survey stations and improved techniques prescribed by the Service, along with annual banding and color-banding of all NSOs that could be captured. Banding enabled identification of individuals, so that if AC locations changed, researchers could determine whether the new site was established by previously uncaptured owls (from inside or outside the study) or by banded owls from other known ACs. The surveys from 2011 through 2016 located 60 occupied ACs within the study area. Appendix 3.1 includes a detailed report on the survey results (SPI 2017).

The ongoing Landscape Survey Strategy was developed to inform THP development and avoidance of take; it is not a long-term demographic study. Conclusions as to the observed numeric increase between the two survey periods (2003 through 2007 and 2011 through 2016) may be confounded by evolving survey methods between the survey periods. However, SPI saw no evidence of declines in the number of occupied sites between the first and second survey periods (Appendix 3.1). Baldwin and Raphael (unpublished data in Appendix 3.2) reported that there was no discernible trend in NSO occupancy rates in the survey area during the period from 2011 through 2017.

Analysis of Prey Remains

SPI biologists have collected regurgitated owl pellets (n = 124) containing the remains of NSO prey at NSO nesting and roosting areas. The most common prey, based on the biomass of prey items identified in the owl pellets were northern flying squirrel (46 percent), followed by the dusky-footed woodrats (39 percent). Various other small mammals and birds made up the remaining 15 percent (Figure 3.5). Woodrat prey remains were more abundant in pellets found at lower elevations. Flying squirrel remains were most common at higher elevations. The apparent transition occurred in the 2,500- to 3,000-foot elevation zone. The prey-remains analysis is described in detail in Appendix 3.7.

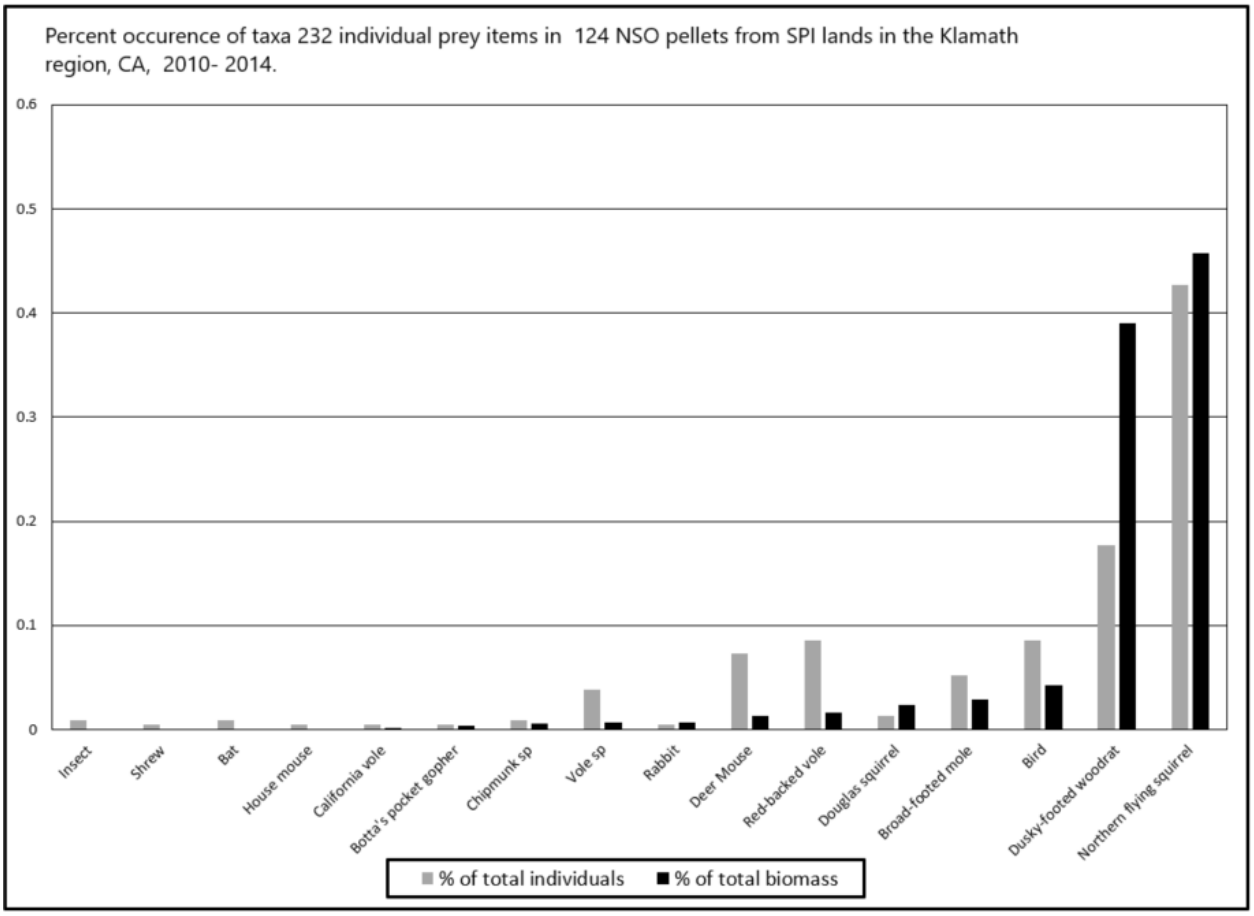

Figure 3.5. Prey Remains Identified in Northern Spotted Owl Pellet Analysis.

Northern Spotted Owl Habitat Use in the Action Area

SPI has described forest stand conditions within a 1-acre area surrounding reproductive sites for wildlife species (including NSO) that use high canopy large tree forests (Habitat Form 4 [HF4]) (Appendix 4.2). Results are summarized in Table 3.1. The descriptions of SPI nest sites and stands in terms of tree size and canopy cover are similar to those described in USDI (2011), with the exception of lower stand diameters (i.e., quadratic mean diameter [QMD] of the stands) and basal areas.

Table 3.1. Northern Spotted Owl Nest and Nest Site Data.						
NSO Cross Plots – Nest Site n = 26						
	Percent Canopy Closure	Quadratic Mean Diameter (inches)	Basal Area (sq. ft. per acre)	Trees per Acre ≥22 Inches DBH	Elevation (feet)	Nest Tree DBH (inches)
Mean	94.8	16.7	213.6	19.5	3246	38.2
Median	96.2	15.1	195.3	20.2	3300	42.8
Standard Deviation	4.9	6.4	86.2	12.1	830	16.0
Minimum	82.8	10.1	101.4	3.4	840	12.1
Maximum	99.9	33.7	428.6	43.9	4400	65.8
Lower Bound	89.9	10.3	127.5	7.4	NA	22.2

DBH = diameter at breast height, NSO = northern spotted owl

Gradient Nearest Neighbor Habitat Analysis

SPI also described habitat conditions at several scales around 94 NSO ACs on multiple ownerships using a gradient nearest neighbor (GNN) analysis similar to that of Davis et al. (2016). All but one of these ACs were on or within 1.3 miles of SPI land (about 11 percent in the Plan Area and 88 percent in the Action Area). The proportion of nesting habitat was greater at all scales (50, 500, 1,000, 3,398 acres) around ACs than at similar scales around random locations. At the 500-acre scale, mean proportion of nesting habitat was 0.39 (standard deviation [SD] = 0.16, median = 0.37). The proportion of nesting habitat in the 50-acre area around ACs was much greater than at other scales and was much greater than areas around random sites. The study is described in more detail in Appendix 3.4 (Spotted Owl Nesting Habitat GNN Analysis).

Once the GNN habitat maps were produced for the model region, a group of 146 NSO ACs from the SPI occupancy analysis was intersected with the GNN habitats. For that dataset, at the 500-acre scale, mean proportion of nesting habitat was 0.37 (SD = 0.14, median = 0.36). The sites had essentially level occupancy during the years 2011 through 2017 (Baldwin and Raphael unpublished data, Appendix 3.2 Spotted Owl Trend Analysis).

Global Positioning System Habitat Study

In 2017, SPI studied NSO habitat use in Trinity County using global positioning system (GPS) telemetry (described in detail in Appendix 3.6). Twenty-one adult members of pairs and three other NSOs were fitted with tail-mounted GPS receivers, which stored location data five times per night over a 6- to 8-week period during the breeding season. The NSOs with GPS receivers used mature, closed-canopy forest at a rate greater than availability at all scales evaluated around ACs and used very young forest and open areas less than availability. Use of several intermediate forest types was not different than availability. Use was concentrated at scales close to the nest site: the median 50 percent core use area comprised less than 11 percent of the total area of the median 95 percent kernel range; the median 25 percent kernel comprised

4.5 percent of the median home range area, and the median 10 percent kernel constituted 2.2 percent of the area of the median 95 percent kernel home range.

The GPS habitat study corroborated high use of mature, closed-canopy stands reported by other authors (e.g., Solis et al. 1990; Dugger et al. 2005), and expanded upon information reported by Irwin et al. (2013) regarding the use of earlier (younger) successional vegetation as foraging habitat during the nesting season.

Barred Owls in the Action Area

BDOW were first detected on SPI's Weaverville district at two different NSO ACs in 2003. By 2011, the number of NSO ACs where BDOW were found had grown to 14. In 2012, SPI began surveying systematically for BDOW by playing BDOW calls for an additional 5 minutes of all first pass surveys for NSO each season. If a BDOW was detected during this additional survey, all calling was stopped to avoid potential negative interactions between any NSOs that may have been present.

By 2014 the number of NSO ACs affected by BDOW grew to 46, with most of those on SPI's Weaverville district and neighboring lands. During 2014 and 2015, 50 BDOW individuals were collected. Subsequent surveys allowed us to determine that the number of affected NSO ACs was reduced to 17. These surveys also demonstrated that NSO reoccupied (or began to respond to surveys again from) ten ACs where BDOW had been removed from the vicinity. After the removal effort ended prior to the 2016 breeding season, BDOW again began to influence NSO sites. As of July 1, 2018, BDOWs were found occupying or near 35 NSO ACs in the former removal area.

This collection was conducted under Migratory Bird Permits and Scientific Collection Permits from the Service and CDFW. The collection was designed to provide additional scientific information to researchers studying the genetics of the barred owl invasion.

3.1.3. Critical Habitat

The Service designated revised critical habitat for the NSO in 2012 (77 FR 71876). The designation included 2.1 million acres within California. No critical habitat was designated on private lands, so there are no critical habitat units on SPI land. However, many critical habitat units on federal land share property lines with SPI. Over 90 percent of critical habitat bordering SPI land is on USFS land (Figure 3.2). There are over 450 linear miles of shared border between the Plan Area and designated critical habitat. There are 228,641 acres of critical habitat within 1.3 miles of the Plan Area, comprising about 11 percent of the NSO critical habitat designated in California.

3.2. CALIFORNIA SPOTTED OWL

3.2.1. Status, Distribution and Habitat

The California spotted owl (CSO) subspecies is closely related to the NSO subspecies, but the CSO is not currently listed under the ESA. CSOs occur from the southern end of the Cascades and northern Sierra Nevada, south through the Peninsular and Transverse Ranges of southern California and northern Baja California (Gutiérrez et al. 2017). They are also found in the coastal mountains north to Monterey Bay, but much less is known about owl numbers and locations along the coast (Gutiérrez et al. 2017). The range of the CSO is divided into two physiographic provinces: the Sierra Nevada Province and the Southern California Mountains Province (Gutiérrez et al. 2017). The ranges of the northern and California subspecies are immediately adjacent in the Southern Cascades and Sierra Nevada Provinces, and a zone of hybridization has been described by Gutiérrez and Barrowclough (2005) and Miller et al. (2017). The 1990 ESA listing of the NSO established the "Pit River area in Shasta County" as the dividing line between the subspecies' ranges for regulatory purposes. Differentiating between the two subspecies is only possible via genetic analysis. For regulatory purposes, spotted owls north of the Pit River are considered NSO, and spotted owls south of the Pit River are considered CSO (55 FR 26114). This HCP uses the boundary shown in Figure 3.2 (derived from the boundary established by the USFWS and the NWFP) to delineate the regulatory boundary between the NSO and CSO ranges.

CDFW has recorded 2,531 CSO ACs throughout the CSO range in the state (CDFW 2017). The Service (USDI 2006) estimated that the CSO population in the Sierra Nevada Province (which includes portions of the area of this HCP) included approximately 1,865 owl sites, with 1,399 sites on USFS land, 129 sites on USDI National Park Service land, 314 sites on private land, 14 sites on BLM land, 8 on State of California land, and 1 on Native American tribal land. It is understood that the CDFW Databases AC count is not a precise estimate of the existing number of ACs. Recently discovered ACs may not be in the database and older sites in the database may no longer be occupied. Some areas of the range may not have been surveyed or surveyed recently. Regardless, this remains the best available estimate of AC numbers and the best proxy for a population estimate.

In 2006, the Service determined that listing the CSO as threatened or endangered under the ESA was not warranted (71 FR 29886). The Service found in 2006 that there was not conclusive evidence of a population decline and that available measures to reduce risk of catastrophic wildfire would have long-term benefits. In 2019, the Service again ruled that listing the CSO was not warranted (84 FR 60371; Nov. 8, 2019).

The CSO is listed as a Species of Special Concern by CDFW. The subspecies also is included on the USFS and BLM list of sensitive animal species and is, therefore, afforded a level of protection on USFS land through management practices. All national forests in the Sierra Nevada have designated, 300-acre, "protected ACs" (PACs) (USFS 2004). Berigan et al. (2012) tested the

efficacy of 38 PACs in the central Sierra Nevada and found a high degree of overlap between PACs and confirmed diurnal CSO locations at several scales.

Threats to the CSO include habitat loss and degradation from wildfire, forest management practices, human development, and other forms of disturbance; competition from the invasive BDOW; effects of drought and climate change on vegetation; development of gaps in CSO distribution in the Sierra Nevada; expansion of West Nile virus into the CSO's range; and secondary ingestion of rodenticides used on marijuana farms (USDI 2017; Gutiérrez et al. 2017).

CSO Population Trends

Several long-term demographic studies of the CSO have been conducted primarily on federal lands in the Sierra Nevada. Within the three study areas on National Forests, CSO populations have declined during recent decades (1990 - 2013; Conner et al. 2016, Tempel et al. 2014), but the population in Sequoia-Kings Canyon National Park appeared to be stable or increasing. Key findings from these studies are summarized in following paragraphs. Analyses in these studies were often complex and not amenable to brief summaries. For more detailed results and interpretation, the reader should examine the original works.

The study areas included:

- Lassen, primarily on the Lassen National Forest (Blakesley et al. 2005). This study area borders tracts of SPI lands in eastern portions of Tehama and Butte Counties.

- Eldorado, primarily on the Eldorado and Tahoe National Forests. This study area lies between the Stumpy Meadows and Chalk Bluff CSO Watershed Study Areas maintained by SPI (Roberts et al. 2017) in Eldorado and Placer Counties, respectively.

- Sierra, primarily on the Sierra National Forest. This study area lies about 60 miles to the south of the nearest SPI lands, which are in eastern Tuolumne County.

- Sequoia/Kings Canyon, primarily within Sequoia and Kings Canyon National Parks. This study area lies about 100 miles to the south of the nearest SPI lands, which are in eastern Tuolumne County.

Blakesley et al. (2010) conducted a meta-analysis of population trends from all four of these federal study areas using the finite rate of population change (lambda) between 1990 and 2005. They reported that lambda was stationary on the Lassen and Sierra study areas, and increasing after an initial decrease on the Eldorado and Sequoia/Kings Canyon study areas.

Conner et al. (2013) estimated probabilities of various degrees of population declines from 1990 to 2011 at the Lassen, Sierra, and Sequoia/Kings Canyon study areas. They concluded that CSO declines of greater than 20 percent at these study areas had probabilities of 0.54, 0.26, and 0.02, respectively. Conner et al. (2016) expanded the period of analysis to include the period 1990 through 2013. They concluded that lambda was decreasing at the Lassen and Sierra study

areas, and that population declines of greater than 30 percent had probabilities of 0.89, 0.53, and 0.0 at the three respective study areas (See the original citations for more detail).

Several analyses of data from the long-term Eldorado study area provide relevant context to this HCP. The Eldorado study area lies among the SPI density study areas described in Roberts et al. (2017) and further discussed in Section 3.2.2 below. Tempel and Gutiérrez (2013) modeled demographic performance in the Eldorado study area over a different time period than Blakesley et al. (2010), and, using different analysis methods, concluded that CSO population trend, occupancy, and territory colonization had decreased during the period 1993 through 2010, while territory extinction had increased. Both Tempel and Gutiérrez (2013) and Jones et al. (2016) indicated that occupancy rates in the Eldorado study area were more stable in recent years.

Tempel et al. (2016) conducted a meta-analysis of trends in CSO occupancy as related to habitat conditions using presence/absence data from the same four study areas (Lassen, Eldorado, Sierra, and Sequoia/Kings Canyon) included in the previous meta-analyses of population trend (Blakesley et al. 2010). They reported that "forests with medium (40 to 69 percent) and high (70 percent) canopy cover were the most important predictors of territory occupancy in all study areas, and that both canopy cover categories were positively correlated with occupancy." They also stated that "In this post hoc analysis, occupancy declined sharply when territories contained more area with less than 40 percent canopy cover, and the amount of 50 to 59 percent and 60 to 69 percent canopy cover had a more positive association with occupancy than did 40 to 49 percent canopy cover."

Blakesley et al. (2005), Seamans and Gutiérrez (2007), and Tempel et al. (2014), reported that CSO occupancy, survival, and reproduction at the Lassen and Eldorado study areas were positively related to amount of mature forest with high degrees of canopy cover. Also, one of the most important predictors of occupancy appears to be the intersection of dense canopy cover habitat with large-tree-dominated habitat (Jones et al. 2017; North et al. 2017a).

None of these studies evaluated habitat areas with substantial amounts of even-aged forest management within CSO home ranges, such as occur on SPI lands. Tempel et al. (2014) found that the probability of territory extinction on the Eldorado study area (EDSA) was reduced in relation to larger amounts of high-intensity timber harvest, and that survival and population growth were positively related to the amount of edge between forested stands and areas of shrubs/saplings. However, only 5.4 percent of their study area consisted of areas of high-intensity timber harvest, so conclusions were limited. As noted by Roberts et al. (2017), CSO exist under a variety of forest conditions, and further analysis is needed to understand the effects of various management regimes.

Hobart et. al. (2019a) compared occupancy and reproduction rates during 2013 - 2017 from the EDSA and SPI's five density study areas which contain substantial amounts of even-aged forest management. They found CSOs in the density study areas to have higher occupancy and reproductive probabilities due to greater amounts of younger forests with high basal area of

hardwoods. They went on to report that "… private lands in mixed-ownership landscapes may be more important to spotted owl populations than previously believed and, more broadly, highlight the importance of including private lands in conservation research and planning."

Barred Owls in the CSO Range

Interactions between BDOWs and spotted owls are described in Section 3.1.1. Regarding the presence of BDOW in the range of the CSO, the Service's Conservation Objectives for CSO (USDI 2017) stated:

> "*A barred owl was first detected in the northern Sierras in 1989 and in the central and southern Sierras in 2004 (Steger et al. 2006). As of 2013, there were 51 barred owls detected in the Sierra (Keane 2017). Currently there are over 140 barred owl detections recorded in CNDDB, although these records do not necessarily reflect unique individuals. However, no systematic surveys have been conducted and all detections are incidental; therefore, they may be at a low density throughout the region (Dark et al. 1998; Keane 2014). There have also been a number of sparred owl detections, hybrids between the two species. As their range continues to expand, barred owls will likely become a significant threat to CSO (Gutiérrez et al. 2017).*"

Keane (2017) reported that BDOWs were slowly expanding in the Sierra Nevada range of the CSO, stating as follows:

> *"This is the pattern observed in the range of the northern spotted owl—a slow increase followed by a rapid one. The invasion of the barred owl into the Sierra Nevada poses a significant threat to California spotted owls. Based on the limited observations discussed above, it is possible that they will ultimately colonize the entire Sierra Nevada. Without control efforts, barred owls can potentially become a primary threat to the California spotted owl in the Sierra Nevada."*

Habitat Characteristics and Use

Habitat for the CSO is similar to that of the NSO. Studies that have specifically examined CSO habitat characteristics use the same three categories of NRF habitat, foraging habitat, and dispersal habitat.

- **Nesting, Roosting, and Foraging:** NRF stands typically include a moderate to high canopy cover (≥75 percent); a multilayered, multispecies canopy with an abundance of large (greater than 24 inches dbh) trees, but numerically dominated by medium-sized trees (12 to 24 inches dbh); a high incidence of large trees with various deformities (e.g., large cavities, broken tops, mistletoe infections, and other evidence of decadence); large snags; large accumulations of fallen trees and other woody debris on the ground; and sufficient flying space below the canopy (citations summarized in Roberts [2017]).

- **Foraging Habitat:** Similar to habitat of the NSO, CSO foraging habitat includes a mosaic of vegetation types and seral stages, including the ecotones between late- and early-

successional forest. Continuous patches of mature, closed-canopy forests are important for foraging habitat (Williams et al. 2011), but CSO also have been found to forage more frequently near high-contrast edges than in interior patches, at least near areas burned at high severity (Eyes 2017). This is likely related to prey availability, as described above for NSO foraging habitat. A study conducted on SPI and USFS lands in the central Sierra Nevada found that canopy cover at foraging locations averaged 69 percent (Irwin et al. 2007).

- **Dispersal Habitat:** Dispersal habitat has not been specifically described for the CSO but is considered equivalent to NSO dispersal habitat; i.e., forested stands including NRF and other stands with mean diameter >11 inches and >40 percent canopy cover.

CSOs establish and defend large home ranges that, contain higher habitat diversity than NSO home ranges (Roberts 2017). Because the CSO is not listed under the ESA or CESA, there is no regulatory definition for the representative size of the CSO home range or core use area. CSO home ranges are larger in the northern Sierra Nevada than in the southern Sierra Nevada, and USFS guidelines accordingly indicate three different home range sizes (USFS 2004).

At the northern end of the CSO range in the southern Cascades (the two northern districts of the Lassen National Forest), the representative CSO home range is 2,400 acres. In the central Sierra Nevada (near the Plumas, Tahoe, Eldorado, and Stanislaus National Forests, and southern district of the Lassen National Forest) and in the Modoc National Forest, the representative CSO home range is 1,000 acres. The SPI Plan Area does not overlap the southern Sierra Nevada, where the USFS uses 600 acres as the representative CSO home range (Roberts 2017).

Gradient Nearest Neighbor Habitat Study

SPI described conditions at several scales around 562 CSO ACs on multiple ownerships using a GNN analysis similar to that of Davis et al. (2016). The study is described in Appendix 3.4. Of these ACs, 455 were on or within 1 mile of SPI land (about 20 percent were in the Plan Area and 61 percent in the Action Area). In the entire study area, the proportion of nesting habitat was greater at all scales (50, 500, 1,000, 3,398 acres) around ACs than at similar scales around random locations. At the 500-acre scale, mean proportion of nesting habitat at ACs above 4,500-foot elevation was 0.50 (SD = 0.18, median = 0.50). Below that elevation, mean proportion of nesting habitat at the 500-acre scale was 0.45 (SD = 0.20, median = 0.44). The proportion of nesting habitat in the 50-acre area around ACs was much greater than at other scales.

Once the GNN habitat maps were produced for the model region, a group of 67 CSO ACs from the SPI occupancy analysis was intersected with the GNN habitats. At the 500-acre scale, the mean proportion of nesting habitat was 0.38 (SD = 0.16, median = 0.38). The sites had essentially level occupancy during the years 2011 through 2017. The occupancy analysis is explained in more detail in Baldwin and Raphael (unpublished data, Appendix 3.2).

3.2.2. Presence and Habitat Use in the Plan Area and Action Area

SPI's Plan Area includes 1,188,265 acres within the range of the CSO. The Action Area (including the Plan Area) included 3.2 million acres with (as of 2018) 688 documented CSO ACs: 182 ACs located on the Plan Area plus, within 1 mile of the Plan Area, another 438 ACs on USFS land, 5 ACs on BLM land, 54 ACs on other private land, and 9 ACs on other public land (Figure 3.6).

California Spotted Owl Habitat Use in the Plan Area and the Action Area

SPI has described forest stand conditions in terms of tree diameter and canopy cover using a 0.3-acre actual sampled area to represent a 1-acre area surrounding reproductive sites for wildlife species (including the CSO) that use high canopy large tree forests (HF4) (Appendix 4.2). Results are summarized in Table 3.2. The descriptions of SPI nest sites and stands are similar to those described in literature, with the exception of lower stand diameters and basal areas.

Table 3.2. California Spotted Owl Nest and Nest Site Data.

CSO Cross Plots – Nest Site n = 106						
	Percent Canopy Closure	**Quadratic Mean Diameter (inches)**	**Basal Area (Sq. Ft. per acre)**	**Trees per Acre ≥22 Inches DBH**	**Elevation (feet)**	**Nest Tree DBH (inches)**
Mean	91	17.7	244	31	3,822	40
Median	92	17.7	231	30	3,870	38
Standard Deviation	7	3.2	78	14	779	14
Minimum	61	10.5	104	0	2,440	17
Maximum	100	29.8	485	74	5,900	85
Lower Bound	84	14.5	166	18	NA	26

California spotted owl, DBH = diameter at breast height

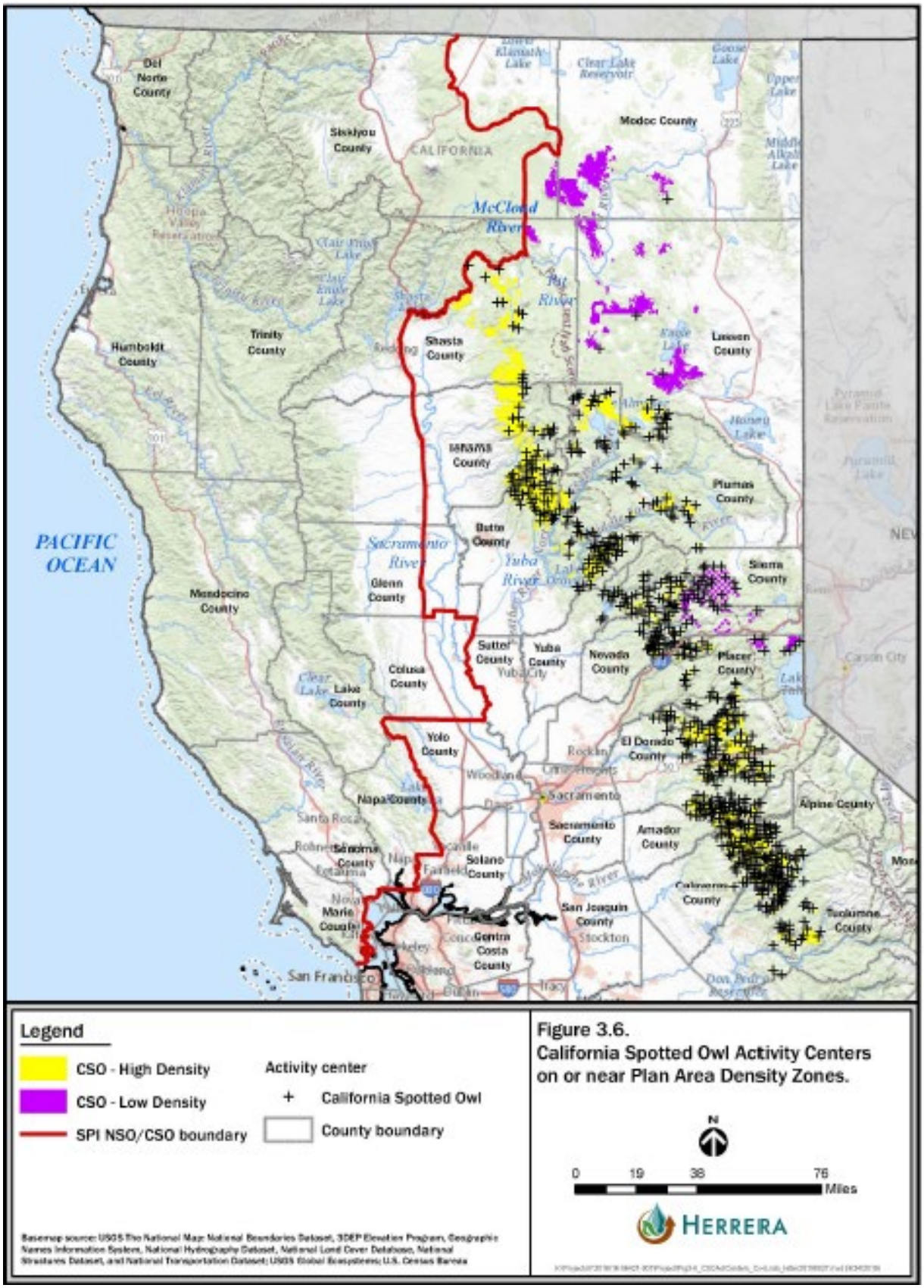

Figure 3.6. California Spotted Owl Activity Centers on or near Plan Area Density Zones.

Data from Table 3.1 and Table 3.2 are combined in Table 3.3. These two spotted owl subspecies utilize similar habitats and SPI manages across the historically identified contact zone for these subspecies. Recent genetic testing has shown that there is an extensive hybrid zone overlapping most of the NSO range on SPI Plan Area lands (Miller et al. 2017). Adding the measured datasets together provides potentially more reliable estimates of the variables of interest. This table is provided to describe reproductive nest sites for "spotted owl" on or near SPI lands.

Table 3.3. Combined Northern and California Spotted Owl Nest and Nest Site Data

NSO and CSO Cross Plots – Nest Site n = 132						
	Percent Canopy Closure	**Quadratic Mean Diameter (inches)**	**Basal Area (Sq. Ft. per acre)**	**Trees per Acre ≥22 Inches DBH**	**Elevation (feet)**	**Nest Tree DBH (inches)**
Mean	90	17.5	238	29	3,708	39
Median	92	17.3	226	27	3,730	38
Standard deviation	7	4.1	80	14	819	14
Minimum	61	10.1	101	0	840	12
Maximum	100	33.7	485	74	5,900	85
Lower Bound	83	13.5	158	15	NA	25

CSO = California spotted owl NSO = northern spotted owl

DBH = diameter at breast height

Occupancy and Density Study

In 2012, SPI began a long-term study of CSO occupancy and density within five watershed study areas (WSAs) within the Sierra Nevada Mountains from the southern end of the Cascades to just north of Yosemite National Park. The five WSAs are: Fall River, Chalk Bluff, Stumpy Meadows, South Fork Cosumnes River, and South Fork Mokelumne River (Figure 3.4). These WSAs average about 42.5 square miles (ranging from 33 to 53 square miles) in area. SPI owns an average of 52.5 percent (ranging from 26.8 to 68.8 percent) of the land within the WSAs and the remainder is primarily owned by USFS. Study results through 2016 were reported by Roberts et al. (2017).

During the period from 2012 through 2016, Roberts et al. (2017) identified 67 CSO ACs. Of those, 41 were on SPI lands, 19 were on USFS lands, and 5 were on other private lands. Habitat analysis indicated that 82 percent of the habitat within a 1,000-foot radius of each AC consisted of primary habitat (HF2H and HF4) (defined as stands with ≥11 inches QMD and ≥50 percent cover); however, only 70 percent of the combined area of the five WSAs consisted of primary habitat. This finding indicated that CSOs are preferentially selecting areas with more primary habitat (HF4 and HF2H) for nesting locations (Roberts et al. 2017).

Beginning in 2013, all CSOs in the five WSAs that could be captured were banded and color-banded. Banding enabled identification of individuals, so that if AC locations changed, researchers could determine whether the new site was established by previously uncaptured owls (from inside or outside the study area) or by owls from other known ACs.

The ongoing study in the five WSAs was primarily designed to evaluate occupancy and density; it is not a long-term demographic study. However, Baldwin and Rafael (unpublished data, Appendix 3.2) reported that CSO occupancy rates in the WSAs had essentially level occupancy during the period 2011 through 2017.

Analysis of Prey Remains

SPI biologists have collected 488 regurgitated owl pellets containing remains of CSO prey at CSO nesting and roosting areas. The most common prey, based on the biomass of prey items identified in the owl pellets, were dusky-footed woodrats (57 percent), followed by the northern flying squirrel (30 percent). Various other small mammals and birds made up the remaining 13 percent (Figure 3.7). Woodrat prey remains were more abundant in pellets found at lower elevations. Flying squirrel remains were most common at higher elevations. The apparent transition occurred in the 4,500- to 5,500-foot elevation zone. The prey remains analysis is described in detail in Appendix 3.7.

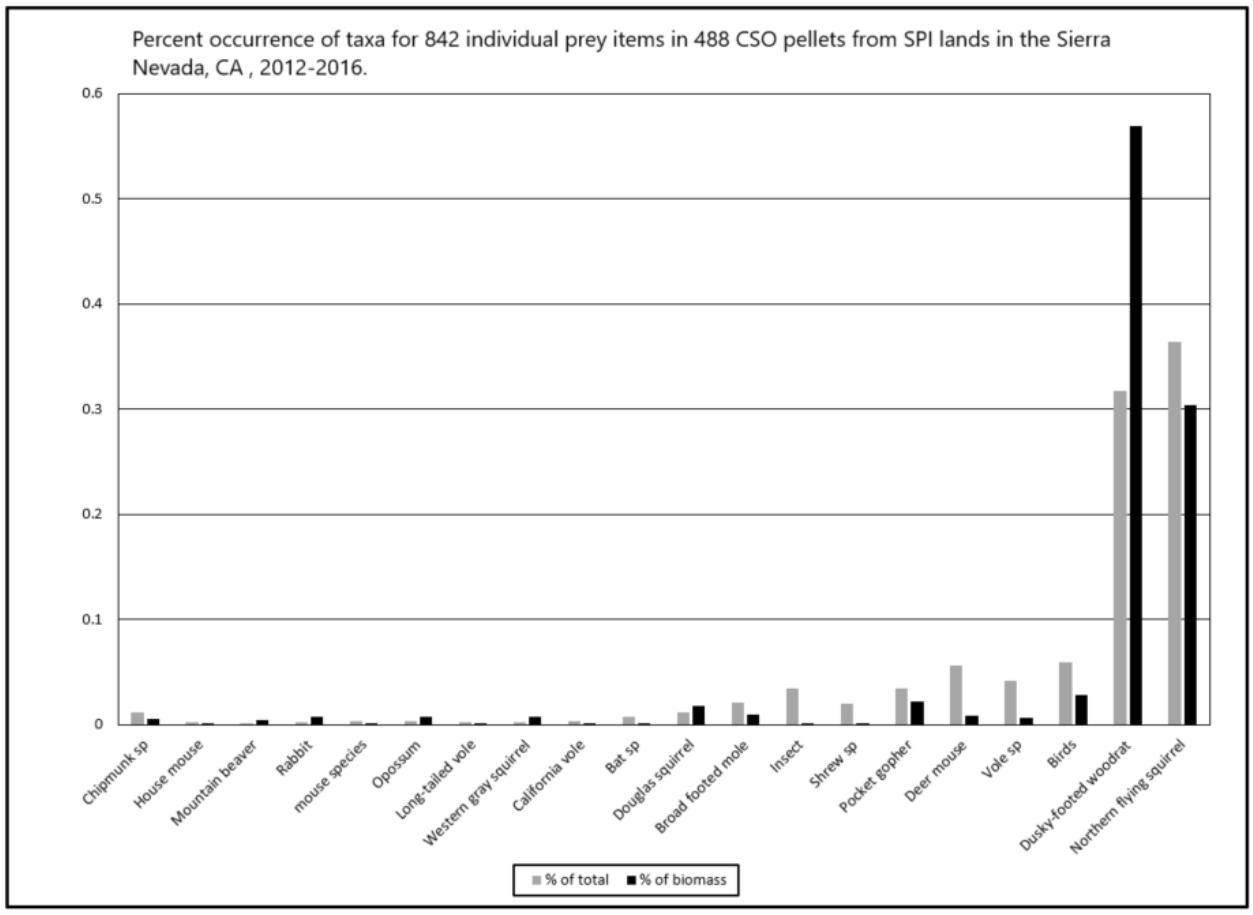

Figure 3.7. Prey Remains Identified in California Spotted Owl Pellet Analysis.

Global Positioning System Habitat Study

The GPS telemetry study described in Section 3.1.3 (Appendix 3.8, and Atuo et al. 2018) included CSOs with ACs on or near SPI ownership in the Sierra Nevada. The study area included 145,319 acres, of which 66,832 acres (46 percent) were SPI lands. Most of the neighboring lands were within the Lassen, Plumas, Tahoe, Eldorado, and Stanislaus National Forests. The purpose of the study was to improve SPI's understanding of CSO habitat use in order to inform habitat conservation, as well as to gain a more comprehensive understanding of CSO behavior related to forest habitat conditions. SPI coordinated the study with Dr. Zach Peery (University of Wisconsin), who leads studies on the Eldorado Study Area. Combined, 56 adult or sub-adult CSOs were fitted with tail-mounted GPS receivers, which stored location data five times per night over a 6- to 8-week period during the breeding season. Twenty-three of those CSOs were within the five WSAs described in Roberts et al. (2017), 17 were on other SPI land, and 16 were associated with ACs on USFS land.

The recorded locations were focused within forest stands near or within an owl's AC, probably reflecting time spent in attending young and delivering prey. The GPS study corroborated high CSO use of closed-canopy stands of large diameter trees (HF4) at all scales, as reported by other authors (Laymon 1988; Zabel et al. 1992; Call et al. 1992; Moen and Gutiérrez 1994). CSOs used closed–canopy stands of moderate diameter trees (HF2H) in approximately equal proportion to availability. The GPS study also expanded on information reported by Williams et al. (2011) and Irwin et al. (2013) regarding the use of earlier (younger) successional stands. While mean CSO foraging use of earlier successional stands (Habitat Form 1 [HF1] and Habitat Form 2 Light [HF2L]) was slightly less than the proportion of those habitats available, several individuals used these types more than they were available. Over 10 percent of the overall use was in HF1 and HF2L stand types, indicating at least some value to foraging CSOs. Detailed results of the GPS telemetry study are included in Appendix 3.8 and Atuo et al. (2018).

Nesting Structure Inventory

Spotted owls do not build nests but instead nest in existing cavities (either natural or excavated by other wildlife), on platforms created by mistletoe brooms and other tree deformities, or on old nests created by other species such as northern goshawks (citations summarized in Roberts 2017). The presence of such structures is key to the suitability of nesting habitat. SPI's definition of nesting habitat (further detailed in Section 4.1) includes the presence of apparently suitable structures. As part of SPI's Candidate Conservation Agreement for fishers (SPI 2017), SPI biologists sampled forestlands for visible cavities and platforms and located an average of one possibly-suitable structure per acre. This inventory, including study area and methodology, is included as Appendix 4.4.

Barred Owls in the Plan Area/Action Area

SPI has not surveyed systematically for BDOW within the range of the CSO but has detected BDOW sporadically while conducting active audio surveys for CSO. In past years, follow-up searches did not locate BDOW ACs, and the BDOWs were thought to be transient. BDOW were repeatedly located during 2013 through 2015 at one location on the Eldorado National Forest within the Action Area. BDOW were not found at that location in subsequent years.

In the spring of 2018, BDOW detections were increasing and social status becoming more stable on the following SPI districts (see Appendix 5.8 for a map of SPI districts) and nearby areas in the range of the CSO:

- Burney: One BDOW pair.
- Lassen: One BDOW pair, and three individual BDOW on USFS Plumas/Lassen Density Study Area.
- Almanor: One BDOW pair, and one pair of a BDOW and a BDOW hybrid pair on USFS.
- Stirling: Four BDOW singles, one nesting pair a BDOW male with a CSO female.
- Camino: One BDOW pair, one resident single BDOW and one BDOW hybrid nesting with a CSO male.
- Sonora: One BDOW hybrid and a CSO female (present for several years).

4. ENVIRONMENTAL CONDITIONS

This section provides a brief description of environmental conditions in the Plan Area and Action Area. The descriptions of conditions within the Plan Area are more precise because SPI has specific data for these lands. Information within the Action Area, but outside the SPI ownership may be more general because SPI often does not have site-specific data for lands they do not own. Since this document covers such a large area of California, the discussion spans several ecoregions each with distinctive characteristics. The California ecological classifications of Miles and Goudey (1997) summarize the regions; the specific summaries for regions relevant to the HCP are cited below.

SPI's Weaverville and Redding Districts cover lands in Trinity, Siskiyou, and western Shasta County, which fall in the Klamath Mountain range. (This roughly corresponds to the NSO Klamath and California Cascade Provinces in California). This range consists of Paleozoic sedimentary and volcanic rocks with some inclusions of Mesozoic ultramafic, granitic, volcanic, and sedimentary rocks. Forest vegetation is primarily a Douglas-fir – ponderosa pine type with tanoak, black oak, Oregon white oak, canyon live oak, and some sub-alpine communities. Winter snow at high elevations with rain at lower elevations creates seasonally rapid flows in and streams. Natural disturbance regimes include frequent, lightning caused fires in dry months and mass soil movement, often during wet months. Historically, fires in this region generally burned at mixed severity based on topography and climatic variables such as wind and relative humidity (Miles and Goudey 1997).

The region from Mount Shasta to the Lassen Peak area includes SPI's Lassen, Burney, and Almanor Districts in the Southern Cascades range. Soils in this region have been variously eroded and derived from Cenozoic volcanic activity. Natural vegetation forest types are Mixed-conifer (ponderosa pine, Douglas-fir, white fir, sugar pine, and incense-cedar), ponderosa – Douglas-fir, ponderosa pine, and red fir. Precipitation is abundant, up to 80 inches annually, with much of it falling as snow. Natural disturbance regimes are fire, volcanic activity, and a wide range of climatic conditions, which include drought periods followed by above average moist periods (Miles and Goudey 1997).

SPI's Stirling, Tahoe, Camino, Martell, and Sonora Districts lie within the Sierra Nevada range. Largely composed of Mesozoic granitic rocks; there are also inclusions of Mesozoic ultramafic, Paleozoic and Mesozoic metamorphosed sedimentary, and Mesozoic metamorphosed volcanic rocks. Soils are generally very productive for growing trees. Vegetation is dominated by the Mixed-conifer forest type, and smaller components of ponderosa pine, white fir, red fir, and lodgepole pine types. Precipitation ranges from 10 to 90 inches in non-summer months, with snow generally falling above 6,000 feet. Rivers flow from east to west in deep incised channels with a bedrock base into the Central Valley. Natural disturbance regimes include fire at all elevations. Historical fires were frequent and burned at low and moderate intensity with small

patches that burned at high severity. Recent burns are characterized as large, stand replacing fires, primarily because the natural fire return interval has been altered and areas of heavy fuel accumulation now occur across much of the landscape. Wide fluctuations in year-to-year rainfall are also considered a natural disturbance (Miles and Goudey 1997).

Throughout California, land use history including mining, settlements, water storage dams, livestock grazing, and logging have also shaped forest structure and vegetation types (Miles and Goudey 1997).

4.1. SPI Habitat Categories

This HCP uses SPI's categorization of forests in Habitat Forms to provide standardized definitions of habitat types. Habitat Forms are defined based on five land classes, along with tree size class, large tree component, canopy cover, and suitable nest structures. Definitions of these parameters and a short description of methods for determining the parameters for a stand are provided in Table 4.1 and Table 4.2.

Table 4.1. Definitions of Land Class Used to Develop Habitat Form Categories

Land Class	Description	Percent of SPI Ownership January 1, 2016
Mixed	Forest containing a mix of trees in various sizes and ages, often contains dbh of 12–24 inches and canopy cover over 50 percent. The older Mixed stands contain significant numbers of trees in dbh classes 22–40 inches dbh. Rarely contain trees ≥42 inches dbh. Includes presence of hardwoods, large snags, downed logs, and understory brush.	64
Inoperable	Forests not available for economic management due to location, condition, or physical constraints (e.g., un-roaded areas, areas with poor soils, or areas with low tree density). (Inoperable Land Class is counted as additional Mixed forest.)	5
Non-Forest	Lands that do not support conifer species (e.g., rock outcrops, talus slopes, quarries, grasslands, lakes, and wet meadows).	2
Regen	Regenerated forest stands, replanted with usually two or more conifer species. Generally, under 25 years of age. Trees in the stand are generally the same age and height, except for retained trees left behind after logging. As this land class ages, it moves into the Even land class.	28
Even	After Regen stands are mature enough to cruise for standard timber inventory, they are considered to be in the Even class. Typically, they are commercially thinned at 30–60 years and clearcut at 60–80 years of age.	1

dbh = diameter at breast height, SPI = Sierra Pacific Industries

Table 4.2. Definitions and Methods for Determining Forest Stand Parameters for Habitat Form Categories

Parameter	Measurement	Definition	Method
Tree Size Class	Quadratic Mean Diameter (QMD)	Mean diameter of trees in a stand, not including stems <5 inches dbh	Derived from SPI's intensive sampling system of actual tree diameters
Large Tree Component	Number of trees per acre exceeding large tree size threshold	Number of trees per acre ≥22 inches dbh	Estimated from SPI's intensive sampling system
Canopy Cover	Modeled Vertical Projected Canopy	Percent canopy cover	The cover value is derived from modeled vertical projection of canopy using tree inventory data from SPI's intensive sampling system
Suitable Nest Structure	N/A	Hardwood tree or snag ≥22 inches dbh, or one green conifer or snag ≥30 inches dbh. Trees of these size classes are potentially large enough and old enough to have been subjected to the processes that could cause a nest structure to develop.	Assumed that suitable nest structures exist if the stand includes trees meeting either one of the definitions. The SPI structure inventory from the Fisher Candidate Conservation Agreement with Assurances (Permit TE09082C-O) is included as Appendix 4.4.

DBH = diameter at breast height, N/A = not applicable, SPI = Sierra Pacific Industries

Virtually all nesting habitat for spotted owls on SPI property today is in the Mixed land class, existing as a legacy of past management. Prior to 1999, various owners harvested the lands currently owned by SPI using selection methods that removed large individual trees in repeated harvests during the past 50 to 100 years. Since 1999, SPI has been implementing an even-aged management strategy (clearcutting and regeneration of forest stands). The Mixed land class currently comprises about 69 percent of SPI's ownership. There are virtually no areas on SPI lands that have not been previously harvested or managed; no unentered old-growth forests remain.

SPI began its current practice of converting the Mixed land class over time into even-age stands with well-spaced trees as guided by the sustained yield plan approved in 1999 (see Appendix 4.5 for an example of the current publicly available SPI Option A document for the CAL FIRE Northern District). Because the conversion began less than 20 years ago, very few of the existing stands have yet grown from the Regen land class into the Even land class at this time. It is anticipated that regeneration harvest of trees in the Even land class will begin around 2060 as the earliest established plantations reach harvestable age (60 years). Since 1999, approximately 20 percent of the SPI land base has been planted to forest stands ranging from 0 to 17 years old. This includes all even-aged regeneration, both planned and as a result of wildfire. Approximately 7 percent of the land base was planted by prior owners as a result of planned even-aged harvests, wildfire rehabilitation, insect infestation or disease. As of January 1, 2016, these planted stands ranged in age from approximately 1 to 40 years of age.

At SPI's currently projected rate, approximately 55 percent of the land base will comprise even-aged timber stands with controlled stocking levels and spacing by the end of the 50-year permit term. Another 7 percent of the land base comprises older planted stands from prior owners where little effort was undertaken to control spacing. Approximately 14 percent of the Mixed forests is constrained by non-timber values, such as aesthetics, soil resources, wildlife, archeological sites, and water quality precluding intensive even-aged management. In these areas, the Mixed land class will be managed more slowly using techniques such as shelterwood steps or group selection[2]. An additional 12 percent of the entire SPI land base will never be harvested using even-aged management. These areas are predominantly located in watercourse and lake protection zones where long-interval, uneven-aged silviculture methods will be used. SPI generally reenters these areas on a 20-year cycle, except for WLPZs, which will be timed with adjacent even-aged entries at 40 to 50 years.

In total, 30 to 35 percent of the SPI land base will not be subject to clearcutting and approximately 43 percent of the existing Mixed stands will be retained throughout the permit period. It should be noted that these estimates do not precisely match values presented in Appendix 4.3 in Section 4.3.4 and Figure 4.3.11 where planned even-aged percentages are presented; those planned percentages are the maximum allowed but rarely achieved. During on-site harvest layout, areas are removed from planned even-aged harvest for many reasons; our experience is that number and size of units are typically a few less and smaller than originally planned. As an example, the first two decades of the Option A modeled a range of 38 to 43 percent evenaged harvests. Despite these planning estimates as shown in Table 4.3.1 and Table 4.3.3, only 29 percent of the total land base has actually been harvested into Regen and grown into the Even class by 2016.

SPI measures forest stand parameters during the intensive stand inventories conducted across the ownership. The inventory system consists of one sample point approximately every 4 acres on a predetermined grid, resulting in a total of about 400,000 plots (Figure 4.1). The example map shows SPI's grid-based inventory, with one sample point every 4 acres across the Plan Area. This density of sampling allows for the data-driven approach to Habitat Form development, mapping, and forest management.

[2] Shelterwood techniques involve removing mature trees in two or more cuttings to establish a new stand under the protection of the overstory. Group selection techniques involve removing trees in small groups within a stand to mimic natural, small-scale disturbance.

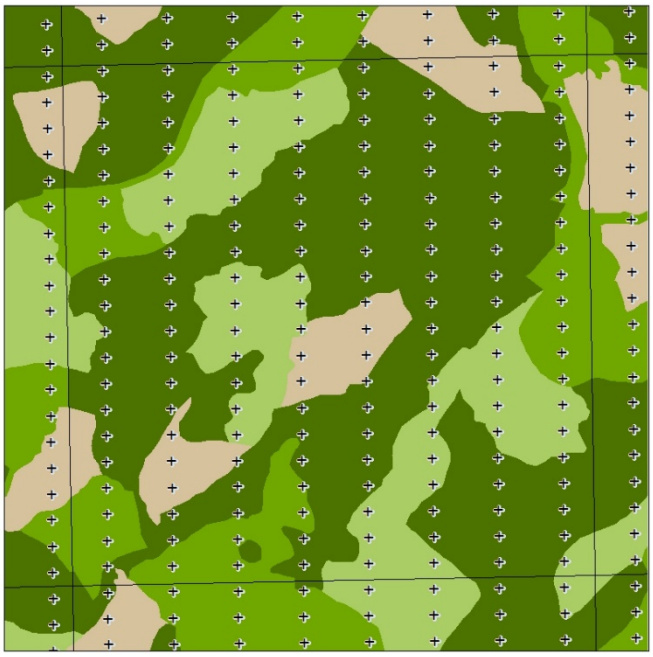

Figure 4.1. Example Map of SPI Inventory Plot Grid.
(Outlined square is a Section, approximately 1 square mile).

Using the land class and the forest stand parameters measured through the inventory system, SPI classified forest types based on parameters of forest stands (Table 4.2) used by wildlife species. These Habitat Form classifications are described in Table 4.3. The forested Habitat Forms range from Habitat Form 1 (young forest) to Habitat Form 4 (high canopy cover, large tree forest). Derivation of the Habitat Form classification system is described in Appendix 4.1. This system was based upon the California Wildlife Habitat Relationships system (Mayer and Laudenslayer 1988) and further refined using inventory data on SPI lands and with data collected at reproductive sites of six wildlife species associated with large tree, closed canopy forest stands (Appendix 4.2). The relationship between these Habitat Forms and the definition of NSO and CSO habitats is described in Sections 4.2 and 4.3.

Table 4.3. Habitat Forms Definitions and Spotted Owl Habitat (January 1, 2016).

Habitat Form	Minimum QMD and Percent Canopy Cover [a]					Spotted Owl Habitat	Percent of Plan Area (by E and M; and by E and M within the HF)
Early Seral Forest (HF1)	HF1 stands usually result from even-aged clearcut harvesting, brush field conversion, or reforestation following wildfire. The HF1 persists for 10 to 20 years depending on soil classification. HF1 stands gradually grow to HF2 following pre-commercial thinning at age 8 to 15. HF1 Even is composed of planted forests. HF1 Mixed is composed of montane chaparral or early seral conditions (not planted; no age).					No NR habitat. Prey species associated with HF1.	13% (11% E, 2% M); within HF1: 88% E, 12% M
Small Tree, High Canopy Cover Forest (HF2L)	Mixed, Regen, or Even land class with a stand QMD 6 to 10.9 inches dbh and ≥40 percent canopy cover. HF2L stands in Mixed class vary between 30 to 90 years old and contain large trees, especially hardwoods and, based upon sampling, contain potential nesting structures for spotted owls. HF2L in Even class are between 15 and 30 years old.					Dispersal. Prey species associated with HF2L.	28% (14% E, 14% M); within HF2L: 49% E, 51% M
Medium Tree, High Canopy Cover Forest (HF2H)	Mixed or Even class with a stand QMD of 11 to 12.9 inches dbh and ≥50 percent canopy cover. HF2H stands in Mixed class may have trees greater than 22 inches dbh but not enough to reach a stand QMD of 13 inches dbh. HF2H stands grow into HF4 over time when left uncut. HF2H stands in Mixed class average >100 years old and contain many large trees, especially hardwoods and, based upon sampling, contain numerous potential nesting structures for spotted owls. HF2H in the even land class are between 25 and 40 years old.					NR, foraging, and dispersal. Prey species associated with HF2H.	26% (3% E, 23% M); within HF2H: 11% E, 89% M
Open Forest (HF3)	Mixed or Even land class with a stand QMD ≥6 inches dbh and canopy cover of 10–39 percent. HF3 stands may have trees ≥22 inches dbh, but not enough to exceed 40 percent canopy cover. HF3 dominant trees vary in age from 60 to 120 years old					Foraging and likely dispersal. Prey species associated with HF3.	7% (0% E, 7% M); within HF3: 0% E, 100% M
Large Tree, Closed Canopy Cover Forest (HF4)	Mixed >120 years old	Canopy cover ≥60 percent	QMD ≥13 inches dbh	At least 9 trees ≥22 inches dbh/acre	At least 1 suitable nest structure per stand	NR, foraging, and dispersal. Prey species associated with HF4.	23% (0% E, 23% M); within HF4: 1% E, 99% M
	Even projected >35+ years old	Canopy cover ≥60 percent	QMD ≥13 inches dbh	At least 20 trees ≥22 inches dbh/acre			
Non-Forest (HF5)	Non-forest areas, cliffs, caves, talus slopes, open water						2% (100% M)

[a] Age of Mixed land class in this table are reasonable estimates. SPI does not measure age on Mixed inventory plots; age in Even land class is established from planting date. See Table 4.1 for land class definitions.

dbh= diameter at breast height, E = Even; HF = Habitat Form, M = Mixed, NR = nesting and roosting, QMD = quadratic mean diameter

4.2. Northern Spotted Owl Habitat in the Plan Area and Action Area

Since 1990, SPI has provided a minimum of 18 acres of no-harvest protection around all documented NSO ACs and modified harvest levels for the 72-acre area that included this nest protection. These protections increased over time under the direction of the Service. These current limitations are found in USDI (2009) (the NSO take guidance document). The combination of the Service's guidelines and the requirements of SPI's state-approved sustained yield plan, such as restrictions on harvest on adjacent lands, protection of watercourse zones, and requirements for sustainable harvest levels, has resulted in acreages of NSO nesting habitat around NSO ACs even greater than those resulting from the Service's guidance (USDI 2009). Much of the USFS land within the Action Area has not been harvested to a significant degree in the last 20 years (Davis et al. 2016).

4.2.1. Habitat Form 4 and NSO

Habitat Form 4 (HF4) comprises approximately 56,808 acres of the Plan Area within the range of the NSO. This area accounts for roughly 15 percent of the total acreage of the Plan Area within the range of the subspecies. All of this Habitat Form is in the Mixed land class. To see average diameter frequency distributions across the Plan Area for SPI HF4 (and HF2H), please see Appendix 5.8.

The HF4 stands have a minimum of 60 percent canopy cover (using SPI's vertical projection methodology; see Appendix 4.1). The HF4 stands have a threshold QMD of 13 inches and a threshold of 9 trees (in the mixed land class) or 20 trees (in the even land class) per acre greater than 22 inches dbh. By comparison, the Service's NRF definition uses 60 to 80 percent canopy cover, and an average dbh of 16.5 to 24 inches with large trees defined as ≥26 inches dbh (USDI 2009). SPI criteria for HF4 habitat are based in part upon the attributes of stands where NSO nests are known to occur on SPI lands (Appendix 4.2).

On SPI lands, 26 NSO reproductive nest sites examined had an average canopy cover at nest sites of 95 ± 5 percent, an average QMD of 16.7 ± 4.9 inches, and an average of 19 ± 12 trees per acre that were greater than 22 inches dbh (Appendix 4.2). This indicates that SPI lands classified as HF4 consistently have many locations within them that exceed the minimum requirements for the category and provide suitable NRF habitat for NSO.

NSO are known to forage in mature stands with high degree of canopy cover, and therefore, based on the Service's criteria, HF4 stands provide foraging habitat. Use of HF4 as foraging habitat was documented by a GPS study (Raphael et al. unpublished data, Appendix 3.6). NSO dispersal habitat has 40 percent canopy cover and an average dbh of approximately 11 inches (Thomas et al. 1990; USDI 2011), and therefore HF4 stands also provide for dispersal habitat.

4.2.2. Habitat Form 2 Heavy and NSO

The SPI Plan Area includes approximately 113,690 acres of Habitat Form 2 Heavy (HF2H) within the range of the NSO, which accounts for 30 percent of the total acreage of the Plan Area within the range of the subspecies. Of the current HF2H, 89 percent is in Mixed and 11 percent is in Even land classes.

The HF2H stands have a minimum of 50 percent canopy cover and a threshold QMD of 11 inches. The HF2H stands in the mixed land class have low numbers of large trees (≥22 inches dbh) that may provide nesting and roosting structures, yet NSO nests are known to occur in this type on SPI lands (Table 4.6). In addition, HF2H stands provide for foraging and dispersal habitat. Based on canopy cover and QMD, HF2H provides "low quality foraging habitat" under Service guidelines (USDI 2009). The NSO GPS study found that HF2H was used in approximate proportion to availability at the 25 percent, 50 percent, and 95 percent kernel scales(Raphael et al. unpublished data, Appendix 3.6).

4.3. California Spotted Owl Habitat in the Plan Area and the Action Area

Since 1999, SPI has provided a minimum of 18 acres (500-foot radius) of no-harvest protection around all CSO ACs located by surveys near operations. The requirements of SPI's state-approved sustainable yield plan, such as adjacency restrictions on harvest units, protection of watercourse zones, and requirements for sustainable harvest levels, has resulted in additional nesting habitat around CSO ACs. Since 2004, CSO ACs on USFS land have had 300-acre protection zones (PACs) around them, and 600- to 2,400-acre home range core area (HRCA) around each PAC. Between 1999 and 2014, the dominant prescriptions on USFS lands in the Sierra Nevada were commercial thinning associated with CSO guidelines, which focused on forest thinning to meet fuels reduction objectives, and post-fire salvage logging (North et al. 2017b).

4.3.1. Habitat Form 4 and CSO

An estimated 299,294 acres (about 25 percent) of the Plan Area within the range of the CSO are in HF4 (Mixed). Studies of CSO habitat (as described in Section 3.2.2) indicate that nesting habitat has a high amount (75 percent) of canopy closure, large trees greater than 24 inches dbh, and stands composed predominantly of 12 to 24 inches dbh trees (citations summarized in Roberts 2017). SPI's HF4 threshold definition matches closely with these parameters, as HF4 stands have a minimum of 60 percent cover (as measured by SPI's vertical projection method; see Appendix 4.1), a QMD of at least 13 inches, and a threshold of 9 trees (Mixed land class) or 20 trees (Even land class) per acre greater than 22 inches dbh. In addition, the stand must contain at least one tree or snag that is large enough to provide a nest structure to qualify as HF4. Within SPI lands, 106 CSO reproductive nest sites examined had an average canopy cover

91 ± 7 percent, an average QMD of 17.7 ± 3.2 inches, and an average of 31 ± 14 trees per acre that were greater than 22 inches dbh (Appendix 4.2). This indicates that SPI lands classified as HF4 consistently have many locations within them that exceed the minimum requirements for the category and provide suitable NRF habitat for CSO.

Studies of CSO foraging behavior have indicated that, at the home range scale, CSO select mature forest with medium and high canopy cover as well as using younger stands (Irwin et al. 2007; Williams et al. 2011; Atuo et al. 2018; Raphael et al. unpublished data, Appendix 3.8). HF4 stands include the parameters described by these studies and provide CSO foraging habitat. HF4 also meets the criteria for spotted owl dispersal habitat described by Thomas et al. (1990).

4.3.2. Habitat Form 2 Heavy and CSO

HF2H comprises an estimated 295,861 acres (about 25 percent) of the Plan Area within the range of the CSO (89% Mixed and 11% Even). HF2H stands have a minimum of 50 percent canopy cover and a minimum QMD of 11 inches. Some HF2H stands in the mixed land class have large trees (SPI's definition of 22 inches or greater dbh), and some CSO nest sites are known to occur within this type. In addition, HF2H stands provide for foraging habitat within stand parameters as described by Irwin et al. (2007), Williams et al. (2011), and Raphael et al. (unpublished data in Appendix 3.8) and were shown to be selected for in Atuo et al. (2018). The CSO GPS study found that HF2H was used in approximate proportion to availability at the 25 percent, 50 percent, and 95 percent kernel scales Raphael et al. (unpublished data in Appendix 3.8). HF2H also meets the criteria for spotted owl dispersal habitat described by Thomas et al. (1990).

4.4. SPI Baseline Hexagon Analysis

In order to evaluate the distribution of existing NSO and CSO suitable habitat, and to project and track these quantities over the 50-year term of the HCP, SPI developed a hexagon analysis tool. Since adjacent hexagons share a side and are comparable to circles, the use of hexagons is warranted to avoid overlap or gaps in any area analysis. The same tool is in use in implementation of SPI's Fisher CCAA (SPI 2017). SPI will briefly describe the hexagon analysis method in this section, along with the results of analyses relevant to the description of the Environmental Baseline for the HCP. Rationale for various criteria used in the hexagon analysis are described in Appendix 4.3. More detailed description and results of projections of future habitat using this analytical tool are provided in HCP Section 5 (the Conservation Strategy).

Based on rationale described in Appendix 4.3, SPI established a network of 500-acre hexagons across the entire SPI ownership and areas adjacent ranging from 0 to 0.5 miles from SPI lands. After intersection with the Plan Area, hexagons with no SPI ownership were removed from further analysis. Forest stands on SPI lands that fell within analyzed hexagons were delineated, and aggregated data from SPI's forest inventory point plots were integrated into the hexagon analysis areas. The use of a hexagon network avoids overlap (which would result in double-

counting errors) and gaps (which would cause omission errors). To describe the baseline condition, hexagons were then evaluated based on the amount of existing potentially suitable spotted owl habitat (HF4 and HF2H) on SPI lands, as further detailed below. SPI does not include lands outside its managed lands in the quantification of habitat forms and hexagon types, as described in more detail in Appendix 4.3. The available data on adjoining ownerships in the hexagons were not sufficient to use in classification or to estimate growth. When the HCP describes habitat within a hexagon, it is always referring to habitat only on the SPI portion (Plan Area) of the hexagon.

Hexagons in the analysis were categorized as Nest Hexagons, Support Hexagons, or as currently Below Threshold Hexagons. Nest and Support categories were based on the criteria in Table 4.4, using only SPI lands within the hexagon. The rationale for these criteria is described in Appendix 4.3.

Table 4.4. Definitions of Spotted Owl Nest and Support Hexagons.

Hexagon Type	Habitat Conditions	Requirements
Nest	a) At least 30 percent HF4	Must meet all three conditions (a, b, and c) under Habitat Conditions, and must include greater than100 acres of SPI land (Plan Area).
Support	b) At least 50 percent HF4 and/or HF2H c) at least one contiguous area (a potential nest stand) of at least 50 acres that includes at least 30 acres of HF4 and 20 acres of HF2H	Must meet one of the following options from the Habitat Conditions: • Conditions a and b. • Conditions b and c. • Condition b only.

HF4 = Habitat Form 4, Large Tree Closed Canopy Forest, HF2H = Habitat Form 2, Medium Tree, High Canopy Forest

At the hexagon scale, the thresholds for the Habitat Forms (Table 4.4) are the approximate minimum amounts of habitat to potentially begin to function as spotted owl nesting sites. These threshold criteria are not management goals; instead they provide a means of accounting for current and future habitat conditions. As further described in Section 5 and Appendix 4.3, current habitat amounts within hexagons average substantially higher than the defined minimum thresholds.

To qualify as a Nest Hexagon, on SPI land there must be at least one contiguous area (a potential nest stand) of at least 50 acres that includes at least 30 acres of HF4 and 20 acres of HF2H; overall at least 30 percent HF4, and a combined HF4 and HF2H total of at least 50 percent of the hexagon area. Habitat in a Support Hexagon provides support for nest hexagons by including surrounding high canopy cover, occasional use for nesting and roosting, and stands that will grow into nesting habitat in a relatively short period. To qualify as a Support Hexagon, on SPI land there must be a combined HF4 and HF2H total of at least 50 percent of the hexagon area. The 2016 starting classification of all hexagons in the network is shown in Table 4.4(a).

Table 4.4(a). Classification of Hexagons (2016)		
Hexagon Type	**Hex Count**	**Percentage**
Nesting	1,438	27%
Support	1,377	25%
Below Threshold	2,495	47%
Net Classified	5,260	80%
<50 acres SPI land (AIC)	1,324	20%
Total Hex Network	6,584	100%
Nesting & Support	2,765	53%

To establish the correspondence of the hexagon system to the actual presence of spotted owls, the 199 known ACs located on SPI lands were evaluated with respect to their occurrence in hexagons qualified as "Nesting" or "Support." Table 4.5 indicates that 83.9 percent of the two-subspecies' current ACs occur in either Nest or Support Hexagons, as defined by the thresholds. The remainder of the ACs occur in hexagons with less habitat than the thresholds.

Table 4.5. Spotted Owl ACs (2018) and Hexagon Classifications (January 1, 2016).			
Northern Spotted Owl			
Hexagon Class	**AC Count**	**Percentage**	**Nesting and Support Combined**
<50 Acre of SPI Hexagon	0	0	58.8 percent
Currently Below Threshold	7	41.2	
Support	4	23.5	
Nesting	6	35.3	
NSO Total	17	100	
California Spotted Owl			
Hexagon Class	**AC Count**	**Percentage**	**Nesting and Support Combined**
<50 Acre of SPI Hexagon	4	2.2	86.3 percent
Currently Below Threshold	21	11.5	
Support	25	13.7	
Nesting	132	72.5	
CSO Total	182	100	
All Spotted Owls			
Hexagon Class	**AC Count**	**Percentage**	**Nesting and Support Combined**
<50 Acre of SPI Hexagon	4	2.0	83.9 percent
Currently Below Threshold	28	14.1	
Support	29	14.6	
Nesting	138	69.3	
NSO and CSO Total	199	100	

AC = Activity Center; CSO = California spotted owl; NSO = northern spotted owl; SPI = Sierra Pacific Industries

The hexagons containing the 182 CSO ACs that are on SPI lands are described in Table 4.5. 72.5 percent of the CSO ACs are in hexagons that qualify as nesting. Of the hexagons containing

the 17 NSO ACs only 35.3 percent of the NSO ACs are in hexagons that qualify as nesting. This condition is driven primarily by the checkerboard ownership pattern and the different management histories on those areas (Figure 4.2). SPI's methodology likely underestimates the actual number of hexagons that might qualify as Nest and Support Hexagons, because SPI does not include lands outside its managed lands in the quantification of habitat forms and hexagon types, as described in more detail in Appendix 4.3.

In Figure 4.2, the left image has SPI land mixed in a checkerboard pattern; the image on the right has a more contiguous ownership pattern.

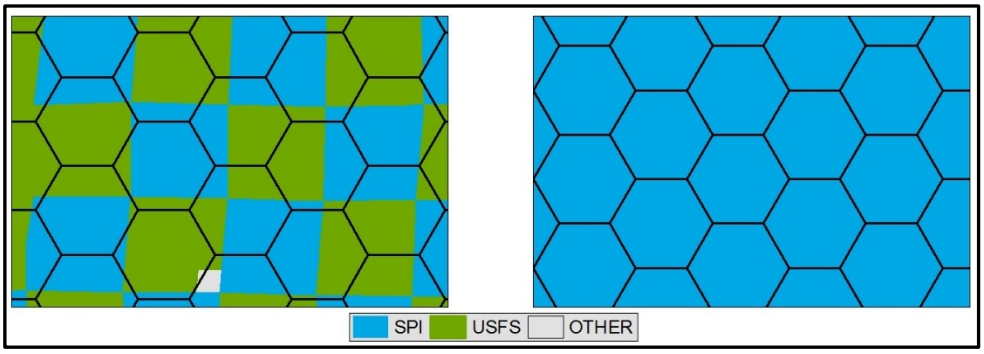

Figure 4.2. Hexagons and Ownership Pattern.

Table 4.6 describes the 199 ACs on SPI lands in terms of the Habitat Form at the AC, and the Hexagon Class within which the AC resides. Despite the differences in sample size for NSO and CSO, they are quite similar in terms of the combined HF2H and HF4. Combining NSO and CSO ACs, 93.0 percent of the ACs occur in HF4 or HF2H. The additional 7.0 percent of the ACs occur in locations where the nest or AC is located in an area where QMD of the entire stand is not large enough to classify stands as HF2H or HF4.

The most recent complete habitat dataset for the entire ownership has been updated to 2016. That dataset was used to establish the baseline condition for Hexagons in the Plan Area (and edges of the Action Area).

Table 4.6. Habitat Forms at Activity Centers Grouped by Hexagon Type and Subspecies (January 1, 2016)						
NSO ACs by Habitat Forms						
Hexagon Class	**HF1**	**HF2L**	**HF3**	**HF2H**	**HF4**	**Total**
<50 Acre of SPI Hexagon	0	0	0	0	0	
Currently Below Threshold	0	2	0	4	1	7
Support	0	1	0	3	0	4
Nesting	0	0	0	3	3	6
Total	0	3	0	10	4	17
Percentage	0%	18%	0%	59%	24%	100%
	Combined HF4 and HV2H 82.4%					–
CSO ACs by Habitat Forms						
Hexagon Class	**HF1**	**HF2L**	**HF3**	**HF2H**	**HF4**	**Total**
<50 Acre of SPI Hexagon	0	0	0	0	4	4
Currently Below Threshold	0	6	1	3	11	21
Support	0	1	1	13	10	25
Nesting	0	1	1	12	118	132
Total	0	8	3	28	143	182
Percentage	0%	4.4%	1.6%	15.4%	78.5%	100.0%
	Combined HF4 and HV2H 93.4%					–
ALL Spotted Owl ACs by Habitat Forms						
All ACs	**HF1**	**HF2L**	**HF3**	**HF2H**	**HF4**	**Total**
<50 Acre of SPI Hexagon	0	0	0	0	4	4
Currently Below Threshold	0	8	1	7	12	28
Support	0	2	1	16	10	29
Nesting	0	1	1	15	121	138
Total	0	11	3	38	147	199
Percentage	0%	5.5%	1.5%	19.1%	73.8%	100%
	Combined HF4 and HV2hv 93.0%					–

AC = Activity Center; CSO = California spotted owl; NSO = northern spotted owl; SPI = Sierra Pacific Industries

HF1 = Habitat Form 1 – early seral, HF2L = Habitat Form 2 - small trees, HF3 = Habitat Form 3 - open forest, HF2H = Habitat Form 2, - medium trees, HF4 = Habitat Form 4 – large trees

As described in greater detail in Appendix 4.3, we aggregated two adjacent qualifying 500-acre hexagons (1,000 acres) into Potential Habitat Areas (PHAs) that will serve as the unit of landscape measure for baseline habitat and habitat trends. A PHA at a minimum is composed of one Nest Hexagon and one Support Hexagon, for a total of 1,000 acres, of which 50 percent meets the thresholds for the two hexagon types described above, and contains a minimum of 250 acres of SPI land. The average PHA over the permit term contains over 650 acres of SPI land (Appendix 4.3 Table 4.3.11).

SPI used these Nest and Support Hexagon definitions to estimate the number of PHAs in the following steps:

1. Define the spatial extent of each habitat component;

2. Describe the characteristics and amount of suitable habitat at each at the three scales: nest stand, nest hexagon, and PHA; and

3. Estimate the present number of PHAs based on SPI's contribution of such habitat configurations in hexagons on the Plan Area.

These 500-acre hexagons will be used for analyzing the Plan Area for presence of PHAs over the term of the agreement. PHAs will be the metric for monitoring the achievement of Conservation Measure 1.

5. CONSERVATION STRATEGY

This section describes the detailed conservation strategy that SPI proposes to implement in the Plan Area during the term of the ITP.

The intent of SPI's conservation strategy over the permit term is to:

1. Maintain landscape-scale habitat conditions equivalent to habitat currently used by spotted owls on SPI lands,

2. Increase opportunities for spotted owl occupancy,

3. Recover lands degraded by catastrophic events to provide future owl habitat, and

4. Minimize and mitigate impacts to spotted owls that result from the Covered Activities.

SPI will maintain or enhance habitat for both the NSO and CSO by protecting habitats at occupied ACs and maintain or increase habitat at the landscape scale with the goal of increasing PHAs for spotted owls over time. The conservation strategy also will contribute to the scientific knowledge base for the potential future management of spotted owls as well as BDOWs.

The biological goals and objectives of an HCP may be either habitat or species based (HCP Handbook, USDI 2016). SPI describes biological goals in this plan in terms of quantity and quality of habitat (expressed in number of PHAs). Research on spotted owls has found that variations in demographic performance may be related to temporal, geographic, and physical variations in prey availability and weather in addition to amounts and quality of habitat types available (Franklin et al. 2000; Blakesley et al. 2005; Dugger et al. 2005; Tempel et al. 2016, Hobart et al. 2019b). Other than attributes that result from forest management, these variables are outside SPI's control.

The primary biological goal of the plan is to maintain and create amounts of habitat contributing to territories for spotted owls that include nesting/roosting stands, territory core areas, and territory support areas, with sufficient foraging habitat to support reproductive spotted owls and their offspring. SPI will evaluate future suitable habitat using currently occupied ACs to guide evaluation criteria. The ACs in SPI study areas have a varying history of occupancy and reproduction, and recent analyses have indicated that these populations had "essentially level" occupancy in recent years (2011–2012 through 2017) (Hobart et al. 2019a; Baldwin and Raphael unpublished data, Appendix 3.2).

At time of preparation of this HCP, the State CESA and Federal ESA prohibitions against take of the Covered Species exist only for the NSO, either directly or via habitat modification. Current NSO take avoidance guidance from the Service and CFPRs requires direct protection of nest

sites and prescribed habitat amounts near ACs and within representative home range circles; surveys are necessary to locate these sites for protection. If the CSO is listed, similar prohibitions and protections will likely come into effect for the subspecies. Most of the HCP Conservation Measures that SPI is committing to under this HCP provide protections that may exceed the take avoidance measures in some cases or address subjects that are not included in the present State and Federal statutory and regulatory requirements regarding take of listed spotted owls.

A portion of the Conservation Measures of this HCP (Retention Standards, found in Section 5.2.7 and Section 5.2.3) arise from the voluntary decision SPI made to sign the fisher CCAA (Permit TE09082C-O). These specific measures are enforceable as permit conditions until November 2026. Including them in this HCP extends these requirements for the HCP 50-year permit period.

5.1. Biological Goals and Objectives

The biological goals set forth below define the expected outcome of this conservation plan. These goals are broad, representing the guiding principles for operation of the conservation approach and forming the basis for the avoidance, minimization, and mitigation strategies employed. The biological objectives represent the means through which the biological goals will be achieved and provide a basis for measuring progress toward and achievement of those goals. The biological goals and objectives of this conservation plan are:

- Goal 1: Increase the amount and distribution of habitat contributing to survival and reproductive capacity of CSO and NSO on the Plan Area over the permit term. This goal should promote potential population growth of both subspecies. The primary objective for this goal is to implement habitat management and protection strategies that will identify, maintain, restore, and increase aggregations of habitat measured in NSO and CSO PHAs on the Plan Area. A corresponding objective is to decrease the likelihood of harm (take due to habitat modification) to owls at existing occupied ACs as measured by projected and actual reduction of condition of Occupied Hexagons and to increase the quantity and distribution of PHAs, thus offsetting the impacts that may result from timber harvest. This goal and accompanying objectives will be accomplished through Conservation Measures 1, 2, 3, and 4, further discussed below in Sections 5.2.1, 5.2.2, 5.2.3, and 5.2.4.

- Goal 2: Avoid direct CSO and NSO mortality related to timber harvest and illegal activities on the Plan Area and the surrounding Action Area. The objective of this goal is to implement protective measures that will minimize the likelihood of killing or injuring CSO and NSO. This Goal and accompanying objectives will be carried out through Conservation Measures 5 and 6, further discussed below in Sections 5.2.5 and 5.2.6.

- Goal 3: Protect habitat elements in current stands and provide key owl habitat needs and specific habitat elements in future timber stands. The objective for this goal is to implement habitat management and protection/retention measures during timber

harvest, including salvage, to facilitate accelerated development of foraging habitat and nesting/roosting habitat for spotted owls. This goal and accompanying objectives will be achieved through Conservation Measure 7 further discussed below in Section 5.2.7.

- Goal 4: Implement a BDOW research program that examines important aspects of the BDOW invasion of spotted owl habitat in California. The objective for this goal is to conduct a research program under appropriate permits from state and federal agencies, carried out through Conservation Measure 8 and discussed below in Section 5.2.8.

The approach outlined above is based on three important biological requirements: (1) sufficient prey resources will be available on the Plan Area within habitats at various ages and management histories; (2) sufficient structures for nesting and roosting will be available on the Plan Area in forest stands of certain types; and (3) the amount and spatial arrangement of habitat in both Mixed and Even land classes at scales relevant to owl territories will be available and accurately estimated at the time of permit issuance and, projected with reasonable accuracy into the future. Use by spotted owls will be monitored with sufficient accuracy to verify performance in the future. (See Section 6.7, Monitoring of Even Habitat Use by Spotted Owls).

An important element of the HCP land management strategy is the assumption that prey species exist in Mixed, Even and Regen land classes on SPI lands. Prey remains collected in spotted owl ACs on and near SPI lands include several prey species known to inhabit habitat types consistent with these land classes (see Spotted Owl Prey Analysis, Appendix 3.7). Isotopic analysis of feathers collected from spotted owls indicated that these owls consumed significantly more woodrats and pocket gophers in landscapes with stable (national parks) and high-occupancy (private lands) populations than in landscapes with declining owl populations (National Forests) (Hobart et al. 2019b). SPI's nocturnal telemetry studies found both NSO and CSO presumably foraging in a variety of habitat types (thus indicating the prey identified in pellets and the stable isotope analysis were available in those areas) (Hobart et al. 2019b; Atuo et al. 2018; Appendix 3.6 and Appendix 3.8, GPS Telemetry Studies). Mixed, Even and Regen land classes will remain abundant during the permit term (Appendix 4.3). Another key element of the HCP land management strategy is that nesting structures are and will be available in Mixed stands of HF4 and HF2H (Appendix 4.4, SPI Structure Inventory). This conclusion is supported by descriptive data from nest sites on SPI lands reported in Section 3, Tables 3.1, 3.2, 3.3, and in the inventory reported in Nesting/Denning Structure Presence and Abundance Survey in Covered Species Conservation Areas (Appendix 4.4). Even-origin stands are also expected to provide nesting structures as a result of the Conservation Measure 7 (Section 5.2.7, Element Retention) and further described in Appendix 4.6 (Even Narrative).

Distribution of existing habitat is described in the results for the GNN research project as well as in the GPS tracking research on owls conducted in the 2017 field season in conjunction with the USFS (Atuo et al. 2018; Appendix 3.4, Appendix 3.6, and Appendix 3.8). Section 3 of the HCP describes size of spotted owl core use areas and territories derived from analyses by other researchers and by SPI.

The estimation of the representative size and characteristics of potential nest stands, Nesting Hexagons, Support Hexagons, and PHAs is for the purpose of producing a quantified estimate of the number of aggregations of habitat that contribute to spotted owl territories that SPI will provide within each qualifying hexagon. This method of accounting for spotted owl habitat (based upon individual hexagons) also provides a means of estimating potential future harm and annual tracking of harm by habitat modification supported by pre-project spotted owl surveys (Appendix 4.3).

5.2. Conservation Measures

5.2.1. Conservation Measure 1: Increase Potential Habitat Areas (PHAs) Across the Landscape Over the Permit Term

This primary Conservation Measure provides that SPI will increase the amount and distribution of habitat contributing to survival and reproduction of CSO and NSO on the Plan Area over the permit term. SPI will implement habitat management and protection strategies that will identify, maintain, restore, and increase aggregations of habitat accounted for by NSO and CSO PHAs in the Plan Area. Over the permit term, SPI will increase aggregations of habitat (as measured by the number of PHAs and the proportion of SPI lands contained within PHAs) composed of at least 50 percent nesting habitat (HF4 and HF2H) (described in detail in Appendix 4.3). Habitat acres qualifying as a PHA are projected to nearly double (from 589,642 to 1,135,604 acres) during the permit period. The number of PHAs is projected to decrease by approximately 4 percent from 870 down to 832 over the first 2 decades, followed by an upward trend that will result in a final total of 1,729 (199 percent of the starting PHA count), over the permit term (Table 5.2, Figure 5.3, and Figure 5.4; for more detail see Appendix 4.3). Importantly, the net increase in PHAs is projected to occur throughout the range of both CSO and NSO on the Plan Area. As shown in Table 4.3.12 of Appendix 4.3, the proportional increase of PHAs in spotted owl high density areas will be greater than the proportional increase in low density areas. As a key part of this process, habitats for prey species will be produced and maintained through time. Other habitat elements also are important for potential use by spotted owls and are discussed under additional specific Conservation Measures below.

Implementation of this Conservation Measure will be monitored through annual updates of habitat changes and PHA counts via hexagon analysis and the quantification of actual annual harvesting. An overview of the results of the projected PHA analysis is presented in Section 5.3 in Table 5.2, Table 5.3, Figure 5.3, and Figure 5.4 (See Appendix 4.3 for more detail).

5.2.2. Conservation Measure 2: Protection of Habitat at Known Spotted Owl ACs and Surrounding Areas

Conservation Measure 2 also contributes to achieving the first biological goal, by minimizing the potential to take spotted owls by habitat modification. While Conservation Measure 1 provides for maintenance and increase of habitat at the landscape scale regardless of presence of spotted owl ACs, Conservation Measure 2 provides direct protection of habitat around occupied spotted owl ACs by controlling habitat modification near nesting sites and in larger areas around ACs.

Protections at the AC Scale

Under this Conservation Measure, all occupied (known and newly discovered) NSO and CSO ACs will receive a Protection Zone (PZ) where only very limited harvest is allowed. Justification, standards, restrictions on harvest, and methods for designating PZs are presented in Appendix 5.2 (Protection Zones), which was reviewed by the Service and CDFW during HCP development. PZ designation has no authority outside of the Plan Area (i.e., on lands not owned by SPI).

For the analysis in this HCP, SPI already has established PZs at 428 occupied spotted owl ACs on or within 0.25 mile of the Plan Area. The PZs are established without considering ownership at a minimum of 72 acres. Of the initial 367 PZs that overlap SPI lands, SPI ownership averages 59 acres (range from 1 to 187 acres), (The SPI contribution is 60 percent of the average 98-acre PZ). Most vegetation-disturbing activities on SPI land will be precluded in all PZs. If an AC has been determined to be unoccupied by 3 consecutive years of SPI protocol surveys, the AC PZ is removed. As designated, these 367 PZs contain 21,747 acres of SPI lands. Exceptions related to potentially increasing numbers of PZ designations are described in HCP Section 7 (Changed Circumstances).

It is possible that spotted owls will move their ACs or that the total number of ACs will decline such that total acres of PZs would fall below 80 percent of the baseline value for either subspecies (19,245 acres for CSO and 2,502 acres for NSO). In such an event, SPI will retain at least 80 percent of each subspecies' baseline PZ acreage, and may re-allocate retained acres to existing PZs or retain recently retired PZs, with Service concurrence. Based on continued research, other modifications to PZ size could also be considered.

Protections at Hexagon Scale

Around present and future occupied ACs of CSO (367 in 2018) and NSO (61 in 2018) (i.e., in Occupied Hexagons as described in Appendix 4.3), reduction of HF4 and HF2H below prescribed threshold levels will be assessed as incidental take via habitat modification (harm). These thresholds are described in Section 5.4 and in greater detail in Appendix 4.3. Since a limited amount of incidental take will be authorized under the ITP, these thresholds will limit the overall amount of habitat modification at the landscape scale as provided by Conservation Measure 1.

Conservation Measure 2 will also provide several different levels of protection and management specific to NSO in the Action Area. These measures are designed to reduce take of NSO that

may occur on or near SPI lands. As described in greater detail in Appendix 5.3, the different levels of protection for NSO are termed "Tiers." To inform assignment of NSO ACs to various Tiers, SPI developed a ranking system for all valid NSO ACs within the HCP Action Area. This ranking system was refined using input from the Service's Yreka Fish and Wildlife Office and US Forest Service (USFS) staff biologists. Data were compiled for each of the 164 NSO ACs that fall within the Plan Area and Action Area, and each NSO AC was placed in one of four tiers based on the qualities of the site. All Tier 1 ACs and their best available habitat designations were individually reviewed by Service and CDFW staff and are included in Appendix 5.3 (Tiering Analysis). The Tiers were classified and assigned as follows:

Tier 1 ACs receive the highest level of protection. Within the 1.3-mile-radius circle representing the home range ("home range circle") surrounding the AC (USDI 2009), the best available habitat was identified for retention up to a target of 1,336 acres regardless of ownership. These areas were then intersected with SPI ownership to determine SPI's proportional amount of the areas identified. The portion of these lands on SPI are designed to serve as a long-term habitat refugia in the HCP. There are 11,762 acres of this habitat on the Plan Area and other portions are on the Action Area. Among the 34 ACs in this Tier, the average Plan Area acreage designated is 346 non-overlapping acres (minimum = 69 acres; maximum = 1,106 acres). In the 11,762 acres of habitat designated around Tier 1 ACs, SPI will not conduct harvest regardless of occupancy status within these designated areas for the duration of the permit, except salvage operations in Substantially Damaged Timberlands and for minor modification of habitat following analysis of potential impacts of such modification and Service review as described in Appendix 5.3 (Tiering Analysis).

Tier 2 ACs will be maintained within the habitat objectives described in Conservation Measure 1 (i.e., a landscape that will maintain, increase, or make progress toward consisting of 50 percent combined HF4 and HF2H on SPI land, as measured by the PHA process described in Appendix 4.3). PZs will be designated for all occupied Tier 2 ACs. Habitat modification in Occupied Hexagons that include Tier 2 ACs will be subject to the threshold levels for HF4 and HF2H, and will be subject to the limits of the ITP.

Tier 3 ACs are established where the amount of SPI land within the home range circle surrounding the AC is insignificant. NSOs at such ACs are considered not likely to be taken by Covered Activities because habitat modification by SPI could have only a minor effect on the home range circle. If an NSO AC meeting Tier 3 standards moves onto or within 0.25 mile of the Plan Area, a PZ would be designated, and habitat modification around the AC would be subject to the limits of the ITP.

Tier 4 ACs were considered low conservation value in the context of this HCP. Several circumstances, either alone or in combination, led to the determination that Covered Activities are not likely to result in take of NSO that may be associated with ACs in Tier 4. If a Tier 4 AC is determined to be reoccupied and is on or within 0.25 miles of the Plan Area, a PZ will be designated, and habitat modification around the AC would be subject to the limits of the ITP.

5.2.3. Conservation Measure 3: Mitigation of Substantially Damaged Timberlands

Conservation Measure 3 establishes retention standards that apply during the salvage harvesting of Substantially Damaged Timberlands (defined in CFPRs 14 CCR 895.1) to ensure functional forest structures remain available to spotted owls in these areas. Substantially Damaged Timberlands are the result of unpredictable events that kill trees. Under the CFPRs (and subject to the ESA and other regulations), all dead, dying, or damaged trees may be harvested immediately to recover their economic value before deterioration sets in. SPI typically conducts an Emergency Notice of Timber Operations on Substantially Damaged Timberlands as soon as possible. This Conservation Measure establishes retention standards to be applied during such operations. Spotted owl protection and survey requirements are detailed in Section 5.2.5 (Conservation Measure 5) and in Appendix 5.4 (Survey Protocol).

Under this conservation measure, harvest under an Emergency Notice of Timber Operations on Substantially Damaged Timberlands will include the retention standards in Sections 5.2.7.1 through 5.2.7.4, and retention of all undamaged green trees within the Substantially Damaged Timberland. If all the trees are dead, the retention standards will be met with dead trees.

As in the regeneration harvest standard, Habitat Retention Areas (HRAs) will be established at a frequency of 0.4 acre in every 20 acres salvaged, excluding required WLPZs. HRAs will be established around individual Wildlife Trees where available and will include undamaged green trees that are most likely to persist. Most dead, dying, damaged or diseased conifer trees in Substantially Damaged Timberlands have >25 percent merchantable wood for a limited amount of time and would not be retained. Any living or dead tree which persists long enough to reach the non-merchantable condition would then be provided protection under Section 5.2.7.

The standards for Additionally Retained Trees (Section 5.2.7.5) will not be applied in a fire-killed environment. Fire-killed conifers will not grow or persist over time. When available, the fire-killed hardwood trees in a burn area will be retained at a density of one per 2 acres. Depending on fire intensity, many burned hardwoods will sprout back from the base after the fire. The target diameter for hardwood retention is 12 inches dbh or greater. If larger hardwoods are available (>22 inches dbh), they will be preferentially retained. This provision is an exception to Section 5.2.7.5 (Additionally Retained Trees).

Reforestation is not a CFPR requirement for an Emergency Notice of Timber Operations on Substantially Damaged Timberlands. Because it is voluntary, reforestation is not a condition of this HCP. The retention of habitat elements in harvest of Substantially Damaged Timberland provided in Conservation Measure 3 is mandatory and is a benefit to both NSO and CSO regardless if reforestation occurs. Voluntary reforestation, while beneficial to CSO and NSO into the future beyond the permit term, is not a benefit considered under the HCP. Under long-standing internal policy, SPI has voluntarily reforested the timber-capable areas where salvage harvest operations occurred in the past and will continue to do so voluntarily in the future. Although the amount of retention in these past wildfire salvage harvests is unknown, the

contribution of past reforestation efforts to increasing future amounts of spotted owl habitat is partially responsible for the projected increase in PHAs (Appendix 4.3). If SPI discontinues its program of reforestation of Substantially Damaged Timberland, such an occurrence would constitute a Changed Circumstance in Section 7 in this HCP, triggering an evaluation by the Service.

Conservation Measure 3 has retention standards that are the same as Conservation Measure 4 in SPI's Fisher CCAA (Permit #TE09082C-0). Under that permit, these specific measures are enforceable until November 2026. Including the Fisher CCAA permit measures in this HCP extends these requirements for the HCP 50-year permit period. Under the CFPRs, there are no retention standards for Emergency Notice of Timber Operations on Substantially Damaged Timberlands.

5.2.4. Conservation Measure 4: Reduction of Potential for Catastrophic Fire

Catastrophic fire is a stand-replacing fire that alters forest habitat at a scale that can threaten the persistence of a species that is not widely distributed or may cause a significant barrier to gene flow if the species does not emigrate easily. A threat to a species can occur where loss of habitat due to catastrophic fire outpaces the regrowth of habitat. Davis et al. (2016) reported that wildfire was the most important factor in recent declines of NSO habitat in the Klamath Province of the NWFP area, which includes the NSO range on SPI lands.

In this HCP, SPI proposes to reduce the risk of catastrophic fire consuming suitable owl habitat by the continued use of even-age management and by establishment of a system of fuel breaks and fuel reduction strategies across the landscape. It should be noted that no forest with high canopy closure is completely resistant to high intensity fire under extreme fire weather conditions (high temperature, high winds, and low humidity). SPI recognizes that a wide range of recent wildfire events and many social and environmental variables contribute to uncertainty regarding reduction of risk of high intensity wildfire. While many of these variables are beyond SPI's control, the intent of Conservation Measure 4 is to reduce existing and future risk to the degree feasible within the Plan Area and Action Area. Accomplishing this objective is imperative for conservation of the Covered Species and for the continued economic viability of SPI, as well as for contributing to broader public goals.

Even-aged management and fire risk

The following paragraphs discuss the relationship between various forest stages and wildfire intensity and spread, as well as fire suppression.

Depending on environmental conditions (weather, fuel moisture, etc.), many SPI Mixed stands are at high risk of intense wildfire and may contribute to high rate of spread. The presence of fuel breaks allows more efficient and effective ground-based fire suppression activities in a forest composed of Mixed stands. Although they have been selectively harvested in the past,

these stands typically have a high degree of canopy cover and understory ladder fuels that can carry crown fires. This is essentially a permanent condition in the absence of harvest or fuel-break construction. From the standpoint of available areas of high-risk fuels, the amount of such area and the size of individual stands of such condition will be reduced as the area of contiguous Mixed stands declines.

Even-aged forest management creates patches of forests of different ages that respond differently to fire as clearcutting, growth, and thinning occur. An SPI clearcut removes Mixed stands and creates an area of approximately 20 acres that for a few years will provide only light flammable vegetation in the form of grass, sprouting brush, and newly planted trees. A newly stocked clearcut may burn rapidly and suffer almost complete mortality among the small trees. However, because fuels are near the ground, the fire may not contribute substantially to crown fire in surrounding stands. In this stage, the clearcut opening may slow the overall rate of spread across a landscape. Also, with short notice and road access, bulldozers can quickly convert a young plantation to an area of bare soil ahead of advancing fire where suppression crews can stage, fuel breaks and fire lines may be anchored, and back-burning can be started.

A landscape with a substantial percentage of young clearcuts may resemble a landscape with intentionally-created patches where vegetation has been modified with the objective of interrupting the spread of wildfire. This concept was introduced and modeled by Finney (2001). Later, Finney et al. (2007) modeled and compared systems of patches that were designed based on landscape characteristics against systems of patches chosen randomly.

The modelling by Finney et al. (2007) included areas on the Stanislaus National Forest, California, near the southern portion of the Plan Area. For this area, the study predicted that using optimally-placed treatment unit on about 10 percent of the landscape per decade for two decades could reduce the rate of wildfire spread by a factor of 0.8 (an 80% reduction in the rate). Using random placed units, about twice the area of treatment would be required to achieve the same result.

Hypothetically, a landscape with a substantial portion of young clearcuts might reduce the rate of wildfire spread. The continuing creation of new openings through SPI's even-aged management might resemble the random treatment areas described by Finney et al. (2007). The area in clearcuts under 10 years old is currently roughly two times greater than the area within modeled treatments evaluated by Finney et al. (2007). Over the permit period, an average of about 10 percent of the plan area will be in new clearcuts, the same proportion of the landscape as the modeled treatments evaluated by Finney et al. (2007).

As planted stands grow in height and density, their flammability may increase, and in some cases, managed forests may be subject to high intensity wildfire. For instance, in a retrospective study of wildfire in a mixed ownership study area in Douglas County, Oregon, Zald and Dunn (2018) stated that "[after] accounting for fire weather, topography, stand age, and pre-fire biomass, intensively managed private industrial forests burned at higher severity than older federal forests managed by the BLM". Zald and Dunn (2018) did not describe the age, size, or

spatial arrangement of the managed forest units evaluated, but noted that increasing tree size and promoting spatial heterogeneity could reduce fire severity. Zald and Dunn (2018) also noted that the wide variety of management techniques used in industrial forestry may limit widespread applicability of their findings.

In contrast to un-managed forests with continuous ladder fuels, or un-thinned plantations, even-aged stands may grow out of this state of flammability when planned thinning creates spacing and crown structure less susceptible to crown fire. SPI plantations will gradually transition through stages in which danger of high severity fire is relatively low (approximately 0 to 10 years of age), then relatively high (approximately from 10 to 20 years of age, post-PCT), eventually changing to a state of progressively lower as they age (starting at approximately 20-plus years of age). Overall, SPI expects that the continued presence of distributed young clearcuts, thinned plantations and older even-aged units will result in a net reduction of risk of high severity fire at the landscape level.

Fuel Breaks

Given many other constraints, the rate at which the landscape can be converted into even-aged conditions is limited. To reach a more resilient state more quickly and provide time to attain landscape conditions as described above, this approach will be supported by the systematic construction of a network of fuel breaks. Fuel breaks provide some reduction in spread of low-intensity fire, but often are not effective in reducing spread of high intensity wind-blown fire on their own. Their primary objective is to limit the advance of wildfires by providing a functional space and safety zone for conducting fire suppression operations, including an already-prepared area from which to conduct backfires. Fuel breaks can be effective because they strategically address sources of ignition (lightning and human-caused) and focus on locations with access for suppression forces.

In evaluating the application of fuel breaks, land managers analyze the environmental and investment resources at risk, regional and local historical fire patterns, regional weather patterns, forest type, topography, usefulness to fire suppression resources, and relationship of the project within a larger landscape-scale fire risk management strategy. Where fuel breaks are deemed appropriate, the THP process is used to incorporate reduction of surface and ladder fuels and create wide spacing between live tree crowns to limit an advancing crown fire from continuing to propagate in the crowns through the fuel break.

SPI estimates that fuel breaks will compose approximately 2 to 3 percent of the Plan Area over the term of the permit. This estimate is supported by analyses that have been submitted to CAL FIRE on SPI fuel break THPs (e.g., Line THP, THP #02-14-102TEH). Investment in a fuel break will only be made when its potential effectiveness is commensurate with the values at risk. HCP retention standards will not be applied in fuel breaks.

In combination, regeneration or even-aged units and the fuel breaks are expected to reduce the ability of large crown fires to spread rapidly across large areas, as the tree crowns are generally

discontinuous in relation to the adjoining stands at a landscape scale. At the landscape scale, effective fuel breaks must include multiple ownerships.

In August 2017, SPI, the USFS, NFWF, and CAL FIRE entered into a MOU to coordinate the protection of spotted owl habitat on the SPI Plan Area and neighboring lands (USFS Agreement #17-MU-11052007-096). The purpose of this MOU is to help identify and prioritize areas near spotted owl ACs in need of fuels treatment to lessen potential impacts on owl habitat from wildfire, to encourage prompt construction of fuel breaks in these areas, and to coordinate fire suppression planning and response efforts on lands managed by the signatories. The first MOU and examples of resulting fuel reduction efforts are in Appendix 5.6. In this HCP, SPI commits to complete its portion of the range-wide system (an estimated 425 miles of fuel breaks on the SPI land base on the Plan Area) within the HCP's first decade, regardless of the contribution of the MOU partners. To maintain expected benefits, understory brush or trees intruding into the fuel break system on the Plan Area will be controlled by SPI as necessary over the permit period.

In 2019, this original MOU was updated and signed by all commercial land owners in the CSO range in the Sierra Nevada. While SPI's portion of the fuel reduction strategy is a significant contribution to the protection of CSO on the Action Area, the potential value to the subspecies of a range-wide system is even greater, as it could relieve a substantial stressor facing the subspecies' long-term survival (USDI 2017).

Using this first MOU as a template, SPI created an addendum to the MOU, extending the coverage to most of the NSO range in California. In June of 2019, the original parties and eleven other commercial land owners in northern California signed this Addendum to the MOU to coordinate the protection of NSO habitat on commercial forest lands and surrounding Federal and State responsibility areas. This MOU and Addendum is included in HCP Appendix 5.6.

As a result of these MOUs, planning and implementation of projects is leading to many fuel reduction activities across the range of the CSO and NSO. SPI will continue a good faith effort to coordinate fuel reduction efforts (including collaboration and data sharing) with federal and state agencies, private landowners, and non-governmental organizations, as established by the MOUs.

5.2.5. Conservation Measure 5: Reduction of Potential Impacts at Reproductive Sites

Conservation Measure 5 addresses the second biological goal of avoiding the potential for spotted owls to be killed or injured, and minimizing the harm that might occur by timber harvest activities. The objective will be addressed in several ways. Direct killing or injuring will be avoided and minimized by conducting pre-harvest surveys and designating seasonal buffers around all active nest sites (including those in THPs, Emergency Notice, and Exemption Harvests) as described in Sections 5.2.5.1, 5.2.5.2, and 5.2.5.3. The likelihood of harm (take by habitat modification) will also be reduced by designating no-harvest protection zones surrounding the

three most recent Yearly Activity Centers (YACs). Avoidance and minimization measures are described below and in Appendix 5.2 and Appendix 5.4.

5.2.5.1. Pre-Operational Survey

As described in the Service's biological opinion, dated September 25, 2020 (USFWS File 08EYRE00-2020-F-0151), in the absence of effective surveys, falling trees and operating heavy equipment in forested areas could topple an occupied spotted owl nest or crush eggs or a juvenile that was not yet able to fly. However, the chance of that occurring during SPI Covered Activities is negligible because of SPI survey efforts. SPI has surveyed for NSO since 1989 and for CSO since 1990 As a result of those efforts, SPI estimates that the surveys by qualified biologists have a greater than 97 percent probability of detection of occupied ACs (Roberts et al. 2017). SPI will continue to conduct THP pre-operational surveys to provide information on AC movement and seasonal protections at occupied ACs. Appendix 5.4 provides the details of the SPI Survey Protocols developed from current SPI survey methods and based upon USFWS (2012) survey protocol conducted to discover and protect ACs.

Surveys are currently required for NSO as part of take avoidance for timber harvest. For NSO, SPI presently implements a Service approved survey protocol, which CAL FIRE accepts for CFPR needs. USFWS has been involved in the development of this protocol since the early 1990s. At present there is no required survey protocol for the CSO; to date SPI's CSO surveys have been voluntary. Including SPI's previously voluntary policy for the CSO in this HCP makes it a requirement for the HCP 50-year permit period.

For this HCP, SPI will utilize the SPI Survey Protocol as detailed in Appendix 5.4. The differences between the Service's Standard Protocol (USFWS 2012) and the SPI Protocol (Appendix 5.4) are outlined in Appendix 5.4 Addendum.

Through the duration of the permit, SPI and the Service will apply the best available science in implementing, interpreting, and revising the survey protocol and may incorporate new technology as it becomes available and feasible. Changes to the protocol may be warranted based upon demonstrated outcomes such as a high probability of detection and repeatability. Ultimately, the Service is responsible for determining the most appropriate survey protocol.

5.2.5.2. Spotted Owl Take Minimization Seasonal Restrictions Within 0.25 Mile of Nesting/Reproductive ACs.

SPI will continue to implement 0.25-mile seasonal buffer around occupied ACs during the Critical Period (March 15 until August 31), with no harvesting or vegetation-disturbing activity within the buffer. As described in the Service's biological opinion, in addition, prolonged excessive noise that could result in take will be restricted, including activities such as road construction, use of heavy equipment, heavy traffic from logging trucks, chipping material, etc. In the case of road use, SPI will notify the Service if use of roads is reasonably certain to disturb spotted owls, so that the Service and SPI can meet and confer to adopt measures to minimize

such disturbance, including, but not limited to, reducing speeds on these haul roads during this period (USFWS File 08EYRE00-2020-F-0151 dated September 25, 2020). The seasonal buffer may be suspended if there is conclusive evidence that nesting was not initiated, nesting has failed (no young produced or adults no longer attending the nest) or young have fledged and are capable of sustained flight. More detailed description of the surveys and restrictions required under this HCP are provided in Appendix 5.4.

5.2.5.3. Sighting Spotted Owls During Harvest Operations

SPI has operated under a raptor policy (Appendix 5.7, SPI Raptor Policy) for many years and will continue to do so. This effort trains woods personnel and logging contractors to recognize large raptors and stop vegetation disturbing activities until an SPI forester or biologist can assess the discovery. Including this previously voluntary policy for both NSO and CSO in this HCP makes it a requirement for the HCP 50-year permit period.

5.2.5.4. AC Protections

Under Conservation Measure 2, SPI will establish minimum 72-acre no-harvest zones, called PZs (see Section 5.2.2) at all occupied spotted owl ACs on or within 0.25 mile of the Plan Area. These areas will provide protection from direct mortality to all occupied ACs, which will provide this protection at reproductive ACs. Including this protection in this HCP increases the current CFPR take avoidance AC protection area for NSO from 18 acres (500' radius) and creates a larger protection zone than SPI's previous voluntary zone for the CSO.

5.2.6. Conservation Measure 6: Reduction of Potential Impact from Illegal Activities

Illegal uses of the property may negatively impact spotted owls. Among the known illegal activities, toxicants associated with the cultivation of marijuana perhaps pose the largest risk. Presence of anti-coagulant rodenticides (ARs) has been widely documented at illegal marijuana cultivation sites (Gabriel et al. 2012). Owls may be directly or indirectly be exposed to toxicants when they consume contaminated prey animals. The effects on spotted owls from consuming exposed prey may be chronic or acute. The effects to exposed owls are not known but may range from direct mortality to reduced juvenile survival or depressed reproductive rates. Detection of ARs in animals requires necropsy, and few spotted owls have been analyzed; however, 7 out of 10 NSOs that were opportunistically collected when found deceased in northwestern California tested positive for one or more AR (Gabriel et al. 2018). In a different case study, one female NSO that was found deceased in northwestern California had ARs detected in her liver (Franklin et al. 2018).

Due to the overlapping diets of BDOW and spotted owls, BDOW necropsy results are often used as a surrogate for spotted owls due to low numbers of spotted owls available for necropsy. Higley (2015) reported that 50 percent of 155 samples from barred owls collected in

northwestern California contained AR residues, and Gabriel et al. (2018) detected the presence of one or more ARs in 34 out of 84 liver samples from BDOWs collected in Humboldt County. It is likely that spotted owls are also exposed where these compounds are used. Gabriel et al. (2018) stated "This study demonstrates environmental contamination within occupied Northern Spotted Owl habitat and that Barred Owls can be used as adequate surrogates for detecting these pollutants in a rare species such as the Northern Spotted Owl."

All fisher mortalities found in the SPI's Stirling Management Area translocation project were provided to Dr. Gabriel for necropsy. Results have not shown toxicants to be a significant threat to fishers in that area (A. Facka, primary investigator, personal communication). We suspect this result may be due to access control and cooperative law enforcement activities. Illegal marijuana planting sites on SPI lands are uncommon, cover small acreages, and are usually at the outer periphery of SPI ownership.

SPI maintains a system of gated roads, daily patrols and camera surveillance on its lands to control public access, both legal and illegal, to minimize resource damage to roads, vegetation, wildlife and watercourses. Public camping is not allowed on SPI lands and motorized use is strictly limited to existing roads. These currently voluntary control activities will be implemented and maintained as a requirement of the HCP for the life of the permit. SPI cooperates with local, state, and federal law enforcement agencies to eradicate marijuana plantations found on SPI lands, and cooperates with agencies in their remediation efforts. In 2017, SPI and law enforcement agencies eradicated 6 marijuana sites on the Plan Area.

A secondary risk to spotted owls from the cultivation of marijuana can result from the cutting of a nest tree by growers preparing a site or tending their plants. The nest/den structure inventory suggests that there is approximately 1 potential nesting structure on every acre of HF2L, HF2H and HF4 so there is little proportional impact to this threat (Appendix 4.4). Given this distribution, it is unlikely that the loss of a nesting structure in this manner is a significant threat, as marijuana cultivation on SPI property is infrequent and eradicated as soon as possible.

Another illegal use of SPI property that is a risk to spotted owls is firewood cutting. Illegal firewood cutting tends to target snags and green hardwood trees that are near access roads. This activity can remove important habitat elements and increase the risk of human caused wildfires.

Illegal use of the property is limited by controlling access and patrolling land areas where feasible. Illegal use of the property is reported wherever it is evident. Foresters, biologists, loggers, and patrolmen are vigilant for suspicious trails, road use, illegal firewood cutting, and altered vegetation that is not part of a THP. SPI commits to continued controlling access and patrol for the permit term. When an illegal activity is identified, the appropriate law enforcement personnel will be promptly contacted, and the incident recorded for inclusion in the Annual Report.

5.2.7. Conservation Measure 7: Management for Habitat Elements and Operational Standards

Conservation Measure 7 supports the third conservation goal for this HCP (to provide key owl habitat needs and specific habitat elements in future timber stands) by incorporating provisions for retention and recruitment of Habitat Elements into harvest planning and operations. These retention standards are intended to allow the Mixed land class to continue as prey producing, spotted owl foraging, and nesting/roosting habitat, and for the Regen and Even land classes to develop these characteristics by retention and through growth as quickly as possible. Retention of elements should accelerate the rate of spotted owl habitat development in Even stands (See Section 6.7, Monitoring of Even Habitat Use by Spotted Owls).

Prey species for owls rely on snags, down logs, brush, and hardwoods capable of significant mast production and cavity formation (citations summarized in Roberts 2017). In the Mixed land class, these habitat elements are currently represented in HF4, HF2H, and HF2 stands. By retaining habitat elements, this measure ensures that many of these elements persist immediately after harvest or continue to be produced through time. This retention and recruitment of elements will enable the planted Regen and Even land class stands to better function as habitat associated with spotted owl prey as they develop through HF1, HF2, and HF2H. As these young stands mature, the elements retained from the previous stands, or that develop naturally through time from climatic forces and biological processes, will not only provide prey habitat, but also provide nesting structures within future stands of HF2H and HF4. These future HF2H and HF4 habitats will contribute to the owl PHAs during the term of the HCP.

The operational standards of this Conservation Measure are provided in a list below, with additional discussion of each measure in a subsequent section. Standards are provided for regeneration harvest units (even-aged silvicultural prescriptions) and for non-regeneration harvest areas (selection, salvage, and intermediate silvicultural prescriptions). Road construction and rock pit development will not include the management of habitat elements. These activities remove all the vegetation and overburden from a site making habitat element retention infeasible.

CFPRs provide a general guidance stating: "Retain or recruit late and diverse seral stage habitat components for wildlife concentrated in the watercourse and lake zones and as appropriate to provide for functional connectivity between habitats." There are no specific standards mandating specific quantities, sizes or locations in the CFPRs; site specific measures are resolved during THP plan review. In this light, the HCP requirements described below in Sections 5.2.7.1 through 5.2.7.7 are much more specific and protective for the covered species and apply to all harvest methods and terrestrial locations as well.

Conservation Measure 7 standards are the same as Conservation Measure 3 in SPI's Fisher CCAA (Permit #TE09082C-0). Under that permit, these specific measures are enforceable until November 2026. Including them in this HCP extends these requirements for the HCP 50-year permit period.

SPI commits to the standards in 5.2.7.1 through 5.2.7.7 of Conservation Measure 7 by incorporating the standards into THP language, which also makes them enforceable by CAL FIRE.

An overview of these standards are as follows:

1. SPI will retain all spotted owl nest structures for the permit period (i.e., trees where spotted owls are known to have nested currently or in the past or those discovered in the future) wherever they exist (see Section 5.2.7.1).

2. SPI will retain HRAs (defined in Section 5.2.7.2) at a rate of 2 percent of each harvest area. In regeneration harvest areas, HRAs will occur at a rate of 2 percent of the regeneration area.

3. SPI will retain Wildlife Trees (defined in Section 5.2.7.3), where available, at a rate of one per 5 acres, in all regeneration units, non-regeneration harvest, rehabilitation areas, and fire salvage areas.

4. SPI will retain Legacy Trees (as defined in Section 5.2.7.4), wherever they exist.

5. SPI will retain Additionally Retained Trees (small hardwoods or conifers, further defined in Section 5.2.7.5) in regeneration harvest units such that there are no locations that exceed a distance of 150 feet from other retained elements (HRAs, Wildlife Trees, Legacy Trees).

6. SPI will retain and recruit Hardwoods (defined in Section 5.2.7.6). In all non-regeneration harvest areas, SPI will retain at least two hardwoods greater than 22 inches dbh per acre, when available. If unavailable, the next largest diameter hardwoods will be retained at a rate of two per acre. In regeneration harvest units, SPI will retain small hardwoods (<6 inches dbh) or regenerate (recruit) stump-sprouting hardwoods at a rate of two per regenerated acre where they exist.

7. SPI will retain Snags and Green Culls (non-merchantable snags and green culls ≥15 inches dbh, further defined in Section 5.2.7.7) during all regeneration or non-regeneration harvest activities, as feasible, unless determined to be a safety hazard or a regulation requires their removal.

8. SPI will leave un-thinned patches of plantations in order to maintain density induced mortality processes (defined in Section 5.2.7.8)

5.2.7.1. Management for Spotted Owl Nest Structures

Since the mid-1990s trees containing spotted owl nesting structures known to have been active were identified with a SPI wildlife tag. This process will continue for all newly discovered nesting structures. SPI will retain all spotted owl nest structures for the permit period (i.e., trees where

spotted owls are known to have nested currently or in the past) wherever they exist. Such nest trees shall be retained in HRAs, except the additional HRA area surrounding a nest tree will not be designated in the rare circumstance where other required HRAs around Legacy trees and would exceed 3 percent of the unit area (e.g., 0.6 acre in a 20-acre unit). This circumstance has not occurred prior to the writing of this HCP. Under this exception, the nest tree will still be retained, just not inside an HRA.

5.2.7.2. Habitat Retention Areas

The primary measure to maintain and recruit habitat elements into future stands will be the establishment of HRAs in all regeneration harvest units. SPI biologists and foresters work closely together to identify and protect habitat elements. HRAs will preferentially contain one or more Wildlife Trees, Legacy Trees, and, if available, large woody debris that contributes towards owl habitat. An HRA will consist of a representative sample of the species and diameter classes of trees present prior to harvest, retained at a rate of 2 percent of the total harvest unit area, excluding acres within WLPZs. HRAs will be retained for the rotation length of the regeneration and rehabilitation or fire salvage areas and thus are intended to become potential nesting or roosting sites within those stands over the next rotation as the crop trees grow larger and the stand becomes denser. HRAs in regeneration and rehabilitation or fire salvage areas will not be entered for salvage harvesting over the rotation length.

In non-regeneration harvest areas larger than 20 acres, the distribution of HRAs will occur at a rate of 2 percent per each 20 acres. In all harvest areas of greater than 2.5 acres and fewer than 20 acres, HRAs will occur at 2 percent of the harvest area. No HRAs are required in harvest areas less than 2.5 acres. Acreage of required retained WLPZs is excluded from the calculation of the unit area and the 2 percent retention standard is based upon the non WLPZ harvest area only. The overall acreage of retention of mature trees may be greater than the 0.4 acre per 20 acres of the HRAs where there is WLPZ retention, which represent approximately 12 percent of SPI lands. As described earlier, approximately 43 percent of the existing Mixed stands containing mature trees will be retained throughout the permit period. Adding up all retention types averages 4.34 to 4.64 trees/acre (87 to 93 trees in a 20-acre harvest unit) (See analysis in Section 5.2.7.10 for details). HRAs will preferentially contain one or more Wildlife Trees, Legacy Trees, and, if available, large woody debris that contributes elements of owl habitat. HRAs will consist of a representative sample of the species and diameter classes of trees present before harvest. In non-regeneration harvest areas, the HRAs will remain un-entered for harvest until the next harvest entry, at which time they will be either retained or re-designated.

The cross-plot inventory SPI conducted on known nest sites in its forests (Appendix 4.1 and 4.2), as well as other literature (Thome et al. 1999; Blakesley et al. 2005), demonstrates that a nest site is often a small stand of large trees surrounding the nest structure. Known nesting trees, and whenever possible Wildlife Trees (potential nest structures), will be included within an HRA. The arrangement of HRAs will be variable. For example, in a 20-acre harvest area there will be one to four small groups ranging in size from 0.1 to 0.4 acre, which will consist of a representative sample of the species and diameter classes of trees present before harvest. These small groups

of trees are expected to persist, grow, and develop age-related defects during the stand's rotation period. The HRAs in regeneration areas will be retained for the entire stand rotation period and not be thinned or salvage harvested. Figure 5.1 provides photographs of example HRAs and Wildlife Trees.

Retention of HRAs will provide elements of older forest structure, ensuring management options at the end of the rotation period. Those options may include continued retention of the entire HRA, or any portions thereof, or designation of other stand elements of higher wildlife value (e.g., recruited hardwoods), as replacement for these structural components.

5.2.7.3. Wildlife Trees

The retention of Wildlife Trees where available, at an average rate of one per 5 acres, is specifically intended to provide potential nest and roost structures in all future stands outside WLPZs. A Wildlife Tree is a hardwood ≥22 inches dbh or a non-merchantable live green conifer ≥30 inches dbh with the characteristics described below. Such trees are within the size range of existing spotted owl nest trees and will grow to even larger diameters over time as the surrounding stand grows up around them. Wildlife Trees will be selected from among the oldest and largest available. These Wildlife Trees should be selected for their potential to function as a nesting structure either presently or in the future. If Wildlife Trees of the requisite minimum diameters are unavailable, preference will be given first to hardwoods that have the next highest wildlife value, because of their value to prey species and as potential nest trees, and second, to conifers below the target diameter that exhibit wildlife characteristics. Wildlife characteristics include: age, diameter, longevity/persistence, signs of previous use by wildlife (e.g., excavated cavities), indication of current or incipient heart rot (conks, natural cavities), species (hardwoods preferred), presence of large mistletoe broom, crooks, reformed tops, forks or large lateral limbs, etc. Known past nest trees outside retained nest stands will be included as Wildlife Trees. Prior to the regeneration unit being harvested, Wildlife Trees will be marked for retention or designated by description. Wildlife Trees will be preferentially retained within or at the edge of an HRA (Figure 5.1).

Figure 5.1. Example Habitat Retention Areas and Wildlife Trees.
Photo credits: Phil Detrich

Regardless of harvest type, Wildlife Trees may be unevenly distributed prior to harvest. For this reason, we cannot establish a mandatory standard for the distribution of Wildlife Trees. It is still SPI's intent to reach the objective of leaving an average of four per 20 acres. In the unlikely circumstances where the requisite numbers of Wildlife Trees are not available, Wildlife Trees will not be designated, but retention of existing trees will still occur in HRAs. Given the protection afforded to HRAs, these trees will likely develop characteristics of wildlife trees over time. Age and tree density are the most significant contributing factors for trees to develop the characteristics of wildlife trees. The existing HF4 and HF2H stands generally have trees in the 120-year age class and if left in an HRA, many of these trees will likely persist for the rotation length (60 to 80 years), reaching a total age of 180 to 200 years. Over that time period, standing at high density in a shorter and younger growing stand, they will experience more wind, lightning, and other exposures that aid in creating wildlife tree characteristics and potential snags.

5.2.7.4. Legacy Trees

A Legacy Tree is any hardwood tree ≥36 inches dbh or non-merchantable live green conifer ≥30 inches dbh. HRAs will be preferentially placed to include Legacy Trees within or at the edge of a HRA. The only exceptions to this retention standard are if the Legacy Tree has been determined to be an OSHA safety hazard, other regulation requires their removal, or under the exception specified in Management for Nest Structures (Section 5.2.7.1). Prior to the unit being harvested, Legacy Trees will be marked for retention or designated by description.

5.2.7.5. Additionally Retained Trees

The spatial distribution of structural elements and areas of dense cover are important components of spotted owl foraging habitat. SPI's GPS transmitter study located spotted owls using many scattered perch trees within various foraging habitats, including lower successional stands (Appendix 3.6 and Appendix 3.8, and Atuo et al. 2018). In order to provide for perch trees in regeneration units, additional trees will be retained during harvest, such that there are no locations that exceed a distance of 150 feet from other retained elements (HRAs, Wildlife Trees, Legacy Trees) in or adjacent to the unit, or between a retained element and the existing forest edge. For this purpose, a forest edge is an edge between a proposed harvest unit and stands of HF2, HF3, HF2H, or HF4. Where such a forest edge does not exist, additional small hardwoods or conifers shall be retained along that edge every 300 feet to meet the desired spacing that there are no locations that exceed a distance of 150 feet from retained elements. Although these scattered trees may be small, they will grow over time. They also contribute to visually breaking up the area and may assist in spotted owls avoiding detection by predators such as great horned owls. Preference will be given to hardwoods so as to favor tree species that may contribute to small mammal habitat. These additionally retained trees can be conifers at least 10 inches dbh or hardwoods that are at least 6 inches dbh at the time the unit is harvested (approximately one per 2 acres).

When available, hardwoods are preferred, and in practice, the minimum diameters will likely be exceeded due to the irregular distribution of candidate trees in a given harvest unit. The retention of these trees will provide conservation benefits for spotted owls both immediately following harvesting and into the future as the retained trees and the surrounding forest stands mature. These additionally retained trees will provide perch trees for foraging in younger stands and may develop nest tree characteristics over time. If additionally retained conifers persist in an exposed "open grown" condition, they are more likely to develop characteristics often found in spotted owl nest trees, such as large lateral branches, high live crown ratios, and low height to diameter ratios (Sensenig et al. 2013). Habitat for spotted owls will be further enhanced, as these additionally retained trees create another scattered height class to promote vertical heterogeneity in the regenerating stand.

5.2.7.6. Hardwood Retention and Recruitment

In all non-regeneration harvest areas, SPI will retain at least two hardwoods greater than 22 inches dbh per acre, when available. If unavailable, the next largest diameter hardwoods will be retained at a rate of two per acre.

In regeneration harvest units, SPI will retain small hardwoods (<6 inches dbh) or regenerate stump-sprouting hardwoods at a rate of two per regenerated acre where they exist and maintain them as co-dominants for the rotation of the stand. These retained/regenerated trees may be clumped within the harvested area. When maintained as co-dominants, these hardwoods will provide mast production during the life of the stand and recruit potential Legacy hardwoods or wildlife replacement trees through time for retention in the next rotation. This retention/recruitment standard will be more observable after PCT, but will be demonstrated through time by the implementation monitoring reporting requirement.

5.2.7.7. Snags, Green Culls, Down Logs

In addition to individual Wildlife Trees, other structural elements will be retained to provide late/mature legacy structures in the Even and Mixed land classes. During all regeneration or non-regeneration harvest activities, SPI will retain, as feasible, non-merchantable snags and green culls (≥15 inches dbh) unless determined to be a safety hazard, obstructions to timber operations or a regulation requires their removal. The term "feasible" refers to the fact that some snags and green culls are accidentally knocked over or must be felled to carry out harvest operations. A non-merchantable conifer (alive or dead) contains <25 percent merchantable volume that can be recovered as lumber. SPI does not pay loggers for the falling, yarding, or delivery of non-merchantable conifers. The result has been an increase in the number of non-merchantable conifers being retained standing in the forest for the benefit of wildlife, including owls. If felled for safety reasons or knocked down during operations, trees or snags will be left on site or, if necessary, moved to a nearby safe location. Retention will not occur in any road right-of-way and only Legacy hardwoods and previous spotted owl nest or fisher den trees will be retained in fuel breaks.

Hazardous or obstructive non-merchantable snags ≥15 inches dbh that are felled (or toppled by operations) will be left on the ground as operationally feasible for the purposes of providing down wood for prey base production. Wherever they exist, large non-merchantable logs (≥20 inches large end) will be retained during harvesting and site preparation activities.

A non-merchantable log contains <25 percent merchantable volume that can be recovered as lumber. To the extent practicable, these logs will be left undisturbed. If accumulations of snags and down wood create excessive fuel loading and preclude meeting the purposes of CFPR 14 CCR §915/935/955 (Site Preparation), the RPF may propose treatments to remedy those conditions. In such cases, the RPF must balance snag and log retention with management of excess fuels and increased fire risk.

Large cull logs or trees may be removed if they are a safety hazard or carry pathogens detrimental to the future health of the plantation. Green cull trees felled due to the multiple risks they represent (e.g., shading, disease vectors, safety hazard) would then be treated as down logs and retained or treated as described above.

5.2.7.8. Thinning Skips in Plantations

During pre-commercial and commercial thinning of plantations, SPI will leave 2 percent of the area un-thinned, which will remain until the next harvest entry. Preferentially and if available, such areas would contain previously retained habitat elements (e.g., Wildlife Trees, Legacy Trees and Additionally Retained Trees).

Following pre-commercial thinning (PCT) the typical outcome is an 18-foot by 18-foot tree spacing. Two percent of the treated stand (or 0.4 acre per 20 acres) will be retained at the 13-foot by 13-foot planting spacing. This retention is intended to promote natural density-induced mortality, which will increase the likelihood of recruitment of snags. Tree diameter estimated by the University of California Research Cooperative G-space (G-space) tree growth model is projected to be 16 inches to 18 inches dbh, the point when mortality is expected to begin to occur. While snags of this size may be of limited value as spotted owl nest sites, they will provide habitat for spotted owl prey species and important forest ecosystem function. PCT also will maintain the regenerating hardwood trees (two per acre) in a codominant/dominant crown position.

Eventual commercial thinning is timed to avoid tree mortality predicted to occur by the G-space tree growth model. During the commercial thin, 2 percent of the treated stand (or 0.4 acre per 20 acres) will be retained at the 18-foot by 18-foot PCT spacing. Tree diameter estimated by the G-space tree growth model is projected to be 24 inches dbh, at which point mortality is expected to begin to occur. The reason for this retention is to promote natural density-induced mortality. This retention will increase the likelihood of recruiting snags projected to be 24 inches dbh or larger in each of the retained islands.

Due to the numerous factors that cause mortality, the models do not attempt to quantify mortality; they only estimate when such mortality will begin. Snags produced by high densities and those caused by other stochastic events will produce a continued supply of downed wood, in addition to the amount of smaller downed wood generated by harvesting. Such down wood provides habitat and foraging locations for spotted owl prey.

5.2.7.9. Enhancement of Heterogeneity to Promote Spotted Owl Habitat

Implementation of all the above retention measures will allow nest trees/structures, habitat for prey production, and stand structural complexity to be maintained or developed across the Plan Area. Retention and recruitment of habitat elements that provide cover or are known to support prey production can also enhance the reproductive output and survival of spotted owls. Many

owl researchers have suggested that within limits, such heterogeneity is beneficial to spotted owls (Franklin et al. 2000; Hobart et al. 2019a, 2019b; citations summarized in Roberts 2017).

5.2.7.10. Results of Retention in a Regeneration Unit

This section summarizes the numerical effect of the above retention standards, from Legacy Trees, Wildlife Trees, HRAs, Regenerating Hardwoods and additionally retained trees.

On SPI lands the most common hardwoods are black oak, red alder, aspen, tanoak, live oaks, madrone with miscellaneous other hardwood species also occurring. As described elsewhere in this HCP, hardwoods are important to owls for nesting/roosting structures and for promoting prey production. All mature hardwoods retained as individual Wildlife Trees, Additionally Retained Trees, and within the HRAs will, over time, contribute to meeting the large hardwood retention goal of supplying nesting and roosting structures and mast production. Regenerating sprouting hardwoods may or may not be evenly distributed within harvest units but will generally reflect their distribution prior to harvest. In other words, where hardwoods are found in a clumpy distribution, they will be regenerated in a clumpy distribution. Alternatively, where hardwoods are more evenly distributed across the landscape, they will be regenerated in a generally even distribution. The retained or regenerated sprouting hardwoods will be in addition to HRAs.

The total number of trees per acre retained by each of the above measures is shown in Table 5.1. The estimate for the number of trees ≥12 inches dbh per unit that will be found in HRAs at 2 percent area retention was based on inventory plot data from HF4 and HF2 Mixed land class stands within the entire the Plan Area, covering approximately 1.5 million acres. The retention standards will result in an average of 4.34 to 4.64 trees per acre (87 to 93 retained trees in an average 20-acre unit) and will contribute to future stand structural heterogeneity (see Appendix 5.8, Diameter Frequency Distributions). These trees will be retained for the entire 60- to 80-year rotation. These values are based on retention standard minimums, which are often exceeded in practice, and do not include existing adjacent WLPZs, retained snags and other scattered residual trees of various sizes and ages (Table 5.1; see Figure 5.2 for an example).

Table 5.1. Estimated Trees (per acre) Retained in an Average Even-Aged Harvest Units

HRA	Wildlife Trees	Regenerated Hardwood Trees	Legacy Trees	Additionally Retained Trees
Trees per acre ≥12 inches dbh averaged over 20-acre unit	Total number of (4) averaged over 20-acre unit, per acre	Hardwood <6 inches dbh or stump sprouting per acre	Hardwoods ≥36 inches dbh or Conifer Wildlife Trees ≥30 inches dbh	A maximum of 300 feet apart, approximately one per 2 acres (6 inches dbh hardwood or 10 inches dbh conifer)
1.64	0.2[a]	2	0 to 0.3	0.5

[a] The distribution of Wildlife Trees is unknown prior to the field work being completed, but this standard is expected to lead to approximately 0.2 trees per acre (4/20 acre = 0.20) retained (averaged over the unit). Adding up all retention averages 4.34 to 4.64 trees/acre (87 to 93 trees in a 20-acre harvest unit).

HRA = Habitat Resource Area

dbh = diameter at breast height

While these elements are expressed in average tree per acre values as shown in Table 5.1, their actual distribution within the harvest units will be highly variable, depending on the pre-harvest distribution of key elements within those units.

Figure 5.2 is an example of harvest unit with HRA, Wildlife Trees, Legacy Trees, additionally retained trees, scattered residuals and regenerated hardwoods (not visible at this scale). Section 6, Monitoring and Adaptive Management, will detail how these retention standards will be monitored and reported.

Figure 5.2. Example of Retention in a Harvest Unit.

5.2.7.11. Exemption Logging and Retention

SPI will include the retention of HCP habitat elements described above in the standard THP language, which also makes them enforceable by CAL FIRE. However, a small percentage of SPI's harvested volume and area occur under the CFPR's Exemption process (CFPR Section 1038), which does not require advanced review or approval. The following briefly describes the "Exemption" process in general, SPI's recent implementation of the process, and proposed application of the standards of the HCP.

In 1973, the Board of Forestry under its legislative authority determined that certain harvests were considered *de minimis* and authorized such harvests to be "Exempt" from the THP process (only the CEQA equivalent analysis, not the CFPRs). Trees harvested under the Exemption

process are normally very recently dead trees or showing signs of pathogens that reduce forest health conditions. Large old trees (>48 inches dbh) are generally allowed to be harvested only if certain conditions are met (CFPR, 14 CCR 1038(h). As described in Section 5.2.7.3 (Wildlife Tree) and 5.2.7.4 (Legacy Tree), trees of this size likely meet the Wildlife Tree and Legacy Tree definitions and be protected in this HCP. Because of past harvesting, such trees are very rare on the Plan Area. Most trees remaining in this size class have the characteristics that result in them being protected by the described retention requirements.

The CFPRs limit exemption harvests to less than 10 percent of the total volume per acre. Per the CFPRs, exemption harvests must be conducted by a Licensed Timber Operator (LTO) under the supervision of an RPF, who is responsible for filing the exemption forms and for ensuring that the harvest complies with all applicable regulatory standards. All other operational CFPRs must be followed and CAL FIRE does inspect these operations for compliance. CFPR exemption harvests have been conducted over the present SPI land base since the early 1970s. Despite past exemption harvesting, the SPI 2012 structure inventory (Appendix 4.4, the Wildlife Structure Inventory) found on average one potential nesting/denning structure per acre in HF2L, HF2H and HF4 stands.

This salvage effort is SPI's way of keeping disease and insect damage from becoming epidemic. During 2015 through 2017, SPI harvested an average of about 3.9 percent of its total annual volume using the Exemption process. While only 3 years of data were immediately available for review in the SPI accounting system, this estimate is an accurate representation of exemption harvests over the past decades and into the future. SPI reports all exemption volume harvested as part of SPI annual harvest limits under Option A, but does not update stand level inventory estimates due to the very small impact these have on any stand volume estimate. While the exemption area itself may be large (in order to provide flexibility in identifying small patches of timber where pathogens may be affecting stands), the areas harvested often consist of individual trees or groups of trees and are so small that they are not mapped.

The HCP will incorporate measures to protect occupied ACs from potential impacts of exemption harvest. As detailed in Appendix 5.4 (Spotted Owl Survey Methodology), SPI surveys have a 97 percent probability of detection of owls at occupied ACs. SPI has surveyed all suitable nesting habitat over the Plan Area in the past 5 years. Under the HCP, all future THPs will be surveyed in advance of operations, covering the Plan Area approximately every 5 to 10 years.

Given the high probability of detection, the past and future survey coverage of all suitable nesting habitat, and the walk-in search of retired PZs, the likelihood of exemption harvest encountering a previously unknown active nest is so small as to be discountable. To further minimize the potential for take, in any retired PZ that is more than 0.5-mile from an existing occupied PZ, SPI will conduct a walk-in search prior to exemption harvesting during the period March 15 to May 30 (Fledging period is defined as beginning in late May per, USDI (2012) Survey Protocol, Section 17.5). Retired PZs (which have 3 consecutive years of non-occupancy as described in Appendix 5.2), might be a likely location in an unoccupied area for a new AC to

be established. If an occupied owl AC is detected it will be afforded the same protections as other occupied ACs (including a new PZ designation).

Since January 1, 2016, SPI exemption harvest operations have been subject to the retention standards of the SPI Fisher CCAA, which are identical to those proposed in this HCP. Under the HCP, exemption harvest will be subject to all the protection and retention standards listed above in Section 5.2.2 (PZs), 5.2.5.2 (0.25-mile seasonal buffers), 5.2.5.3 (raptor policy) and 5.2.7 (habitat element retention). SPI will treat occupied PZs for spotted owls as "known sites" per CFPR 14 CCR 1038(b)(7) which states these sites shall not be disturbed, threatened, or damaged. Except as provided in Appendix 5.2 (which limits operations in PZs), exemption timber harvests will not occur in PZs. To this end, maps (including digital maps) of all PZs within the area covered under the exemptions shall be available and provided to LTOs and these PZs shall be clearly identified prior to operations. In addition, the following standards will apply:

1. In areas where retention standards have not been applied and specific trees have not been designated, the responsible RPF will ensure that the exemption harvest does not remove trees qualifying as Wildlife trees, spotted owl nests, fisher dens, or Legacy trees.

2. Inside previously harvested even-age units, no trees dead or alive that are within HRAs or otherwise designated for retention may be harvested under exemption salvage until the next rotation harvest (60 to 80 years from planting).

Given the very limited and scattered nature of Exemption harvests and the HCP restrictions on these harvests, they are unlikely to have a significant impact on habitat element retention under the HCP.

5.2.8. Conservation Measure 8: Addressing BDOW as a Stressor on NSO and CSO

Sections 3.1.1 and 3.1.2 described the invasion of the Pacific Northwest range of the NSO and the Action Area by the BDOW. Sections 3.2.1 and 3.2.3 described what are apparently the early stages of a similar invasion of the Sierra Nevada range of the CSO. In the range of the NSO, extensive experiments are underway in which hundreds of BDOW are being removed to evaluate the response of NSO (Wiens et al. 2017). In the CSO range, the Service (USDI 2017) has recommended active monitoring and development of "a comprehensive barred owl management study and/or plan … before full barred owl expansion occurs within the range of CSO."

In implementing this Conservation Measure, SPI anticipates scientific information needed to further understand and help inform how to address BDOW as a stressor on NSO and CSO populations. With the apparent increase in BDOWs observed at former CSO sites in 2018 (described in HCP Section 3.2.2), the need for data to inform potential management is becoming more evident. In addition to continued monitoring of the occurrence of barred owls on the

Action Area, we are proposing to conduct several studies with four primary objectives: (1) assess the genetic differentiation of BDOW populations across northern and central California, (2) analyze allele frequency changes on the front of the range expansion, (3) estimate the amount of spotted owl – BDOW admixture in each population, and (4) identify wildlife species that BDOW prey upon in California. These studies would be carried out under agreements with the University of California San Francisco, the University of California Berkeley Museum of Vertebrate Zoology, and the California Academy of Sciences. These studies would require collection of up to 300 barred owls during the first 6 years of the HCP, if possible. Collections would be carried out under all required permits from the Service and the CDFW. The proposed studies are described in detail in Appendix 5.5. SPI has obtained the necessary state and federal permits to conduct this research and such permits are on file with CDFW and USFWS.

Research conducted by SPI on BDOW may contribute to the objectives of the Services' NSO Recovery Plan (USDI 2011) and CSO Conservation Objectives Report (USDI 2017). Based upon the results from SPI's BDOW research and other BDOW studies, SPI and the Service will jointly determine the appropriate level of effort required to further address BDOW as a stressor to NSO and CSO during the remainder of the HCP. Such efforts may include, but are not limited to, designing further studies that build upon the current research, additional monitoring, and reviewing the survey methodology to include BDOW specific calls. As applicable, SPI will seek the necessary Service and CDFW permits to implement future conservation efforts. If collection continues at the current rate of 50 per year, a potential total of 2,500 BDOWs might be collected over the permit term. However, if BDOW populations increase as found in other areas, this estimate could rise to 100 to 150 per year (Diller et al. 2016).

5.3. HEXAGON ANALYSIS SUMMARY

In developing the analysis and conservation framework contained in this HCP, SPI has followed all applicable agency regulations and policies. SPI has likewise considered recent caselaw, including *Klamath-Siskiyou Wildlands Ctr. v. Nat'l Oceanic & Atmospheric Admin. & Fruit Growers Supply Company*, 99 F. Supp. 3d 1033 (N.D. Cal. 2015) ("*Fruit Growers*"). A detailed discussion of this issue and its relationship to the SPI HCP is included in "Overview of Fruit Growers Case in Relation to this HCP and its Modeling Methodology" in Section 4.3.7 of Appendix 4.3.

In order to evaluate the existing NSO and CSO suitable habitat aggregations and distribution, and to project and track these quantities over the 50-year term of the HCP, SPI developed a hexagon sampling and analysis tool. This network was built from a random starting point south and west of SPI's entire ownership, so each hexagon is a random sample of SPI lands (see Appendix 4.3, The Hexagon Modeling and Analysis Process).

5.3.1. Hexagon Modeling Results: Landscape PHA Distribution

For the purposes of the HCP modeling, SPI used the 2016 habitat dataset for the entire ownership, which is based on SPI's most recent updated plot inventories. That dataset was used

to establish the baseline condition for PHAs in the Plan Area (and edges of the Action Area). In 2016 in the Plan Area, there were 147 PHAs in the range of the NSO, and 723 PHAs in the range of the CSO. The combined total of 870 PHAs represents the starting condition of the metric for monitoring the trend in HCP Conservation Measure 1.

The number of PHAs is projected to decrease by approximately 4 percent from 870 down to 832 over the first 2 decades, followed by an upward trend that will result in a final total of 1,729 (199 percent of the starting PHA count) over the permit term (Table 5.2, Figure 5.3, and Figure 5.4; for more detail see Appendix 4.3). As a result of SPI management, these habitats will be well distributed across the landscape and the amount of SPI land that qualifies to be included in PHAs will increase from 37.6 percent to 72.5 percent (Figure 5.3 and Table 5.3). The rehabilitation of past wildfire areas will result in 130 PHAs (25 in NSO range, 105 in the CSO range; 7.5 percent of the 2066 PHA count) developing over the permit term (Figure 5.4). (It should be noted that most of these fire origin PHAs included many of the proposed Conservation Measure 7 retention standards).

Table 5.2. Potential Habitat Area, Nest Hexagon, and Support Hexagon Numbers and Quality Rank Over Time.

Year	Potential Habitat Areas (number)	Nest Hexagons (number)	Support Hexagons (number)	Quality Rank
2016	870	1,287	453	7.9
2021	852	1,267	437	7.9
2026	852	1,251	455	7.9
2031	873	1,289	457	7.9
2036	832	1,231	433	7.9
2041	906	1,292	520	7.7
2046	968	1,344	592	7.6
2051	1,270	1,726	814	7.4
2056	1,402	1,950	854	7.6
2061	1,543	2,256	830	7.8
2066	1,729	2,704	754	8.3

Table 5.3. Habitat Form Presence in Potential Habitat Areas, 2016 and 2066.

	2016		2066		Change, 2016 to 2066	
Habitat Form	Acres	Percent of PHAs	Acres	Percent of PHAs	Acres	Percent of PHAs
HF5	6,510	1.1%	15,282	1.3%	8,692	0.2%
HF1	46,539	7.9%	40,410	3.6%	(6,129)	(4.3%)
HF2L	102,914	17.5%	135,517	11.9%	32,603	(5.6%)
HF3	12,873	2.2%	16,268	1.4%	3,395	(0.8%)
HF2H	150,482	25.5%	344,792	30.4%	194,310	4.9%
HF4	270,322	45.8%	583,334	51.4%	313,012	5.6%
HF2H and HF4	420,805	71.4%	928,127	81.7%	507,322	10.3%
Net SPI	589,642	37.6% of SPI	1,135,604	72.5% of SPI	545,962	34.9%

HF1 = Habitat Form 1, HF2L = Habitat Form 2 Low, small tree, HF2H = Habitat Form 2 Heavy, medium tree, HF3 = Habitat Form 3, HF4 = Habitat Form 4, large tree, HF5 = Habitat Form 5, PHAs = Potential Habitat Areas, SPI = Sierra Pacific Industries

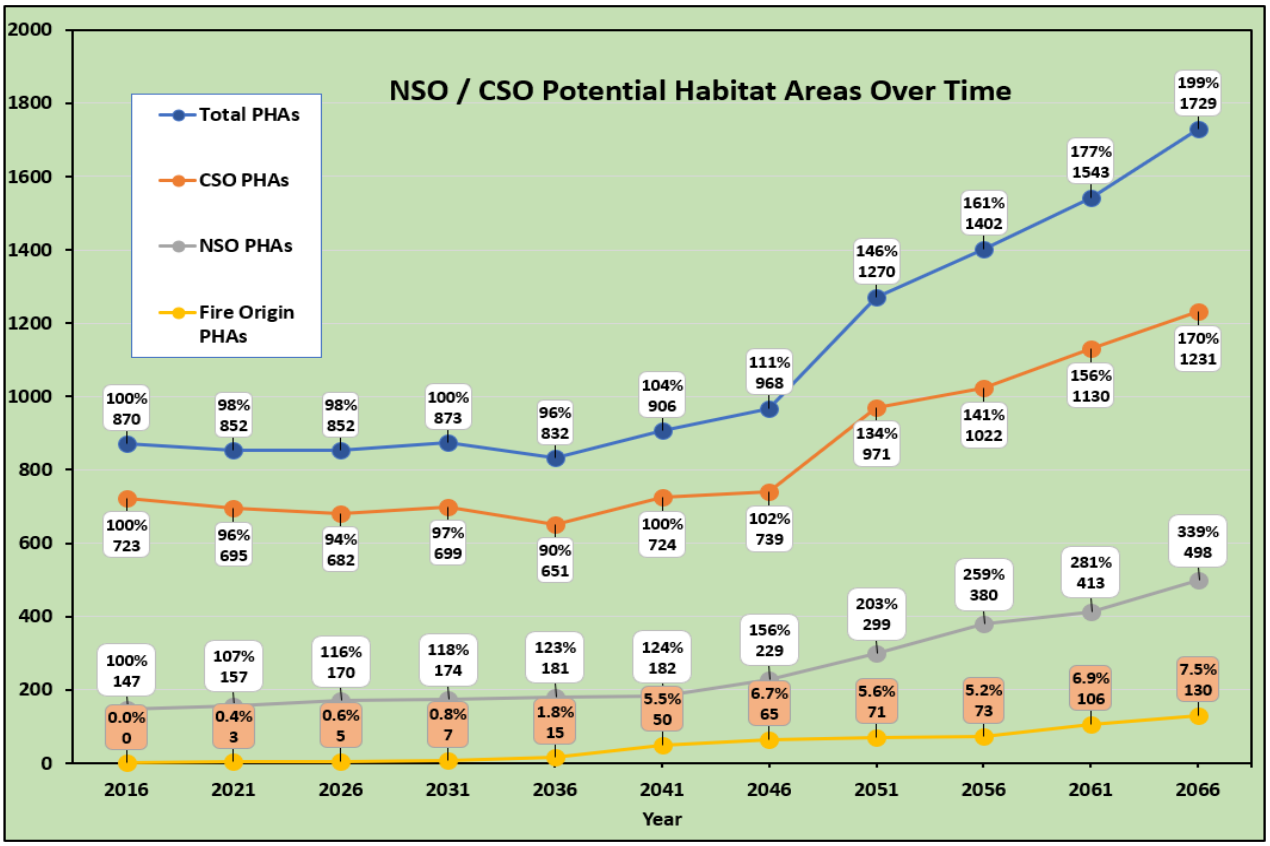

Figure 5.3. Northern Spotted Owl (NSO) and California Spotted Owl (CSO) Potential Habitat Area (PHA) Change Over Time (includes the subset of PHAs from fire rehabilitation areas).

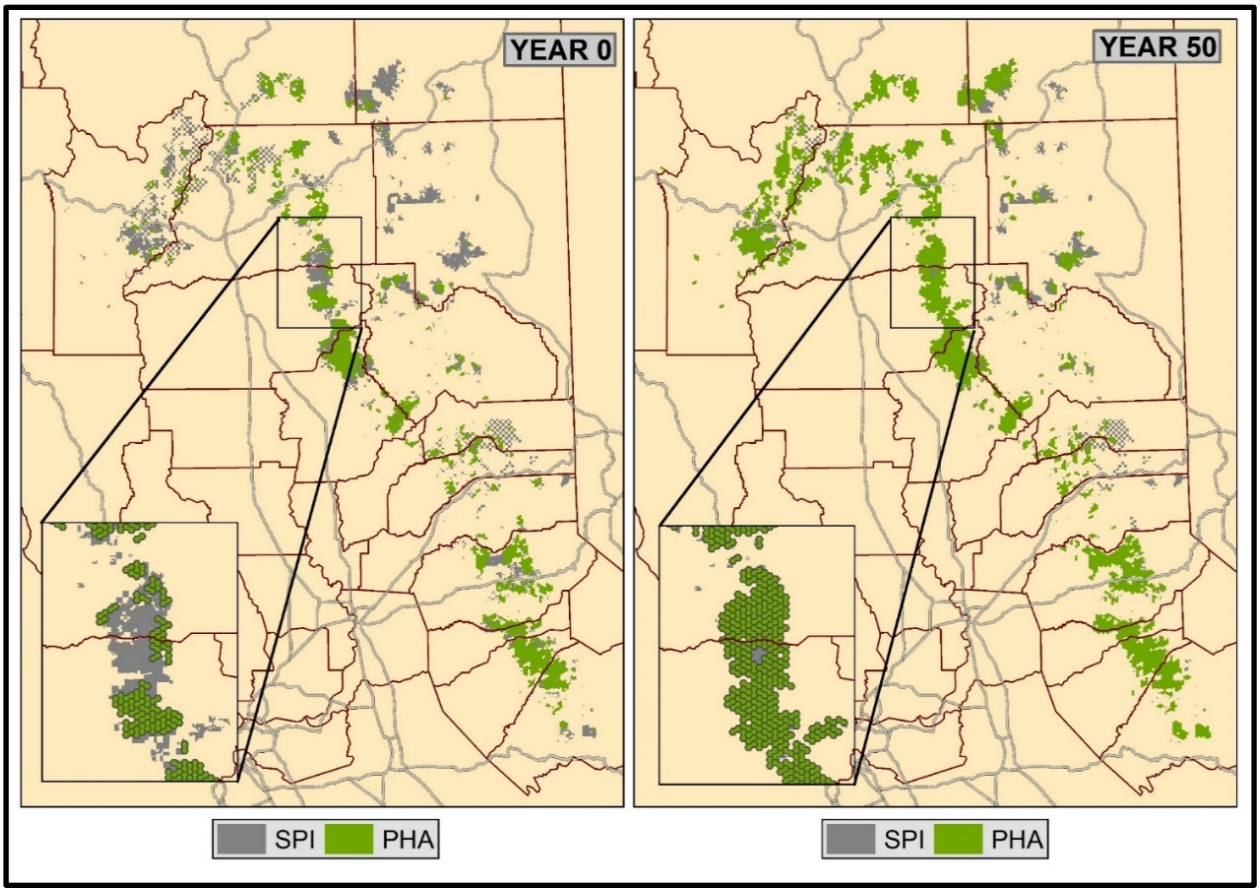

Figure 5.4. Year 0 and 50 Potential Habitat Area (PHA) Distribution within SPI Plan Areas

Additional descriptive statistics for the resulting PHA distribution are provided in Appendix 4.3, Table 4.3.11, which has overall data for all PHAs (including both CSO and NSO subsets).

Important results from Appendix 4.3, Table 4.3.11:

a. Average SPI ownership within individual PHAs exceeds 657 acres over the permit term (i.e., 65.7 percent of the 1,000-acre PHAs).

b. Of all hexagons included in PHAs over the permit term, 68 percent to 78 percent are projected to be Nest hexagons.

c. Average Nest hexagon's proportion of HF4 is 46 percent or greater throughout the permit term.

d. Minimum average size of the connected stand (HF2H & HF4) in Nest hexagons in PHAs is projected to be 204 acres at the end of the second decade and increases thereafter (ranging from 204 to 265 acres), indicating that SPI's management will

not fragment or isolate stands capable of providing necessary cover for spotted owls.

e. Total Plan Area acres qualifying as a PHA is projected to nearly double (from 589,642 to 1,135,604 acres) during the permit period.

In Section 4.4 and Appendix 4.3, we described the thresholds that determine when a hexagon begins to meet the Nest or Support status. As described in Appendix 4.3, SPI has developed quality ranking categories that give the highest values to PHAs composed of two Nest Hexagons.

As with the PHA count, average PHA quality rankings are projected to remain stable for two decades, decrease slightly, then increase over the permit term. This outcome results from retention of a portion of existing Mixed and an increasing amount of Even HF4 that maintains the average ranking of PHAs at 7.4 or higher. The increase in Even HF4 is projected to be well distributed over the Plan Area resulting in the PHA distribution shown in the map (Figure 5.4 above). The projected quality ranking and the total acres of HF2H and HF4 are displayed in Table 5.2. Detailed discussion of quality ranking and PHAs with maps and 50-year results can be found in Appendix 4.3.

5.3.2. Trend of All Spotted Owl PHAs

As of 2016, there were 870 PHAs (723 CSO and 147 NSO) on the Plan Area and portions of the Action Area. The hexagon analysis indicates the projected harvest would cause approximately 28.8 PHAs per year to fall below threshold during the first 5 years (144 "lost" divided by 5 years) (3 percent of total period PHAs per year) (Figure 5.5). Modeling harvest, applying annual growth of stands, and recalculating the PHA status for the first 5-year period indicate that there will be a projected net reduction in PHAs of 28 (870 minus 852 or 3 percent). Over the first 20 years of the permit period (i.e., harvest through 2035), the estimated net loss would be 38 PHAs (870 minus 832 or 4 percent) of the starting PHA number (Figure 5.5). Detailed discussion of modeling PHAs, maps, and 50-year results can be found in Appendix 4.3.

Importantly, the net increase in PHAs is projected to occur throughout the range of both CSO and NSO on the Plan Area. As shown in Table 4.3.12 (Appendix 4.3) the proportional increase in spotted owl high density areas is greater than the proportional increase in low density areas. A discussion of the PHAs in the low-density area in the north east portion of the Plan Area is provided in the subsection "Hexagon Modeling Landscape PHA Distribution" in the Section 4.3.8 of Appendix 4.3 In areas where owls are presently at low density, it is possible that density may increase in the future, particularly if owl habitat develops by SPI management activities or in response to climate change (See Appendix 4.3, Figure 4.3.13 and Table 4.3.12). Additional Maps in Appendix 4.3, Figures 4.3.27 and 4.3.28 show the current and future PHAs with the 2018 ACs and the NSO / CSO range line for reference.

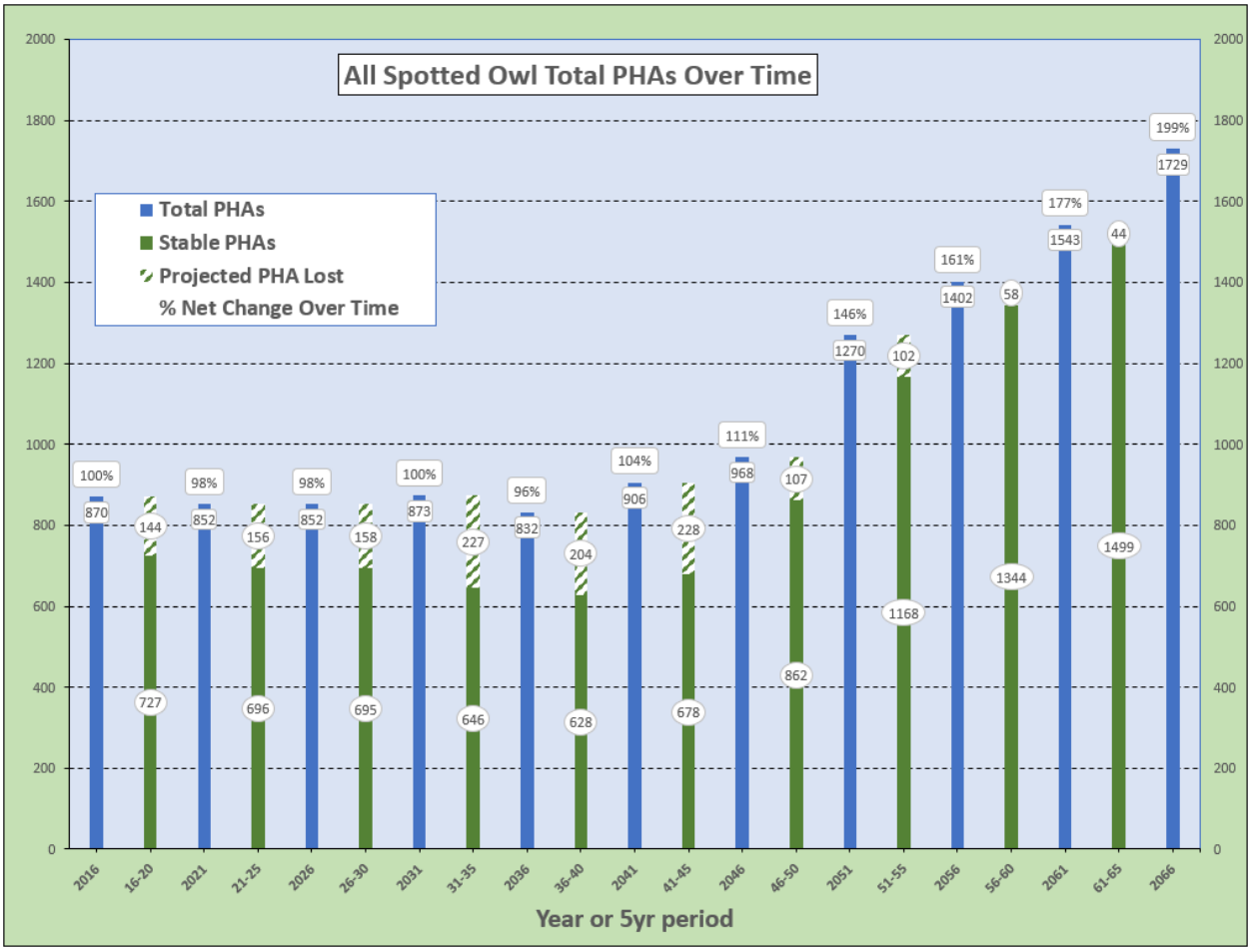

Figure 5.5. Projected Trend in Total NSO and CSO PHAs

5.3.3. Trend of CSO PHAs.

As of 2016, there were 723 CSO PHAs on the Plan Area and the portion of the Action Area within 0.25 miles of the Plan Area. The hexagon analysis, modeling only harvest, would project approximately 22.1 PHAs per year to fall below threshold during the first 5 years (111 "lost" divided by 5 years) (3 percent of total period PHAs per year) (Figure 5.6). Modeling harvest, applying annual growth of stands, and recalculating the PHA status for the first 5-year period indicate that there will be a projected net reduction in PHAs of 28 (723 minus 695 or 4 percent). During the first 20-year period this analysis projects a net reduction of 72 PHAs (10 percent); 90 percent of the starting PHA number will persist over the first 2 decades before increasing substantially due to ongoing growth in Mixed stands and ingrowth of Even stands in the latter decades of the permit.

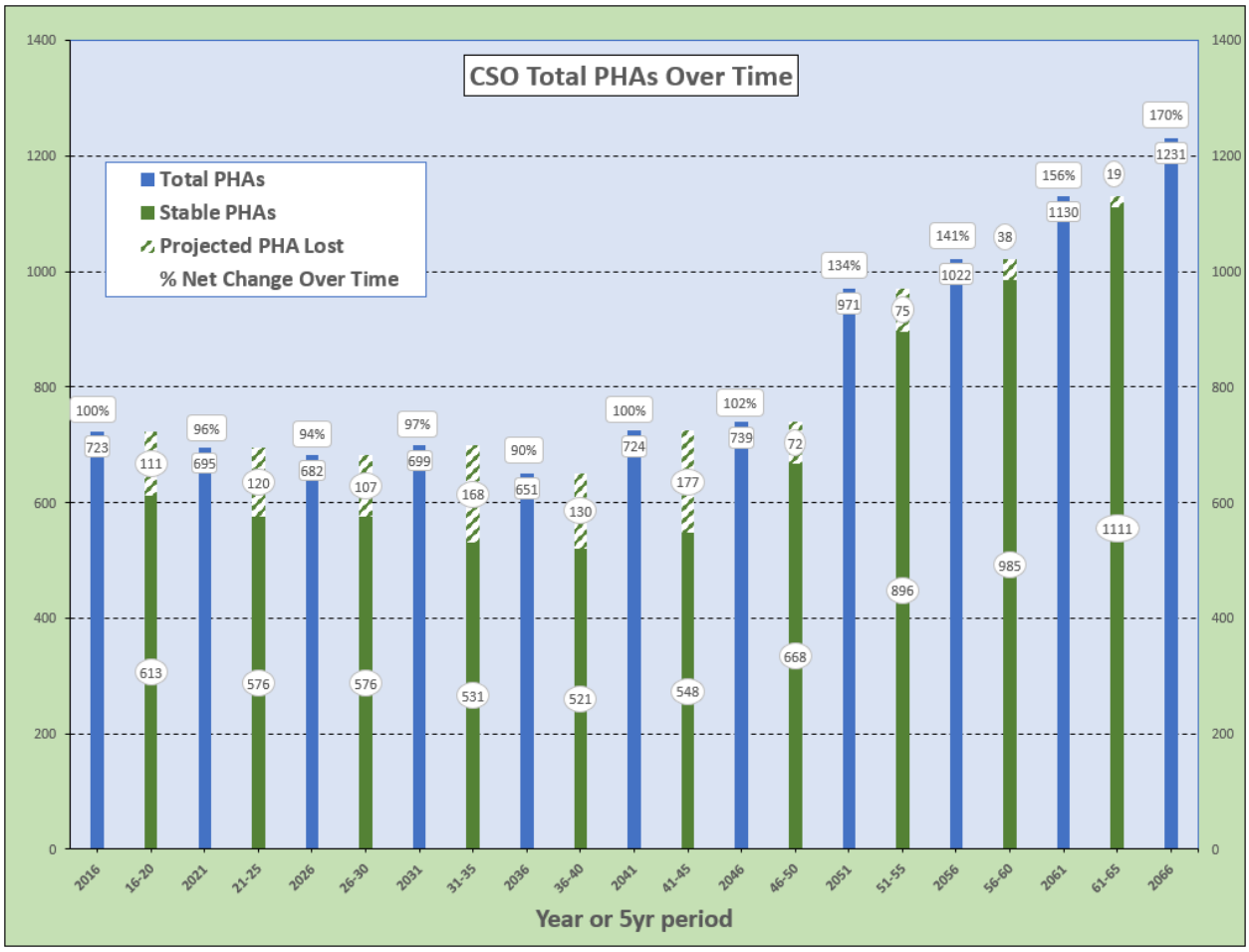

Figure 5.6. Projected Trend in CSO PHAs.

5.3.4. Trend in NSO PHAs

As of 2016, there were 147 NSO PHAs on the Plan Area and the portion of the Action Area within 0.25 miles of the Plan Area. The hexagon analysis, modeling only harvest, would project approximately 6.6 PHAs per year to fall below threshold during the first 5 years (33 "lost" divided by 5 years) (4 percent of total period PHAs per year) (Figure 5.7). Modeling harvest, applying annual growth of stands, and recalculating the PHA status for the first 5-year period, indicates a net gain of 14 PHAs (+9 percent). The analysis projects relatively steady increase over the first 25 years to 182 PHAs (24 percent above the starting PHA number) before increasing substantially in the latter decades of the permit period due to ongoing growth in Mixed stands and ingrowth of Even stands. The projected number of NSO PHAs over time under the HCP is shown in Figure 5.7.

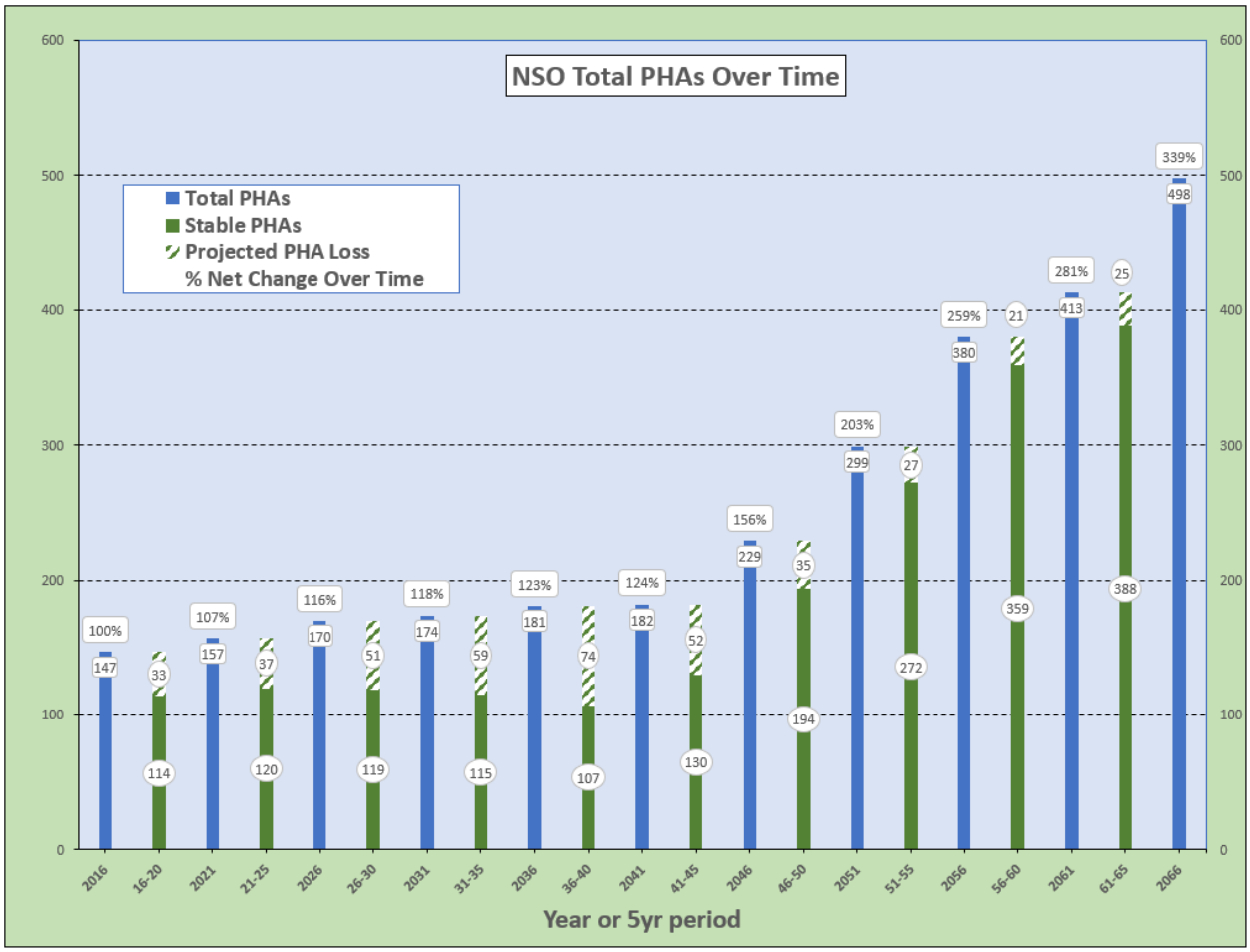

Figure 5.7. Projected Trend in NSO PHAs.

5.3.5. Conclusion: Landscape PHA Trend

This modeling effort and analysis of trend in PHAs indicates that based upon the best estimate of a modeled future, including all projected harvest and growth, SPI's proposed management will meet the objectives of Conservation Measure 1. This primary Conservation Measure provides that SPI will increase the amount and distribution of habitat capable of contributing to survival and reproductive capacity of CSO and NSO on the Plan Area over the permit term. PHA distribution maps for Year 0 start, 0 to 20 change, 0 to 50 change, and the end of the 50-year term of the HCP are provided in Appendix 4.3.

5.4. Hexagon Modeling Methodology for Occupied Hexagon Take Accounting

SPI has developed a methodology for projecting an estimation of the amount of future take. The method analyzes projected harvest in Occupied Hexagons. SPI maintains a database of the locations of all ACs for both NSO and CSO that can be intersected with the hexagon network. As

described in the PHA accounting methodology (Appendix 4.3), individual hexagon types over the permit term can be defined according to percentages of HF4 and HF2H by intersecting the HF type map with the hexagon network (Table 5.4). This intersection is done at the beginning of a given modeling period, again after harvest, and then again after modeled growth for each period throughout the HCP term. A hexagon may change type because of changes in HF composition. Post-growth values become the following period's starting condition. Tracking harvest impact across the 500-acre hexagon network in each model period allows assessment of the projected impact on every AC in Occupied Hexagons.

Table 5.4. Definitions of Spotted Owl Nest and Support Hexagons for Take Estimates.

Hexagon Type	Threshold Habitat Conditions	Requirements
Nest / Nesting	a) At least 30 percent HF4	Must meet all three conditions (a, b, and c) and be based upon minimum 100 acres SPI land.
Support	b) At least 50 percent HF4 and/or HF2H	Must meet one of the following options: • Conditions a and b • Conditions b and c • Condition b only
	c) At least one contiguous area (a potential nest stand) of at least 50 acres that includes at least 30 acres of HF4 and 20 acres of HF2H	
Below Threshold	Note: This category is for all hexagons currently below Nest or Support thresholds.	Fails to meet either a or b; may or may not meet c

HF4 = Habitat Form 4, - large tree; HF2H = Habitat Form 2 Heavy, - medium trees.
SPI = Sierra Pacific Industries

The projected status of an individual AC in an Occupied Hexagon is derived from the answers to the following questions regarding modeled harvest in each period:

1. Did SPI harvest in the hexagon? (If no, "No Take" is assigned)

2. Did that harvest cause the hexagon type to drop from Nest to Support, Nest to Below Threshold, or Support to Below Threshold? – (If yes, an instance of "Habitat Take" is estimated)

3. Did that harvest occur in a hexagon that was Below Threshold at the beginning of the period? – (If yes, an instance of "Habitat Take" is estimated)

For the purposes of quantifying potential "take" over the permit term, SPI uses the known occupied AC locations as of January 1, 2018, as the starting conditions for the modeling effort. ACs are not projected to move from their starting location for the purposes of this modeling effort. SPI considered other methodologies for projecting "movement" of ACs through time and determined that no methodology could simulate such movement without introducing significant speculation and uncertainty.

Throughout the permit term, individual Occupied Hexagons will sometimes be projected to fall below established thresholds (see Table 4.3.7 in Appendix 4.3) due to modeled timber harvest. The modeled occurrences of such future events are the basis for the projected amount of potential (modeled) take resulting from habitat changes that is proposed for authorization under the incidental take permit (i.e., a habitat-based surrogate for take via harm).

5.4.1. Annual Estimation and Tracking of Actual Take

In addition to modeled projections, planned harvests that would potentially reach these thresholds will be reported annually as projected instances of take. Given that such projected take can occur near or on other landowners, any appropriate notification of other landowners will remain the responsibility of the Service. After actual harvest is completed, the action will be reviewed using continually updated AC locations and PZ boundaries. The annual analysis of take will identify and count the Occupied Hexagons where harvest occurred in Below Threshold Hexagons or where SPI harvest resulted in the number of habitat acres falling below thresholds. These instances of potential take will be reported by SPI and will be reviewed by the Service. This review, including a NAIP image review of surrounding habitat (both SPI and other ownerships), will confirm or reject the rule-based estimate of take. This final analysis will produce the actual annual take amount that will be charged against the take authorized under the ITP. To maintain consistency with our modeled estimate of take and as a practical accounting matter, when take has occurred by Covered Activities within a given Occupied Hexagon, additional take will not be counted for covered activities in the same Occupied Hexagon over the 5 following years. However, as explained in the Service's biological opinion dated September 25, 2020, if it becomes clear through annual reports or other information that operations within a given hexagon over consecutive years have resulted in impacts to an occupied AC, the Service and SPI will work together to determine if actual take has occurred more than once during that time period (USFWS File 08EYRE00-2020-F-0151).

5.4.2. Potential Sources of Error in Estimating Projected Take

Three primary sources of error may occur using the analysis of projected take. The first two may contribute to an overestimation of projected take. The third source, while unlikely, may contribute to underestimation of projected take.

1. Overestimation of incidental take in the form of harm may result because habitat on non-SPI lands near SPI lands is not counted as habitat in the projections. The GNN analysis (Raphael et al. unpublished data, Appendix 3.4) found high amounts of combined nesting and marginal nesting habitat in 500-acre areas around CSO and NSO ACs (at 267 CSO low elevation sites: mean 78 percent, SD = 15 percent; at 295 CSO high elevation sites: mean 80 percent, SD = 12 percent; at 94 NSO sites: mean 74 percent, SD = 15 percent). That analysis of habitat was independent of ownership. When it is on other ownerships, such habitat is not included in the projection. Where present in Occupied Hexagons and around nearby ACs on other ownerships, it could

serve to limit the actual effect. In such a case, projected estimation of NSO and CSO habitat amounts on SPI lands may indicate that harvest will reduce habitat to a level below the take threshold (and be projected as an instance of take), even if habitat on neighboring ownerships is sufficient for the hexagon as a whole to remain above the threshold.

While SPI's decision not to project habitat provided by other owners avoids speculation and reliance on habitat SPI doesn't control, it will likely result in instances of overestimation of take projected for future periods. SPI's annual reporting of harvest activity in Occupied Hexagons, including analysis of remote imagery of all habitat in the hexagons, will allow the Service to evaluate actual take (i.e., reduction below threshold or harvesting in a below-threshold hexagon) on an annual basis and compare actual take against the authorized amount (See Section 5.4.1 above).

2. The model used to predict future growth and harvest may introduce some error into take projections due to the modeling interval used for these activities (a 5-year period). Harvest is modeled as occurring at the beginning of each 5-year period while growth is calculated at the end of each period. This may artificially inflate the projected estimate of habitat loss in relation to take thresholds during a given period. However, actual harvest and observed growth near ACs, with related changes in amount of Habitat Forms, will be reported to the Service each year. This will enable the Service to evaluate actions against the take thresholds on an annual basis and compare actual take against the authorized amount (See Section 5.4.1 above).

3. It also is possible that the projection for future take due to habitat modification could be underestimated by the methodology, which models the future condition of only the individual Occupied Hexagons that are occupied as of 2016. It is possible that an Occupied Hexagon would retain sufficient habitat to meet the threshold at various intervals and not be included among those where take is projected, but that the spotted owls at the AC depend substantially on conditions in nearby neighboring hexagons. In this situation, future harvest in one or more neighboring hexagons could reduce success of the owls at that Occupied Hexagon. However, for reasons described below, this condition is unlikely, and that likelihood will decline further through the permit period.

Among the existing Occupied Hexagons, 84 percent qualify as Nesting and Support Hexagons (i.e., they exceed the 50% HF2H and HF4 Threshold – see Table 5.4) while the overall current landscape contains only 52 percent Nesting or Support Hexagons (Appendix 4.3, Table 4.3.7(a)). Under these conditions, spotted owl populations in SPI's monitored study areas have demonstrated stable occupancy rates over the period 2012-2017 (Appendix 3.2). This suggests that the recent rate of continuing harvest and the relatively lower proportion of Nesting and Support Hexagons around Occupied Hexagons has not led to conditions detrimental to those spotted owl populations. At the time of permit issuance, the acreage of decadal clearcutting is declining and will continue to decline for the permit period, while the number of hexagons

qualifying as Nesting and Support Hexagons are projected to increase over the permit term to 93 percent of all hexagons. This will further reduce the likelihood of poor conditions in hexagons that neighbor hexagons with spotted owl ACs. Given the current and projected landscape conditions, actions in the neighboring hexagons (which are a randomly located sampling method overlain without regards to AC location) are not likely to increase the amount of estimated take.

Additionally, a potential large underestimate of this nature would not be expected to occur in reality, because the actual amount of habitat loss will be limited by spatial and temporal protections of the PZs and by the landscape improvement in HF2H and HF4 from Conservation Measure 1. All of these factors will be considered during the annual review of projected take in THPs, which will serve to limit the actual amount to that estimated in the original modeling and authorized in the ITP (See Section 5.4.1 above).

5.4.3. Analyzing Take in Spotted Owl Occupied Hexagons

The HCP Handbook provides for the use of habitat-based surrogates as indicators of incidental take where it is not practical to express the amount of take in terms of numbers of individuals (Section 8.2.2 of Handbook, USDI 2016). Such surrogates must be causally-linked to take of the covered species. In the present case, it is not practical to express the amount of take in terms of individual spotted owls given the broad variation in forested habitat quality and individual spotted owl response to habitat modification, the scope of covered lands, and the duration of the proposed HCP. In similar circumstances, the Service's NSO take avoidance guidelines for timber harvest (USDI 2009) established thresholds of habitat amounts at several scales (i.e., surrogates for take due to habitat modification), but also recognized that there may be other ways to evaluate the potential of take of timber harvest activities on NSOs.

As described in HCP Appendix 4.3, SPI's scientific data describes habitat conditions that are preferred by spotted owls on SPI lands. SPI established habitat thresholds below which it is reasonably foreseeable that take in the form of "harm" to spotted owls may occur from timber harvest. The term "harm" is defined under agency regulations to mean any act which actually kills or injures fish or wildlife, where such acts may include significant habitat modification or degradation that significantly impairs essential behavioral patterns, including breeding, feeding or sheltering (50 CFR § 17.3). The habitat thresholds identified by SPI are briefly described in the following paragraph, and in more detail in Appendix 4.3 of the HCP. The HCP uses these habitat thresholds as the surrogate units to specify the amount of potential incidental take. SPI will monitor these surrogate units and report changes annually to the Service to ensure the level of authorized incidental take is not exceeded during the term of the permit.

5.4.3.1. Hexagon Thresholds and Incidental Take

In this section, SPI describes methodology and quantifies the amount of potential take that may occur in hexagons with ACs (i.e., actually occupied by CSO or NSO). SPI considers the Plan

Area/Action Area population of the two subspecies together, then each of the subspecies separately. Our analysis considers impacts to spotted owl ACs because they represent a specific location, and as such, the impacts of harvest and growth at these sites can be predicted. Later in this document, these AC "takes" will be converted to estimated impact to individual owls (See Section 5.5).

For purposes of this HCP, if (1) a THP on SPI land reduces habitat in a spotted owl Occupied Hexagon below the Nesting or Support hexagon thresholds noted above, or (2) timber harvesting on SPI land occurs in a Below-Threshold spotted owl Occupied Hexagon, incidental take in the form of "harm" is reasonably foreseeable to occur. As described in section 4.3.9 of HCP Appendix 4.3, SPI estimated how often, over the 50-year permit term, timber harvest may reduce habitat conditions on covered lands to below these thresholds. These estimated instances are based on projected annual harvest over the 50-year term of the permit and currently Occupied Hexagons.

As of 2018 (the starting date for the AC modeling used in this HCP), there were 809 ACs (121 NSO and 688 CSO) in the Action Area (i.e., out to 1.3 miles from SPI lands in the NSO range and 1.0 miles from SPI lands in the CSO range). An AC more than 0.25 mile away from the Plan Area is unlikely to be impacted by SPI covered activities, for reasons explained in Section 4.3.9.1 of Appendix 4.3. There were 428 ACs (61 NSO and 367 CSO) on or within 0.25 mile of the Plan Area. This group represents the Occupied Hexagons for consideration of projected habitat take. Within this subset, 199 ACs (17 NSO and 182 CSO) were located on SPI lands. An additional 229 ACs (44 NSO and 185 CSO) were located within 0.25 mile of the Plan Area.

Among the 428 ACs on or within 0.25 mile of SPI lands, 41 were in hexagons that contained less than 50 acres of SPI ownership. Only 4 (all of which are CSO) of these 41 ACs were on the Plan Area. Because SPI owns less than 10 percent of the land within each of these 500-acre hexagons, and considering the rest of the conservation measures, occupied ACs among these 41 are unlikely to be impacted by SPI activities and are not included in the projection of take resulting from habitat modification. Therefore, 387 ACs (428 minus 41) (90 percent of all ACs on or within 0.25 mile of SPI lands) can be evaluated by modeling change within the hexagon network. SPI will still provide standard HCP protections to these 41, including surveys to detect owls (Appendix 5.4), designation of PZs (Appendix 5.2), and will include them in the annual evaluation as to whether potential take has in fact occurred (HCP Section 5.4.1).

5.4.3.2. Estimating Take of Spotted Owls in Occupied Hexagons

An example analysis, during the first 5-year modeling period (starting in 2016), 66 spotted owl ACs (28 on SPI and 38 others within 0.25 miles of SPI) were in hexagons where the projected harvest would meet the criteria for "habitat take." These actions would be counted as instances of projected take in the form of "harm." The projected take via harm would occur annually on average at 13.2 ACs (1.6 percent; 13.2/809) of the Plan Area/Action Area ACs. Whether this take actually occurs would be confirmed and potentially reduced from this estimate in the annual review of actions and conditions (See Section 5.4.1).

The potential instances of take described above are the basis for the proposed amount of take that would be authorized in the permit. However, the actual amount of take that would be counted against the permitted amount is expected to be less, as a result of the temporal and site-specific application of the other conservation measures.

It is important to note that most of the instances of habitat falling below thresholds will occur because the Nest Hexagon's HF4 percentage falls below its separate threshold of 30 percent based on SPI lands. The Occupied Hexagons that will have been harvested below the threshold are projected to contain an estimated average of 23.5 percent nesting habitat (HF4) and 48.4 percent total nesting habitat (HF4 and HF2H combined) based on SPI lands following the modeled harvest. Consequently, most hexagons falling below threshold will still contain substantial amounts of nesting habitat, even though the overall hexagon condition has fallen below threshold, triggering an occurrence of incidental take using the habitat-based surrogate. (See Post-harvest Analysis in Section 4.3.9.3 of Appendix 4.3).

Real-time habitat accounting associated with the annual monitoring will identify stands that have grown into threshold condition; this actual annual accounting will find more habitat in most years than was projected because growth is occurring annually and the modeled impact on ACs is based upon harvest only. Further, pre-project surveys will identify ACs actually inhabited by spotted owls prior to timber operations. SPI's modeled estimate is that habitat in 24 (36 percent) of the 66 hexagons where take could occur (and included in the estimate) will grow back above the threshold values in the same 5-year period because many stands nearly meet the habitat thresholds. The required annual monitoring will also account for the actual location of PZs and the habitat protected within them. Therefore, it is likely that the actual number of instances of habitat take will be less than those modeled.

5.4.3.3. Estimating Take of CSO in Occupied Hexagons

This discussion considers the CSO as a subset of the discussion of all ACs above. There were 367 CSO ACs (86 percent of the total of 428 ACs identified above) on or within 0.25 mile of the Plan Area. Thirty-four were in hexagons with less than 50 acres of SPI ownership. Thus, 333 CSO ACs (367 minus 34 = 333) were within the range of the CSO in the Plan Area and Action Area out to 0.25-mile from the Plan Area. Using the same analysis described above (Section 5.4.3.2), we estimated that take would occur at 58 CSO ACs over the first 5-year period (26 on the Plan Area, 32 in the Action Area), an estimated average annual impact of 11.6 ACs (1.7 percent of the 688 CSO ACs in the Action Area).

5.4.3.4. Estimating Take of NSO in Occupied Hexagons

This discussion considers the NSO as a subset of the discussion of all ACs above. There were 61 NSO ACs (14 percent of the 428 ACs of both subspecies identified above) on or within 0.25 mile of the Plan Area. Seven were in hexagons with less than 50 acres of SPI ownership; all the remaining are in the hexagon network. There were 54 NSO ACs within the evaluated Plan Area and the Action Area out to 0.25 mile from the Plan Area. Using the same analysis described

above (Section 5.4.3.2), we estimated that take would occur at 8 ACs over the first 5-year period (two in the Plan Area, six in the Action Area), an estimated average annual impact of 1.6 ACs (1.3% percent of the 121 NSO ACs in the Action Area). (Note that all SPI harvesting in the NSO range prior to issuance of this ITP was and will be conducted under take avoidance determinations by CAL FIRE and the Service).

The actual instances of take at NSO ACs may be fewer than this estimate, especially because the hexagon modeling estimate could not exclude harvest around the 34 NSO ACs being given 50-year protection under the NSO prioritization Tier program (HCP Section 5.2.2 and Appendix 5.3). These SPI-designated "no-harvest areas" will reduce the instance of take to below the modeled harvest estimate, but by an unknown amount. Modeled estimates of take are estimates of ACs on the landscape and given the potential for movement out of the "no harvest" Tier 1 areas, we need to continue to estimate these potential takes. If an AC moves outside of the designated Tier 1 area, they will become subject to the take analysis. Annual surveys will track the actual locations of ACs for the annual take calculations.

5.4.3.5. Summary of Projected Instances of Incidental Taking

Summarizing the types and amount of incidental take projected to occur under the HCP:

Direct killing or injuring of adult spotted owls at ACs: Negligible. As a result of pre-project surveys, seasonal restrictions around ACs, PZs (all in Section 5.2.5), the SPI raptor policy (Appendix 5.7), and the ability for adults to escape harvest activities, we estimate its effect to be discountable.

Direct killing or injuring of eggs or flightless juvenile spotted owls at ACs: Negligible. While there is an insignificantly small chance that this might occur, we estimate its effect to be discountable.

Direct killing or injuring of adult or fledged juvenile spotted owls away from ACs: Negligible. These mobile birds are capable of avoiding timber operations, habitat exists nearby in 500-acre cores and home ranges, and dispersal habitat exists throughout the Plan Area, so we estimate its effect to be discountable.

In summary, the potential take via harm of spotted owls due to habitat modification based on the criteria of impacts on Occupied Hexagons is as follows:

- For CSO, 649 projected instances over 50 years, on average 13.0 per year.
- For NSO, 115 projected instances over 50 years, on average 2.3 per year.
- The average annual instances of take are estimated to occur in 15.3 Occupied Hexagons (13.0 + 2.3) for CSO and NSO.

The distribution of modeled take by habitat modification over the permit term is shown in Table 5.5. (For more detail see Section 4.3.9 in Appendix 4.3, Hexagon Analysis.)

Table 5.5. Instances of Modeled Take by Habitat Modification by Decade over the Permit Term

Decade	Decadal CSO Total	Average/Year CSO	Decadal NSO Total	Average/Year NSO
1	136	13.6	18	1.8
2	150	15.0	29	2.9
3	173	17.3	31	3.1
4	119	11.9	21	2.1
5	71	7.1	16	1.6
Average	130	13.0	23	2.3

CSO = California spotted owl, NSO = northern spotted owl

Although SPI intends to meet the Table 5.5 values over the permit term, the practical application of modeled take to actual annual take accounting may include some variability due to changing numbers and locations of owl territories and habitat conditions. To account for this reasonable variability, while remaining within the range of expected impacts, the following limits shall apply to actual take throughout the permit term, and are enumerated in Table 5.6:

1. During each decade, an annual limit of no more than 25% above the modeled average annual take portrayed in Table 5.5.
2. At the end of each decade, a decadal limit of no more than 5% above the modeled decadal total take portrayed in Table 5.5. These decadal limits are a guide and running total take is limited to the summed Total Max values for each decade as shown in Table 5.6 (See #3 below). The decadal limits are designed to ensure that the estimated impacts to spotted owls are distributed over time, and occur concurrently with or after the mitigation.
3. By the end of each decade, the sum total actual takes shall not exceed the summed total modeled take (red columns) shown in Table 5.6; and at permit term (year 50) the summed total actual takes must not exceed the original total modeled takes (649 for CSO and 115 for NSO).

Table 5.6 Maximum Instances of Take by Habitat Modification over the Permit Term

Decade	Decadal CSO Max	Annual CSO Max	Sum Total CSO Max	Decadal NSO Max	Annual NSO Max	Sum Total NSO Max
1	143	17	143	19	2	20
2	158	19	296	30	4	50
3	182	22	469	33	4	81
4	125	15	588	22	3	102
5	75	9	649	17	2	115

These limits were added to minimize potential "front loading" of take, while accounting for assumed natural changes in owl territories over time, and to allow for necessary operational flexibility.

Actual take may include some temporal variability due to modeling limitations, changing numbers and locations of owl territories, and habitat conditions. To account for this reasonable variability, we have built in flexibility to our analysis of the modeled take (now shown as annual, decadal, and running sum total limits in Table 5.6). In addition, the Service will be meeting with SPI biannually, and as needed, can discuss the possibility of reasonable variations in these limits as necessary.

Any additional reasonable variation in these limits will be assessed on a case by case basis and would be allowed if the Service determines, in coordination with SPI, that the impacts of exceeding the decadal limits are supported biologically and within the total amount of take (649 for CSO and 115 for NSO). The Service's determination will fully utilize information derived from SPI's HCP monitoring activities, such as spotted owl status on SPI lands resulting from covered activities, demonstrated benefits of SPI's conservation measures on SPI lands, and other new scientific data derived from SPI's HCP relevant to spotted owls.

Authorized take in this HCP is fully described in the Service's Incidental Take Permit (USFWS Permit Number: TE84089D-0 dated September 30, 2020).

5.5. Impact of Incidental Taking at Various Population Scales

Criteria in the U.S. ESA require an HCP applicant to evaluate the impact of the proposed taking (HCP Handbook, USDI 2016). To assess the potential importance of the taking in the context of regional and range-wide populations, we will compare the projections with spotted owl numbers known at various scales. Estimates of population change have been calculated based on demographic studies for both NSO and CSO. Prediction of spotted owl populations in future decades on the Plan Area, Action Area, or across the range of the two subspecies would be conjectural. Therefore, SPI compares the projected instances of incidental take with populations known at the present time and assumes that impacts will remain roughly proportional into the future.

There is limited available scientific information on the effects of harvest on spotted owl survival and reproduction. Recent data from Green Diamond Resource Company (GDRC 2018) indicated that adult spotted owls were unlikely to be killed or suffer direct bodily injury as a result of reducing habitat below habitat thresholds similar to that proposed in this HCP. However, spotted owls are likely to be impaired if changes in habitat near previously used nest sites result in failed breeding attempts or if breeding is foregone in any given year. GDRC (2018) reported that 16.7 percent of their total 1990-2008 NSO re-capture histories were from females that had been displaced by harvest under the GDRC NSO HCP. Their study found no measurable effect of displacement on survival rates among adult NSOs.

Although effects to adult survival rates were not detected, GDRC (2018) found that displacement of female NSO by habitat modification resulted in lower subsequent reproductive rates among those individuals. This indicates habitat modification may result in harm to spotted owls by reducing production of young. GDRC (2018) found that the amount or degree of harm depended on the age of the individual breeding female spotted owl when displaced and on the number of years in which the reproductive rate was reduced. GDRC (2018) concluded that the maximum cumulative effect of displacement on their lands equated to 1.57 fewer young produced per 100 adult females per year.

Over SPI's permit term, projected harvesting that would result in crossing the threshold will be an uncommon event. For the CSO, there are 333 ACs on or within 0.25 miles of the Plan Area; over 50 years covered activities are projected to cause habitat amounts to drop below the surrogate threshold 649 times, or an annual average of 13 times (3.9%). For the NSO, there are 54 ACs on or within 0.25 miles of the Plan Area; over 50 years covered activities are projected to cause habitat amounts to drop below the surrogate threshold 115 times, or an annual average of 2.3 times (4.3%).

Based on the GDRC analysis presented above, reducing habitat conditions below the thresholds is unlikely to cause the death or direct bodily injury of spotted owls that are capable of dispersing. This is likely because sufficient habitat will remain adjacent to these individuals on covered lands to support their needs for foraging and dispersing. It is reasonably foreseeable that reproductive rates will be reduced among female spotted owls that reside in areas where the threshold is crossed, resulting in harm to individual owls. Although the duration of reduced reproductive rates is unknown, SPI suggests that it is likely to be limited to one year because remaining stands adjacent to harvested areas will contain nesting habitat (HF4 and HF2H combined), thus minimizing and mitigating the impacts to individual owls. (Conditions in Hexagons Adjacent to Occupied Hexagons in Section 4.3.10 of Appendix 4.3). Further, the amount of harvested habitat will be relatively small as demonstrated by the declining percentage of clearcut harvesting into the future (Post-Harvest Conditions in Taken Occupied Hexagons in Section 4.3.10 of Appendix 4.3). Within the affected hexagon, the rate of habitat growth returning to threshold levels is another mitigating factor to the duration of the reduction in reproduction, since 32 to 55 percent (with a weighted average of 41%) of impacted hexagons per period grow back to their starting category within the same 5-year modeling period. (Post-harvest Growth of Taken Occupied Hexagons in Section 4.3.10 of Appendix 4.3).

Based on spotted owl reproductive data collected from SPI's WSAs and Census Area (2011 through 2018), the average annual production of young per occupied AC was 0.30 young for the CSO and 0.45 young for the NSO. The projected harvest modeling (Section 4.3.9.2 of Appendix 4.3) estimated an annual average of 13 habitat threshold crossings in the range of the CSO and 2.3 habitat threshold crossings in the range of the NSO, leading to an average annual loss or reduction in reproduction of 3.93 (4.0) CSO potential young (4% of CSO average annual production of young owls) and 1.04 (1.0) NSO potential young (4.3% of NSO average annual production of young owls). These 5 lost potential young would be the equivalent of 4 percent loss from the estimated average annual production of 124 (333*0.30 + 54*0.45 = 124) young across the Plan Area.

Precise comparison of this loss of potential reproduction to range-wide spotted owl reproduction is not feasible because exact overall population numbers are not known, and spotted owl reproductive rates are variable among study areas as well as subject to numerous environmental and methodological factors (for examples, see Blakesley et al. 2010, Dugger et al. 2016, GDRC 2018). To provide a general perspective for potential effects to the CSO and NSO, we used SPI's young per AC and estimates of AC numbers at broader scales, as follows:

The 333 CSO ACs evaluated above constitute about 18 percent (333/1,865 = 18%) of the estimated 1,865 CSO ACs known in the Sierra Nevada. (This estimated number of Sierra Nevada ACs is known to be only approximate for reasons detailed in HCP section 3.2.1, but is the best available estimate.). Using 1,865 as the number of potential reproductive ACs, the loss of 4 percent (4/100=4%) of potential young from SPI's reproduction would constitute less than 1 percent (18% x 4% = 0.72%) of the average annual reproduction in the Sierra Nevada. (This calculation is based on applying SPI's average young production per AC across the entire Sierra Nevada CSO range).

The 54 NSO ACs constitute about 3 percent (54/1,595 = 3.3%) of the 1,595 NSO ACs in the California Klamath and California Cascades provinces, within which SPI's NSO ACs occur. (This estimated number of sites is known to be only approximate for reasons detailed in HCP section 3.1.1, but is the best available estimate). Using 1,595 as the number of potential reproductive ACs, this loss of 1 (1/24.3 = 4.1%) potential NSO young from SPI's reproduction would constitute much less than 0.1 percent (3% x 4% = 0.12%) of the average NSO annual reproduction in the two provinces. (This calculation is based on applying SPI's average young production per NSO AC across the two provinces described above).

As described above, several factors indicate that these annual rates of potential take at HCP ACs may be overestimated, and therefore the proportional projected impact at various scales is also likely overestimated. The actual amount of take that is counted against the permitted take is expected to be less than projected, as a result of the temporal and site-specific application of the other conservation measures. Real-time habitat accounting associated with the annual monitoring will identify stands that have grown into threshold condition; this actual annual accounting will find more habitat in most years than was projected because growth is occurring annually and the modeled impact on ACs is based upon harvest only.

5.5.1. Minimization and Mitigation of Impacts

SPI's barred owl research will reduce the risks to spotted owls on an annual basis by collecting barred owls for scientific studies. This program will provide mitigation for the reduction in reproduction due to habitat modification. Removing barred owls has been demonstrated to reduce their effects on spotted owl occupancy, survival, and reproduction, and spotted owls are known to re-occupy their former ACs following removal of barred owls (Dugger et al. 2016, Diller et al. 2016). SPI's scientific collections of barred owls prior to the development and approval of this HCP documented spotted owls re-establishing occupancy and breeding in at least 10 NSO ACs and 17 CSO ACs during the period 2015 through 2019.

As discussed above, the estimated amount of take in the form of "harm" will result in the lost production of 1 juvenile NSO per year and 4 juvenile CSO per year. Applying SPI's observed NSO reproductive rate of 0.45 young per occupied AC per year, the removal of barred owls from 10 NSO ACs and preventing re-occupancy by barred owls will compensate for one year of lost reproduction among NSO ACs taken by habitat modification across the NSO portion of the Plan Area (0.45 young X 10 ACs = 4.5 young). Applying SPI's observed CSO reproductive rate of 0.30 young per occupied AC per year, the removal of barred owls from 17 CSO ACs and preventing re-occupancy by barred owls will compensate for one year of lost reproduction among spotted owls at CSO ACs taken by habitat modification across the CSO portion of the Plan Area (0.3 young X 17 ACs = 5.1 young). The combined annual projected increase in produced young is 9.6 juvenile owls.

These annual effects will compound into subsequent years at the already restored ACs and the number of such sites likely will increase with continued barred owl research collections. Continued scientific collections of barred owls across the Plan Area under HCP Conservation Measure 8 will allow spotted owl occupancy and reproductive behavior to persist at many more ACs than will be taken by habitat modification and will enable greater reproduction than the projected loss. In this way, the barred owl research program will entirely mitigate for the impact of the projected take due to habitat modification.

In addition, post-harvest habitat conditions will combine to limit and mitigate the effect of harvest at the landscape scale and at the Occupied Hexagons. As described in HCP Appendix 4.3, most Occupied Hexagons that fall below the take threshold will do so by relatively small amounts and most of these hexagons will continue to contain habitat for spotted owls (See Post-Harvest Conditions in Taken Occupied Hexagons, Appendix 4.3). Also, modeled continuing habitat growth will often return the taken hexagon to above the threshold, since 32 to 55 percent (with a weighted average of 41%) of impacted hexagons grow back to their starting category within the same modeling period (5 years) (Post-harvest Growth of Taken Occupied Hexagons, Appendix 4.3). Harvests that cause habitat in Occupied Hexagons to fall below thresholds also will be mitigated by the habitat conditions in adjacent hexagons (described in the Conditions in Hexagons Adjacent to Occupied Hexagons, Appendix 4.3.

The effects of timber harvest that cause habitat in Occupied Hexagons to fall below thresholds also will be mitigated at the broader landscape scale by the widespread presence of habitat, as indicated by the number of PHAs. As of 2016, the PHA count in the CSO range was nearly 2.2 times the number of CSO ACs, and in the NSO range, 2.7 times the number of NSO ACs. As of 2016, the average Nest Hexagon of the PHAs contained a habitat distribution of 55 percent HF4 and 18 percent HF2H, and by year 20, the average Nest Hexagon in the PHAs is projected to contain 47 percent HF4 and 18 percent HF2H. Although the modeled PHA count for the CSO will decline by 10 percent before rebounding in the third decade and throughout the remaining permit period (see HCP Figure 5.3), even at the lowest point the projected PHA count will be almost 2 times larger than the present number of CSO ACs. The PHA count for the NSO starts at nearly 3 times the present number of NSO ACs and increases throughout the permit term.

As a result, although access to some habitat may be limited by the owls' territorial behavior, alternate habitat will be available for spotted owls capable of dispersal that might be displaced by habitat modification, mitigating the effects of the instances of take even at the lowest projected count of PHAs. The rapid increase in PHAs after year 20 will provide even greater opportunity for re-settlement of dispersed breeders and mitigation of effects of timber harvest. The expected increase in the number of PHAs is the direct result of an increase in the total amount and distribution of SPI land consisting of large tree high-canopy-closure stands (HF4). These stands will be accompanied by significant retention of older forest elements, as a result of the retention conservation measures.

Summary of Mitigation

In summary, throughout the permit term, the habitat remaining in Occupied Hexagons and surrounding areas is expected to be sufficient to provide for displaced owls that are capable of dispersal, which will mitigate the effects of habitat modification at the time they occur. Meanwhile, the barred owl research program is expected to continually protect and enable greater spotted owl reproduction than that projected to be lost due to habitat modification. Therefore, the effects of take will continually be mitigated by the Conservation Measures, and no take effects would remain to be mitigated in any period.

The benefits to spotted owls from successful implementation of this HCP will exceed the projected impacts and minimize or mitigate to the maximum extent practicable the impacts of the taking resulting from the covered activities.

5.6. BENEFITS OF THE HCP

SPI has concluded that this HCP should meet the statutory and regulatory requirements for issuance of incidental take permits under the federal ESA and CESA. SPI has the most extensive industrial forest ownership in the California range of the NSO and CSO. In SPI's opinion, the benefits to spotted owls from successful implementation of this HCP will exceed projected impacts and minimize or mitigate to the maximum extent practicable the impacts of the taking resulting from the covered activities. An even broader conservation benefit will occur with the ensured establishment of this overall habitat management on these important portions of the subspecies' ranges. The HCP provides conservation benefits for both the federally protected NSO and the CSO whether or not CSO becomes listed under the federal ESA.

In addition, many HCP measures go beyond what is required under existing regulatory mechanisms for federally protected NSO. Extensive conservation benefits associated with the HCP are briefly reviewed below. Significantly, much of the benefit comes from SPI management decisions to maintain existing unoccupied suitable habitat and to encourage growth of more suitable habitat over time.

Over the Permit term, the number of PHAs is projected to increase from 870 to a final total of 1,729 (199 percent of the starting PHA count). A PHA is based on important component parts of a potential territory for a reproductive pair of spotted owls and their offspring. These components include nest stands, the surrounding core use areas, and central portions of the home range that receive high use relative to other portions of the territory and home range. The net increase in PHAs is projected to occur throughout the range of both CSO and NSO on the Plan Area.

This HCP would also result in a significant net increase in nesting habitat of medium-tree high-canopy and large-tree closed-canopy Habitat Forms (HF2H and HF4) over the permit term. Forty-three percent of today's Mixed stands will be retained throughout the permit period, and the planting, management, and growth of even-aged crop trees will combine with volunteer understory conifers to create multi-storied stands averaging more large trees than in today's Mixed stands. Continued harvest and growth will create a variety of forest conditions that can reasonably be expected to provide habitat for spotted owls and important prey species.

With respect to the NSO, the HCP would bring benefits beyond the existing protections under the take avoidance standards of the CFPRs and the Service's take avoidance guidelines. In particular, 11,762 acres of the best nesting and roosting habitat surrounding 34 NSO ACs will be removed from the harvest rotation for the permit period regardless of its occupied status, to serve as occupied habitat or habitat that may be re-occupied in the future.

Other important benefits will include all of the mandatory retention and limits described in Section 5, including AC PZs, HRAs, Legacy Trees, Wildlife Trees, former spotted owl nest trees, additionally retained trees, hardwood recruitment, retention in thinned plantations, retention of

snags, green culls, and cull logs, and retained elements in salvage harvest of burned areas. In combination, these measures will contribute to earlier formation of spotted owl habitat as planted stands grow into medium-tree high-canopy and large-tree closed-canopy Habitat Forms (HF2H and HF4) over time. The PZ designations currently include 21,706 SPI acres and will vary with location of Occupied ACs. SPI has committed to maintain 80 percent of this value over the permit term (see Section 5.2.2 and Table 6.2).

The HCP would ensure implementation of key scientific studies that would be voluntary without an HCP. These include continued monitoring of owl occupancy in the NSO Weaverville Study Area and in the CSO Watershed Study Areas, with establishment of adaptive management triggers for annual, 5-year, 5-year dynamic and multi-state occupancy models, and 10-year monitoring and detection of declines (HCP Section 6.5, Monitoring). The HCP also would ensure the implementation of key scientific studies related to the invasion by BDOWs, and enable production of additional young than may be lost to incidental take due to timber harvest. The HCP would include a planned study to determine how spotted owls will utilize planted forests that include the required retention standards.

Outside of SPI lands, progress on NSO recovery actions (USDI 2011) and CSO conservation objectives (USDI 2017) is not within SPI's direct control. However, during the permit term, SPI conservation measures would contribute to improved conditions outside the Plan Area, including the following:

- aggressive fuels and fire risk reduction that will benefit spotted owls and adjacent landowners,
- cooperation with agencies in amelioration of sites where contaminants are present in trespass marijuana growing operations that will benefit spotted owls and other wildlife that use the surrounding landscape, and
- reduction of short- and long-term effects of the BDOW expansion across the entire range of NSO and CSO.

Another key benefit of the regulatory stability of the HCP and ITP will be its contribution to SPI's ability to continue providing 5,500 family wage jobs and renewable carbon-friendly wood products to society.

6. MONITORING AND ADAPTIVE MANAGEMENT

SPI's monitoring strategy will:

1. Monitor landscape-scale and PHA specific Habitat Form conditions across the Plan Area;

2. Annually track and report the number and spatial distribution of PHAs;

3. Report annually estimated potential take from that year's projected harvest, and from the previous year's actual harvest;

4. Continue to monitor and report spotted owl occupancy trend in six existing and potentially additional monitoring density study areas distributed across the range of each subspecies;

5. Monitor movement of spotted owl ACs in response to timber harvest;

6. Monitor implementation of retention standards;

7. Early in the third decade, meet with the Service and CDFW to review monitoring results over the first 20 years and determine the necessity of, and potential methodologies to, evaluate spotted owl use of planted forests that have developed with the retention standards described in Section 5 of this HCP;

8. Monitor compliance with the HCP;

9. Monitor barred owls; and

10. Report to the Service on these monitoring efforts by June 30 of each year.

Each item in the above list will be further discussed under the subsections of this section below.

As feasible, SPI will continue to gather detailed data and to apply the most recent technologies and statistical methods to gain more insights to meet SPI commitments in this HCP. These combined monitoring efforts will inform SPI, the Service, and CDFW if there is any trend towards exceeding the estimated level of authorized incidental take, and if necessary, trigger a process with the Service to develop and implement adaptive management actions to reduce potential take for the remaining term of the ITP. Further, this monitoring will provide important information to SPI and the Service regarding the implementation of the Conservation Measures.

6.1. Monitoring Habitat Conditions Across the Plan Area

SPI will annually update the base Habitat Form polygons for all changes in the Plan Area. This will include scheduled timber harvest, any unplanned land disturbance, and tree growth. A detailed summary of forest inventory procedures conducted on SPI timberlands can be found in Appendix 4.3.

SPI maintains all the necessary GIS data layers for all stand boundaries and uses these stand boundaries to accumulate the plot data into the average values needed to categorize stands into Habitat Forms. A planted stand survey will be used to provide information to describe each planted stand, and then all data used to develop Habitat Form categories. SPI's cruise manual and regeneration survey procedure are in appendixes (Appendix 6.2, Cruise Manual and Appendix 6.3, Regeneration Survey Procedure).

The amount of Habitat Forms will be summarized by spotted owl subspecies range in the annual report. The report will include a narrative that describes the Mixed- or Even-origin status of the total Habitat Forms.

6.2. Monitor Potential Habitat Areas

Each year after the update of the inventory and the Habitat Forms is completed, SPI will re-intersect the fixed hexagon set with the Habitat Forms and reevaluate each hexagon according to the hexagon class rules and aggregate them into PHAs. The number of PHAs lost/gained and the total number of PHAs will be reported annually to the Service. Spatially explicit maps along with a descriptive narrative of PHA change will be provided. Amount of Habitat Forms will be summarized by PHA in the annual report. The report will include details as to Mixed-origin or Even-origin status of the Habitat Forms in the PHAs and changes in quality ranking. Reports also will provide narratives describing the subtotals for high- and low-density areas by subspecies.

6.3. Monitoring Potential and Actual Incidental Take

On an annual basis, SPI will intersect its projected harvest units with the hexagon-based Habitat Forms and evaluate the projected change in habitat conditions under the standards for take from habitat modification for all Occupied Hexagons. These standards are described in Table 5.4 in Section 5.4. As is detailed in Section 5.4.1, during the first year of plan implementation and annually thereafter, the proposed take estimates for the coming year will be reported to the Service prior to the spotted owl breeding season, including a list, a narrative description and map of each Occupied Hexagon where take is projected to occur via habitat modification. This potential take report will be submitted to the Service by February 28 of each year. A summary of the previous year's accounting of potential take, including a process narrative, maps and data, will be provided in the June 30 complete annual report. At the second biannual meeting (see Section 6.10, Reports and Annual Meetings) each year, this complete annual report will provide the basic information for the Service's final determination of actual take for each previous calendar year of the permit term.

6.4. MONITORING STUDY AREAS

SPI currently maintains five density study areas representing the high-density area within the range of the CSO in the Plan Area along a north-south transect on the west slope of the Sierra Nevada (Figure 6.1). Another large study area in Trinity County represents the high-density area within the NSO range on the Plan Area (Figure 6.1).

The amount and relative percentage of SPI lands in existing and proposed study areas for this monitoring program are shown in Table 6.1. These studies will continue the ongoing occupancy monitoring started in 2012 for CSO (Roberts et al. 2017) and in 2003 for NSO (as shown in Appendix 3.1).

Table 6.1. Monitoring Study Areas: Size and Percentage of HCP Activity Centers.

Monitoring Study Areas	SPI Acres in Study Area	Total Acres in Study Area	Percent SPI Land in Study Areas	Subspecies	Map Label (Figure 6.1)
South Fork Mokelumne River	17,637	30,147	59%	CSO	CSO 1
South Fork Cosumnes River	22,237	33,518	66%	CSO	CSO 2
Stumpy Meadows	18,953	28,444	67%	CSO	CSO 3
Chalk Bluff	5,646	29,972	19%	CSO	CSO 4
Fall River	14,514	21,900	66%	CSO	CSO 5
Proposed Antelope Creek	26,489	34,082	78%	CSO	CSO 6
Weaverville	145,359	311,928	47%	NSO	NSO 1
Total	**247,917**	**485,471**	**51%**		

Study Areas Summary	SPI acres in Study Areas by Density Area	SPI Total Acres by Density Area	Percent SPI in Study Areas	HCP ACs on SPI or Within 0.25 Mi.	HCP ACs in Study Areas (2018)	Percent of HCP ACs in Study Areas
CSO High Density Area	105,476	841,686	13%	349	56	16%
CSO Low Density Area	–	346,579	0%	18	0	0%
CSO Study Areas Total	**105,476**	**1,188,265**	**9%**	**367**	**56**	**15%**
NSO High Density Area	142,442	199,835	71%	56	53	95%
NSO Low Density Area	–	177,607	0%	5	0	0%
NSO Study Area Total	**142,442**	**377,442**	**38%**	**61**	**53**	**87%**
Study Areas Total	**247,917**	**1,565,707**	**16%**	**428**	**109**	**25%**

AC = Activity Center - CSO = California spotted owl - NSO = northern spotted owl - SPI = Sierra Pacific Industries

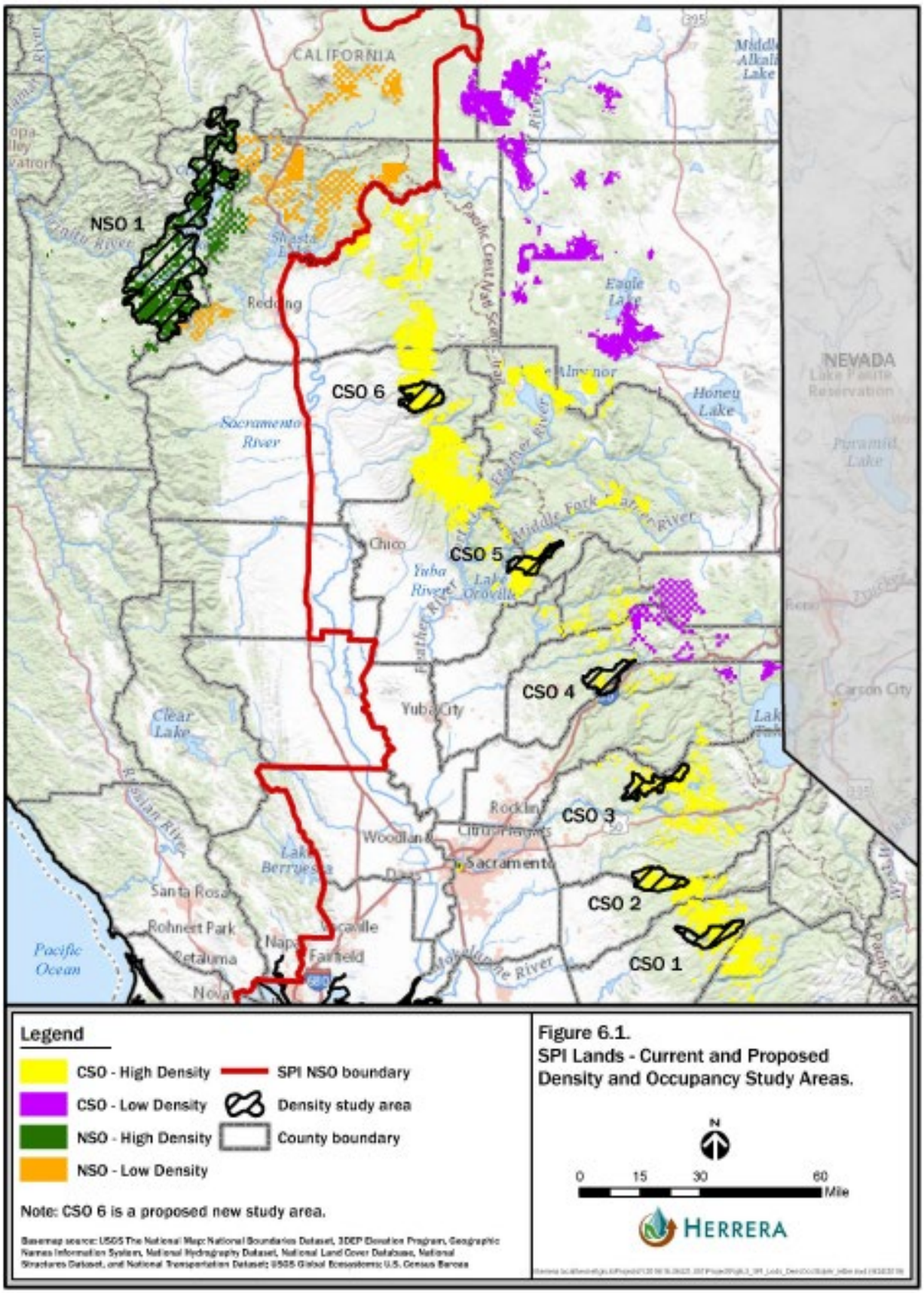

Figure 6.1. SPI Lands – Current and Proposed Density and Occupancy Study Areas.

If improved technologies or modeling systems become available and are economically feasible, SPI and the Service will confer to amend the monitoring proposal to enhance the ability to evaluate the trends in these subspecies. Loss of study area ACs to wildfire or other disturbance to the extent that prevents meeting the statistical goal of the occupancy study will constitute a changed circumstance (HCP Section 7, Changed Circumstances).

SPI does not propose monitoring the CSO or NSO populations in the low-density areas (see Figure 6.1) because these areas are at the edge of each subspecies' range. At this time, monitoring at the range edge is unlikely to provide information regarding trends that would inform adaptive management. If owl distribution changes with potential climate change or habitat conditions, SPI will confer with the Service regarding necessary changes in monitoring areas.

A sixth CSO study area may be established near the northern end of the Sierra Nevada, in an area that is primarily SPI property (Figure 6.1). This study area will not be added to the existing dataset as there is currently no existing population to monitor occupancy. This is an area that has lacked spotted owls for several decades but appears to be on the leading edge of re-occupation (J. Kelley, biologist with 25 years of experience in this area, pers. comm.). It is the intention to monitor the reoccupation process in this study area. This additional study area may provide a potential replacement for one of the five CSO study areas, should that become necessary. After 20 years, SPI will consider whether to include it into the complete occupancy analysis or to discontinue.

Comparison of Study Areas to SPI Lands

To evaluate whether study areas are representative of the entire Plan Area, this section provides comparisons of elevation, percent ownership and percent Habitat Form are provided for the CSO study areas and the NSO study area in Figure 6.2 and Figure 6.3, respectively.

Elevation is compared between the study areas and the Plan Area in the high-density zones for each of the Covered Species. Over the elevation range from 2,000 ft. to 6,000 ft. in the percentage of study areas and the SPI Plan Area within each 500-foot elevation increment does not differ by more than 10 percent.

In the WSAs and the NSO study area, the percent of Plan Area ownership exceeds the percentage in the high-density areas throughout the ownership (by 23 percent for CSO and 15 percent for NSO). This is to be expected since the study areas were selected on a contiguous area basis and intended to study SPI management impacts on spotted owls.

2016 Habitat Form percentage in the study areas is within 4 percent of the proportional amounts throughout the high-density zone, except for HF4 in the CSO study areas, which is about 9 percent higher than the Plan Area. The percentage of Habitat Form 4 in the various CSO study areas ranges from 32 percent to 56 percent, which is similar to conditions across the Plan Area.

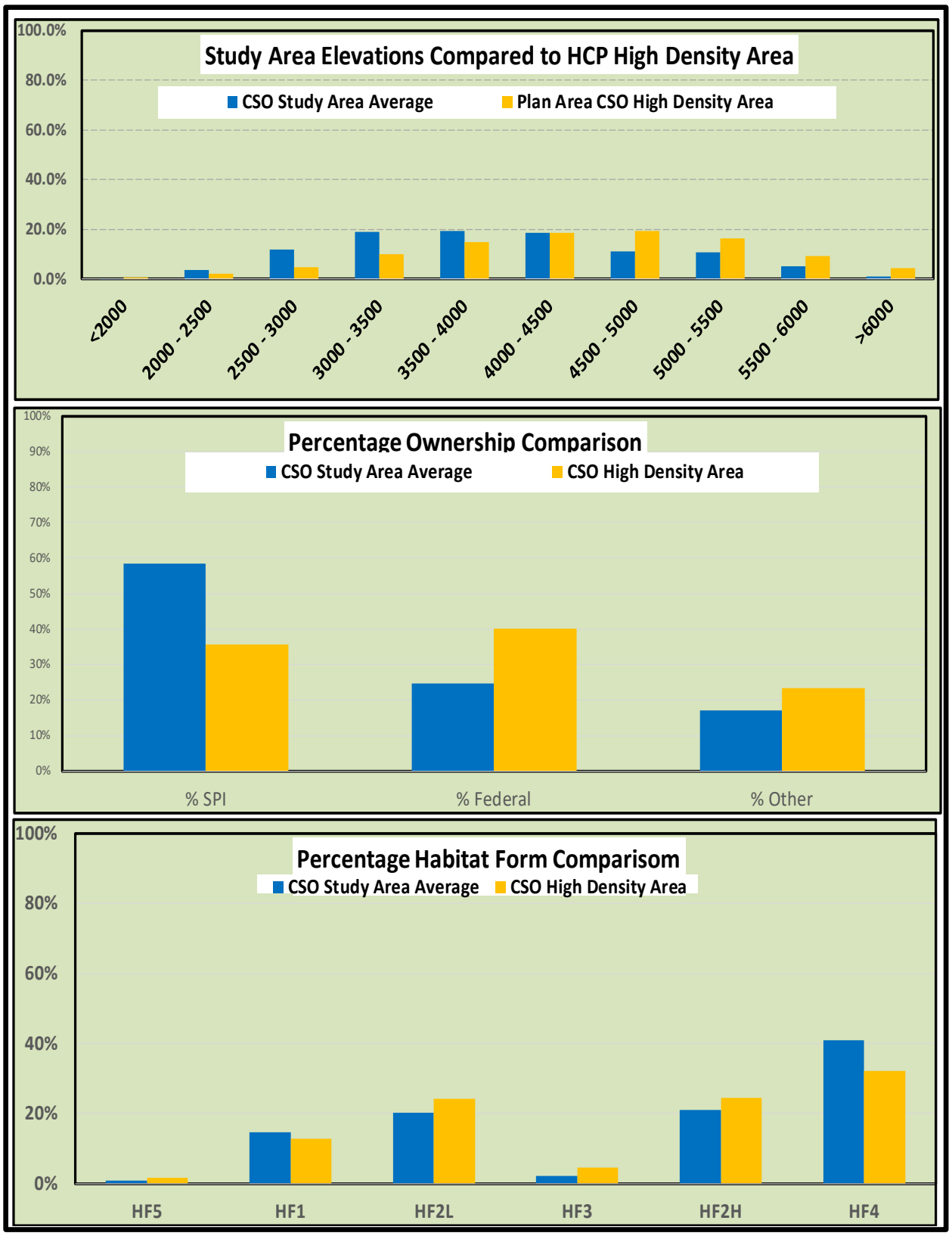

Figure 6.2. California Spotted Owl (CSO) Study Area Comparisons.

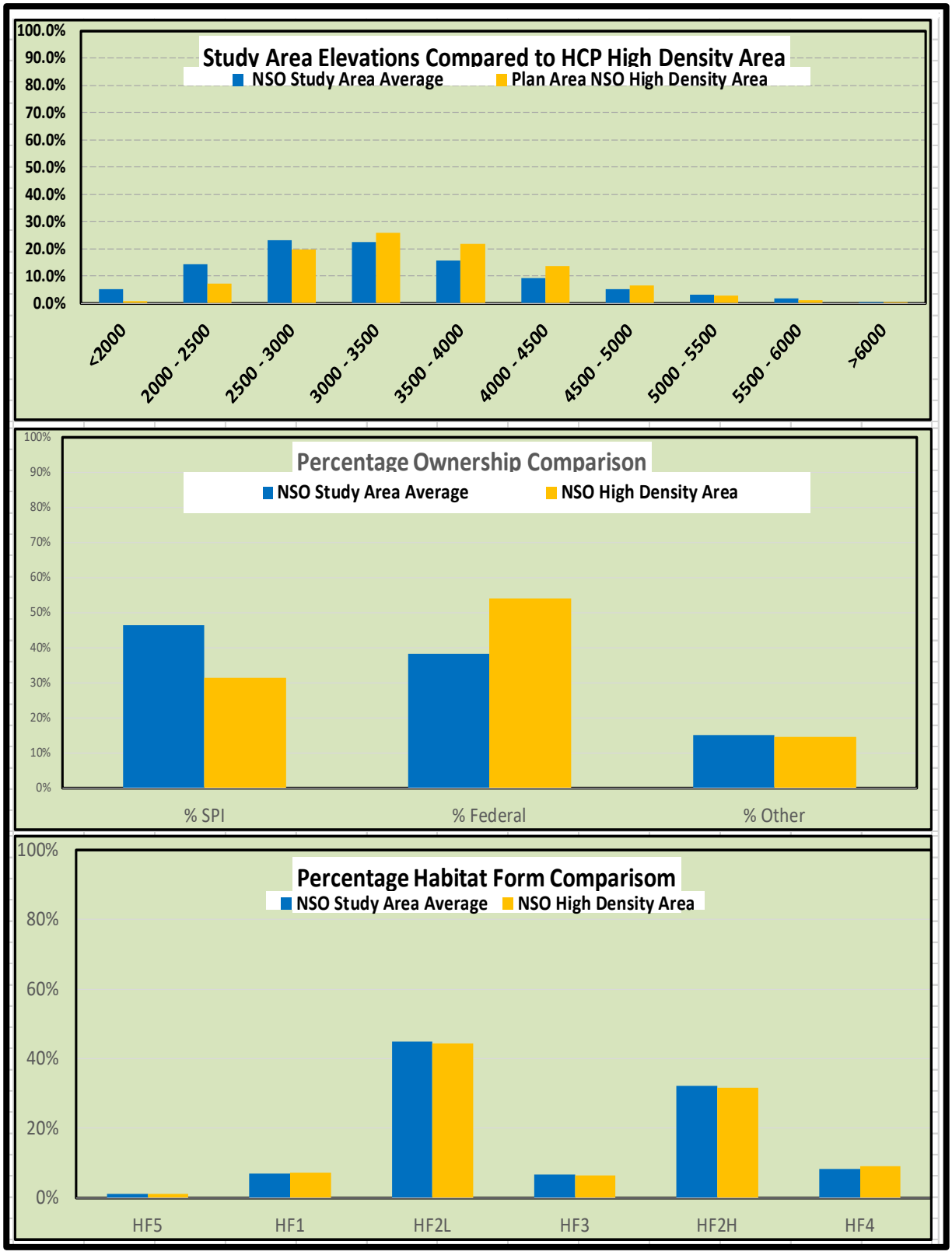

Figure 6.3. Northern Spotted Owl (NSO) Study Area Comparisons.

The occupancy study areas provide valid application to the Plan Area because they are representative of the Plan Area in terms of spatial distribution, proportion of elevation, percentage of SPI ownership, amount of Habitat Forms, and amount of timber harvest. The similarities between the occupancy study areas and the remainder of the Plan Area are discussed below.

The spatial distribution of the study areas within the Action Area is shown on the map in Figure 6.1. The NSO study area comprises over 70 percent of the NSO high-density area. The five CSO study areas comprise 13 percent of the Plan Area in the CSO high-density area and are arrayed from north to south across the central portion of the Plan Area in the CSO range. Within the spotted owl monitoring study areas, SPI monitors the following metrics annually:

- AC locations, presence/absence of spotted owls from known sites;
- density of population within study areas based on complete survey of study area;
- occupancy (daytime detection); social status (absence, single, resident single, pair, nesting pair, reproductive pair);
- reproductive status (nesting/not nesting), and reproductive success (number of young).

From these data, additional analyses of the sampled population can occur regarding the probability of detection, fecundity, productivity, and annual location and movement of ACs. Additionally, all spotted owls that can be captured in or near the study areas are banded for potential re-sighting in the future, which will aid in the long-term understanding of the studied population. The study areas will receive harvest and other management activities similar to the entire Plan Area. SPI will additionally maintain all data to provide additional ACs and the control sites for the supplemental post-harvest monitoring (see Section 6.5.2 below).

6.5. Monitoring Spotted Owls

6.5.1. Monitoring Occupancy of Spotted Owls

Study area calling stations are established at fixed locations and are called annually. SPI will provide the Service with a map of each study area showing these calling stations. Any changes to these fixed locations will be discussed at the bi-annual meetings.

The purpose of monitoring spotted owl occupancy is to detect changes in populations in high-density areas in the Action Area over the 50-year permit term. Several methods and time intervals will be used to detect trends and provide insight as to whether any observed trends are related to the Covered Activities. As described in more detail below, occupancy monitoring will include 1) review of annual and rolling 5-year changes in occupancy as an early-warning system for substantial changes, 2) statistical trend analysis of occupancy data at 10-year intervals, 3) multi-state modeling of occupancy at 5-year intervals to corroborate the trend analysis, and 4) a habitat use study at the 15th year to evaluate potential changes in habitat use. At the bi-

annual meetings, SPI and the Service will review these occupancy monitoring datasets and results as detailed below.

Analytical Framework

SPI has established an analytical framework using the annual survey data from the study areas to test for and detect declines in spotted owl occupancy rates. A tiered monitoring approach will be implemented to identify both short-term and long-term changes in population status over the next 50 years. The proposed process will entail annual occupancy determination, 5-year rolling assessments and decadal evaluations.

The primary quantitative goal for these occupancy study areas is to have sufficient statistical power to detect a 25 percent decline in occupancy over a 10-year period if it occurs, similar to the Mexican Spotted Owl (MSO) Recovery Plan (USDI 2012). The MSO strategy is referenced because it recommended the desired level of statistical power to detect declines, whereas the NSO Recovery Plan did not [USDI 2011]). SPI's goals for the statistical power to detect declines for this HCP are as follows:

1. For each Covered Species (i.e., NSO and CSO), a statistical power of 1-β = 0.80 to detect a 25 percent relative decline in occupancy over a 10-year period at α = 0.10 1-tailed;

2. For the combined Covered Species, a statistical power of 1-β = 0.90 to detect a 25 percent relative decline in occupancy over a 10-year period at α = 0.10 1-tailed.

As explained below, SPI will use Covered Species occupancy trend estimates (a, above) for one of the Adaptive Management thresholds. Given the relatively low number of NSO sites available, in the future it may not be possible to maintain the 80 percent statistical power, since all available sites are already in the study.

Annually, the most recent 5 years of occupancy data will be used to identify significant short-term declines. Over 5 consecutive years, there is only a 6.25 percent $\{ \left(\frac{1}{2}\right)^4 = \frac{1}{16} = 0.0625 \}$ probability of detecting a 5-year trend of declining occupancy by chance alone (Appendix 6.1, Monitoring Study Power Analysis).

Annual Review of Occupancy Monitoring Data

In advance of each 5-year assessment (as described in Appendix 6.1), SPI will also compare annual occupancy estimates against average occupancy rates over the term of data collection. SPI has estimated annual spotted owl occupancy rates on its ownership since 2013. The average occupancy rate has been slightly increasing at a rate of 1.2 percent (SE = 0.013) over this time period. If in any given year, the annual occupancy rate for either Covered Species declines by more than 5.0 percent, such a result could reflect regional variation, signal environmental changes, or indicate that SPI's management strategy may not be providing sufficient habitat to support spotted owl occupancy.

Response to Annual Occupancy Monitoring Results

If such a decline is observed, SPI will conduct a further evaluation of individual Covered Species populations among each of the monitoring study areas to assess factors that may be potentially influencing the decline. SPI will then evaluate the potential causes of the decline to determine if it is consistent with regional variation, might be attributed to Covered Activities, or other environmental factors. SPI will submit this analysis to the Service at the next scheduled biannual meeting. SPI will then confer with the Service to consider if observed occupancy parameters trends could be related to habitat modification by Covered Activities. If there is such a relationship, in cooperation with the Service, SPI will consider additional monitoring to evaluate the decline. A single year's monitoring result will not trigger the need for additional action.

Response to 5-Year Occupancy / Multi-State Monitoring Results

Information gained from annual assessments will be used to assess if cumulative changes exceeding 10 percent over a rolling 5-year period have occurred. The 5-year occupancy analysis will be conducted following the power analysis developed by Skalski (2018) (Appendix 6.1, Monitoring Study Power Analysis). In addition to this assessment and analysis, trends will also be determined using a multi-state/multi-season occupancy model approved by the Service and using the SPI-collected study area monitoring dataset. An example is the model used by Hobart et al. 2019a (the comparative EDSA/SPI occupancy dataset). The Hobart (2019a) effort was modeled using the program PRESENCE.

SPI will provide a proposed multi-state / multi-season model to the Service within one year after issuance of the permit. Thereafter, the Service will review the model for SPI's use prior to the end of the second year after permit issuance, and provide recommendations for model refinement and/or approval. SPI will maintain and run the model every 5 years during the term of the permit. SPI will notify the Service of any proposed changes to the multi-state / multi-season model based upon new information obtained by SPI. The Service will approve any model changes prior to use by SPI.

If there is a substantial difference between the results of both models, the difference will be discussed at the next bi-annual meeting. If either model indicates a decline (cumulative >10 percent), SPI will provide an analysis to the Service assessing whether the trend could be related to SPI Covered Activities, regional variation (e.g., based on the monitoring study areas), or environmental factors.

At the next biannual meeting, if the trend is mutually determined to have a material relationship between observed occupancy parameters and habitat modification by Covered Activities, SPI and the Service will confer under Adaptive Management (Section 6.11). Together the parties will evaluate potential changes to Covered Activities or thresholds for estimating take, to address whether management actions could reverse negative population trends, and how those actions might be implemented by SPI. In addition, the parties will consider whether to initiate the planned year 15 habitat use study at an earlier date.

If the trend is mutually determined not to have a material relationship between observed occupancy parameters and habitat modification by Covered Activities, SPI and the Service will confer under Adaptive Management (Section 6.11) to evaluate other mutually-agreed-upon potential remedies that could reverse negative population trends and how those actions might be implemented by SPI.

Response to 10-Year Occupancy Monitoring Results

In Year 11 of the ITP, SPI will prepare two analyses of Covered Species occupancy using the power analysis developed by Skalski (2018) (Appendix 6.1, Monitoring Study Power Analysis), and the Service-approved multi-season/multi-state occupancy model. SPI will submit these analyses to the Service for review. These analyses will assess whether the trend could be related to SPI Covered Activities, regional variation (e.g., based on the demographic study areas) or environmental factors. If there is a substantial difference between the results of both models, the difference will be discussed at the next bi-annual meeting.

If a significant negative trend is detected in occupancy modeling results, defined as a >25 percent relative decline from the starting occupancy of a Covered Species over a decadal period, SPI will meet and confer at the next scheduled biannual meeting with the Service to discuss appropriate Adaptive Management (Section 6.11) responses.

If the Service determines that it is reasonably certain a material relationship exists between observed occupancy parameters and habitat modification or other impact by Covered Activities, SPI and the Service will evaluate potential changes to Covered Activities, Conservation Measures, or thresholds for estimating take, to address whether management actions could contribute to the reversal or slowing of a declining population trend, and how those actions might be implemented by SPI. The Service will then notify SPI of any changes or addition to Covered Activities that are reasonably necessary to aid in reversing or slowing these negative trends. Such changes may include, but are not limited to, those described in Table 6.3. In addition, if the Service determines that cumulative changes have a material relationship between observed occupancy parameters and habitat modification or other impact by Covered Activities, the Service will consider whether the planned 15-year habitat use study should be initiated at an earlier date.

If the Service determines that the negative occupancy trend in Covered Species is unlikely to have a material relationship between observed occupancy parameters and impacts resulting from Covered Activities, SPI and the Service will then meet and confer, and identify mutually-agreed-upon actions that SPI could take to contribute to the reversal the negative trend, and how those actions might be implemented by SPI.

Response to Occupancy Monitoring Trends

In addition to the triggers identified above and in Table 6.3, SPI will evaluate any observable trends throughout the permit term, including information provided by the Service from off SPI ownership, to determine whether adaptive management actions may be needed. In cases where

the identified trend does not cross the thresholds described previously in this section, (and are determined to be materially related to Covered Activities) any proposed adaptive management actions in response to such trends would be subject to approval by both SPI and the Service.

Habitat Use Study

In Year 15 of the permit term, SPI will conduct a habitat use study comparable to the studies in Appendix 3.6 (Northern Spotted Owl Telemetry), Appendix 3.8 and Atuo et al. 2018 (California Spotted Owl Telemetry). Given the expense and potentially duplicative nature, additional habitat use studies will only be undertaken if there is declining occupancy performance in a 10-year review that could be related to the Covered Activities under the HCP.

6.5.2. Monitoring Spotted Owl's Potential Response to Harvest Operations

As described in Sections 5.2 (PZs) and 5.5 (Pre-Operational Surveys, seasonal buffers, raptor policy), numerous surveys and protection measures will result in a very low likelihood of take of adult spotted owls and their young at ACs. Based on locations of ACs, PZs will be updated annually (as new YAC information is collected). Updated PZ location information will be provided to SPI personnel and contractors as relevant to Covered Activities and updated weekly based on active survey results and provided via a KMZ or equivalent electronic file to the Service, CAL FIRE and CDFW.

Several of the measures in this HCP present a new approach to conserving spotted owls, and validating this approach is important. SPI expects that the establishment of PZs and the measures for preventing disturbance will minimize the effects of timber harvest activities. Long term monitoring of harvests conducted under the HCP is needed to confirm this expectation.

The WSAs, as described in Section 6.4, will provide information regarding trends in occupancy in the long-term. However, information regarding owl response to timber harvest at the local level and in the short-term is needed as an early "pulse check" on the effectiveness of the HCP take minimization measures. This information will be gathered by monitoring ACs following nearby timber harvest and comparing results to ACs without nearby harvest (from the WSAs).

In the WSAs, monitoring of post-harvest response will occur for the duration of the permit period. The study area ACs (76 NSO, 67 CSO) as of 1/1/2018 represented a 33.4 percent sample of the 428 ACs in the Plan Area and the portion of the Action Area. These study areas presently include 15 percent of all currently known CSO ACs and 87 percent of currently known NSO ACs on the Plan Area or portions of the Action Area.

In addition to post-harvesting monitoring in the WSAs, outside of the WSAs ten CSO ACs where SPI harvesting occurs within 0.5 miles will receive supplemental post-harvest monitoring. (NSO are not added to supplemental monitoring because 87 percent of NSO ACs will receive post-

harvest monitoring in the NSO Weaverville Study Area). Detailed methodology for selection and monitoring are described in the following subsection.

During the first ten years, the results of post-harvest monitoring in the WSAs and at the ten supplemental ACs will be reported and evaluated at each bi-annual meeting. Additionally, SPI will present seven years of observations (2012 through 2018) from the CSO WSAs regarding the owl's potential response to harvest. Based on these evaluations, if post-harvest occupancy differs substantially from occupancy at unharvested ACs, SPI and the Service will collaboratively determine if adaptive management actions are needed. If post-harvest occupancy or social/reproductive status does not substantially differ from the same parameters at unharvested ACs, the parties may consider terminating the supplemental monitoring prior to the ten-year milestone with the Service making the final termination determination. Conversely, after ten years, this supplemental monitoring will be evaluated by SPI and the Service to determine if continuation or other monitoring actions may be necessary. In either case, post-harvest monitoring will continue in the WSAs for the duration of the permit.

Methodology Pertaining to Supplemental Post-Harvest Monitoring
(See Section 6.4 for WSA Post-Harvest Monitoring details)

Selection of ACs:

- SPI and the Service will collaboratively select the supplemental monitoring locations.
- Ten ACs occupied by pairs in the year of harvest will be selected.
- All supplemental ACs must be outside of the current WSAs.
- Harvest must be planned to occur within 0.5 mile of the previous year's YAC.
- The selected AC must have a single designated PZ.
- Yearly, add new collaboratively selected ACs, as needed, to keep the total supplemental monitored ACs at ten every year. If new ACs are not available to be monitored SPI and the Service will meet and confer to decide which additional sites to add.

Surveys:

- Following the completion of timber harvest, the 10 supplemental ACs will receive SPI protocol surveys within 0.5-mile of the previous YAC and social status will be determined.
- If social status is determined to be successful nesting, or upon two consecutive years of pair status, the AC will be dropped from supplemental monitoring in subsequent years (unless future harvests are planned and the AC is chosen again).
- If social status is not nesting, or the AC does not have two consecutive years of pair status, or no owls are found, these ACs will be included in subsequent years until three years of non-nesting is determined.

Data collected:

- Harvest acreage by silvicultural method within the 0.5-mile radius.
- Occupancy and social status of the owl AC.

- Metrics of direction and distance from the YAC prior to harvest to the harvest edge.
- Movement (distance and direction) from the YAC prior to harvest to the subsequent YAC as determined by the post-harvest surveys.
- Acres of SPI land in PZ.

SPI and the Service will work collaboratively to prioritize the monitoring locations. SPI and the Service will also collaboratively examine data resulting from this additional monitoring and determine if adaptive management actions are needed.

6.6. Monitor Implementation of Retention Standards

SPI will retain habitat elements per Section 5.2.7 as a part of its harvest activities during implementation of this HCP. Under CAL FIRE authority for regulating timber harvest, the retention of elements is ensured by making them enforceable in the THP process and they will be monitored annually by third party Sustainable Forestry Initiative (SFI) audits. NAIP imagery (or similar) will also be utilized to assess and ensure retention standards are being met. In the proposed biannual meetings, SPI will provide opportunity for field review of both completed retention and proposed retention in unharvested units. Many of the retention elements can only be accurately assessed for compliance after PCT is completed. PCT generally occurs in the first 10 years post planting. In Year 11 of the permit term (estimated to be 2030), in cooperation with the Service, SPI will develop a statistically reliable post-PCT subsample inventory of retained elements using visual evidence (e.g., satellite imagery, drone video) as an additional compliance monitoring component.

6.7. Monitor Spotted Owl Use of Even-Origin Habitat

The occupancy studies described in Section 6.5 above will provide information over time as to how SPI's conversion to Even-origin habitat may be affecting the spotted owl. As shown in Figure 4.3.11 in Appendix 4.3 (Hexagon Analysis), in the third decade of the permit term the average amount of Even-origin HF4 in PHAs is projected to increase from 8 percent to 18 percent and begin to potentially play a more significant role in providing habitat. In the 21st year of the permit term (estimated to be 2040), SPI will meet with the Service to review monitoring results over the first 20 years and the Service will determine the necessity of and jointly develop additional methodologies to specifically evaluate spotted owl relationships to and use of planted forests that incorporate the retention standards described in Section 5.2.7 (Habitat Element Retention). If it is determined that there is a material negative relationship between spotted owl performance (e.g., occupancy, social status, reproductive status, reproductive success; see metrics in Section 6.4 above) and even-origin habitat, then adaptive management responses might include, but not be limited to, conducting an AC ranking analysis

for either subspecies (to potentially change protection measures for high rank ACs), increasing the habitat threshold for take estimation, increases to Conservation Measure 7 (Retention) standards, reduction in the size of clearcuts, implement group selection silviculture for some portion of even aged silviculture, or increases in riparian buffer widths in clearcut silviculture.

6.8. Compliance and Effectiveness Monitoring

Compliance monitoring is intended to ensure that all Conservation Measures and other HCP commitments are being fully implemented during the term of the ITP. Compliance monitoring and reporting requirements for each individual Conservation Measure are described in Table 6.2 below.

Effectiveness monitoring is intended to provide the Service and SPI with specific data from the Action Area and Plan Area regarding the performance of the spotted owl in relation to the Conservation Measures. These data will inform bi-annual meeting discussions, evaluation of potential Changed Circumstances, and Adaptive Management during the term of the ITP. Effectiveness monitoring and reporting requirements for each evaluation method are described in Table 6.3 below.

If SPI identifies any failures to comply with the terms of the ITP during its compliance monitoring, SPI will place these on the agenda for the biannual meetings and propose a plan to remedy any non-conformity. In doing so, SPI will also identify steps the company will take to avoid similar issues in the future. The Service may request additional information or a site visit at any time upon identifying concerns regarding implementation or compliance.

Compliance and Effectiveness monitoring will be ensured by requiring that the annual report include 1) an advance certification by a RPF that Covered Activities as planned will comply with the requirements of the HCP, and 2) a certification by a RPF with direct knowledge of the HCP that implementation was consistent with the HCP and all Conservation Measures during the past year, 3) all results and analyses from monitoring activities specified in the HCP. Each annual report will include a narrative of what is being presented or reported along with any necessary supporting maps, lists, data, and tables.

Table 6.2 Compliance Monitoring				
CM #	**Conservation Measure**	**Annual Reporting Requirement**	**Trigger to Initiate Review**	**Potential Responses**
1	Increase PHAs across the Plan Area over the Permit Term	1) Number of PHAs lost/gained. 2) Number of PHAs will be reported annually. 3) PHA reports will include narrative detail, tabular data and maps with spatial detail.	At decadal intervals, the actual number of combined NSO/CSO PHAs is 10 percent less than the projected PHA number for the first 20 years, and 20 percent less for the remainder of the permit term. PHA loss to wildfire will be explicitly identified as a cause within the review. (Substantial wildfire impacts are considered a Changed Circumstance, See Section 7.2.)	SPI and the Service will meet and confer to discuss the cause of the lower actual PHAs relative to projected numbers. If it is determined that there is a shortfall in PHAs greater than the review trigger due to SPI management and/or modeling error, then SPI will propose for Service approval a revised modeled trajectory, or a revised management regime designed to accomplish the goals of the HCP.
2	Protection of Habitat at Known Spotted Owl ACs and Surrounding Landscapes	1) Number of PZs. 2) The total acres of PZs and percent of PZ acres that overlap with SPI ownership. 3) Number of PZs—occupied, assumed occupied, new, retired. 4) PZ reports will include tabular data and maps with spatial detail, and a narrative regarding failure to comply with PZ or designated Tier 1 standards in timber harvest plans.	Total acreage designated for PZ type protection (no significant harvest per Appendix 5.2) will be maintained at 80 percent of baseline value. If total SPI acres in PZs falls below 80 percent of the baseline value (21,747 acres (comprised of 19,245 CSO and 2,502 NSO acres), a review will be initiated. An additional trigger would be if CAL FIRE reports an SPI violation consisting of unauthorized harvesting within a PZ or designated Tier 1 AC area. A website will be provided to the Service, CAL FIRE and CDFW with current KMZ or equivalent electronic file for each active THP locating PZs or Tier 1 AC areas.	At the first biannual meeting each year a standard agenda item will be to discuss the SPI annual report on PZ changes. In response to the review, SPI may re-allocate retained acres to existing PZs or to recently retired PZs, with Service concurrence. Based on continued research, other modifications to PZ size could also be considered. In the event of a CAL FIRE violation for such unauthorized harvests, SPI will notify the Service and promptly take steps to address the violation. Thereafter, SPI will review prior history of violations and assess if additional steps are needed to prevent future violations (e.g., training, contractor termination).

Table 6.2 Compliance Monitoring				
CM #	**Conservation Measure**	**Annual Reporting Requirement**	**Trigger to Initiate Review**	**Potential Responses**
3	Mitigation of Substantially Damaged Timberlands	1) Number of acres of Substantially Damaged Timberland and the number of acres that were harvested under Emergency Notice, including a narrative regarding retention measures implemented. 2) Number of acres replanted or planned for future reforestation. 3) Substantially Damaged Timberlands that exceed 2,500 acres will be reported and mapped annually. 4) Maps of Substantially Damaged Timberlands replanted, including Tier 1 locations, spotted owl survey points and ACs and PZs on or within 0.25 miles of the Plan Area.	SPI narrative or third-party verification reports demonstrate SPI is not meeting Substantially Damaged Timberlands retention requirements. (If reforestation is not occurring, that change is addressed under Changed Circumstances in Section 7.2.)	SPI and the Service will meet and confer to determine if failure to implement retention requirements will materially impact SPI's ability to meet its conservation objectives under the plan. SPI and the Service will review prior history of such failures and assess if additional steps are needed to prevent future failures (e.g., training, contractor termination).
4	Reduction of Potential for Catastrophic Fire	1) Number of SPI acres proposed, treated, and maintained. 2) MOU report/summary. 3) Maps with spatial detail. 4) A narrative of how existing fuel breaks and regenerated areas were utilized in firefighting.	Projects are not being implemented or maintained as contemplated in the MOU in three consecutive years, or estimated generalized reductions in risk are not being achieved.	SPI and the Service will meet and confer to determine if a change in fuel break construction and maintenance will materially impact SPI's ability to meet its conservation objectives under the plan. SPI and the Service will review prior history of such failures and assess if additional steps are needed to prevent future failures (e.g., training, contractor termination). The parties will also consider the performance of monitored spotted owl populations on SPI lands, and respond as outlined in Section 6.5.

Table 6.2 Compliance Monitoring				
CM #	**Conservation Measure**	**Annual Reporting Requirement**	**Trigger to Initiate Review**	**Potential Responses**
5	Reduction of Potential Impacts at Reproductive Sites	1) Number of times seasonal 0.25-mile buffer was implemented the previous breeding season, and maps of locations.	CAL FIRE reports an SPI violation consisting of operating within 0.25 miles of a reproductive AC during the breeding season. A website will be provided to the Service, CAL FIRE and CDFW with current KMZ or equivalent electronic file for each active THP locating seasonal buffers.	SPI will notify the Service of any occurrence and any violation, and promptly take steps to address the violation. Thereafter, SPI will review prior history of violations and assess if additional steps are needed to prevent future violations (e.g., training, contractor termination).
6	Reduction of Potential Impact from Illegal Activities	1) a narrative including the number and spatial maps of marijuana sites located and remediated, and ACs potentially impacted 2) Number and spatial maps of PZs receiving substantial (>10 trees) illegal wood cutting that were observed, including brief write up of the event how it may have impacted the PZ. 3) SPI Patrolman and/or Biologist monitoring reports.	1) A substantial increase in number of marijuana sites without a cleanup action; or 2) A substantial increase in the annual report of PZs with illegal cutting.	SPI will notify the Service of this occurrence, and develop a mechanism to further reduce the occurrence of marijuana cultivation sites in the future. SPI will implement this mechanism after review by the Service.
7	Management for Habitat Elements and Operational Standards	1) SPI third party audit report (will be turned in the following year). 2) In Year 11, post PCT inventory sampling analysis.	1) More than 5 percent of third-party audited units do not meet the combined retention standards; or 2) Less than 95 percent of HRAs reviewed in the complete NAIP imagery test meet the 2 percent HRA requirement.	SPI will notify the Service of this occurrence, and develop a mechanism to prevent such events in the future. SPI will implement this mechanism after review by the Service. The parties will also consider the performance of monitored spotted owl populations on SPI lands, and respond as outlined in Section 6.5.

Table 6.2 Compliance Monitoring				
CM #	**Conservation Measure**	**Annual Reporting Requirement**	**Trigger to Initiate Review**	**Potential Responses**
8	Research on Barred Owl as a Stressor	1) Number and spatial maps of occupied BDOW zones and number of adults known in such zones. 2) Number of BDOW collected in the genomics and diet study. 3) Number of Spotted Owl ACs affected by BDOW presence (within 1.3 miles). 4) Migratory Bird and CDFW Scientific Collecting Permit report. 5) Narrative summary of spotted owl observations at BDOW zones.	Occupied BDOW zones continue to increase over three consecutive years.	SPI, CDFW and the Service will meet and confer to determine if available scientific information indicates a need to alter the existing barred owl research program. The parties will also consider the performance of monitored spotted owl populations on SPI lands, and respond as outlined in Section 6.5.

Table 6.3 Effectiveness Monitoring					
EM #	**Evaluation Method**	**Annual Reporting Requirement**	**Trigger to Initiate Review**	**Initial Response**	**Possible Adaptive Management Actions (but not limited to)**
1	WSAs Yearly	1) Annual Occupancy estimates: Estimate Number of Occupied Activity Centers and percent occupancy in monitoring study areas. 2) As necessary updated maps of the study area ACs will be included in the annual reports. 3) Other demographic parameters as collected (i.e. productivity, fecundity, etc.)	If in any given year, the annual occupancy rate for either Covered Species declines by more than 5.0 percent	Conduct a further evaluation of individual Covered Species populations among each of the monitoring study areas to assess factors that may be potentially influencing the decline and submit this analysis to the Service at the next scheduled biannual meeting.	SPI will then confer with the Service to consider if observed occupancy parameters trends could be related to habitat modification by Covered Activities. If there is such a relationship, in cooperation with the Service, SPI will consider additional monitoring to evaluate the decline. A single year's monitoring result will not trigger the need for additional action.
2	WSAs every 5 years	1) Conduct rolling five-year occupancy analysis from yearly occupancy estimates 2) Conduct multi-state / multi season occupancy modeling	If in any of the five-year analysis periods, a cumulative change in occupancy exceeds 10.0 percent as derived from either analysis. Other demographic parameters as collected (i.e. productivity, fecundity, etc.) will be available to advise this trigger.	At the next biannual meeting, if the trend is mutually determined to have a material relationship between observed occupancy parameters and habitat modification by Covered Activities, SPI and the Service will confer under Adaptive Management.	Conduct an AC ranking analysis for either subspecies (to potentially change protection measures for high rank ACs), modify PZ size, modify the threshold for take estimation, modify Conservation Measure 7 (Retention) standards, increases in riparian buffer widths in clearcut silviculture or implementing the 15-year habitat use study at an earlier date.

Table 6.3 Effectiveness Monitoring					
EM #	**Evaluation Method**	**Annual Reporting Requirement**	**Trigger to Initiate Review**	**Initial Response**	**Possible Adaptive Management Actions (but not limited to)**
3	WSAs every 10 years	1) Conduct an occupancy analysis as shown in Appendix 6.1 2) Conduct multi-state / multi season occupancy modeling	If in any of the decadal periods, a >25.0% relative decline from the starting occupancy is observed from either analysis. Other demographic parameters as collected (i.e. productivity, fecundity, etc.) will be available to advise this trigger.	Meet and confer at the next biannual meeting. 1) If the Service determines that it is reasonably certain a material relationship exists between observed occupancy parameters and habitat modification or other impact by Covered Activities, SPI and the Service will evaluate potential changes to Covered Activities or thresholds for estimating take, to address whether management actions could contribute to the reversal of negative population trends, and how those actions might be implemented by SPI. 2) If the Service determines that the negative occupancy trend in Covered Species is unlikely to have a material relationship between observed occupancy parameters and impacts resulting from Covered Activities SPI and the Service will then meet and confer, and identify mutually-agreed-upon actions that SPI could take to contribute to the reversal the negative trend, and how those actions might be implemented by SPI.	1) Conduct an AC ranking analysis for either subspecies (to potentially change protection measures for high rank ACs), modify PZ size, modify the threshold for take estimation, modify Conservation Measure 7 (Retention) standards, increases in riparian buffer widths in clearcut silviculture or implementing the 15-year habitat use study at an earlier date. 2) Mutually agreeable action(s) yet to be determined as Covered Activities are not responsible for the decline
4	Post-Harvest Monitoring (1st decade)	1) Occupancy/Status 2) Distance moved 3) Comparison with WSA non harvested	1) No trigger in year 1-10 as this is planned analysis 2) Significant decline in occupancy after harvest occurs within 0.5 miles	Possible additional monitoring and adaptive management	Modify PZ size

Table 6.3 Effectiveness Monitoring					
EM #	**Evaluation Method**	**Annual Reporting Requirement**	**Trigger to Initiate Review**	**Initial Response**	**Possible Adaptive Management Actions (but not limited to)**
5	15th Year of permit term	1) Conduct habitat use study comparable to the studies in Appendix 3.6, Appendix 3.8 and Atuo et al. 2018 2) Use vs. Availability	1) No trigger in year 15 as this is a planned analysis. 2) Avoidance of Even habitat forms	Possible additional monitoring and adaptive management	Modify Conservation Measure 7 (Retention) standards, increases in riparian buffer widths in clearcut silviculture, change in silviculture
6	21st Year Spotted Owl Use of Even-Origin Habitat	1) Annual Occupancy Estimates 2) Five Year Occupancy Trend and Modeling Analysis 3) 10-year occupancy analysis (Appendix 6.1) 4) 15-year Habitat Use Study	If the study determines there is a negative relationship between Occupancy and Covered Activities,	After review of the first 20 years monitoring results, the Service will determine the necessity of and jointly develop additional methodologies to specifically evaluate spotted owl relationships to and use of planted forests that incorporate the retention standards described in Section 5.2.7 (Habitat Element Retention).	Conducting an AC ranking analysis for either subspecies (to potentially change protection measures for high rank ACs), increase the threshold for take estimation, increases to Conservation Measure 7 (Retention) standards, reduction in the size of evenaged units, implement group selection silviculture for some portion of even aged silviculture, or increases in riparian buffer widths in adjacent even-aged silviculture.

6.9. LOCATING AND REPORTING BARRED OWLS

The Service (USDI 2017) has recommended immediate development of a BDOW monitoring program. Specific research data that could inform an effective BDOW monitoring plan includes the location of BDOWs collected for studies described under Conservation Measure 8 and described in Appendix 5.5. In the fall of 2018, SPI began collecting BDOWs under the State of California Scientific Collection Permit (Entity – SCP# 011963) and the USFWS Migratory Bird Treaty Act Permit (MB53229B-0) to help further evaluate the scientific issues regarding BDOW colonizing California, particularly the Sierra Nevada range.

As described in section 5.4.3 of Appendix 5.4, SPI will continue to primarily use spotted owl survey calls to locate BDOWs throughout the Plan and Action Area. SPI will report to the Service and CDFW annually the number of locations where BDOW have been encountered, the number of known adults present, the number and locations of BDOWs collected, and the number of spotted owl ACs located within BDOW zones per SPI protocol.

SPI will actively participate in development of range-wide monitoring with state and federal agencies and academic institutions, including ongoing development of auditory BDOW sampling techniques. SPI's participation will be summarized in the HCP annual report.

6.10. Reports and Annual Meetings

SPI will submit a monitoring report required under Sections 6.1, 6.2, 6.3, 6.4, 6.5, and 6.6 of the HCP to the Service by June 30 of each year after ITP issuance.

During the first 10 years of the permit, SPI will meet with the CDFW and the Service biannually, (on dates mutually agreed upon, with an agenda agreed upon in advance) to review annual reports, conduct field review, and resolve any questions. At their discretion CDFW and the Service may invite other Agencies to participate. After the first 10 years of the permit, the parties will meet and at the Service's discretion decide if the biannual meeting schedule can be changed to another schedule. If the Service determines the need to meet with SPI to discuss monitoring results and potential management actions, the Service may do so at any time.

In recognition of the Service's responsibility to monitor implementation of this HCP and the recognition of the propriety nature of SPI's computer models and geographic information system databases, SPI will provide access to our data, shapefiles and analysis tools upon request of the Service. This access will be provided at SPI's offices or on a SPI secure computer. While review and analysis access will be provided, SPI retains its proprietary rights and ownership of the systems and data.

6.11. Adaptive Management

Using adaptive management SPI may modify operations outlined in the HCP to incorporate new information or changing conditions in order to minimize take and ensure conservation of Covered Species. SPI will use adaptive management to minimize take associated with its operations, and to promote the long-term survival of both CSO and NSO. For each Conservation Measure, a specific trigger has been established (Table 6.2) for when adaptive management will be implemented, in which case SPI will meet and confer with the Service. In cooperation with the Service, impacts will be analyzed using the best available scientific information at that time, including scientific advancements made after issuance of the ITP.

New scientific information triggering consideration of adaptive management may include, but would not be limited to, monitoring results, new information concerning habitat use, and habitat

conditions in the Plan Area that will contribute to or impair species conservation. With the agreement of both Parties, additional or alternative conservation measures may be implemented if scientific research suggests that they may be successful in reducing the level of take of Covered Species in the Plan Area. Adaptive management responses will be implemented by the processes described in Section 8.3.4. Changes to the HCP made through adaptive management will not increase the amount of take authorized in the ITP.

Adaptive management could allow SPI to reduce the uncertainty associated with gaps in scientific information or biological requirements pertaining to spotted owls. Although the spotted owl has been studied extensively for more than 30 years, there are still questions about habitat conditions that affect demographic parameters and how forest management may influence population performance. Adaptive management will provide flexibility and allow the HCP to adjust to future research findings and consider new management strategies under the HCP. As part of SPI's commitment to ongoing basic research related to spotted owl biological requirements, SPI, the University of Wisconsin, and the USFS Pacific Southwest Research Station have signed a 5-year Cooperative Research and Development Agreement (CRADA) to continue collaborative spotted owl research. SPI's participation will be summarized in the HCP annual report.

If monitoring determines there is a negative relationship between Occupancy and Covered Activities, adaptive management responses might include, but not be limited to, conducting an AC ranking analysis for either subspecies (to potentially change protection measures for high rank ACs), modifying the threshold for take estimation, increases to Conservation Measure 7 (Retention) standards, and increases in PZ sizes and/or riparian buffer widths in clearcut silviculture.

7. CHANGED CIRCUMSTANCES

This HCP is a mandatory element of the permit application and its implementation is a condition of the permit. This HCP is designed to be self-implementing, providing the requirements for Covered Activities, as well as required avoidance, minimization, and mitigation measures.

The applicant requests the benefits of the Federal No Surprises Rule, 63 FR 8859 (February 23, 1998) (codified at 50 CFR §§ 17.3, 17.22(b)(5), 17.32(b)(5)). It generally provides assurances to ESA Section 10 permit holders that, as long as the permittee is properly implementing the HCP, and the ITP, no additional commitment of land, water, or financial compensation will be required with respect to Covered Species, and no restrictions on the use of land, water, or other natural resources will be imposed beyond those specified in the HCP without the consent of the permittee. The "No Surprises" Rule has two major components: changed circumstances and unforeseen circumstances.

The term "changed circumstances" means changes in circumstances affecting a species or geographic area covered by an HCP that can reasonably be anticipated and that can be planned for (e.g., the listing of new species or a fire or other natural catastrophic event in areas prone to such events). If additional conservation and mitigation measures are deemed necessary to respond to changed circumstances, and such measures were provided for in the HCP, the permittee will be required to implement such measures (50 CFR 17.22(b)(5)(i); 17.32(b)(5)(i)). If additional conservation and mitigation measures are deemed necessary to respond to changed circumstances, and such measures were not provided for in the HCP, the Service will not require any additional measures beyond those provided for in the HCP, without the consent of the permittee, provided the HCP is being properly implemented (50 CFR 17.22(b)(5)(ii); 17.32(b)(5)(ii)). As outlined below in the response to each identified changed circumstance, where the Service and SPI have met and conferred and agreed upon the specific necessary additional actions to be performed, those actions are considered to have been provided in the HCP and shall be implemented by SPI.

Changed circumstance responses will be implemented by the processes described in Section 8.3.4. In this HCP, SPI has identified both negative and positive conditions that may constitute changed circumstances. These include but are not limited to effects due to climate change, impacts of wildfire or disease on habitat availability, changing usage of the Plan Area by covered species, effectiveness of planted trees beginning to function as spotted owl habitat, elevated annual take due to spotted owl population increases, the listing of new species, and changed technologies/techniques as foreseeable changed circumstances triggering additional action.

7.1. Effects due to Climate Change

The gradual increase of potential effects related to climate change may warrant consideration in this HCP. As a potential driver of increased wildfire intensity and size, fire season length, and as a cause of the additional stressors of drought or storm intensity, climate effects may impact habitat availability. These impacts also may result in changes in prey. When changes in climate becomes an identifiable changed circumstance in this HCP they will likely be expressed in other changed circumstances. Therefore, we will address the impacts as the potential results of the specific changed circumstances described below, while recognizing that each of these effects may also occur independent of climate change.

7.2. Impacts of Fire, Insects and Disease on Habitat Availability

The occurrence and effects of wildfire, insects, and disease on forested areas constitute foreseeable changed circumstances that warrant consideration in this HCP. Wildland fires, in particular, have increased in size and intensity in California (Westerling et al. 2006; Abatzoglou and Williams 2016). Disease outbreaks and insect infestations have occurred on areas of the Plan Area, which could result in reduced habitat potential in the Plan Area. Each of these events have the potential to reduce the amount of PHAs available to Covered Species in a given year, or over the term of the ITP. In addition, they all could be early indicators of changes in climate due to increased ambient temperatures, lack of rainfall, and more frequent occurrence of drought conditions.

The largest fire that has affected the Plan Area to date was the 2018 Carr Fire, which severely affected multiple patches totaling over 30,000 acres of Plan Area. Consequently, a loss of habitat of up to 25,000 contiguous acres on the Plan Area is reasonably foreseeable in view of past fire events. On 1.5 million acres of land, the destruction of habitat on 25,000 contiguous acres of land could materially impact whether SPI achieves the biological goals of this HCP, whereas fires of a smaller size are unlikely to do so. Over the last 20 years SPI has experienced many large wildfires, but throughout that time period the annual harvest limits of the Option A (Appendix 4.3.4, Hexagon Analysis), have never been exceeded. The primary reason is that SPI moves most of its green tree harvest operations as soon as possible and feasible to the wildfire area.

As a result of the potential fire risk in California, SPI has entered into an MOU (described in Section 5.2.4) to coordinate with adjacent landowners on fire management activities. SPI believes that the MOU, and actions taken pursuant to it by MOU parties, will help reduce the risk of large-scale fire events on the Plan Area. The MOU is part of Conservation Measure 4, which is intended to address the risk of fire in the Plan Area.

A changed circumstance will be triggered if a single fire or disease or insect outbreak results in: (1) the creation of more than 25,000 contiguous acres (1.6 percent of the Plan Area) of Substantially Damaged Timberland on the Plan Area during the term of the ITP; or (2) during the term of the ITP, multiple fires or disease or insect outbreaks result in the cumulative creation of more than 100,000 acres (6.2 percent of the Plan Area) of Substantially Damaged Timberland on the Plan Area. If such a loss occurs, then SPI and the Service will meet and confer to agree upon additional actions that SPI shall implement in response to this as a changed circumstance to achieve the biological goals of this HCP. As the initial response to this changed circumstance, SPI will move most of its green tree harvest operations to the damaged area(s) as soon as feasible. Other additional actions may include, but are not limited to, expediting reforestation activities on specific parcels in affected areas, further modifying fire management activities to prevent additional fire risks, and modifying actions identified in the MOU to coordinate fire management activities among other landowners. SPI shall implement mutually agreed upon actions identified as necessary to respond to this changed circumstance.

Wildfire or other disturbance may affect monitoring areas if it destroys ACs that are part of the long-term density study areas. Loss of ACs to disturbance in a monitoring study area to the extent that prevents meeting the statistical goal of the occupancy study will constitute a changed circumstance. Within 6 months of such a disturbance, SPI will modify the study methodology or will relocate or redesign the study area to include additional nearby ACs and will meet and confer with the Service on modifications. The remaining density study areas will continue to support this HCP until data are available from the modified study. SPI will implement actions identified as necessary to respond to this changed circumstance.

Although not required by State law, SPI currently reforests areas on their land that can support commercial timber production after a fire event, disease outbreak, or other catastrophic event to enhance the economic value of lands within the Plan Area, as described in Section 5.2.4. In certain cases, however, SPI may not reforest small areas because they will not support commercial timber production, or they are land areas that are prone to repeated fire losses. SPI will continue its current reforesting activities during the term of the HCP and will report SPI reforestation activities to the Service on an annual basis occurring as a result of a catastrophic event. In the event SPI elects not to reforest certain Plan Area lands after a catastrophic event, SPI will notify the Service of this occurrence, and explain in writing why such lands have not been reforested. It is possible that discontinuation of reforestation will not materially alter SPI's ability to achieve the goals of this HCP, depending on when and where such an action occurs during the term of the ITP. If the Service determines SPI's lack of reforestation may negatively impact SPI's ability to achieve the goals and objectives of the HCP, then the parties will meet and confer, and agree upon adjustments or additional actions to address this situation. Such adjustments or additional actions may include, but are not limited to, conducting more focused reforestation activities on specific parcels, modifying fire management activities to prevent additional fire risks, or modifying actions identified in the MOU to coordinate fire management activities among other landowners. SPI shall implement actions identified as necessary to respond to this changed circumstance.

7.3. CHANGING USAGE OF THE PLAN AREA BY COVERED SPECIES

As discussed in Section 6.5, SPI has maintained five WSAs, representing the range of the CSO on the Plan Area, along a north-south transect on the west slope of the Sierra Nevada (Figure 6.1). Another study area represents the Plan Area range of the NSO. The purpose of the study areas is to monitor trends in CSO and NSO occupancy on the Plan Area and portions of the Action Area during the term of the ITP to determine how land management practices might be affecting populations of the Covered Species.

As described in Section 4, CSO and NSO occupancy on the Plan Area, as monitored in the density study areas, has remained essentially level during the years 2012 through 2017. The monitoring results support SPI's proposed habitat management strategy for the Plan Area. It is reasonably foreseeable that Covered Species populations will remain stable or will increase in the Plan Area based on data collected to date. However, if CSO or NSO occupancies decline in a statistically significant manner within the occupancy study areas, such declines could indicate a need to revise the habitat management strategy. Section 6.5 (Monitoring Occupancy of Owls) and Appendix 6.1 (Monitoring Power Analysis) describe the methodologies for measuring CSO and NSO occupancy declines.

In the case of a statistically significant decline in Covered Species occupancy as detailed in Section 6.5, SPI will notify the Service of this occurrence, prepare an analysis of Covered Species occupancy using the power analysis developed by Skalski (2018) (Appendix 6.1, Monitoring Study Power Analysis), and submit this analysis to the Service for review. Such an analysis will assess whether the trend could be related to SPI Covered Activities, regional variation (e.g., based on the demographic study areas) or environmental factors.

A changed circumstance will be triggered if a significant negative trend is detected in occupancy modeling results, defined as a >25 percent relative decline from the starting occupancy of a Covered Species over a decadal period, SPI will meet and confer at the next scheduled biannual meeting with the Service to discuss appropriate Adaptive Management (Section 6.11) responses.

If the Service determines that it is reasonably certain a material negative relationship exists between observed occupancy parameters and habitat modification by Covered Activities, SPI and the Service will evaluate potential changes to Covered Activities or thresholds for estimating take (and therefore affect PHA counts as well), to address whether management actions could reverse or slow declining population trends, and how those actions might be implemented by SPI. The Service will then notify SPI of any changes or addition to Covered Activities that are reasonably necessary to reverse these negative trends. Such changes may include, but are not limited to, conducting more intensive occupancy studies to verify population trends, undertaking additional radio/GPS tracking studies to evaluate changing spotted owl behaviors and habitat usage in the Plan Area, increasing BDOW research efforts to the extent Covered Species declines are shown to be due to BDOW incursions, or modifying the habitat

management strategy over the remaining term of the ITP. In addition, if the Service determines that cumulative changes have a material relationship between observed occupancy parameters and habitat modification by Covered Activities, the Service will consider whether the planned year 15 habitat use study should be initiated at an earlier date. SPI shall implement actions identified as necessary to respond to this changed circumstance.

If the Service determines that the negative occupancy trend in Covered Species is unlikely to have a material relationship with habitat modification resulting from Covered Activities, SPI and the Service will then meet and confer, and identify mutually-agreed-upon actions that SPI would reasonably take to reverse or slow the negative trend, and how those actions would be implemented by SPI. Such actions may include, but are not limited to, SPI coordinating with other adjacent land managers and researchers on available data to assess the cause of the declining trends and identifying research actions to be taken to address uncertainties regarding such declines. SPI will implement agreed-upon actions as necessary to respond to this changed circumstance.

7.4. Changed Circumstance for Effectiveness of Planted Habitat

While anecdotal evidence exists that spotted owls appear to be using even-aged forests planted in reforestation of wildfire areas in the 1930s, 1950s, and 1960s, there is still a question as to whether spotted owls will utilize such planted landscapes in the future. In the hexagon modeling effort, SPI projected the Even vs. Mixed origin of the Habitat Form classes through time. As shown in Figure 4.3.11 in Appendix 4.3 (Hexagon Analysis), in the third decade of the permit term the average amount of Even-origin HF4 in PHAs is projected to increase from 8 percent to 18 percent and begin to potentially play a more significant role in providing habitat for spotted owls. This projection indicates that landscapes may have enough planted HF4 stands to begin to determine its use by spotted owls during the third decade.

The occupancy studies described in Section 6.5 above will provide information over time as to how SPI's conversion to Even-origin habitat may be affecting the spotted owl. If the trend in spotted owl AC occupancy begins to decline simultaneously with the increased availability of planted HF2H and HF4, and evaluations demonstrate a negative relationship between the trend and habitat characteristics, this would constitute a changed circumstance. To prepare for the potential for such a changed circumstance, in the 21st year of the permit term (estimated to be 2040), SPI will meet with the Service to review monitoring results over the first 20 years. If the Service determines more study is necessary, the parties will jointly develop methodologies to specifically evaluate spotted owls use of planted forests that incorporate the retention standards described in Section 5.2.7 (Habitat Element Retention).

This process will include development of metrics to assess whether there is a negative relationship between a potential decline in AC occupancy and habitat characteristics. SPI has not attempted to design such an evaluation now because the projected landscapes do not yet exist.

SPI anticipates that the likely analytical and technological advances capable of informing such an evaluation warrant waiting to design the evaluation.

If it is determined that there is a material negative relationship between spotted owl performance (e.g., occupancy, social status, reproductive status, reproductive success; see metrics in Section 6.4 above) and even-origin habitat, then adaptive management responses might include, but not be limited to, conducting a tiering analysis for either species, increasing the threshold for take estimation, increases to Conservation Measure 7 (Retention) standards, increases in riparian buffer widths in clearcut silviculture, reduced size of clearcut units, and conversion of clearcut silviculture to group selection silviculture. SPI shall implement actions identified as necessary to respond to this changed circumstance.

7.5. Increasing Number of Spotted Owl Occupied Hexagons

A biological goal of this HCP is to increase available habitat over the term of the ITP as measured by increasing numbers of PHAs. Given uncertainties about the potential expansion or alteration of the Covered Species' range, or possible changes in habitat utilization as a result of climate change, the distribution and occurrence of Covered Species on the Plan Area could increase over the term of the ITP (e.g., spotted owls may be attracted to the Plan Area from outside the Plan Area due to habitat quality and increasing PHAs, or juveniles fledged from existing territories in the Plan Area could colonize within the Plan Area). While spotted owl population expansion would be a positive outcome of the HCP, increasing numbers of nesting areas on the Plan Area could cause additional land areas to be taken out of timber production at least temporarily and protected while owls use them. This, in turn, could limit SPI's access to timber stands for harvest, resulting in significant economic impacts on the company.

If CSO or NSO Occupied Hexagons increase substantially from the baseline numbers (367 CSO and 61 NSO) over a 5-year period across the Plan Area, SPI will notify the Service of this occurrence and will develop an analysis of species trends and habitat usage to assess whether changes in Covered Activities could be warranted. Thereafter, SPI will provide its assessment to the Service and will meet to discuss whether changes to this HCP are warranted.

If the Service determines there is a positive relationship between Occupancy and Covered Activities, adaptive management responses might include, but not be limited to, provide for a limit in the continued increases in the total amount of PZ acreage or the size of PZs, allow for an increase in the number of authorized take allowances, allow the removal of the harvest restrictions on Tier 1 NSO, or reevaluate and revise the definitions of habitat conditions that result in take under the plan. The Service and SPI will mutually agree on appropriate actions to respond to this changed circumstance.

This Changed Circumstance does not authorize an increase in SPI's annual harvest amount modeled under the Plan (Option A). Rather, this Changed Circumstance is only intended to

address SPI's need to maintain its approved Option A harvest levels in the face of successful conservation actions that result in increasing number of spotted owl Occupied Hexagons in the Plan Area.

7.6. Listing of Species Not Covered By this HCP

In the event of any future ESA listing of species not covered under this HCP, SPI will confer with the Service over the need to pursue an amendment to this HCP and the ITP. In the event of a future candidate species designation, SPI will similarly confer with the Service to discuss whether an amendment to this HCP to include them as Covered Species and incorporate appropriate conservation measures is needed.

7.7. Changed Technology or Management Techniques

Over the 50-year term of the ITP, it is reasonably foreseeable that advances in scientific information concerning spotted owl biology will occur and that feasible changes in management techniques to avoid or minimize the take of Covered Species may be necessary. Examples include advances in spotted owl monitoring technology and increased knowledge of the relationship between habitat components and spotted owl reproduction.

Any changes in management techniques or technologies will only be considered if: (1) such techniques and technologies have been demonstrated to be feasible and effective in an acceptable, scientifically based study; (2) the results of such studies are found by the Service to constitute the best available science; and (3) implementation of such technologies and techniques will not require an increase in the take authorized for Covered Activities.

7.8. Lapse of State or Federal Permits Necessary for Barred Owl Research

Conservation Measure 8 establishes a research program designed to gather scientific information to inform addressing the invasive BDOW as a stressor on NSO and CSO (Effects of the BDOW to date are described in HCP Sections 3.1 and 3.2). This research will contribute to the conservation of both Covered Species. The research requires continuing federal and state permits that are not included with the ITP. Interruption or lapse of these research permits would require cessation of the research program and, if prolonged, would prevent accomplishment of Conservation Measure 8.

The Service has recognized the need for research and development of management efforts regarding the BDOW (USDI 2011, 2013, 2017) and both the Service and CDFW have provided similar research permits in the past. However, it remains possible that agency funding issues, litigation, or other circumstances beyond SPI's control could result in interruption or lapse in the

research permits during the ITP period. For the purposes of the HCP, this possibility is addressed as a Changed Circumstance.

A prolonged lapse in either state or federal research permits could lead to substantial declines in occupied NSO or CSO ACs in the Plan Area. For example, during a three-year hiatus in SPI's BDOW removal efforts in Trinity County, California, BDOW re-occupied 18 sites from which the species had previously been removed (HCP Section 3.1.2), doubling the number of NSO ACs impacted during that three-year period. Based upon this experience, SPI anticipates a substantial increase in BDOWs in both the NSO and CSO range if research activities are interrupted.

Aside from the collection of BDOWs as described in Conservation Measure 8, there are no established methods to gather information on prey selection that may lead to BDOW management strategies. Similarly, at present there are no known habitat management techniques that could contribute to reduction of BDOW effects on NSO and CSO. As such, there is no feasible way for SPI to carry out the intent of Conservation Measure 8 without the aforementioned research permits, and no feasible way to substantively respond to prolonged interruption or lapse of the permits.

Interruption or lapse of permits for more than a two-year period will constitute a Changed Circumstance. Subject to this Changed Circumstance, SPI will have no responsibility for altering actions under other HCP Conservation Measures. In the event of interruption or lapse of the required permits, SPI will immediately seek to meet and confer with the permitting agencies and will fully cooperate with efforts to renew permits. In such an event, SPI will immediately establish baseline data regarding the number of NSO and CSO sites occupied by BDOW for future reference and will continue to record and report encounters with BDOW in the Action Area. Also, SPI and the Service will consider other methods for implementing meaningful and feasible research and future potential management relating to BDOW and will continue to do so throughout the term of the ITP. If mutually agreed upon, SPI will incorporate such actions in the interest of accomplishing the intent of Conservation Measure 8, i.e., to gather scientific information to inform addressing BDOW as a stressor on NSO and CSO. When new permits are eventually granted, SPI commits to resuming activities as soon as feasible.

8. PLAN IMPLEMENTATION

This HCP is designed to be self-implementing, providing the requirements for implementation of Covered Activities are followed, and all required avoidance, minimization and mitigation measures are implemented. The following subsections are intended to provide further guidance on the implementation of the HCP over the permit term. SPI enters the HCP and ITP based on the understandings outlined below.

8.1. No Surprises Assurances

SPI requests the benefits of the Federal ESA "No Surprises" assurances (codified at 50 CFR §§ 17.22(b)(5), 17.32(b)(5)). As further detailed in the rule and Federal Register notice adopting the rule, if SPI is properly implementing the HCP and the ITP, then no additional commitment of land, water, or financial compensation will be required with respect to Covered Species, and no additional restrictions on the use of land, water, or other natural resources will be imposed beyond those specified in the HCP without the consent of the SPI. With respect to unforeseen circumstances, USFWS bears the burden of demonstrating that they exist using the best available scientific and commercial data available while considering certain factors as specified in 50 CFR §17.22(b)(5)(iii)(C), 17.32(b)(5)(iii)(C).

Notwithstanding these assurances, nothing in the No Surprises Rule will be construed to limit or constrain the USFWS, any federal agency, or a private entity, from taking additional actions, at its own expense, to protect or conserve a species included in a conservation plan.

8.2. Unforeseen Circumstances

Unforeseen circumstances are defined as changes in circumstances affecting a species or geographic area covered by this conservation plan that could not reasonably have been anticipated by plan developers and the USFWS at the time of the negotiation and development of the plan and that result in a substantial and adverse change in the status of the covered species (50 CFR § 17.3).

The USFWS bears the burden of demonstrating that unforeseen circumstances exist using the best available scientific and commercial data available while considering certain factors as specified in 50 CFR §§ 17.22(b)(5)(iii)(C) and 17.32(b)(5)(iii)(C). In deciding whether unforeseen circumstances exist, the USFWS will consider, but not be limited to, the following factors (50 CFR §§ 17.22(b)(5)(iii)(C)):

1. The size of the current range of the affected species;
2. The percentage of the range adversely affected by the conservation plan;
3. The percentage of the range that has been conserved by the HCP;
4. The ecological significance of that portion of the range affected by the HCP;
5. The level of knowledge about the affected species and the degree of specificity of the conservation program for that species under the HCP; and
6. Whether failure to adopt additional conservation measures would appreciably reduce the likelihood of survival and recovery of the species in the wild.

In negotiating unforeseen circumstances, the USFWS will not require the commitment of additional land, water, or financial compensation or additional restrictions on the use of land, water, or other natural resources beyond the level otherwise agreed upon for the species covered by the HCP without the consent of the permittee (50 CFR §§ 17.22(b)(5)(iii)(A)). If additional conservation and mitigation measures are deemed necessary to respond to unforeseen circumstances, the USFWS may require additional measures of the permittee where the HCP is being properly implemented only if such measures are limited to modifications within conserved habitat areas, if any, or to the HCP's operating conservation program for the affected species, while maintaining the original terms of the plan to the maximum extent possible (50 CFR § 17.22(b)(5)(iii)(B)). Additional conservation and mitigation measures will not involve the commitment of additional land, water or financial compensation or additional restrictions on the use of land, water, or other natural resources otherwise available for development or use under the original terms of the conservation plan without the consent of SPI.

8.3. PERMIT AMENDMENTS

The HCP and/or ITP may be modified in accordance with the ESA, the USFWS's implementing regulations and this section. HCP and permit modifications are not anticipated on a regular basis; however, modifications to the HCP and/or ITP may be requested by either SPI or the USFWS. The USFWS also may amend the ITP at any time for just cause, and upon a written finding of necessity, during the permit term in accordance with 50 CFR § 13.23(b). The categories of modifications are administrative changes, minor amendments, and major amendments.

The HCP Handbook (USFWS and NMFS 2016) indicates that an ITP should be amended when the permittee significantly modifies the covered activities, the Project, or the conservation plan as described in the original HCP. Such modifications may include changes in the Project area, changes in funding, addition of species to the ITP that were not addressed in the original HCP, or adjustments to the HCP due to changes in strategies developed to address changed or unforeseen circumstances.

8.3.1. Administrative Changes

Administrative changes are internal changes or corrections to the HCP that may be made by SPI, at its own initiative, or approved by SPI in response to a written request submitted by the USFWS. Requests from the USFWS will include an explanation of the reason for the change, as well as any supporting documentation. SPI will notify USFWS in writing of any proposed administrative changes to the HCP and confirm receipt by the appropriate USFWS personnel implementing the HCP. Thereafter, the USFWS shall have 30 business days to respond in writing to the proposed change. In the event USFWS does not respond within this period, the change shall be deemed approved.

Administrative changes are those that will not: (a) result in effects on a Covered Species that are new or different than those analyzed in the HCP, NEPA EIS, or the USFWS BO; (b) result in take beyond that authorized by the ITP; (c) negatively alter the effectiveness of the HCP; or (d) have consequences to elements of the human environment that have not been evaluated. SPI will document each administrative change in writing and provide the USFWS with a summary of all changes, as part of its annual report, along with any replacement pages, maps, and other relevant documents for insertion in the revised document.

Administrative changes include, but are not limited to, the following:

- Corrections of typographical, grammatical, and similar editing errors that do not change intended meanings;
- Corrections of any maps or exhibits to correct minor errors in mapping; and
- Corrections of any maps, tables, or appendices in the HCP to reflect approved minor modifications, as provided below, to the HCP or ITP.

8.3.2. Minor Modifications

Minor modifications are changes to the HCP the effects of which on Covered Species, the conservation strategy, and SPI's ability to achieve the biological goals and objectives of the HCP are either beneficial or not significantly different than those described in this HCP. Such modifications will not increase impacts to species, their habitats, or the environment beyond those analyzed in the HCP, EIS, and BO, or increase the levels of take beyond that authorized by the ITP.

Minor modifications to the HCP may also require changes to the ITP. A proposed minor modification must be approved in writing by both USFWS and SPI before it may be implemented. A proposed minor modification will become effective on the date of the joint written approval.

SPI or the USFWS may propose minor modifications by providing written notice to the other party. The party responding to the proposed minor modification should respond within 30 days

of receiving notice of such a proposed modification. Such notice shall satisfy the provisions of 50 CFR § 13.23, as well as include a description of the proposed minor modification; the reasons for the proposed modification; an analysis of the environmental effects, if any, from the proposed modification, including the effects on and an assessment of the amount of take of the Covered Species; an explanation of the reason(s) the effects of the proposed modification conform to and are not different from those described in this HCP; and any other information required by law. When SPI proposes a minor modification to the HCP, the USFWS may approve or disapprove such modification, or recommend that the modification be processed as a major amendment as provided below. The USFWS will provide SPI with a written explanation for its decision. When the USFWS proposes a minor modification to the HCP, SPI may agree to adopt such modification or choose not to adopt the modification. SPI will provide the USFWS with a written explanation for its decision. The USFWS retains its authority to amend the ITP, however, consistent with 50 CFR § 13.23.

Provided a proposed modification is consistent in all respects with the criteria above, minor modifications include, but are not limited to, the following:

- Updates to the land cover map or to Covered Species occurrence data;
- Increasing or decreasing the scope of the Plan Area in the HCP (see an example following this list);
- Minor changes to the biological goals or objectives;
- Modification of monitoring protocols for HCP effectiveness not in response to changes in standardized monitoring protocols from the USFWS;
- Modification of existing, or adoption of new, incidental take avoidance measures;
- Modification of existing, or adoption of additional, minimization and mitigation measures that improve the likelihood of achieving HCP goals and objectives;
- Discontinuance of implementation of conservation measures if they prove ineffective;
- Modification of existing or adoption of new performance indicators or standards if results of monitoring and research, or new information developed by others, indicate that the initial performance indicators or standards are inappropriate measures of success of the applicable conservation measures;
- Modification of existing or the adoption of additional habitat objectives for the Covered Species, where such changes are consistent with achieving HCP goals and objectives;
- Minor changes to survey or monitoring protocols that are not proposed in response to adaptive management and that do not adversely affect the data gathered from those surveys;

- Conducting monitoring surveys in addition to those required by the HCP and ITP;
- Modifying HCP monitoring protocols to align with any future modifications to the protocols by the USFWS;
- Adopting new monitoring protocols that may be promulgated by the USFWS in the future; and
- Minor changes to the reporting requirements.

An example of a minor modification would be a property purchase by SPI in the CSO range and subsequent SPI proposal to add such lands to the HCP as an increase in the Plan Area. Such proposal will be in the form of a written report containing necessary data to support the following Conservation Measures. All HCP Conservation Measures would apply to added lands. The addition of such lands would result in an increase in benefits of the HCP, increase in lands where SPI is responsible for fire and fuels reduction (Conservation Measure 4), increases in the form of additional AC protections (Conservation Measure 2, Conservation Measure 5), more lands where harvests must meet the retention standards (Conservation Measure 7), and a landscape level commitment to increasing aggregations of habitat (PHAs) likely to benefit the spotted owl (Conservation Measure 1). Addition of such lands would require SPI to add many protections and analysis of the entire suite of Conservation Measures of the HCP. These protections and analyses include but are not limited to implementing CSO pre-operational surveys (Conservation Measure 5), protection of all Occupied Activity Centers with PZs (Conservation Measure 2), seasonal buffers for active breeding sites (Conservation Measure 5), updates of all necessary data sets (e.g., hexagon updates or additions to the hexagon network, additions to the baseline number of Occupied ACs, baseline acreage of PZs and Occupied Hexagons for PZ and changed circumstance accounting, Habitat Form typing for reporting progress under Conservation Measure 1, and to support annual take analysis). To meet the definition of a Minor Modification all these additional benefits and analyses must be accomplished without additional authorized take.

8.3.3. Major Amendments

A major amendment is any proposed change or modification that does not satisfy the criteria for an administrative change or minor amendment. Major amendments to the HCP and ITP are required if SPI desires, among other things, to modify the Covered Activities described in the HCP such that they may affect the impact and take analyses or conservation strategy of the HCP, affect other environmental resources or other elements of the human environment in a manner not already analyzed, or result in a change for which public review is required. Major amendments must comply with applicable permitting requirements, including Section 7 of the ESA.

In addition to the provisions of 50 CFR § 13.23(b), which authorize the USFWS to amend an ITP at any time for just cause and upon a finding of necessity during the permit term, the HCP and

ITP may be modified by a major amendment upon SPI's submission of a formal permit amendment application and the required application fee to the USFWS, which will be processed in the same manner as the original permit application. Such application generally will require submittal of a revised HCP, and preparation of an environmental review document in accordance with NEPA. The specific document requirements for the application may vary, however, based on the substance of the amendment. For instance, if the amendment involves an action that was not addressed in the original HCP, or NEPA analysis, the documents may need revision or new versions prepared addressing the proposed amendment. If circumstances necessitating the amendment were adequately addressed in the original documents, simply amending the ITP may be sufficient.

Upon submission of a complete application package, the USFWS will publish a notice of the receipt of the application in the Federal Register, initiating the NEPA and HCP Amendment public comment process. After the close of the public comment period, the USFWS may approve or deny the proposed amendment application. SPI may, in its sole discretion, reject any major amendment proposed by the USFWS.

Changes that would require a major amendment to the HCP or ITP include, but are not limited to:

- Revisions to the Plan Area or Covered Activities that do not qualify as a minor amendment;
- Addition of a new Covered Species that is not analyzed in the HCP or NEPA document and is likely to be taken by the Covered Activities; or
- A renewal or extension of the permit term beyond the original term of the ITP, where the criteria for a major amendment are otherwise met, and where such request for renewal is in accordance with 50 CFR § 13.22.

8.3.4. Changes Due to Adaptive Management or Changed Circumstances

Unless explicitly provided in Section 6 (Monitoring and Adaptive Management) and Section 7 (Changed Circumstances) of this HCP, the need for and type of amendment to deal with Adaptive Management or Changed Circumstances will be determined by the Service, in coordination with SPI, at the time such responses are triggered. In general, most changes in the HCP or ITP in response to Adaptive Management or Changed Circumstances are expected to qualify as minor modifications to the HCP or ITP, however, there may be changes that do not qualify as minor modifications and would require an amendment to the HCP or ITP.

8.4. PERMIT RENEWAL

SPI requests that the ITP associated with this HCP be renewable pursuant to 50 CFR § 13.22. If SPI seeks to renew the ITP, then SPI will file in writing a renewal request at least 30 days prior to the permit expiration of the ITP in accordance with the requirements of 50 CFR § 13.22.

8.5. FINANCIAL ASSURANCES

8.5.1. Expenditure of Funds

SPI warrants that it has, and shall expend, such funds as may be necessary to fulfill its obligations under the ITP and the HCP. SPI's demonstrated capability and commitment to fund the studies during development of the HCP provides assurances that commitments under the HCP will be completed when needed. SPI shall promptly notify the Service of any material change in SPI's financial ability to fulfill its obligations under the HCP and the ITP.

8.5.2. Financial Assurances

The ESA implementing regulations provide that an applicant for an ITP must establish that sufficient funding will be available to implement the HCP, including the requirements to monitor, minimize, and mitigate the impacts from the taking.

Measures requiring funding in an HCP typically include onsite measures during project implementation or construction (e.g., monitoring, surveys, research), as well as onsite measures required after completion of Covered Activities (e.g., retention of habitat elements, Section 5.2.7).

With roots as a forest products company dating back to 1949, Sierra Pacific Industries is a third-generation, family-owned, private business based in Anderson, California. SPI owns more than 2 million acres of timberland in California and Washington, with its forestland management certified under the independent Sustainable Forestry Initiative. With over 5,500 crew members across 30 states, SPI is also among the largest U.S. producers of lumber, millwork and wood windows, along with renewable energy production.

In this HCP the Plan Area is 1,565,707 acres of lands managed by SPI. To demonstrate SPI's financial commitment to this process, in just the recent past SPI has funded the last three years of the successful fisher reintroduction to the Stirling Management Area ($1.2 million in direct funding and over $3 million in in-kind contributions) and over the last three years has fully implemented the *Fisher Candidate Conservation Agreement with Assurances* (Permit TE09082C-O) on the same Plan Area. As part of SPI's commitment to ongoing basic research related to spotted owl biological requirements, SPI, the University of Wisconsin, and the USFS Pacific Southwest Research Station have signed a 5-year Cooperative Research and Development Agreement (CRADA) to continue collaborative spotted owl research ($50,000/year,

from each cooperator). In Section 8.14 SPI demonstrates the effects of take will continually be mitigated by the Conservation Measures, and no take effects would remain to be mitigated if the ITP were to be suspended or relinquished at any time during the permit period.

SPI shall ensure full performance of the Conservation Measures in Section 5, the monitoring obligations contained in Sections 6 and 7, and the financial assurance obligations contained in Section 8 of the HCP. SPI will submit a written assurance by June 1 of each year of the ITP that it will carry out all its obligations under this HCP. In that submission, SPI will provide a summary of expenditures made in the prior year of the ITP, and a scope of work and budget for all monitoring actions, including BDOW research, and any other HCP implementation actions SPI will undertake in the following year. The estimated annual budget and budget for the term of the ITP are identified in Table 8.1. A responsible corporate official with authority to commit SPI's financial resources shall certify that funds to implement this HCP has been budgeted and will be committed for use in the following year, as well as any material changes in cost estimates provided below based upon actual work performed.

All reports will include the following certification by a responsible company official who supervised or directed preparation of the report:

> *Under penalty of law, I certify that, to the best of my knowledge, after appropriate inquiries of all relevant persons involved in the preparation of this report, the information submitted is true, accurate, and complete.*

SPI, and any successor in interest, will notify the Service if the permittee's funding resources have materially changed, including a discussion of the nature of the change.

Table 8.1. Funding Assurances Budget for External Costs of HCP Implementation.

(Note: Cost estimates in 2018 dollars. Future cost estimates may be adjusted based on actual costs incurred while fully implementing the HCP.)

Task	Estimated Cost		Major Assumptions/Cost Basis
	Per Year	Total	
(1) Annual habitat assessments	$6,000	$300,000	Producing the report for updates to polygons as a result of actual harvest activities.
(2) Annual monitoring and field verification Years 1–50	$220,000	$11,000,000	Surveys to keep ACs current and to provide PZs near harvest activities under the HCP. Also, density study area surveys for monitoring trends. This includes post-harvest monitoring outside of the study areas.
(a) AC/PZ Surveys	$100,000	$5,000,000	Surveys to keep ACs current over permit term.
(b) Density Area Surveys	$100,000	$5,000,000	Surveys to evaluate density study areas.
(c) Data analysis	$20,000	$1,000,000	Cost estimates using outside consultants.
(d) Adaptive management	$6,000	$300,000	During season triggered adaptive management responses. Although the exact cost of potential adaptive management actions is not predictable, this estimate is for changes to monitoring that may be required. Additional adaptive management responses that result in altered PZs, silviculture, habitat thresholds, etc. would be captured in normal ongoing operating expenditures.
(3) Annual meetings Years 1–50	$6,000	$300,000	Conducted on an annual basis with the Service.
(a) Annual report preparation	$2,500	$125,000	Prepared with involvement of SPI.
(4) Barred owl Research Program	$55,000	$1,125,000	Retaining contractors UC Berkeley and UC San Francisco and other actions that may become required due to adaptive management.
(a) Initial Barred owl research program (3 to 5 years)	$35,000	$175,000	This will be included in above spotted owl survey efforts.
(b) Annual O&M training	$10,000	$500,000	Annual training for operators to follow requirements of HCP.
(c) Additional studies or measures in response to adaptive management	$35,000	$1,575,000	After initial studies, further actions may be needed over the 50-year permit term after the first 5 years of the permit.
(5) Planted forests evaluation starting at Year 20 (5-year effort)	$150,000	$750,000	Design and implement a habitat use and effectiveness for spotted owl use of planted forest.
(6) Fire risk management	$20,000	$1,000,000	Construct and/or maintain fuel breaks on HCP lands; implement Fire MOU actions including mapping and coordination actions. Greater than $1,000,000 of fuel break work has been completed as of 2018.

Table 8.1 (continued). Funding Assurances Budget for External Costs of HCP Implementation.

(Note: Cost estimates in 2018 dollars. Future cost estimates may be adjusted based on actual costs incurred.)

(7) Administrative costs	$100,000	$5,000,000	Internal management and implementation of HCP and related monitoring efforts by SPI staff. The cost of responding to adaptive management actions is included in Administrative costs because such changes would likely entail changing harvest management plans to increase or decrease protective areas for covered species. Monitoring costs associated with adaptive management are addressed under (2) above.
Task	**Estimated Cost**		**Major Assumptions/Cost Basis**
	Per Year	**Total**	
(8) Changed circumstances	$140,000	$700,000	Consultant expenses; studies; contracting; up to five (5) events.
(a) Climate change	NA	NA	Included in other plan costs.
(b) Fire and Disease	$100,000	$500,000	Modifying priorities within Fire MOU; modifying tree replanting schedule. Costs partially covered by administrative costs.
(c) Change of covered species use in the Plan Area	$5,000	$25,000	Majority of costs resulting from monitoring covered in other plan costs.
(d) Change in effectiveness of habitat	$20,000	$100,000	Majority of costs resulting from monitoring covered in other plan costs.
(e) Increasing number of spotted owl occupied hexagons	$5,000	$25,000	Costs associated with permit amendment partially covered by administrative costs.
(f) Listing of new species	NA	NA	Costs associated with permit amendment covered by administrative costs.
(g) Changed Technology	$10,000	$50,000	Implementation of feasible technology. Costs partially covered by administrative costs.
(h) Lapse of State or Federal Permits Necessary for Barred Owl Research	$5,000	$25,000	The costs associated with the efforts to establish baseline data regarding the number of NSO and CSO sites occupied by BDOW and renew permits are partially covered by administrative costs and ongoing BDOW research costs.
Totals	$1,065,500	$32,250,000	Total Estimated Costs

All costs are in 2018 dollars, not adjusted for inflation. ACs = Activity Centers; HCP = Habitat Conservation Plan; O&M = operations and maintenance; PZs = Protection Zones; UC = University of California

8.6. PROPERTY RIGHTS RETAINED

SPI and USFWS agree that SPI has entered the ITP and the HCP on a voluntary basis. Except as otherwise specifically provided herein, nothing in the HCP or ITP shall be deemed to restrict the rights of SPI to manage its lands. Covered Activities may provide multiple benefits beyond conservation of Covered Species, including, but not limited to, renewable benefits, pollution

benefits, tax benefits, environmental benefits, carbon benefits, clean water benefits, and open space benefits ("Additional Benefits"). Nothing in the HCP or ITP is intended to limit SPI's rights to participate in any program or enter into any agreement to recognize the full financial value of these Additional Benefits if SPI complies with the ITP.

The terms hereof are not intended to run with the land and will not bind the existing owners of Plan Area or subsequent purchasers of the Permit Area unless such parties agree in writing to become bound by the HCP and the ITP. Such parties that are not bound the ITP shall not benefit from the Service's authorization of incidental take coverage or assurances.

8.7. Remedies and Liability

Except as set forth below, each Party shall have all remedies otherwise available (including specific performance and injunctive relief) to enforce the terms of the ITP and the HCP. Nothing contained in the ITP is intended to limit the authority of the United States government to seek civil or criminal penalties or otherwise fulfill its enforcement responsibilities under the ESA or other applicable law.

No Party shall be liable in damages to any other Party for any breach of the HCP or ITP, any performance or failure to perform a mandatory or discretionary obligation imposed by the HCP or ITP, or any other cause of action arising from the HCP or ITP.

8.8. Dispute Resolution

The Parties recognize that good faith disputes concerning implementation of, or compliance with, or suspension, revocation or termination of the HCP or the ITP may arise from time to time. The Parties agree to work together in good faith to resolve such disputes, using the dispute resolution procedures set forth in this Paragraph or such other procedures upon which the Parties may later agree. However, if at any time any Party determines that circumstances so warrant, it may seek any available remedy without waiting to complete dispute resolution.

If the Service has reason to believe that SPI may have violated the ITP with respect to any Covered Species, it will notify SPI in writing of the specific provisions that may have been violated, the reasons the Service believes SPI may have violated them, and the remedy the Service proposes to impose to correct or compensate for the alleged violation. SPI will then have sixty (60) days, or such longer time as may be mutually acceptable, to respond. If any issues cannot be resolved within thirty (30) days, or such longer time as may be mutually acceptable, after SPI's response is due, the Parties will consider non-binding mediation and other alternative dispute resolution processes.

The Parties reserve the right, at any time without completing informal dispute resolution, to use whatever enforcement powers and remedies are available by law or regulation, including but not

limited to, in the case of the Service, suspension or revocation of the ITP and civil or criminal penalties.

8.9. References to Regulations

Any reference in the HCP or the ITP to any regulation or rule of the Service shall be deemed to be a reference to such regulation or rule in existence at the time an action is taken, except that SPI may reference federal regulations in effect at the time the ITP became effective to protect its rights under the HCP and the ITP.

8.10. Assignments and Transfers

Assignments or other transfers (in whole or in part) of the ITP shall be governed by the federal regulations located at 50 CFR 13. In accordance with 50 CFR § 13.25, the Parties agree that the ITP may be transferred in whole or in part to a new party through a joint submission by SPI and the new party to the Service field office responsible for administering the ITP describing: (1) each party's role and responsibility in implementing the HCP, (2) each party's role in funding the implementation of the HCP, and (3) any proposed changes to the HCP reasonably necessary to effectuate the transfer and implement the ITP.

The Service may approve a proposed transfer of the ITP in whole or in part to a new party in accordance with the regulations, which approval shall not be unreasonably withheld or delayed, provided that the Service field office responsible for administering the ITP determines that: (1) the proposed transferee meets all of the qualifications to hold an ITP under 50 CFR § 13.21; (2) the proposed transferee provides adequate written assurances that it will provide sufficient funding for the HCP, and that the proposed transferee will implement the terms and conditions of the ITP, including any outstanding minimization or mitigation requirements; and (3) the proposed transferee has provided such other information that the Service determines is relevant to the processing of the submission. No new conditions will be added to the HCP or the ITP by the Service if the proposed transferee meets these conditions for transfer.

8.11. Reporting and Inspections

8.11.1. Reporting and Annual Meeting

SPI will provide the Service with the reports described in Section 6 of the HCP at the notice address then in effect for the Service and will provide any available information reasonably requested by the Service to verify the information contained in such reports. SPI will provide the Service, within 30 calendar days, any additional information requested to determine whether SPI complies with the ITP and HCP.

SPI and the Service shall conduct semiannual meetings during the months of April and September commencing the first April after the first year the ITP is issued to discuss the results of HCP implementation and monitoring. Nothing in the ITP or HCP shall prevent the parties from meeting more frequently.

8.11.2. Inspections

SPI agrees that the Service may inspect the Permit Area in accordance with its applicable regulations and law. Except where the Service has reason to believe that SPI may be acting in violation of applicable laws or regulations or in breach of the ITP, the Service will provide reasonable advance notice (24 hours) of its inspection, and in such cases will adhere to SPI's safety procedures, which require representatives of the Company to escort the Service's representatives making such inspection.

The Service shall ensure that any individual conducting an inspection regarding implementation of this HCP on its behalf performs such inspection in compliance with all regulations and statutes applicable to the Service, and the requirement of this section for advance notice, where applicable. Any representative of the Service conducting such inspections shall use reasonable efforts to promptly brief SPI on the information learned during any such inspection.

For the purpose of this paragraph, the Service is intended to mean agency employees and contractors. Service law enforcement agents acting in their official capacity are not subject to these noticing or information requirements.

8.12. NOTICES UNDER THE HCP OR ITP

8.12.1. Required Notices by SPI

SPI shall notify the Service in writing within 10 days of the occurrence of any of the following: (1) any change in the registered name of SPI; (2) the dissolution of SPI; (3) the sale or conveyance of SPI; (4) bankruptcy proceedings by SPI as well as whether SPI is in receivership; (5) when SPI will no longer perform the Covered Activities in the Permit Area; (6) the revocation or suspension of SPI's corporate authorization to do business in the state or states in which it is registered to do business and, (7) SPI is disqualified from performing Covered Activities under the ITP for either of the disqualifying factors circumstances listed in 50 CFR § 13.21(c) and (d), as may be amended, or under any future Service regulation.

SPI notices must be sent to: Field Supervisor SFWO and Field Supervisor YFWO at:

Field Supervisor SFWO
2800 Cottage Way, Room W-2605
Sacramento, CA 95825

Field Supervisor YFWO
1829 South Oregon Street
Yreka, California 96097

8.12.2. Required Notices by USFWS

The USFWS shall notify SPI within a reasonable timeframe if: (1) for any reason (court ruling or lack of appropriated funds), the Service is unable to fulfill any obligation associated with the HCP or ITP; (2) any lawsuits filed against the Service related to this HCP or ITP, requests for disclosures of documents received under the Freedom of Information Act pertaining to this HCP or ITP, or written notices or letters expressing an intent to file suit against the Service challenging the issuance of, or SPI's compliance with, the ITP. The Service will provide notice to SPI of any such events by telephone, email or other appropriate means to a party designated in writing by SPI.

8.13. Permit Revocation, Suspension, or Relinquishment

8.13.1. Permit Revocation and Suspension

The ITP may be revoked by the Service as to one or both Covered Species only in accordance with 50 CFR §§ 13.28 and 17.22(c)(8). In accordance with 50 CFR § 13.28, the Service may revoke the ITP in whole or in part if SPI willfully violates any Federal or State statute or regulation, Indian tribal law or regulation, or any law or regulation of a foreign country that involves a violation of the conditions of the ITP or of the laws or regulations governing the Covered Activities. The ITP also may be revoked if SPI fails, within 60 days, to correct deficiencies that were the cause of suspension of the ITP; unless the Service determines and notifies SPI in writing that a longer period of time is necessary to correct the deficiencies, or SPI becomes disqualified under 50 CFR § 13.21(c), or because a change occurs in the statute or regulation authorizing the ITP that prohibits continuation of the ITP. Pursuant to 50 CFR §§17.22(b)(8) and 17.32(b)(8), the ITP also may be revoked if continuation of the Covered Activities would be inconsistent with the criterion set forth in 16 U.S.C. § 1539(a)(2)(B)(iv) and the inconsistency has not been remedied.

When the Service believes there are valid grounds for revoking the ITP, it will notify SPI in writing of the proposed revocation by certified or registered mail. The notice, which may be amended by the Service at any time, will identify the ITP, whether the revocation is as to part or all of the ITP, the Covered Activities and Covered Species as to which the revocation applies, the reason(s) for the revocation, and the proposed disposition of the wildlife, if any. The notice also shall inform SPI of its right to object to the proposed revocation. Upon receipt of the proposed notice, SPI may file a written objection to the proposed action within 45 calendar days of the date of the notice providing its reasons for objecting to the proposed revocation as well as any supporting documentation.

The Service will issue a written decision on the revocation within 45 days after the end of the objection period. The written decision will include the Service's decision and its reasons for such as well as information concerning SPI's right to request reconsideration of the decision under 50 CFR § 13.29 and the procedures for doing so. Upon notification that the ITP has been revoked and after all appeal procedures have been exhausted, SPI must surrender the ITP to the Service.

The Service may suspend the ITP, in whole or in part, in accordance with its regulations located at 50 CFR § 13.27. The procedures for requesting reconsideration of the Service's decision to suspend an ITP are located at 50 CFR § 13.29.

8.13.2. Permit Relinquishment

SPI reserves the right to relinquish the ITP as to each Covered Species prior to expiration by providing thirty (30) days advance written notice to the Service as provided by 50 CFR § 13.26. The ITP shall be deemed canceled only upon a determination by the Service that any outstanding monitoring, minimization and mitigation measures have been implemented.

8.14. Post-Termination Obligations

SPI and the Service acknowledge that SPI's compliance with the HCP and ITP will, at the end of the 50-year permit term, result in SPI having fully mitigated for any incidental take of any Covered Species, provided that SPI has fully funded the Plan in accordance with the HCP and implemented the HCP in accordance with the ITP.

Agency regulations at 50 CFR 17.22(b)(7) provide that a permittee and the Service may agree in an HCP on the appropriate minimization and mitigation measures, if any, that may be required upon early termination of a permit. As stated in Section 17.7 (Permit Abandonment or Relinquishment) of the HCP Handbook (USDI 2016): "*Fundamentally, the permittee must ensure that the mitigation required under the HCP for all the incidental take that has occurred is carried out, including any ongoing conservation funding and implementation assurances*." Under those conditions, if SPI is in compliance with the terms of the HCP and ITP upon the date of termination, relinquishment, or revocation of the ITP, then SPI shall have no further obligations pursuant to the ITP with regard to Covered Species or Permit Area, and no further post-termination mitigation shall be owed by SPI if the ITP is terminated, relinquished, or revoked prior to the end of the permit term. In such an occurrence, without an ITP SPI would necessarily return to management under the requirements of ESA Section 9, which prohibit unauthorized take of listed species.

SPI foresees two potential types of effects requiring consideration as to whether either the Plan Area condition or mitigation already accomplished would be sufficient for a determination that all effects have been mitigated at any given time. These two types of effects are 1) Instances of take resulting from crossing of habitat thresholds, and 2) Number of juvenile owls accounted as

taken as a result of crossing of habitat thresholds. Mitigation of each of these effects is discussed below from the standpoint of various intervals during the permit period.

HCP Section 5.5 describes SPI's projections that estimate an average 15.3 instances per year (2.3 for NSO and 13 for CSO) of take due to habitat modification. These projected instances would be triggered when timber harvest removes habitat to below thresholds described in HCP Section 5.5, or when projected harvest would occur in an Occupied Hexagon that is already below these thresholds. This number of instances of take due to habitat modification represents a maximum that would be authorized by the ITP and could not be exceeded. The annual review and accounting of take would determine whether take had actually occurred and ensure that the permitted amount is not exceeded (HCP Section 5.4.1). The annual exercise may also determine that the amount of actual take was lower than that projected.

Minimization and Mitigation of Impacts

As described in HCP Appendix 4.3, most Occupied Hexagons that fall below the take threshold will do so by relatively small amounts, and most of these hexagons will continue to contain habitat for spotted owls (Post-Harvest Conditions in Taken Occupied Hexagons, Appendix 4.3). Also, modeled continuing habitat growth will often return the taken hexagon to be available for use by spotted owls, since 32 to 55 percent (with a weighted average of 41%) of impacted hexagons grow back to their starting category within the same modeling period (5 years) (Post-harvest Growth of Taken Occupied Hexagons, Appendix 4.3). These habitat conditions will combine to limit and mitigate the effect at the scale of the Occupied Hexagon. Harvests that cause habitat in Occupied Hexagons to fall below thresholds also will be mitigated by the habitat conditions in adjacent hexagons (described in the Conditions in Hexagons Adjacent to Occupied Hexagons, Appendix 4.3.

The effects of timber harvest that cause habitat in Occupied Hexagons to fall below thresholds also will be mitigated at the broader landscape scale by the widespread presence of habitat, as indicated by the number of PHAs. As of 2016, the PHA count in the CSO range was nearly 2.2 times the number of CSO ACs, and in the NSO range, 2.7 times the number of NSO ACs. As of 2016, the average Nest Hexagon of the PHAs contained a habitat distribution of 55 percent HF4 and 18 percent HF2H, and by year 20, the average Nest Hexagon in the PHAs is projected to contain 47 percent HF4 and 18 percent HF2H. Although the modeled PHA count for the CSO will decline by 10 percent before rebounding in the third decade and throughout the remaining permit period (see HCP Figure 5.3), even at the lowest point the projected PHA count will be almost 2 times larger than the present number of CSO ACs. The PHA count for the NSO starts at nearly 3 times the present number of NSO ACs and increases throughout the permit term.

As a result, although access to some habitat may be limited by the owls' territorial behavior, alternate habitat will be available for spotted owls capable of dispersal that might be displaced by habitat modification, mitigating the effects of the instances of take even at the lowest projected count of PHAs. The rapid increase in PHAs after year 20 will provide even greater opportunity for re-settlement of dispersed breeders and mitigation of effects of timber harvest.

Any concern for post-termination mitigation would be further reduced after year 20 due to the rapid increase in available spotted owl habitat.

In addition to improving habitat, SPI will undertake barred owl research that will reduce the risks to covered species on an annual basis by collecting barred owls for scientific studies. Removing barred owls has been demonstrated to reduce their effects on spotted owl occupancy, survival, and reproduction, and spotted owls are known to re-occupy their former ACs following removal of barred owls (Dugger et al. 2016, Diller et al. 2016). SPI's scientific collections of barred owls prior to the development and approval of this HCP allowed SPI to document spotted owls re-establishing occupancy in at least 10 NSO ACs and 17 CSO ACs during the period 2015 through 2019.

Based upon the analysis below, the barred owl research program is expected to entirely mitigate for the impact of the projected take due to habitat modification. As discussed in Section 5.5, the estimated amount of take in the form of "harm" will result in the lost production of 1 juvenile NSO per year and 4 juvenile CSO per year. Applying SPI's observed NSO reproductive rate of 0.45 young per occupied AC per year, the removal of barred owls from 10 NSO ACs and preventing re-occupancy by barred owls could compensate for one year of lost reproduction among NSO ACs taken by habitat modification across the NSO portion of the Plan Area (0.45 young X 10 ACs = 4.5 young). Applying SPI's observed spotted owl reproductive rate of 0.30 young per occupied AC per year, the removal of barred owls from 17 CSO ACs and preventing re-occupancy by barred owls could compensate for one year of lost reproduction among spotted owls at CSO ACs taken by habitat modification across the CSO portion of the Plan Area (0.3 young X 17 ACs = 5.1 young). The combined annual projected increase in produced young is 9.6 juvenile owls. These annual effects compound into subsequent years at the already recovered ACs and the number of such sites likely will increase with continued barred owl research collections (A minor overestimate of this increase would occur when an AC is simultaneously taken by harvest and therefore for that year the increase would be somewhat lower, but the barred owl removal effect will persist for the permit term). Continued scientific collections of barred owls across the Plan Area under HCP Conservation Measure 8 will allow spotted owl occupancy and reproductive behavior to persist at many more ACs than will be taken by habitat modification and will allow for higher amounts of reproduction than the projected loss. In this way, the barred owl research program will entirely mitigate for the impact of the projected take due to habitat modification.

Summary

In summary, throughout the permit term, the habitat remaining in Occupied Hexagons and surrounding areas is expected to be sufficient to provide for displaced owls that are capable of dispersal, which will substantially mitigate the effects of habitat modification at the time they occur. Any need for post-termination mitigation would be further reduced after year 20 due to the rapid increase in available spotted owl habitat.

Meanwhile, the barred owl research program is expected to continually protect more spotted owl reproduction than that projected to be lost due to habitat modification. Therefore, the effects of take will continually be mitigated by the Conservation Measures, and no take effects would remain to be mitigated if the ITP were to be suspended or relinquished at any time during the permit period.

8.15. Land Transactions

If SPI acquires any additional land, SPI may elect to include such land in the HCP and ITP in accordance with the Minor Modification or Major Amendment Process. Upon such election, SPI shall provide notice to the Service of its desire to include additional lands, along with a specific description of the location, legal description, and conditions of such additional property.

SPI may not sell or dispose of any Lands included in Plan Area, or exchange any portion thereof, to any new party during the term of the HCP unless: (a) the HCP or ITP is modified to delete such lands in accordance with Section 8.13.2 (Relinquishment); or (b) the lands are transferred to a third party who has agreed to be bound by the terms of the HCP, in accordance with Section 8.10 (Assignment and Transfer).

8.16. No Recording

The HCP, the ITP, or any obligations thereunder, will not be recorded on Plan Area, and will not run with Plan Area.

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APPENDIX 1.1

Draft HCP Biannual Meeting Agenda & Draft Annual Report Template

APPENDIX 3.1

SPI Research NSO Density Study

APPENDIX 3.2

Spotted Owl Trend Analyses

APPENDIX 3.4

Spotted Owl Nesting Habitat GNN Analysis

APPENDIX 3.6

Northern Spotted Owl Telemetry

APPENDIX 3.7

Prey Analysis

APPENDIX 3.8

California Spotted Owl Telemetry

APPENDIX 3.9

Core Use Area Determination

APPENDIX 4.1

SPI Habitat Form Definition and Description

APPENDIX 4.2

Cross Plots

APPENDIX 4.3

Hexagon Analysis

APPENDIX 4.4

SPI Structure Inventory

APPENDIX 4.5

Example SPI Option A

APPENDIX 4.6

Even-Aged Narrative

APPENDIX 4.7

Modeled Threshold Crossings by Activity Center

APPENDIX 5.2

Protection Zones

APPENDIX 5.3

Tiering Analysis Binder

APPENDIX 5.4

SPI HCP Spotted Owl Survey Protocol and Activity Center Protections

APPENDIX 5.4 ADDENDUM

SPI HCP Spotted Owl Survey Protocol and Activity Center Protections Addendum

APPENDIX 5.5

Barred Owl Study

2019 Fuels Reduction MOU CSO USFS R5
SPI NFWF CAL FIRE
CFL ADDENDUM

APPENDIX 5.7

SPI Raptor Policy

APPENDIX 5.8

Diameter Frequency Distributions HF2H and HF4

APPENDIX 6.1

Monitoring Study Power Analysis

APPENDIX 6.2

Cruise Manual Appendix

APPENDIX 6.3

Regeneration Survey Procedure