Candidate Conservation Agreement with Assurances for Fishers on the SPI ownership in the Klamath, Cascade, and Sierra Nevada Mountains

between

Sierra Pacific Industries

and

U.S. Fish and Wildlife Service

This Candidate Conservation Agreement with assurances (CCAA), effective and binding on the date of last signature below, is between Sierra Pacific Industries (SPI), A California Corporation (Applicant), and the U.S. Fish and Wildlife Service (Service).

The Administrators of this CCAA are:

Sierra Pacific Industries designates the following as the Agreement Administrator:

Sierra Pacific Industries Corporate Office
P.O. Box 496014
Redding, CA 96049-6014
19794 Riverside Ave.
Anderson, CA 96007
(530) 378-8000 (Phone)
(530) 378-8139 (Fax)

U. S. Fish and Wildlife Service designates the following as the Agreement Administrator:

Yreka Fish and Wildlife Office
1829 South Oregon Street
Yreka, CA 96097
(530) 842-5763 (Phone)
(530) 842-4517 (Fax)

Permit Number: TE09082C-0

Table of Contents

Appendix J: SPI 2014a. Draft RRHS as an Indicator of HeterogeneityV2

Appendix K: SPI 2014b. Forest Conditions within Hexagons – Interstitial space

Appendix L: 2008-2012 Monitoring Report pursuant to the Candidate Conservation Agreement with Assurances for Fisher for the Stirling Management Area between Sierra Pacific Industries and U.S. Fish and Wildlife Service

Appendix M: Nibblet et al. 2014. Structure of fisher (*Pekania pennanti*) habitat in a managed forest in an interior Northern California coast range (Online at Forest Science)

Appendix N: Fisher Natal Den Use On Managed Timberland In California. Fisher Data Compiled from Cooperative Studies Study Cooperators: California Department of Fish and Wildlife, US Fish and Wildlife Service, North Carolina State University, Sierra Pacific Industries. December, 2012

Appendix O: Methodology for the Hexagon modeling analysis

Appendix P: SPI Mesocarnivore Camera Protocol

Appendix Q: Snag Management Objectives for Cavity-Using Species on Sierra Pacific Industries' Lands

Appendix R: Canopy Regrowth in SPI Planted Forests

Appendix S: Legal Descriptions of the Enrolled Lands

1 AUTHORITIES

1.1 SIERRA PACIFIC INDUSTRIES

Sierra Pacific Industries (**SPI**) and all related entities enters into this Candidate Conservation Agreement with Assurances (**CCAA**) under the inherent authority of the corporate management of Sierra Pacific Industries.

1.2 U.S. FISH AND WILDLIFE SERVICE

Sections 2, 7, and 10 of the Endangered Species Act of 1973, as amended (ESA), and the Fish and Wildlife Coordination Act, allow the United States Fish and Wildlife Service (**Service**) to enter into this CCAA. Section 2 of the ESA encourages interested parties, through Federal financial assistance and a system of incentives, to develop and maintain conservation programs as a key to safeguarding the Nation's heritage in fish, wildlife, and plants. Section 7 of the ESA requires the Service to review programs that it administers and to utilize such programs to further the purposes of the ESA. By entering into this CCAA, the Service is utilizing its Candidate Conservation Program to further the conservation of the Nation's fish, wildlife, and plants. Section 10(a) of the ESA authorizes the issuance of permits to "enhance the survival" of a listed species. The Service's implementing regulations at 50 CFR 17.22 (d) provide the application requirements and issuance criteria for CCAAs.

1.3 PURPOSE

The purpose of this CCAA is to provide a regulatory mechanism for SPI to implement conservation measures that support fishers *(Pekania pennanti)* of the West Coast Distinct Population Segment (**Covered Species**) in a manner that allows the Service to issue an Enhancement of Survival (ESP) permit for the majority of SPI's California timberland ownership (**Enrolled Lands**). This CCAA will contribute to the Service's fisher conservation goals in a manner that, should other landowners contribute a similar level of conservation on their ownership, the potential need to list the fisher is avoided. As discussed in Section 7.3 -- Conservation Measure Standards, the existing Mixed land class on SPI lands that currently provides fisher habitat will be maintained at the 10,000 acre and female fisher territory scale. The retention of key elements will ensure the continued existence of important habitat features (den sites, rest sites, areas of canopy cover) including habitat for small mammals and other fisher prey items in areas receiving vegetation management treatments.

This CCAA provides SPI regulatory certainty concerning land use restrictions that might otherwise apply, should the fisher become listed under the ESA. Likewise, the CCAA provides the Service certainty that a substantial portion of the Enrolled Lands will remain in the Mixed land class, areas currently identified as providing for fisher conservation on SPI's land will be maintained, and habitat elements important to fishers will be identified and maintained on the Enrolled Lands during forest management activities. For the purpose of maximizing the beneficial impact of the CCAA, the Conservation Measures will begin to be implemented on January 1, 2016, or earlier if the agreement is signed prior to that date.

1.4 DURATION OF CCAA AND PERMIT

The term for this CCAA and the associated Enhancement of Survival Permit (ESP) will be 10 years. The Enhancement of Survival Permit issued with the approved CCAA will become effective if the fisher becomes listed, and will remain in effect for the duration of the CCAA. If the Service, in consultation with SPI, determines the conservation benefits of the CCAA are valuable and it is in the public interest to continue the commitment to fisher conservation beyond the current 10-year permit, SPI may seek to renew the CCAA and the Permit beyond the specified term of 10 years. If SPI chooses to seek renewal of the permit, a notification should be provided to the Service in writing no less than 12 months prior to the expiration of the existing permit. If the Service and SPI agree to work to renew the permit, the Service and SPI will initiate the renewal process in accordance with USFWS regulations (50 CFR 13 and 50 CFR 17).

1.5 COVERED SPECIES

This CCAA will cover fishers, *Pekania pennanti (=Martes pennanti)*.

2 RESPONSIBILITIES OF THE PARTIES

SPI will be responsible for implementing this CCAA through programs of habitat management and decisions about where and when to harvest timber on their lands they own beginning on January 1, 2016, or earlier if the agreement is signed prior to that date. By harvesting at the rate specified in their projection of Long Term Sustained Yield Option A Document (SPI Option A), developed per the California Forest Practice Rules (CFPRs)(14 CCR 933.11), the quality of den habitat for fishers on the enrolled lands is expected to improve. SPI's rate of harvesting, placement of harvest units within the landscape, and retention of essential habitat elements will maintain and develop fisher habitat of sufficient condition and quality to allow for continued occupancy by fishers where they currently exist, which is anticipated to provide for a stable or increasing fisher population. Within the historic range of the species, SPI will maintain and develop habitat that allows for the expansion of fisher populations into areas that are currently unoccupied. Upon approval of the CCAA, should the fishers be listed under the ESA in the future, the Section 10(a)(1)(A) permit issued to SPI by the Service shall become effective and, in accordance with 50 CFR 17.22 (a), a specified level of incidental take shall be authorized on the Enrolled Lands. Regulatory assurances, consistent with 50 CFR 17.22 (a)(5) shall be provided. The level of authorized take (described in Section 9 of the CCAA and in the Enhancement of Survival Permit issued by the Service) shall not be exceeded.

3 ENROLLED LANDS

3.1 LOCATION AND DISTRIBUTION OF ENROLLED LANDS

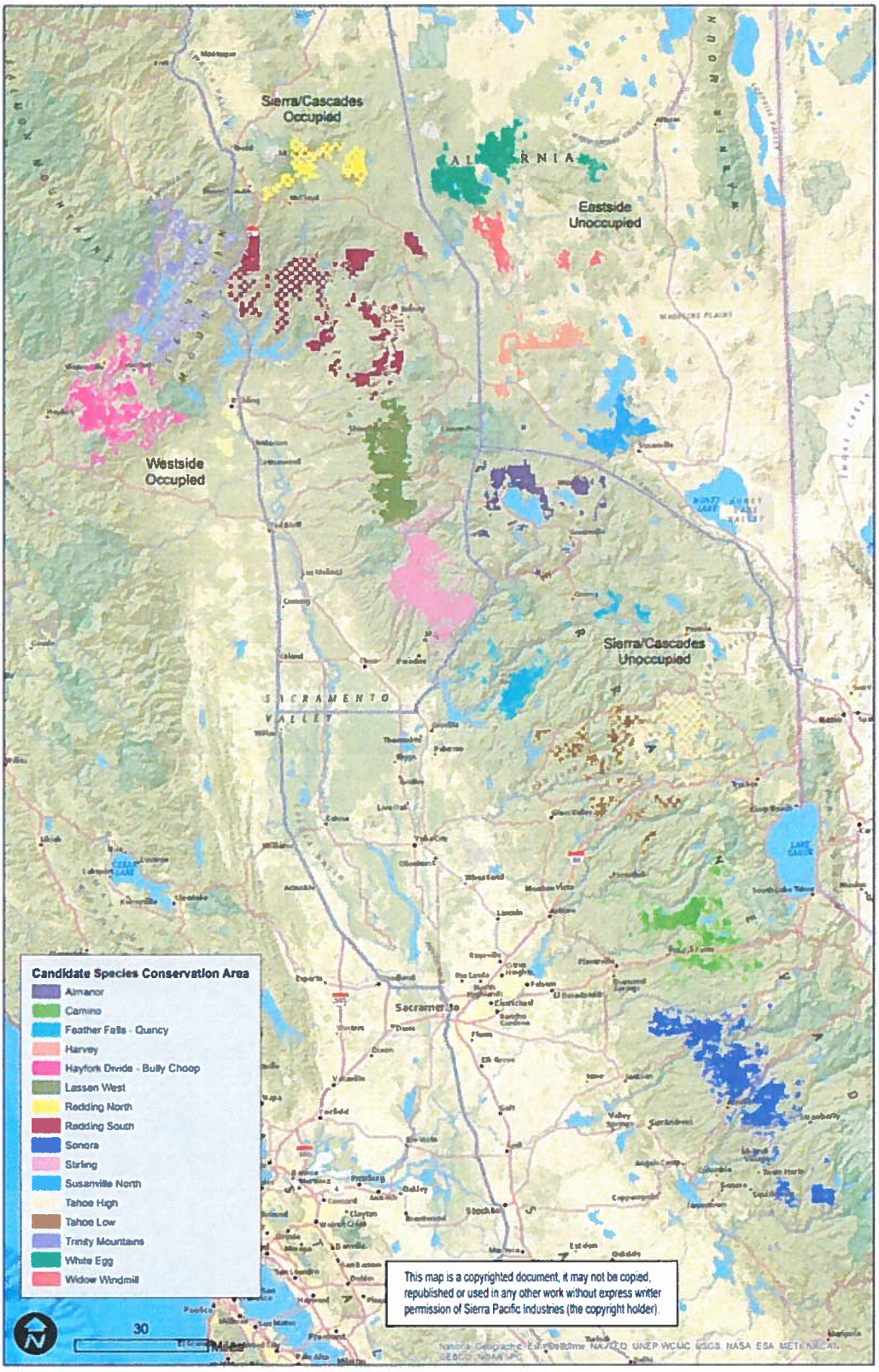
The Enrolled Lands are described in Appendix S and shown on a general map of Covered Species Conservation Areas (CSCAs) in Figure 3.1-1. SPI habitat management areas are segregated into 16 CSCAs and includes ownership, totaling approximately 1,570,963 ac. (Table 3-1).

Table 3-1 -- Covered Species Conservation Areas (CSCAs) on Enrolled Lands

CSCA Westside Occupied	Acres	Sub-Totals
Hayfork Divide - Bully Choop	124,652	
Trinity Mountains	118,009	242,661
CSCA Occupied Sierra/Cascades		
Redding North	43,238	
Redding South	160,491	
Lassen West	116,625	
Stirling	158,798	479,153
CSCA Unoccupied Sierra/Cascades		
Almanor	60,720	
Feather Falls-Quincy	73,133	
Tahoe High	79,054	
Tahoe Low	49,111	
Camino	120,927	
Sonora	198,789	581,734
CSCA Unoccupied Eastside		
White Egg	112,760	
Widow Windmill	40,120	
Harvey	58,232	
Susanville North	*56,303*	267,415
ALL CSCA Grand Total	**1,570,963**	
Note: all acreage data circa 1/1/2012 (Hexagon Analysis)		

In this CCAA the term **Occupied Range** refers to those Enrolled Lands that are within the Sierra Cascades occupied and Westside occupied CSCAs. Other general uses of the term occupied range will not be capitalized.

Figure 3.1-1 Regions and Covered Species Conservation Areas



3.2 INCREASING OR DECREASING ENROLLMENT

Enrolled Lands may increase or decrease under this agreement as the result of the sale, purchase, or exchange of lands. Any increase or decrease in the Enrolled Lands will be reported annually to the Service. The Enrolled Lands may increase without limit when the provisions of this CCAA are adopted and the Service notified regarding the legal description of the addition.

The enrollment of new property or the disposal of previously enrolled property will not change the authorized level of incidental take or require an increase or decrease in the level of commitment to fisher conservation already specified in the CCAA.

Incidental take on newly added lands will not be authorized until the Service provides SPI written notification that the newly added lands have been incorporated into the CCAA.

Newly acquired lands will be subject to the CCAA Conservation Measures and monitoring and reporting requirements. The total amount of authorized incidental take will not change, but Covered Activities will have incidental take authorized. The addition of property to the Enrolled Lands will be considered a minor amendment to the CCAA. Enrolled Lands may decrease by as much as 10% in any individual CSCA, cumulatively (in that CSCA) over the life of the permit, of the acreage enrolled on the day the CCAA agreement is signed, without invoking the need for review and potential changes in the CCAA. Any decrease in Enrolled Lands that is cumulatively greater than 10% of the Enrolled Lands will require prior written notice to the Service (See Section 11.2.3). Decreased enrollment resulting from land transfers to the United States of America will not be counted towards the 10% cumulative total. Upon receiving notice that cumulatively the Enrolled Lands will decrease more than 10%, the Service will then have the discretion to either concur that the purposes of the CCAA are being met, or the Service may require that the CCAA be amended in accordance with all applicable legal requirements.

Changes to the Enrolled Lands as described above shall be treated as minor administrative amendments.

4 COVERED ACTIVITIES

Covered Activities include Timber Operations as defined by the California Forest Practice Rules (CFPRs) (Title 14, California Code of Regulations Chapters 4, 4.5, and 10) when they are included in an approved Timber Harvest Plan (THP) or Emergency or Exemption Notification in accordance with the CFPR. These include: felling and bucking timber, yarding timber, loading and landing operations, transportation of forest products and equipment, chipping, timber salvage, transport of wood products, water, and rock, road construction, road reconstruction, and road maintenance, herbicide applications, crossing facility placement and maintenance, site preparation, mastication, and prescribed burning. Each of these activities is further described in detail when they occur as part of an approved THP, which satisfies California Environmental Quality Act (CEQA) analysis requirements.

Covered Activities also include actions that are not Timber Operations, but may be conducted as part of a THP and its accompanying CEQA analysis. These may include, but are not limited to, machinery maintenance, machinery fueling, and fuel storage.

Covered Activities also include other management actions that are not defined as Timber Operations and that do not require THP or Notifications under the CFPR, but are covered by CEQA analysis under other statutes. These analyses occur under applicable regulatory frameworks relating to Regional Water Quality Control Board Waste Discharge permits or waivers, California Department of Fish and Wildlife Streambed Alteration (Fish and Game Code Section 1600) permits,

the Surface Mining and Reclamation Act of 1975 (SMARA, Public Resources Code, Sections 2710-2796), or California Department of Pesticide Regulations. Government oversight of the implementation of these regulations is provided through California Department of Forestry and Fire Protection (CAL FIRE), California Department of Fish and Wildlife, the Regional Water Quality Control Boards, the California Department of Conservation's Office of Mine Reclamation (OMR), the State Mining and Geology Board (SMGB), and County Agricultural Commissioners. SPI personnel and their contractors that are responsible for these activities have the appropriate licenses from the State of California. A Registered Professional Forester (RPF) must consult with other resource professionals in cases where additional expertise is required. Violations of these regulations can result in civil and criminal penalties for the responsible party. These Covered Activities that are covered by a CEQA analysis or other statutes are specified in Section 4.1 below.

Covered Activities that do not require THPs or Notifications under the CFPR or specific CEQA analysis are discussed under Section 4.2.

Measures to reduce the impacts of Covered Activities are contained in Section 7.3 of this CCAA.

4.1 MANAGEMENT ACTIONS COVERED BY CEQA ANALYSIS

Covered Activities include management actions that are not defined as Timber Operations and that do not require THP or Notifications under the CFPR, but are covered by CEQA analysis under other statutes. These include: rock pit development, rock processing, rock hauling, herbicide applications, and watercourse crossing installations. Many of these actions are extremely unlikely to affect fishers; however, for clarity all of the activities are included as Covered Activities for the rare event that some level of incidental take occurs or the action is construed as reasonably likely to take a fisher.

4.1.1 Rock Pit Development and Rock Processing

Rock pit development is done to acquire aggregate for use on SPI's forest roads. These activities are done in compliance with California's Surface Mining and Reclamation Act (SMARA). 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 there. Rock source development involves the removal of vegetation (if present), excavation of the overburden (soil), and then excavation of the aggregate. The average rock pit excavation generally disturbs less than one acre of land. Most rock pits are adjacent to existing roads. Rock pits may gradually increase in size over time but generally do not exceed 5 acres. Excavation of aggregate may be done by 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. Aggregate may also require mechanical crushing in order to achieve the desired size and uniformity. Rock aggregate of various sizes is used to strengthen a road prism, road surface, and crossing facilities. Rock pit development and reuse of a rock source is intermittent. The conservation measures in 7.3.5 and 7.3.6 will minimize the impact of rock pit development and use.

4.1.2 Transport of Aggregate Products and Heavy Equipment

Transportation of aggregate and heavy equipment involves semi-trucks traveling to and across the transportation network within the Enrolled Lands. Semi-trucks used for hauling materials and equipment include water trucks, end-dump trucks, low beds, and belly dump trucks. Due to the

alignment and grade of the transportation system, hauling operations generally occur at speeds less than 25 mph.

4.1.3 Herbicide Application

Prior to or following planting, areas reforested in accordance with the CFPR will be evaluated to determine if weed competition will adversely affect conifer seedling establishment. The judicious use of chemical herbicides is considered to be the most effective method of controlling competing vegetation. If the reforestation area is determined to require weed control, a California Certified Pest Control Advisor will prescribe an appropriate herbicide treatment. A California Qualified Applicator will supervise the application of the herbicide. The California Department of Pesticide Regulation's (DPR) pesticide program has been certified under CEQA as a functional equivalent of an EIR pursuant to PRC 21080.5. Pesticides registered for forestry use in California will have had their potential environmental impacts evaluated during the registration process. The County's Agricultural Commissioner oversees this program and is designated as a state agency for the purposes of certification (3 CCR 6100(a)(7)). Any pesticide operator must be licensed with the state and must report any pesticide use by the 10th of the month following an application to the county program coordinator. Detailed records are kept on any pesticide application. This information is tracked by DPR and is available to the public. All herbicide applications that are related to reforestation are evaluated in the THP or Emergency Notification process accordance with the CFPR.

4.1.4 Watercourse Crossing Installation

Activities that significantly alter the bed, bank, or stream channel of a watercourse require a permit from the California Department of Fish and Wildlife. Watercourse crossings are designed to minimize their impact to water resources and the surrounding riparian vegetation. The watercourse permitting process requires a CEQA analysis.

4.1.5 Communication Site Construction and Maintenance

Other activities and facilities that occur on the Enrolled Lands include communication site construction and maintenance. There are 17 communication sites in the Occupied Range. Communication sites in the county zone districts encompassing the Occupied Range require a discretionary use permit. A county- issued discretionary use permit requires CEQA review.

Communication sites occur generally on high elevation ridges or peaks that provide the desired coverage for a communication company. Communication sites are generally accessed by existing roads; however new road construction may be necessary in some instances. Appropriate measures of the CFPR will address the harvest of trees at these sites. Communication sites have one or more metal lattice or pole towers, multiple antennae, and one or more small 16 ft. x 20 ft. equipment shelters. The sites are equipped with one or more diesel powered electrical generators. Site perimeters typically have 8 ft.-high cyclone fencing to control access. Vegetation removals 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 fire prevention using mechanical and/or herbicide treatments. Herbicide treatments are prescribed by a California Certified Pest Advisor and applications supervised by a California Certified Qualified Applicator under the authority of the California Department of Pesticide Regulation's pesticide program.

4.2 MANAGEMENT ACTIONS NOT COVERED BY CEQA ANALYSIS

Covered Activities include routine road maintenance, mastication of vegetation within road rights of way, placement and use of water tanks, timber cruising, timber harvest preparation, pre-commercial thinning, construction and operation of communication sites, scientific research, and fire suppression. These minor forest activities are not subject to THP approval or other CEQA review.

These Covered activities may be conducted by SPI employees, contractors, agents, or other assigns.

With the exception of fire suppression, these activities do not generally affect the physical environment significantly in a manner that would likely take a fisher.

4.2.1 Road Maintenance

Road maintenance is done on an as-needed basis to ensure the integrity of the road prism, road drainage, and associated crossing facilities. Road maintenance does not require substantial changes to the road prism and therefore does not require a permit. Road maintenance does not require the removal of substantial amounts of vegetation and is limited to small brush and tree seedlings, branches or grass that has grown in the travel-way.

4.2.2 Mastication of roadway rights of way

Mastication of right-of-way brush and small trees may be conducted in order to maintain sight distance along the roadway, and also so that the road can function more effectively as a fuel break, by reducing the flammability of the fuels adjacent to the road. Mastication of roadway rights -of-way targets limbs of larger trees, brush, and trees up to 6 in. diameter breast height (dbh). Masticating roadway rights-of-way is applied in a narrow corridor adjacent to existing roads and does not target vegetation that is large enough in diameter to hold a fisher den; thus, impacts to fishers are extremely unlikely.

4.2.3 Placement and Use of Water Tanks

Water tanks are placed and maintained to create a water source for use in dust abatement. Water tanks are situated on stable, level ground. Water diversions requiring the alteration of the bed or banks of a watercourse require permit approval from the California Department of Fish and Wildlife. Water tanks will be covered in a manner that excludes fishers and/or designed or equipped such that fishers or other wildlife are not entrapped. As such, take of fishers associated with drowning in water tanks is not reasonably likely to occur. SPI, through its normal operational activities, will continue to identify and, if necessary, remediate water tanks that are a threat to fishers, within the term of the permit. The conservation measures in 7.3.7 will minimize the impact of water tank placement and use.

4.2.4 Timber Harvest Preparation

THP preparation includes foresters driving to the plan area and then traversing the plan area on foot, flagging watercourse buffers, road alignments, and unit boundaries, performing archaeological reconnaissance and, watercourse assessments, and marking timber. Virtually no

impacts to the physical environment result from timber cruising or THP preparation activities. Timber preparation activities are very unlikely to impact fishers.

4.2.5 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 chain-sawing felling of unwanted small diameter (<5"dbh) trees in the plantation to achieve a desired crop tree density. 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 occurs in either restored substantially damaged timberland or in a Regeneration harvest (clearcut) unit. Clearcuts 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 contain a fisher den. While retained structures are in Regeneration units, their use by fishers is not anticipated until after 10 years of development. Because of these factors, pre-commercial thinning is not likely to take a fisher.

4.2.6 Research and Data Collection Activities

Research on SPI land covers many topics, and is done at varying scales ranging from landscape-wide mesocarnivore inventories and water quality assessments to localized investigations of plant populations or wildlife use of a particular structure or site. The following group of activities involves a crew driving on the Enrolled Lands and, if necessary, walking to the point of interest to perform data collection activities.

Research also includes a network of weather stations located strategically throughout the Enrolled Lands. Weather stations are both permanent structures and temporary installations. Permanent weather stations have a very small foot print (10 ft. x 10 ft.) and are designed to operate using solar panels for power. However, removal of trees may be necessary to improve the footprint of the facility and antennae effectiveness. These clearings are generally less than 0.5 ac. in size. Site perimeters typically have 8 ft.-high cyclone fencing to control access. Temporary installations only 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 are a visual inspection of plant habitat, conducted on foot.

Wildlife surveys are conducted where THPs are within the range of special interest, threatened, or endangered species. Wildlife surveys require vehicle travel on existing roads and may also include the placement of photo-stations, attractant/bait, or broadcasting calls to elicit a response from the target species. If species of interest are detected, surveys also often involve site-specific efforts to find the reproductive sites in order to provide necessary protection. Whenever SPI works with animal species, all required permits are first obtained from the California Department of Fish and Wildlife and/or the Service. Because of limited area and intensity, other research activities are extremely unlikely to impact fishers.

Timber cruising involves crews driving to a particular road location on the Enrolled Lands and then walking transects that traverse the ownership, stopping every 4 chains (1 chain = 66 feet) and taking measurements of the forest vegetation. Timber cruising does not require a permit. Timber cruising activities are not reasonably likely to result in take of fishers.

4.2.7 Fire Suppression

Fire suppression activities by SPI contractors are undertaken to stop a wildfire from burning the Enrolled Lands. Fire suppression actions either directly or indirectly limit or stop the spread of fire across the landscape. Fire suppression activities include building fire line by hand or mechanically with crawler dozers. Other fire suppression activities include water drafting, spraying water, spraying retardant, and lighting backfires. Fire suppression activities are coordinated with and often carried out by state and federal agencies. Fire suppression activities are only conducted during fire emergencies to contain wildfire. There is some small risk that fisher may be impacted by these activities, but the risk may be reduced because most fires occur after the denning season.

4.3 ACTIVITIES NOT COVERED

4.3.1 Wind Power Facilities

Wind Power Facilities will not to be covered activities. These facilities may occur on the Enrolled Lands; however the locations where such a facility would be considered feasible are presently unknown, and therefore must be addressed on an individual project basis as part of its environmental review (CEQA, ESA, CFPR as appropriate).

4.3.2 Trespass

Trespass does occur on the Enrolled Lands. Trespass usually involves breaking the locking mechanism of a gate for the purpose of gaining access for hunting or firewood cutting. Gates that are easily accessible or secure large blocks of land are more frequently patrolled than those more remote gate locations that may only control access to smaller parcels. Remote cameras are placed at some locations where trespass is a consistent problem. In some ownership patterns (especially "checker board") gates are not a feasible way to control trespass due to public access. To discourage trespass or other unauthorized (illegal) use of the property, all of SPI's lands are routinely monitored throughout the year by SPI patrolmen and Forestry staff.

4.4.3 Illegal Use of the Property

Illegal uses of the property have been identified as the illegal mining of a perennial watercourse, cutting firewood without a permit, or the cultivation of marijuana. In terms of risk to the fisher, the most important illegal uses of SPI property are the cultivation of marijuana and cutting firewood.

Mining in a perennial watercourse is not considered a risk to fisher since the activity generally is confined to the wetted surface of a watercourse and fisher are a terrestrial species.

Among the known illegal uses of the property, cultivation of marijuana may pose the largest risk to the fisher. While illegal planting sites are uncommon, cover small acreages, and are usually at the outer periphery of our ownership, marijuana cultivation is a risk because these illegal operations sometimes use rodenticides to prevent the crop plants or irrigation lines from being eaten or chewed by rodents. This rodenticide may then be ingested by fishers when they consume baits or contaminated individuals as prey. A secondary risk to fishers from the cultivation of marijuana could be the cutting of a den tree by growers preparing a site or tending their plants. Although den trees having micro-structures appear to be widespread, they occur relatively infrequently in proportion to

the total number of trees on the landscape (SPI 2013b) but still exist at multiple structures (trees) per acre on average.

The other illegal use of SPI property that is a risk to the fisher is firewood cutting. Firewood cutting is allowed seasonally by permit in selected areas. Permitted firewood cutting is restricted to dead and down material. Illegal firewood cutting tends to target snags and green hardwood trees that are near access roads. This activity also involves the concomitant additional risk of human caused wildfires.

Illegal uses of the property are identified wherever it is evident. Foresters, biologists, loggers, and patrolmen all keep an eye out for suspicious trails, road use, and altered vegetation that is not part of a THP. When an illegal activity is identified, the appropriate law enforcement personnel are contacted. Following the conclusion of the law enforcement activity, SPI participates in the restoration and remediation of the site. Remediation can include re-establishing erosion control measures, removal and proper disposal of trash, and cleanup of hazardous materials. The handling of hazardous materials and any necessary cleanup is done in compliance with the appropriate state and local agencies (county sheriff's offices, California Department of Pesticide Regulations, Department of Toxic Substances, CALEPA, the California Regional Water Quality Control Board, etc.)

5 CALIFORNIA FOREST PRACTICE RULE WILDLIFE PROTECTIONS

The California Forest Practice Rules (CFPRs) provide wildlife protections for listed and unlisted species in a variety of ways. Two general provisions of the CFPR that provide protections for wildlife and their habitat are found in 14CCR § 897(b)(1)(B) and 14CCR § 897(b)(2), which describe the principles the Director or their designee of the California Department of Forestry and Fire Protection (CAL FIRE) will use while determining whether a THP conforms to the intent of the Forest Practice Act. Those pertinent portions of 14 CCR § 897 read:

> (b)(1)(B) Maintain functional wildlife habitat in sufficient condition for continued use by the existing[1] wildlife community within the planning watershed.
>
> (b)(2) Individual THPs shall be considered in the context of the larger forest and planning watershed in which they are located, so that biological diversity and watershed integrity are maintained within larger planning units and adverse cumulative impacts, including impacts on the quality and beneficial uses of water are reduced.

Section 898.2 of the CFPRs precludes the approval of a THP that will result in unauthorized take of Federally listed species. Each THP area has unique conditions that the preparer must consider. If the RPF does not possess the expertise to evaluate a particular condition it is his or her responsibility to consult with other qualified professionals.

THPs are reviewed by a multi-disciplinary review team including CAL FIRE, the California Regional Water Quality Control Board, the California Department of Fish and Wildlife, and the California Department of Mines and Geology. Areas covered under THPs are inspected in the field by State Agencies during their implementation and following completion. These inspections are done to ensure the activities are implemented as described in the THP.

---

1 Note: After signing the CCAA SPI will commit to maintain functional wildlife habitat for species that currently don't exist in each planning watershed; for example fisher in the unoccupied range.

Specific provisions for wildlife habitat and forest protection are included in the silviculture section of the CFPR 14 CCR § 933.11/953.11(a)(1). The goal of this section is to achieve Maximum Sustained Production of High Quality Timber Products (MSP). MSP will be achieved by producing the yield of timber products specified by the landowner, taking into account biologic and economic factors, while accounting for limits on productivity due to constraints imposed from consideration of other forest values, including but not limited to, recreation, watershed, wildlife, range and forage, fisheries, regional economic vitality, employment, and aesthetic enjoyment.

Specific provisions for wildlife protection are included in the watercourse and lake protection zone rules 14 CCR § 936/956. The intent of this section of rules is to, among other things, ensure that timber operations do not potentially cause significant adverse site-specific and cumulative impacts to the beneficial uses of water, native aquatic and riparian-associated species, and the beneficial functions of riparian zones. Riparian buffer zones shall provide for vegetation structure diversity for fish and wildlife that maintains: vertical diversity; snags; microclimates; surface cover; large woody material; nesting; roosting and escape cover; and terrestrial migration.

The Wildlife Protection Practices 14 CCR § 939/959 have specific provisions for wildlife protection. One provision is the retention of snags for wildlife in all logging areas except for several exceptions relating to safety laws, human habitable structures, or merchantable snags as specified in the plan. SPI has a snag policy that requires, where practical, non-merchantable snags and green culls (≥15 in. dbh) be left standing in place during harvesting, salvage, and site preparation activities, unless the LTO or RPF determine that they pose a safety hazard or a regulation requires their removal, in which case they will be felled and either left in place or moved to a safe location within or adjacent to the harvest unit. A snag or green cull is considered non-merchantable when it contains <25% merchantable volume that can be recovered as lumber. If felled because of worker safety or knocked down as a result of normal harvest disturbance, these snags become downed large woody debris.

Candidate species covered by the California Endangered Species Act (CESA) are protected by provisions integrated into individual THPs that avoid the potential for killing an individual of that species. While fishers were in the candidate status under CESA (approximately 2010 through 2015), Department of Forestry and Fire Protection (CAL FIRE) provided guidance to RPFs to address fishers so as to avoid causing Take under the CESA. These "no-take" provisions for the fisher include no harvesting of the most commonly used potential den trees during the natal period from approximately March 1st to May 15th, no harvesting of such potential den trees during the maternal denning period of May 16th to July 31st without first harvesting 10 ac. around any potential den trees, such that if a female fisher has kits in a maternal den tree within the area, which this will allow her additional time to move her young from the area. Additionally, SPI provides the following in its THPs: if a fisher is sighted in a harvest unit during timber operations, all vegetation disturbing activities will be suspended within that unit and company biologists will be notified. If a den or habitation of a fisher is discovered, all operations (per PRC § 4527) will additionally be suspended within a 375-foot radius buffer around the den or habitation. The Department of Fish and Wildlife (CDFW) and CAL FIRE will then be immediately notified. CDFW must be consulted if site-specific avoidance measures are needed that differ from those described above.

During the candidacy period under CESA, these measures provided a level of protection that minimized and likely prevented take of a fisher during operations. The CCAA is intended to make some of these measures permanent (the Commission subsequently decided to list only fishers in the Southern Sierra ESU, see Section 6.3). However, the FWS has not specifically approved these

measures as preventive of incidental take of fishers, and thus SPI is seeking regulatory certainty by receiving authorization of incidental take under this CCAA with the FWS.

Listed and unlisted species receive consideration in the cumulative impacts analysis for THPs (14 CCR § 932.9/952.9 Technical Addendum #2(C)(1), (4)(a)-(h)). The cumulative impacts assessment analyzes the past, current, and reasonably foreseeable future projects, together, in order to identify potential long-term significant adverse effects that could result from past, present and reasonably foreseeable future projects working together. The cumulative impacts assessment will need to include a demonstration of how the plan will mitigate potential long term significant adverse effects to less than significant. "Significant" means harm or damage which is substantial and threatens the use of forest-related benefits (i.e., other beneficial uses of the air, water, soil, fish, or wildlife resources). Under the CFPRs, "Harm" is the same as the ESA when addressing federally listed species and means an act that where it actually kills or injures a federally listed wildlife species. Such acts may include a significant habitat modification or degradation which actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering. A long-term significant adverse effect on fish, wildlife, or listed species known to be primarily associated with late succession forest stands means an effect that creates an identifiable trend or set of conditions which provide a substantial level of scientific evidence that a population of one or more species of fish, wildlife, or listed species primarily associated with late succession forest stands will become extirpated from a significant portion of its current range in the Forest District within the planning horizon.

6 FISHERS' DISTRIBUTION, POPULATION STATUS, HABITAT DESCRIPTION, AND THREATS

A considerable body of published information exists regarding habitat relationships for fishers. In the following sections, we summarize pertinent information regarding the distribution, status and habitats used by fishers as thoroughly described in Lofroth et al. (2010), CDFG (2010), USFWS 2014 and CDFW 2015. The following detailed descriptions of important biological factors, current population status and threats to fishers lay the foundation of this CCAA.

6.1 NATURAL HISTORY

Fishers are members of the weasel family found in forested habitats in much of Canada and the northern portion of United States. The USFWS (2004) (69 Fed. Reg. 18770) has defined the fisher population in the Pacific states and British Columbia as the West Coast Distinct Population Segment (DPS). Distribution, population status, and habitat use are described in further detail in the following sections of this CCAA.

In California, body mass of male fishers range from 2.7 to 5.0 kg, and females from 1.52 to 2.65 kg ((as summarized in James et al. (2008, p. 12). (Note that the study by James et al. (2008) was incorrectly cited as Reno et al. (2008) in Lofroth et al. (2010) and other places). In this CCAA, the fisher study conducted at SPI's South Weaverville Study Area (SWSA) will be referred to as James et al. (2008)). Adult and juvenile fishers are prey for various other carnivorous mammals, especially bobcats and mountain lions (various authors summarized in Lofroth et al. 2010). In addition, adult male fishers prey on juvenile fishers. Denial of access to predators is apparently an important factor in the females' selection of arboreal cavities with small entrance holes as natal and maternal dens.

Female fishers bear 1 to 4 young during March and April and at different study areas average 1.8-2.8 (Lofroth et al. (2010, Ch. 6, p. 55). Sweitzer et al. (2015) reported an average fisher litter size of 1.6 (N=89) for the period between 2007 and 2013 in the southern Sierra Nevada region.

After several weeks in the natal den (where the young are born), the females often move the young to larger maternal dens. In some instances, the young are moved several times, perhaps to avoid detection of the dens by predators. This requirement for multiple specialized den sites is a critical part of habitat suitability, as further discussed below in Sections 7.1.3.1 & 7.1.4.

In addition to den sites, resting sites are also important features of fisher habitat and have been described at the "structure" and "micro-structure" scale. The structure and micro-structure are the finest scale at which habitat for fisher has been described (Lofroth et al. 2010, Ch. 7, p. 81 and Lofroth et al. 2011, Ch. 1, p. 6). Fisher selection of den/rest strata, den/rest trees and their micro-structures has provided the most consistent habitat association results (Raley et al. 2012, p. 26). Fishers use a wide variety of arboreal micro-structures for resting, including large limbs, cavities, and platforms such as deformities, mistletoe brooms, and old nests of squirrels and raptors. Raley (2012, p. 8) stated, "...available evidence indicates that the incidence of heartwood decay and cavity development is more important to fishers for denning than is the tree species." On SPI forests 85% of known fisher dens were in Black oak (*Quercus kelloggii*).

Fishers also rest within and under downed logs although this is believed to be infrequent in California. Many of these structures (either standing or downed material) containing suitable micro-structures are not typically found in young forests, unless left as a legacy tree from previous catastrophic events or human management. The specific requirements for the location of structures as they relate to the establishment of a home range are not well understood (Raley et al. 2012, p.27).

Fishers prey primarily on mammals, especially tree squirrels, ground squirrels, and chipmunks. Birds, reptiles, amphibians, and insects also make up a minority portion of the fisher's diet, as well as certain plant materials such as berries. (Lofroth et al. p. 75; Golightly et al. 2006, p. 31).

6.2 DISTRIBUTION

The distribution of fishers in Washington, Oregon, and California is thoroughly described in Lofroth et al. (2010). Historically, the west coast population of fisher extended south from British Columbia through the Cascades and the coast ranges of Washington and Oregon, the north coast ranges in California; the Klamath-Siskiyou Mountains in Oregon and California; and the Sierra Nevada in California (Powell and Zielinski 1994). In California, fishers historically occurred in portions of seven ecological subregions: Northern California Coast, Klamath Mountains, Northern California Coast Ranges, Northern California Interior Coast Ranges, Southern Cascades, Sierra Nevada, and Sierra Nevada Foothills (Grinnell et al. 1937; McNab and Avers 1994) (Figure 6.2-1).

At present, fishers occur in scattered, disjunct regions of the historic range, including portions of British Columbia; the Olympic Peninsula of Washington (a recently reintroduced population) (Lewis et al. 2012); and the southern Cascade Range in Oregon (the descendants of a reintroduced population) (Aubry and Lewis 2003). The species is apparently absent from its former range in much of the Washington and Oregon Cascades and Coast Ranges. The general distribution of fisher populations in Southern Oregon and California are depicted in Figure 6.2-2.

Figure 6.2-1 -- Approximate Historic / Potential Range of fishers in California

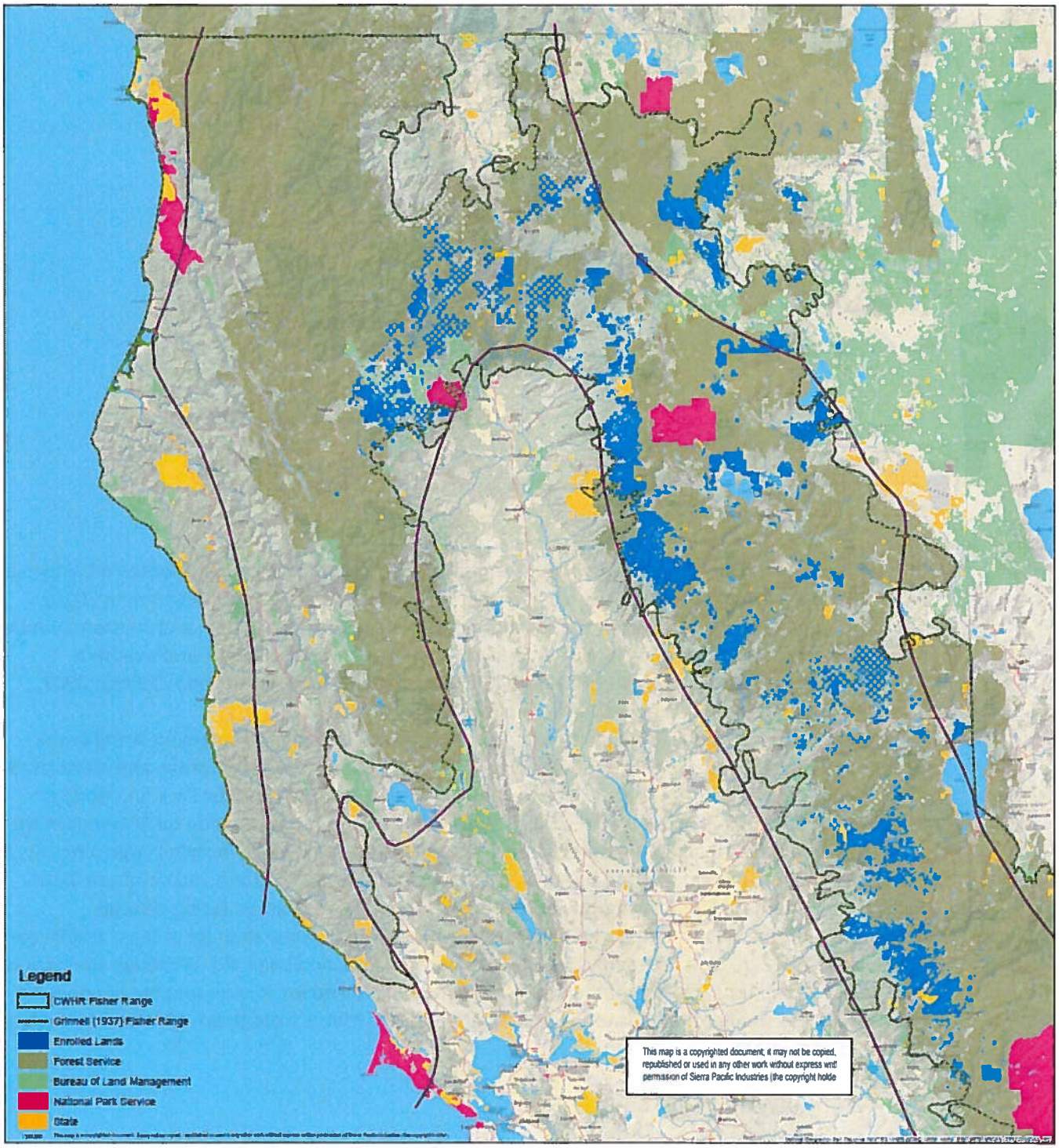
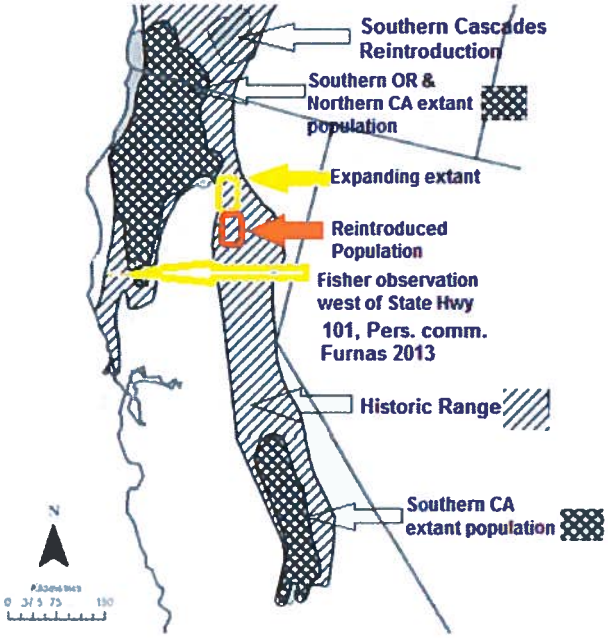


Figure 6.2-2- Fisher populations in Southern Oregon and California, 2013



Fishers remain well distributed in the Klamath-Siskiyou Mountains of northwestern California and southwestern Oregon, and in the north coast ranges of California (CDFG McCamman 2010).

This population now occurs in the southern portions of Curry, Josephine, and Jackson Counties in southwestern Oregon; and in Del Norte, Siskiyou, Humboldt, Trinity, Shasta, and northern Mendocino Counties in northwestern California (Zielinski et al. 1995; Slauson and Zielinski 2007; Furnas 2013 pers. comm; Yaeger 2012 (unpublished)).

A recently re-introduced population occurs on SPI lands (Stirling Management Area) in the southern Cascades/northern Sierra (Powell et al. 2012, p.13) of northern California, and an isolated population remains in the southern Sierra Nevada between Yosemite National Park and northern Kern County, California. (Zielinski et al. 2005). Prior to the recent reintroduction on SPI lands in the northern Sierra Nevada, a gap of approximately 244 miles (390 km), which includes large amounts of apparently suitable habitat, existed between the populations in the northern and southern Sierra Nevada. The southern California population appears to have been isolated (using genetic comparisons) from the northwestern California/southern Oregon population for at least 1,000 years (Tucker et al. 2012, p. 8). As noted by CDFW (2015 introduction, and page 49) "Although the location and size of the gap (or gaps) separating these populations is unknown, it is reasonable to conclude that the gap was smaller than it is today based on records of fishers from that region during the late 1800s and early 1900s."

6.3 POPULATION STATUS

Lofroth et al. (2010) summarized the limited information available regarding estimates of fisher population size and density. Much of the existing information remains in unpublished reports from localized population studies. More recently, the USFWS Species Report (2014) included a discussion of the current knowledge regarding fisher population estimates and densities.

Contemporary surveys and recent field studies suggest the northwestern California/southwestern Oregon population is the largest in the western United States, though formal estimates of the number of individuals have not been reported. The only quantitative estimate for the northwestern California/southwestern Oregon population is from an unpublished report by Self et al. (2008), who projected a population estimate of about 4,616 animals. According to the U.S. Fish and Wildlife Service personal communication with Spencer (2014) and Rustigian-Romsos (2013) the Northern California- Southwestern Oregon population was estimated between 2790 to 3990 individuals (USFWS 2014, p.38). Swiers (2013, p.17) could not discern a decline at the Eastern Klamath study area, where an estimated 10% of the local population was removed during 2009-2011 for the Northern Sierra fisher translocation project.

Lamberson et al. (2000) estimated the number of fishers in the isolated southern Sierra Nevada population at 100 - 500 individuals; more recently this population has been estimated to contain about 300 individuals (Spencer et al. 2011, p. 801) and <500 individuals (Sweitzer et al. 2015). Zielinski et al. (2013, p.10) reported that the small southern Sierra Nevada population was apparently stable , but Sweitzer et al. (2015) were not able to determine if this population was increasing, stable or decreasing (Lambda was calculated at between 0.78 and 1.15). Nonetheless, this population has apparently persisted for thousands of years as a separate population (Tucker et al. 2012, p. 7).

The Enrolled Lands in this CCAA include portions of the northwestern California range of the fisher. In addition, the CCAA covers areas currently unoccupied by fishers in the southern Cascades, and in the large gap in the distribution between the southern Cascades and the southern Sierra Nevada.

On SPI lands, fishers currently occur in the Hayfork Divide – Bully Choop, Redding North, Redding South, Lassen West and Stirling CSCAs. Collectively, the occupied CSCAs in this CCAA are termed the **Occupied Range**. If the species expands or is reintroduced elsewhere in the Sierra Nevada, it may occupy lands in the Almanor, Feather Falls – Quincy, Camino, Tahoe Low, Tahoe High, and Sonora CSCAs. A map showing the occupied and unoccupied regions of the Enrolled Lands is shown in Figure 7.3.6.1. The extent of past and potential occurrence of fishers in the areas designated as unoccupied is unknown; such use is likely limited by local and regional habitat conditions, impacts of historic trapping, and dispersal capabilities of fishers.

In 2004, the USFWS (2004)(69 Fed. Reg. 18770) found that the West Coast Distinct Population Segment (DPS) of fisher warranted listing under the U.S. ESA, but the listing was precluded by other higher priority actions. In 2011, the USFWS (2011, 76 Fed. Reg. 66389) assigned this DPS of the fisher to Candidate Category 6, using the following rationale: "The magnitude of threats is high as they occur across the range of the DPS resulting in negative impacts on fisher distribution and abundance. However, the threats are non-imminent as the greatest long-term risks to fishers in its west coast range are the subsequent ramifications of the isolation of small populations and their interactions with the listed threats." The threats under consideration are discussed in Section 6.5 of this CCAA. In 2013, as a result of the Multidistrict Litigation Settlement Agreement (http://www.fws.gov/endangered/improving_esa/joint_motion_re_settlement_approval_filed.pdf) involving 851 species, the USFWS (2013, 78 Fed. Reg. 16828) opened a new status review for the fisher West Coast DPS fisher to analyze whether listing as endangered or threatened is warranted. On October 7, 2014 the Service published FWS–R8–ES–2014–0041, which is a proposed rule to list the west coast DPS of fisher (79 Fed. Reg. p. 60419), and on April 14, 2015 extended the date for the final determination until April 2016 (80 Fed. Reg. p. 19953).

In 2010, the California Fish and Game Commission (CFGC) (CFGC 2010) denied a petition to list the fisher under the California Endangered Species Act. Their finding was based on the

recommendation of the California Dept. of Fish and Game (now the California Department of Fish and Wildlife (CDFW) (CDFG 2010), whose conclusions stated that population trend and population-level effects of ongoing habitat modification could not be determined with existing information. Due to technical irregularities a California Court has ordered the Commission to redo the CDFW status review and reconsider its decision. Thus at this time the species is listed as a candidate species by the California Fish and Game Commission. Most recently, the CDFW recommended to the California Fish and Game Commission that the fisher Northern California Evolutionarily Significant Unit (ESU) is not warranted for listing as threatened or endangered under CESA (CDFW Bonham 2015). However, within the Southern Sierra Nevada ESU the CDFW believes that listing fishers as threatened under CESA is warranted at this time within the Southern Sierra Nevada ESU (CDFW Bonham 2015). On August 5, 2015 the California Fish and Game Commission affirmed the CDFW's recommendation and chose not to list the Northern California ESU and to list the Southern Sierra Nevada ESU.

In summary, the fisher population appears to have declined within the historic range. There are two remaining extant populations known to occur in two large areas in the northwestern California/southern Oregon (>10million acres) and the southern Sierra Nevada (approximately 2.6 million acres) within the historic range (CDFG McCamman 2010, USFWS 2014). Although the actual size of the current fisher population is unknown, it has likely declined within the historic range, and state and federal agencies are evaluating the need for regulatory protections.

6.4 HABITAT USE

Lofroth et al. (2010, 2011) thoroughly reviewed and summarized results of fisher habitat use studies conducted throughout the range of the species. As summarized in Lofroth (2010), habitat for fishers has been described at several scales: 1) landscape; 2) home range and foraging habitat; 3) stands within the home range that contain sites used for resting or denning; 4) denning sites; and 5) denning tree and micro-structure. Herein, we review information of particular relevance to this CCAA especially data from habitat studies in interior northern California. We also include some information reported subsequent to both Lofroth papers.

A commonly described attribute of fisher ecology is the selection of habitats at multiple spatial scales (Raley et al. 2012, Weir et al. 2012, Schwartz et al. 2013, Sauder and Rachlow 2014). Fisher habitat selection follows hierarchical patterns at the landscape, stand, site, and element (microsite) scales. Raley et al (2012) stated that "...fishers were associated with complex vertical (e.g., large trees and snags) and horizontal (e.g., large logs and dense canopy) structure characteristic of late-seral forests. Fisher distribution (first-order selection) was associated consistently with expanses of low- to mid-elevation mixed-conifer or conifer-hardwood forests with relatively dense canopies. Fisher home ranges (second-order selection) were characterized by a mosaic of available forest types and seral stages, including relatively high proportions of mid- to late-seral conditions, but low proportions of open or non-forested environments. Patterns of habitat use or selection by fishers were strongest at finer spatial scales (third- and fourth-order selection), and demonstrated that the fisher is a structure-dependent species in western North America."

North et al. (2012, p. 49) stated, "The typically high diversity of tree sizes surrounding fisher resting sites suggests the need for complex vertical structure, but may be an artifact of past logging practices and fire suppression, which altered forest conditions from stands dominated by large trees and snags to dense stands with size class distributions that include more small stems and fewer large stems (Goforth and Minnich 2008, Minnich et al. 1995)."

Lofroth et al. (2010) provided the following generalized depiction of fisher habitats: Landscapes used by fishers generally occur in a variety of low and mid-elevation forested plant communities. Moderate to dense contiguous forest canopies are the most important predictor of fisher occurrence at the landscape scale, and home ranges typically include a diversity of forest successional stages and plant communities. Active fishers (as identified through radio-telemetry studies) are frequently associated with complex forest structure. Their rest sites are strongly associated with moderate to dense forest canopy and elements of late-successional forests. They typically rest in large, deformed or deteriorating trees and logs and den in arboreal cavities. At the most site-specific scale, cavities in large trees are a critical resource for reproduction.

At the broader landscape and home range scales, fishers appear to be relatively flexible in habitat association, as long as basic requirements for extensive dense to moderately dense overstory and sufficient prey are met. Fishers in the southwestern Oregon – northwestern California area are known to occur in the following forest plant communities, described by McNab and Avers 1994: Douglas-fir; Douglas-fir – ponderosa pine; Douglas-fir – tanoak; Jeffrey pine; mixed-conifer; white fir; and redwood. In the southern Sierra, fishers are known to occur in mixed-conifer, ponderosa pine, Jeffrey pine, white fir, red fir, lodgepole pine, and giant Sequoia plant communities (Lofroth et. al 2010, p.90). Most studies in California have found that fisher home ranges include a broad range of successional stages, but that structurally complex areas (for instance, including greater densities of large live trees and large woody structures such as snags and down logs) are used preferentially, and forests with mast-producing hardwoods that support prey communities are particularly important (Lofroth et al. 2010).

Across the Pacific region, Lofroth et al. (2010) reported that female home ranges averaged 18.8 km2 (4,646 ac.), and male home ranges averaged 53.4 km2 (13,195 ac.). In northwestern California, Lofroth et al. (2010, Ch. 6, pg. 68) reported that mean male home ranges varied from 1,828 ac. to 9,464 ac., and mean female home ranges from 420 ac. to 5,807 ac. Differences in methodology, season of studies, and geographic region complicate general description and comparison of fisher home range size and composition across the range. Home range sizes are substantially different among sexes (with male home ranges about three times larger), and also increase with latitude (Lofroth et al. 2010). Home range size is believed to be indicative of overall habitat quality, with prey and cover resources at higher densities in smaller home ranges (Zielinski et al. (2004b, p. 654); Lofroth et al. (2010, Ch. 6, p. 69)).

Fishers are dietary generalists, depending on a variety of small mammals, birds, insects, and reptiles, and their diets in California are more diverse than elsewhere in the range (Lofroth et al. 2010). In California, mammals such as woodrats, squirrels, and other rodents appear particularly important. These prey species are widespread in many California conifer and mixed hardwood–conifer forests (Zielinski et al. 1999 p. 964), but may vary in their contribution to the diet in different areas of the fisher's range (Golightly et al. 2006, p. 964). Hares and porcupines do not occur in California diets to the extent prevalent further north in the fisher's range, probably because the range of the snowshoe hare and the fisher do not extensively overlap in California, and porcupine numbers are generally low or absent (Zielinski et al. 1999, p. 962).

At more localized scales, the fisher is more of a habitat specialist, in that both sexes depend heavily on certain types of micro-structures (e.g., arboreal cavities, platforms and mistletoe brooms, and large down logs) for resting, and in particular, on tree cavities for natal and rearing dens. All documented natal and pre-weaning dens are in cavities in standing live or dead trees, including both conifers and hardwoods (Lofroth et al. 2010). Most of these trees are relatively old and large. For instance, across five studies in interior California reporting on a total of 154 den sites, the dbh ranged from 66 cm. to 110 cm. (30 in. to 43 in.) (Lofroth et al. 2010, p. 115). In California, the majority of identified dens were in hardwood species (especially black oak and live oak). Specific

trees that provide cavities suitable (e.g., size of opening and size of cavity) for reproductive behaviors have been suggested to be the most limiting habitat feature required by fishers, however Raley et al. (2012, p.28), indicated that there are few studies that investigated the abundance or spatial distribution of potentially limiting resources.

Generally, the history of timber harvesting on private lands, including the lands presently owned by SPI, has resulted in present-day forests that are younger and have trees with a smaller average diameter at breast height (dbh) than on federal lands. Thus, the habitats used by forest wildlife on private lands usually include fewer large trees. While the average diameter measurements of trees with den micro-structures on private lands are similar to those on public lands, the range of tree diameters (dbh) is wider and the trees within 1 acre of the den structure (tree) are typically smaller in diameter (dbh) (SPI 2013a; Zielinski et al. 2004a).

The importance of evaluating habitat elements at local scales can be demonstrated by comparing three recent studies: Zielinski et al. (2010); Zielinski et al. (2012); and Niblett et al. (2014 (Appendix M)). Each described or predicted likelihood of fisher occurrence in northwestern California based on habitat features. These studies evaluated habitat at different scales with different methodologies.

Here we evaluate their application to SPI's South Weaverville Study Area (SWSA). The 45,000-acre SWSA provides a useful site for comparison of the Zielinski 2010 and 2012 habitat models because an earlier study (James et al. 2008) used radio-telemetry to document habitat use by five reproductive female fishers in that area. Zielinski et al. (2010 & 2012) modeled and mapped fisher detection probability across the Klamath Province, and used expert opinion and previous studies to assign values to eleven categories of landscape-scale predictor variables including: climate; topography; linear features (roads and streams); vegetation cover type; habitat type (based on California Wildlife Habitat Relationships [CWHR] system; California Department of Fish and Game 1992); vegetation density; tree size class; landscape arrangement; landscape diversity; disturbance; and potential mammalian prey habitat values. The values were assigned to geographic positions based on satellite image pixels that were 100 meters square (2.5 ac). The habitat maps characterized the SWSA as a heterogeneous mix of habitat with most of the area assigned values representing areas strongly selected against by fishers ("poor habitat"). There were some areas that had a high strong positive selection value ("good habitat"), but these areas were relatively uncommon. Although a formal site-specific comparison has not been conducted, the model results generally under-predict the detection likelihood because 34 individual fishers were trapped at the SWSA. The results may indicate that the fishers' actual habitat use was not fully reflected in the habitat parameter valuations chosen by the modelers.

Zielinski et al. (2012) developed Relative Resting Habitat Suitability (RRHS) values based on published descriptions of habitat variables used by fishers, and modeled RRHS across broad areas of the fishers' range in California. Vegetation was represented by data from the USFS Forest Inventory Analysis (FIA) system (Bechtold and Patterson 2005). The FIA system uses a grid of fixed plots at a density of one per 6,000 ac., and thus is only representative of average conditions across large areas. According to the review of Zielinski et al. (2012) by Niblett et al. (2014), sixteen of eighteen FIA point plots on the SWSA were characterized as neutral. The characterization of the SWSA as poor fisher habitat primarily resulted because average measured basal area (the cross sectional area of all tree boles in a stand measured at breast height) was lower than values rated highly in the model. Thus, in the comparison conducted by Niblett et al. (2014), the Zielinski et al. (2012) model rated most SWSA habitat as poor and did not classify any habitat as good, even though the area was occupied by multiple reproducing fisher females. It appears that Niblett et al. (2014) found a correlation between the RRHS value and the den neighborhoods they describe due to the difference in the sampling intensity (1 per 4 ac. versus 1 per 6000ac) and Zielinski et al.'s inclusion of the

structure tree in describing the surrounding "resting habitat."

In an effort to further refine the understanding of observed habitat use by fishers in the SWSA, Niblett et al. (2014) applied the model of Zielinski et al. (2012) to the 10,609 SPI forest inventory point plots in the SWSA. (SPI's forest inventory system uses a grid of fixed point plots at a density of about 1 point plot per 4 ac., resulting in about 400,000 point plots across the ownership.) Approximately 81% of the point plots in the SWSA were rated as poor (strongly dissociated) using the criteria of Zielinski et al. (2012), and less than 1% of the SPI point plots were good (strongly associated) with fisher habitat. However, the Niblett et al. (2014) analysis demonstrated a novel means of analyzing the habitat in a manner that appears to better predict the actual suitability of the habitats at the SWSA. Niblett et al. (2014) indicated that fishers strongly selected sites that were significantly different than the surrounding heterogeneous forest. Using its forest inventory point plots, SPI can make finer scale assessments of tree size and density across their ownership to identify areas containing these high value sites. These patches of occupied habitat were too small to be identified in the broad scale modeling by Zielinski et al. (2012), and evidently were inadequately recognized by the vegetation classification of Zielinski et al. (2010).

These findings demonstrate fishers successfully use habitat elements that occur at lower densities than can be identified by broad-scale habitat models or low intensity forest inventory methods. Thus, fishers may occupy areas of smaller diameter forest than predicted by available broad-scale models, provided that desirable habitat elements are sufficiently abundant at local and wider scales.

6.5 FACTORS AFFECTING FISHERS

This section is organized to conform to the factors evaluated by the USFWS in a determination of the need to list a species under the US ESA (50 CFR 424.11(c)). This section summarizes information on existing threats to fishers that may be relevant to this CCAA. Impacts of this CCAA related to these factors are addressed in Section 7.3.

6.5.1 The present or threatened destruction, modification, or curtailment of its habitat or range.

The USFWS (2004; 69 Fed. Reg. p. 18770-18792) concluded that loss of forested habitat throughout the range constituted a threat to fishers, and subsequently in the 2011 Candidate Notice of Review (USFWS 2011) the USFWS; (76 Fed. Reg. p. 66389) reiterated some of the threats to the species regarding habitat loss, as follows:

"Major threats that fragment or remove key elements of fisher habitat include various forest vegetation management practices such as timber harvest and fuels reduction treatments. Other potential major threats in portions of the range include: Large stand-replacing wildfires, changes in forest composition and structure related to the effects of climate change, forest and fuels management, and urban and rural development."

In a 2007 facilitated workshop, thirteen experts on fishers assessed and ranked various perceived threats to the species in various regions (Threat Evaluation Areas - TEAs) of the Pacific States and British Columbia (Naney et al. 2012). In the combined opinion of this panel of experts, across the multi-state range the "most immediate and challenging threat" derives from the small, isolated nature of fisher populations, and the attendant high risk of extirpation from stochastic events. Effects on habitat such as overstory reduction, reduction of structural elements, and

fragmentation were also rated highly as threats prevalent throughout the assessment area. Uncharacteristically severe wildfire was rated as a very important threat in several TEAs, especially in California.

This CCAA includes portions of two of the TEAs evaluated by Naney et al. (2012): northwestern California - southwestern Oregon (the portions of the range occupied by fishers), and the Sierra Nevada (the portion between the Lassen and Yosemite regions, which were unoccupied by fishers at the time of the assessment.) In both TEAs, the highest-rated existing threats were uncharacteristically severe wildfire, overstory removal, and reduction of structural elements.

No estimates are available regarding the amount of habitat available for fishers throughout their range, or the trend in that habitat. Because the covered activities under this CCAA are primarily intensive timber harvesting and even-aged forest management, the threats related to overstory removal and reduction of habitat elements are particularly germane.

6.5.2 Overutilization for commercial, recreational, scientific, or educational purposes

Trapping of fishers for the fur market is believed to have been a very important cause of the species' decline throughout its range in past decades (USFWS 2004, McCamman 2010, Lofroth 2010). All of the states covered in the Conservation Assessment by Lofroth et al (2010) (i.e., Montana, Idaho, Washington, Oregon, and California) had banned trapping of fisher by 1946. In 1998, Fish and Game Code §3003.1 banned body-gripping traps (including snares and leg-hold traps) for commercial or recreational trappers. Licensed individuals trapping for purposes of commercial fur or recreation in California are now limited to the use of cage live-traps. Trappers or their designee are required by regulation to visit all traps at least once a day (McCamman 2010). Trappers in California cannot target fishers and any fishers inadvertently captured must by law be released unharmed. However, populations are still at risk from incidental trapping because the fisher populations in California are considered small, therefore the threat of this impact was considered significant USFWS (2004) (69 Fed. Reg. 18770). No Covered Activities under this CCAA contribute towards this threat. There are no known effects to fisher populations related to overutilization for scientific or educational purposes at this time. As such, these activities are not further addressed in this CCAA.

6.5.3 Disease or predation

As stated by the USFWS (2004, 2011) threats to fishers that lead to direct mortality and injury include: Collisions with vehicles; predation; rodenticides; and viral borne diseases such as rabies, parvovirus, and canine distemper. Impacts of these threats to fishers at the population level are unknown at this time (Lofroth et al. 2010). With the exception of predation, Naney et al. (2012) regarded these threats as low to moderate in severity across most of the range, directly associated with human development, and of greater importance at the scale of individual animals than at the scale of a population. However, in the Northern Sierra TEA, these threats were regarded as moderate because of the extent of development in that region.

Naney et al. (2012) rated predation upon fishers as a moderate threat throughout the range, and the panelists noted that reduction of understory vegetation (e.g. fuels reduction treatments) may increase predation risk. Other researchers (M. Higley, pers. comm.) also have speculated that habitat fragmentation may favor predators of fishers such as bobcats and mountain lions. More recently, Gabriel et al. (2015) quantified causes of mortality in fishers in California. Predation and disease remained the leading cause of death among fishers; starvation and exposure to illegally

applied pesticides were also noted as causes of mortality. Under this CCAA, land and forest management practices that favor fisher predators and competitors may contribute to these threats.

6.5.4 Inadequacy of existing regulatory mechanisms

The USFWS (2014, p.137-138) stated:

"The California Environmental Quality Act (CEQA) can provide protections for a species that, although not listed as threatened or endangered, meets one of several criteria for rarity (CEQA guidelines; Cal. Code Regs. Title 14 § 15380). Fishers meet these criteria. Under CEQA a lead agency can require that adverse impacts be avoided, minimized, or mitigated for projects subject to CEQA review that may impact fisher habitat."

The USFWS (2014, p.141) summarized the in-place regulatory mechanism in California as follows:

"In terms of effects to fisher habitat or incidental harm to fishers from timber harvesting or other types of land disturbing projects, California has regulations that act in combination to disclose, avoid, or mitigate environmental degradation. Cumulative effects analysis to listed and non-listed species is required in both CEQA and the California Forest Practice Rules."

The CDFW fisher status review (Bonham, 2015, p.69) under the California Endangered Species Act stated:

> "Fishers are known to establish home ranges and successfully reproduce within forested landscapes that have been and are being intensively managed primarily for timber production, including industrial ownerships where ongoing intensive even-aged management is the norm. The long-term viability of fishers across their range in California will depend on the continued presence of suitable denning and resting sites and habitats capable of supporting foraging activities. While such structures and habitats are critical to fisher reproduction and survival, the Department is not aware of evidence indicating that habitat modification resulting from timber harvesting and forest management is currently limiting fisher populations in California."

6.5.5 Other natural or manmade factors

As stated by the USFWS (2004, 2011) and CDFG (2010), collisions with vehicles constitute a threat to the species, but that threat has not been quantified. On SPI lands, threats associated with vehicle collisions are low due to typically low vehicle speeds.

Recent research has identified anti-coagulant rodenticides as a potentially important source of fisher poisoning and mortality (Gabriel et al. 2015, p.6). These rodenticides are used at some illegal marijuana growing sites in forested areas, and are apparently ingested by fishers preying upon or scavenging on affected rodents, and consuming baits. To the extent that illegally applied pesticides may be present on SPI lands, it may contribute to this threat.

The threat of accidental entrapment and drowning in improperly constructed and/or maintained water tanks has been identified as a threat; this threat could occur on SPI lands.

6.6 CONSERVATION PLANNING EFFORTS

6.6.1 Northwest Forest Plan (NWFP)

The Northwest Forest Plan (NWFP)(USDA/USDI 1994a) remains the primary management guidance on federal lands throughout the range of the northern spotted owl (NSO) in Washington, Oregon, and northwestern California. Within that region, the range of the NSO closely overlaps the occupied and former range of the fisher. Thus, the NWFP provides the primary management guidance for federal forests occupied by fishers. (Management guidance in the Sierra Nevada, which is outside the range of the NSO, is discussed in the next section of this CCAA). The Enrolled Lands within the occupied range in northwestern California are closely associated with federal lands covered by the NWFP.

Initial analysis of the impacts of the NWFP on fisher (USDA/USDI 1994b; App. J2, p. J2-54) expressed concern over the impacts of the potential degree of forest fragmentation and loss of coarse woody debris in matrix lands outside the network of Late Successional Reserves. The analysis also suggested that these concerns could be substantially alleviated by mitigation during project planning at local levels. It was projected that such implementation would increase the likelihood to above 80 percent that "Habitat is of sufficient quality, distribution, and abundance to allow [fisher populations] to stabilize, well distributed across federal lands." It is beyond the scope of this CCAA to evaluate the implementation and effectiveness of these measures on federal lands.

6.6.2 Sierra Nevada Forest Plan Amendment

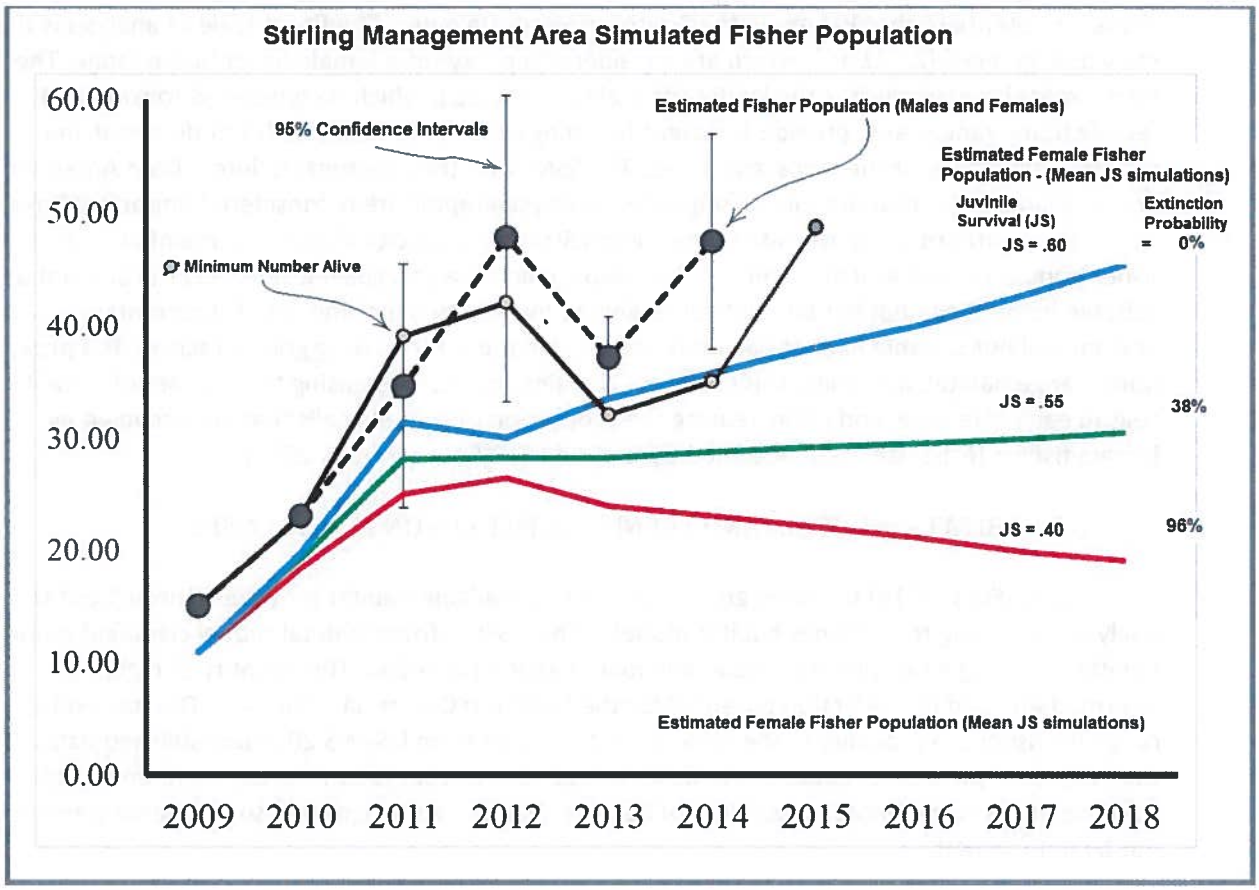
Existing management direction of fisher habitat in the National Forests in the Sierra Nevada is described in Sierra Nevada Forest Plan Amendment Supplemental Environmental Impact Statement (USFS 2004). The purpose of and need for the proposed action includes reduction of the size and intensity of stand-replacing fires in the Sierra Nevada. Maintenance of fisher habitat within that context is a stated goal, and the Standards and Guidelines (Appendix A in USFS 2004) include numerous measures intended to attain that goal. In general these include:

- retention of a minimum canopy closure of 40%,
- minimization of habitat fragmentation
    - connected habitat linkages suitable for wildlife dispersal in riparian areas and ridge top saddles,
    - retention of large trees, including 40% of the existing basal area in westside forest and 30% in eastside forests in the largest size class available,
- recruitment of large trees over time, and
- planned activities that affect approximately 25-30% of the forested land base

6.6.3 Reintroduction in the Northern Sierra Nevada

In 2008, SPI, CDFG, USFWS, and North Carolina State University began implementing a project reintroducing fishers to the northern Sierra Nevada. This project is covered by a Translocation Plan (CDFG 2008a), an evaluation under the California Environmental Quality Act (CEQA) (CDFG 2008b), and a CCAA under the U.S. Endangered Species Act (USFWS 2008). As of early 2013, 40 fishers have been captured in northwestern California and released in SPI's Stirling Management Area in the mountains of Butte Co., California. (Powell et al. 2012) There are 7 primary objectives for the reintroduction research at Stirling (Powell et al. 2013). The first three primary objectives are to: 1) Document survival, reproduction and use of land cover by released fishers as well as their descendants during the first 5 years following the initial release. 2) Predict use of habitat by fishers

using existing models and a model that we develop and to test the models using location data for fishers on Stirling. 3) Predict placement, sizes, and shapes of home ranges using models of optimal home range choice and to test the predictions using location data for fishers on Stirling. The reintroduction has been successful at establishing a population at the Stirling Management Area. The question remains how persistent will this population of fisher remain. The chart below is the estimated population trend for the fisher at the Stirling Management Area developed by the North Carolina State University research team in the winter of 2015 and shows the results of the 2015 trapping effort.



6.6.4 Conservation Assessment

Following the USFWS (2004) determination that the status of the fisher West Coast DPS warranted listing under the ESA, several agencies cooperatively developed a series of documents collectively titled "Conservation of Fishers (*Martes pennanti*) in South-Central British Columbia, Western Washington, Western Oregon, and California." Presently, this assessment consists of three completed volumes: Vol. I: Conservation Assessment (Lofroth et al. 2010); Vol. II: Key Findings from Fisher Habitat Studies (Lofroth et al. 2011); and Vol. III: Threat Assessment (Naney et al. 2012). Vol. IV: Conservation Strategy (Finley 2012) is currently under review by the agencies (L. Finley, pers. comm.). Together, these documents provide an extensive review of available literature and scientific opinion regarding the status of the West Coast DPS of the fisher. The draft Vol. IV is intended to provide conceptual guidance for conservation efforts throughout the range of the West Coast DPS.

6.6.5 Southern Sierra Nevada Conservation Assessment and Conservation Strategy

As introduced by the authors, the Southern Sierra Nevada Fisher Conservation Strategy (Spencer et al. 2015) "is a multi-agency effort to develop a scientifically sound approach for sustaining and recovering an isolated population of Pacific fisher (*Pekania pennanti*) in the southern Sierra Nevada."

The Southern Sierra Nevada Conservation Strategy Area (SSNCSA) is defined by 1009 hexagonal grid cells (2,493,239 acres), which delineate the analysis area and includes the majority of actual or potential fisher habitat in the Southern Sierra Nevada. The finest scale of analysis is the individual grid cell (2,471 ac.), which are considered a proxy for a female fisher home range. The next larger size of analysis is the landscape scale (10,000 ac.), which is considered to contain 4 female home ranges and provide sufficient breeding capacity to facilitate fisher dispersal and genetic interactions at the landscape scale. The SSNCSA is then segregated into 7 Core Areas, which are very large areas that are joined/separated at physiographic areas considered important linkages.

The Southern Sierra Nevada Conservation Strategy's biological goal is to maintain or increase fisher population size and distribution. The steps to achieve this goal include: "(1) the amount of suitable home range habitat be relatively stable or increasing over time, and (2) currently unoccupied but suitable habitat becomes occupied in the future. Using grid cell scores as a proxy for home range habitat suitability, this requires (1) maintaining or increasing the number of suitable cells in each core area, and (2) increasing the proportion of suitable cells that are occupied by female fishers (especially in unoccupied Cores 6 and 7)" (Spencer et al. 2015).

6.7 HABITAT CONDITION AND TREND FOR FISHERS ON PUBLIC LANDS

The USFWS (2014) provided gross estimates of available habitat for fishers throughout the analysis area using their "fisher habitat model". The USFWS fisher habitat model classified potential habitat as having a high, intermediate, and low selection potential. The quantity of high, intermediate, and low selection potential for the Northern California – Southern Oregon extant range for fisher are provided in the table 6.5.1-1 (derived from USFWS 2014 unpublished data). The USFWS (2014) projected reductions in fisher habitat due to vegetation management and wildfire over the next several decades, but did not balance that loss with ingrowth, so an overall trend could not be determined.

Table 6.5.1-1

Occupied Acreage Physiographic Area	Selected For	Intermediate	Selected Against	Grand Total
Oregon	733,327	599,043	503,401	1,835,772
Klamath/Cascade	4,236,116	3,186,662	3,321,800	10,744,578
Grand Total	**4,969,443**	**3,785,706**	**3,825,201**	**12,580,350**

The amount and trend of habitats suitable for fisher is important in assessing the context and the potential impacts of the CCAA. Estimates of the trends in fisher habitat on the Enrolled Lands are provided in this CCAA. Trends for fisher habitat on other ownerships are not available. However, forests generally categorized as mid- to late-seral may provide habitat for fishers. Thus, estimates of such habitat may provide a surrogate for general evaluation of trend in habitat for fisher.

Occupied and unoccupied portions of the Enrolled Lands occur within the range of the California spotted owl (CSO). Subsequent to the USFWS status reviews for the CSO (USFWS 2003,

2006), the USFS reported that, based on remote sensing methods, both mid- and late-seral closed canopy forest habitats have increased substantially (by 17% and 31%, respectively) from 1990 to 2008 (per USDA Forest Service 2010, Table 5) across the National Forests in the range of the California spotted owl. Thus, the amount of habitat for the fisher appears to be increasing on Federal lands in the Sierra Nevada, despite effects of burning over 280,000 ac. in moderate and severe wildfires from 2000 to 2007.

Outside the range of the CSO, fishers occur or potentially occur in areas of Washington, Oregon, and northwestern California managed under the Northwest Forest Plan (NWFP), (which corresponds to the range of the northern spotted owl (NSO)). Moeur et al. (2011) estimated the amount and trend of late successional and old growth forest (LSOG) in the area of the NWFP, using multiple methods of analysis and a broad definition (forests with greater than 10% canopy cover and mean quadratic tree diameters equal to or greater than 20 inches (Moeur et al. 2011, p7)). The canopy cover is the percentage of area covered by live crowns of dominant and codominant conifers, corrected for overlap. The QMD is calculated from the dominant and codominant conifers. Moeur et al. (2011, p7) acknowledged that this definition does not contain the complexity of other LSOG definitions; however they also stated that a more complex definition would not necessarily be more accurate. Moeur et al. (2011, p 6) stated a primary reason for use of this definitions is that it "corresponds closely to the definition of late-successional forests used for mapping purposes by the Forest Ecosystem Management Assessment Team (FEMAT) (FEMAT 1993, Table II-3, p. II-22) and therefore can be used to assess assumptions about the amount and distribution of older forest upon which the Plan was founded." Because the condition of other tree types, canopy layers and down wood were not considered, the extent to which this definition of LSOG, to an unknown extent, may be representative of fisher habitat is unknown. They concluded that between 1996 and 2006 in Washington and Oregon, and between 1997 and 2007 in California, there has been an apparent overall loss of LSOG forest of between (1.8 and 0.6), (2.7 and 3.6) and (1.9 and 3.0%), (which for California is from 7.3 to 7.1 million ac.), but that this apparent trend could not be regarded as statistically significant due to various sources of possible measurement error. Most of the loss was to due to wildfire.

Mouer et al. (2011, p 31) stated that estimates of LSOG recruitment, primarily in stands with increasing mean diameter, nearly overcame the losses due to wildfire. However, the largest losses to wildfire were in areas with important fisher populations, i.e., the Oregon Klamath and California Klamath Provinces. Overall LSOG losses in the Oregon Klamath Province were estimated from 7.9 to 11.6% between 1996 and 2006, and in the California Klamath from 0.9 to 4.9% between 1997 and 2007.

Mouer et al. (2011, p. ii) also noted a trend of reduction of LSOG on private lands, in which harvest was a more important factor than on federal lands. "Federal lands contained less than half of the total forest land, but the federal share of total LSOG increased from 65 to 67% over the monitoring period. Harvesting removed about 13% (approximately 491,000 ac) of LSOG on nonfederal lands. Loss of LSOG on federal lands resulting from harvest was less than 0.5% (approximately 32,100 ac)."

Habitat suitable for nesting and roosting by NSO is considered a surrogate for habitat for fishers in areas where those species overlap (USFWS 2014, p 85). In estimating the amount and trend of nesting and roosting habitat for NSO on federal lands in the area of the Northwest Forest Plan, Davis et al.(2011, p 35-42) used more restrictive and detailed habitat definitions than the LSOG definitions of Mouer et al. (2011). Davis et al. (2011, p 45) reported overall losses of NSO nesting/roosting habitat of about 3.4% range wide, including 1994 through 2007 in California, and 1996 through 2006 in Oregon and Washington. Almost 80% of this loss was due to wildfire. Some of the most important losses were in the Oregon Klamath and California Klamath Provinces, which

sustained losses of 10.2 and 5.2%, respectively (Davis et al. 2011, p. 46, Figure 3-12).

Although forests suitable for fisher have been lost to wildfire and timber harvest, recruitment is also occurring as young forests mature. However, as noted by Davis et al. (2011, p 53) it is difficult to account for recruitment at landscape scales using current remote sensing technologies. Using the broader definition of LSOG, Moeur et al (2001, p. 31) stated: "The LSOG losses associated with wildfire on federal lands apparently were roughly balanced by recruitment, but recruitment is much more difficult to map reliably with available data and technology." The assessment of NSO nesting habitat by Davis et al. (2011, p. 51) was unable to detect recruitment into that category using existing technology, but did note an overall increase in dispersal quality NSO habitat, with declines in some regions. Additionally, as stated by Davis et al. (2011, p.38), "Habitat development is not a mechanistic process, and there is considerable variability in predictions of habitat (Courtney et al. 2004) ...the transition from unsuitable to suitable conditions is more complex than a simple increase in a stand's average tree diameter and canopy closure. In addition, species composition is also important; for instance, late-successional/old-growth ponderosa pine forests do not function as [NSO] nesting/roosting habitat, nor do older subalpine forests." For the purposes of evaluating the potential effect of this CCAA on fishers we draw the following conclusions from this evaluation of habitat trend:

Late seral habitat is increasing in the Sierra Nevada despite large wildfires. Late-seral habitat is approximately stable in the range of the northern spotted owl (which includes a portion of the occupied fisher range), but there have been important losses to wildfire in the Oregon and California Klamath regions. Throughout the ranges of the fisher on federal lands, late seral habitat increases are occurring as ingrowth from younger forests; the quality of this habitat cannot be ascertained with remote sensing methods. However, we must note that the definition of fisher habitat that relies solely on late seral forest is not broad enough to characterize all the occupied amount of fisher habitat that exists currently. Thus the trends in late seral forests only represent an unknown portion of the actual habitat trend.

6.8 DESCRIPTION OF EXISTING CONDITIONS WITHIN ENROLLED LANDS

The following sections describe the Enrolled Lands in terms of land classifications and Habitat Forms as defined by SPI. The Enrolled Lands are subdivided into management units called a Covered Species Conservation Area (CSCA) (See figure 7.3.5.1). The current amount of each Habitat Form represented in a CSCA is generally the result of past management histories and/or wildfire events. For the purposes of this CCAA, the rate, distribution and process of both retention and harvesting of suitable stands combined with prompt regeneration activities and stand density control, programmatic identification and retention of essential fisher habitat elements (large old green trees and cull, large snags and downed wood, large select hardwoods) and other vegetation management to improve stand vigor, combined with growth within existing habitat, will over the next 10 years maintain suitable fisher habitat at both first order (10,000 acre landscape) and second order (2,000 acre female fisher territory) scales of selection on the Enrolled Lands. The management and biological processes over time will create a mosaic of Habitat Forms that will maintain self-sustaining populations of the fisher on Sierra Pacific Industries forest land.

6.8.1 Land Classification

It is important to establish an understanding of the management regimes that created existing forests on SPI lands, and that will create the forests of the future. Approximately 90% of SPI's forests were acquired by SPI during the past three decades. These forests have been managed

under various methods by previous owners and by SPI. The forests on SPI's lands presently occur in five land classes as categorized by SPI, based on conditions and the age structure created by the management history. These five classes are: Mixed, Inoperable, Non-Forest, Regen, and Even. Comprehending differences between these classes is fundamental to understanding the present and projected future habitat for fisher.

Mixed: These land class stands were created by various types of uneven-aged management, which left many trees un-harvested during harvest entries. The Enrolled Land that is capable of growing forest vegetation (i.e., excluding rocky areas, meadows, etc.) and suitable (accessible and manageable), together are the **Capable Land**. The Capable Land has the soil site quality of growing trees into HF4 over time. The Mixed land class currently comprises about 74.2% of the Capable Land. In most cases, these forests contain a mix of trees in various sizes and ages. Generally speaking, these stands rarely contain conifers ≥40 in. dbh, because those commercially valuable trees were harvested in past decades. The Mixed land class often includes stands of trees which generally are larger than 80 acres. Canopy closures are typically well over 50%. These forests include a wide variety of habitat conditions, especially in terms of the presence of hardwoods, large snags, and down logs, most of which exist as legacies left during past harvests. The amount of understory brush also varies substantially.

Virtually all the habitat for fishers on the Enrolled Lands today is in the Mixed land class, existing as a legacy of past management by SPI and previous owners. Hardwoods and deformed conifers that were not commercially valuable (and to a lesser extent, large snags) were normally left standing during selection harvests of the past. These structural elements, surrounded by relatively dense forest of mixed ages, provide many of the existing denning opportunities for fisher.

Most of the Mixed land class stands are not growing at their maximum potential, because the highest quality trees have been removed and spacing between remaining trees is not optimal for growth. SPI's objective under their "SPI Option A" approved by CAL FIRE is to maximize individual tree and stand growth by emphasizing even-aged silviculture wherever such intensive stand treatments are not superseded or constrained by non-timber resource values. The pace of conversion of the Mixed land class to Regen and Even land classes is limited by the management path chosen by SPI in its Option A Plan, so that overall, at least 50% of the Capable Land enrolled in the CCAA will still be in the Mixed land class at the end of the CCAA permit period (i.e., 10 years).

In about 14% of the Mixed forests, non-timber values (such as aesthetics, soil resources, wildlife, archeological sites, botanical resources, and water quality) constrain the use of clearcut silviculture. In these areas, the Mixed land class will be converted more slowly to Even stands, using techniques such as shelterwood steps or group selection. There is an additional 12% of the entire land base that will never be harvested utilizing even-aged silviculture (predominantly watercourse and lake protection zones). In these lands very long interval individual tree selection silviculture will be utilized. Once an area of Mixed forest land class is clearcut and re-planted, it enters into the "Regen" land class and eventually grows into the Even class.

Inoperable: Such areas are forested but not available for economic management due to location, condition, or physical constraints or are areas with suitable soils that are not economical to stock with commercial species due to access. Examples include un-roaded brush fields, areas with poor soils and tree stocking, areas with low tree density that are not roaded adequately, and un-roaded areas with forest cover that won't economically support helicopter logging. Inoperable areas, which comprise about 6% of the property, will not be considered further in this document.

Non-Forest: These areas consist of lands that do not support conifer species, such as rock outcrops, talus slopes, quarries, grasslands, lakes, and wet meadows. Non-Forest, which comprises less than 5% of the property, will not be considered further in this document.

Regen: The Regen land class is made up of artificially regenerated stands. Regen stands originate after emergency salvage operations or silvicultural practices such as shelterwood systems, group selection areas, brush field rehabilitation, or clearcuts. Regenerated stands of all age classes presently comprise about 25.8% of SPI's Capable Lands. Regen stands are replanted by hand, with rarely one and usually two or more mixed-conifer tree species. Trees in the Regen land class are typically all the same age and similar in height, except where older trees were left as individuals or in small habitat retention stands during the previous clearcut harvest. In Regen stands, brush species may be treated with herbicides to assist the growth of young trees. Regen stands typically are pre-commercially thinned at about 7-10 years of age. After such treatment they are considered "free to grow."

Even: When a Regen stand is old enough and sufficiently dense to cruise, and has been cruised with our standard inventory methodology, it is moved into the Even land class. The distinction between Regen and Even is primarily for growth modeling and silvicultural planning purposes. These stands will be commercially thinned twice, depending on the soil site classification, and will be completely harvested in a clearcut harvest at about 80 years of age. After a decade or several decades of growth, Even stands can provide areas of dense trees of sufficient size that may provide foraging or dispersal habitat for fishers. However, to provide the structural elements required by fishers for denning, sufficient numbers of large trees having micro-structures must be intentionally and continually retained and recruited during the conversion from Mixed to Regen stands, and during the pre-commercial and commercial thinning harvests in the Regen and Even stands.

SPI began their current practice of programmatically converting the Mixed land class into well distributed even-age stands only about 15 years ago. Thus, very few of the existing stands have grown from the Regen land class into the Even land class at this time. Mixed stands are converted to Regen stands and present Regen stands continue to mature, an increasing proportion of the den habitat will be provided by the Even land class. (The amount of habitat that is projected to be available at various intervals will be discussed in detail in Section 7.) The suitability of the existing and future habitat for fisher is one of the key issues for long-term fisher management beyond the term of this CCAA.

The criteria for habitat suitability and accounting in both Mixed and Even-aged stands are further discussed below in Section 7 and also in the following White Papers: SPI 2013a, SPI 2013b, SPI 2013c. SPI 2014a (*RRHS as an Indicator of Heterogeneity*) and SPI 2014b (*Forest Conditions within Hexagons-Interstitial Space*).

6.8.2 SPI Option A Demonstration of Maximum Sustained Production

The Sierra Pacific Industries' management actions are guided by its long term management plan, the SPI Option A Demonstration of Maximum Sustained Production (SPI Option A). Growth and yield values were developed using a proprietary planning model that integrates G-Space, Cactos and Systum-1 as growth models and the SPI forest inventory point plots (SPI Northern Option A Sierra Pacific Industries, 1/1/99, pp. 14-15). All subsequent growth and yield scenarios developed to model this 100-year planning horizon have been submitted to CAL FIRE for confidential review, which was completed prior to CAL FIRE's approval of the SPI Option A. The planning tool approved by CAL FIRE is an expert based simulation model of growth, harvest, and quantitative constraints on management intensity such as: stream classification, areas having a high visual aesthetic, high use recreation areas, sensitive geology and soils, known archeological sites, and endangered species.

6.8.3 Habitat Classification

A standardized definition of forest habitats suitable for fishers is needed for describing and quantifying existing habitat, predicting trends in habitat, defining objectives, and tracking progress toward meeting those objectives under the CCAA. SPI refers to habitat categories as Habitat Forms. Habitat Form categories aggregate forest types by expected species use. Assignment of anticipated species use is guided by literature review and by a relational comparison of a Habitat Form to forest types described in the California Wildlife Habitat Relationships system (WHR) (Mayer and Laudenslayer 1988). As further described in SPI 2013a the Habitat Form system was designed to improve on some of the limitations of the WHR system.

The parameters that SPI uses to define or delineate the Habitat Forms are 1) tree size class, as represented by the quadratic mean tree diameter (QMD) (i.e., the quadratic mean diameter of all trees >5 in. dbh) in a given stand; 2) large tree component, as represented by the number of trees per acre (tpa) of a specified size threshold; and 3) canopy cover classifications, as represented by the percent of the sky obscured by foliage when viewed vertically from below.

Habitat Form classifications are applied at the stand scale. SPI defines a forest stand as a forested area that can be distinguished from neighboring areas either visually and through measurements. SPI identifies and delineates stands using a combination of air photo analysis and inventory plot data. Usually, a distinct stand can be easily identified within the surrounding forest because of differing management history. This is especially true in areas in which intensive even-aged management has been applied, i.e., where clear-cut or variable retention harvest, brush field rehabilitation, and re-growth have created distinct stands with clear edges against surrounding stands of different ages. In areas where even-aged management has been applied, the Regen stands average about 17 acres in size, as a result of CFPRs limitations on clear-cut size. In Mixed stands with more varied management history, the stand may be defined by its recognizable borders with neighboring stands, or by the legacy of various harvest prescriptions or logging methods.

The progression of Habitat Forms follows a trend of growth indicative of the soil productivity and reflects the management activities that occur within the stand. Habitat Form 1 (HF1) is the youngest Habitat Form and is usually the result of even-aged clearcut harvesting, the rehabilitation of brush fields to conifer trees, or fire salvage harvesting of substantially damaged timberlands. The HF1 will persist for between 15-30 years depending on the soil site classification. Habitat Form 1 consists of the WHR 1 and 2 size classes, regardless of density class and is associated with ground vegetation that includes the grass, forb, seedling and sapling stages of forest development. HF1 stands grow into Habitat Form 2 (HF2) stands following a pre-commercial thinning that will occur at stand age 8-15 depending on the soil site classification, effects of animal browsing, and the effectiveness of controlling competing vegetation.

HF2 and HF2Hv stands can be either in the Mixed or Even land class. Habitat Form 2 consists of WHR 3M & D (6-11" QMD with >40% canopy closure). Habitat Form 2Hv consists of WHR 4M & D stands that are ≥ 11" and <13" dbh with >50% canopy closure. HF2 and HF2Hv stands that are in the Mixed land class are stands that on average are approximately 100 years old, contain numerous large trees, especially hardwoods, and based upon sampling, contain many potential nesting/denning structures for forest wildlife species including the fisher (SPI 2013b). Because of numerous small diameter trees and variable sized openings, these HF2 stands have a QMD of between ≥6-10.9"dbh and canopy cover of 40-100%. HF2 stands in the Mixed land class also have many trees greater than 22" dbh present, but their contribution to the stand is not substantial enough to increase the QMD to >10.9 inches. Most HF2 stands in the Mixed land class will not be thinned prior to clearcutting, unless basal areas over time reach levels that risk attack by bark beetles. HF2 stands that are in the Even land class will receive a commercial thinning when necessary to avoid individual tree mortality. This generally will occur at between age 30 and 60

depending on the soil site classification. HF2 stands grow into HF2Hv, which has a QMD of ≥11 dbh and canopy cover ≥50%. HF2Hv stands in the Mixed land class have many trees greater than 22" dbh present, but their contribution to the stand is not substantial enough to push the QMD ≥13 inches. HF2Hv stands grow into Habitat Form 4 (further described below) over time when left uncut.

Habitat Form 3 (HF 3) stands have a QMD of ≥6"dbh and canopy cover of 10-39%. HF3 stands can have trees ≥22" dbh however they are not numerous enough to cause the canopy closure to exceed 40%. HF3 makes only a minor contribution to the Mixed land class.

HF2 and HF2Hv are the dominant habitat on the Enrolled Lands. HF2 and HF2Hv will contribute on average more than 50% to the total habitats available until the middle of the 5th decade of the SPI Option A.

Over the course of the permit term the proportion of the total HF2 provided by Mixed will decline but that which remains will mature over time. Even though the total number of acres in the Mixed land class decrease due to harvest, the silvicultural choice and voluntary constraints on harvest in the Mixed land class (described below in Section 7.2.8 Hexagon Analysis Results & 7.2.9 Summary Territory Opportunity Trends) will cause the amount of timber inventory in HF4 and HF2Hv to increase and remain at proportionally higher levels than today in aggregations that could function as female fisher territories. The transition from HF2 and HF2Hv to HF4 is not a qualitative estimate but relies on inventory data collected in the field and grown consistently using modeling that has been evaluated and found acceptable by CAL FIRE biometricians in 1999 and again in 2014.

The continued willingness of SPI to invest in increasing the growth rates of its forest and to choose not to harvest otherwise available stands, allowing them to accrue continued growth, will be an essential part of the SPI Option A and the success of the CCAA.

6.8.4 Den Habitat

6.8.4.1 Habitat Form 4

Based on descriptions of fisher habitat in the literature (Lofroth et al. 2011, p. 73; Purcell et al. 2009, p. 2701; Higley and Mathews 2006, p. 9), the SPI stand classification that includes the dense stands of large trees that represents the best fisher habitat on the property is Habitat Form 4 (HF4) in the Mixed land class. A detailed description of the derivation of HF4 is contained in SPI (2013a Appendix G). Appendix G also includes comparisons of HF4 to other classification systems. SPI has conducted research using radio telemetry to locate areas and sites used by fishers in the Sacramento Canyon north of Redding in Shasta County, and southwest of Douglas City in Trinity County (Self and Kerns 2001, James et al. 2008, Niblett et al. 2014). This research, and measurements at additional dens at the Stirling Translocation Study Area (https://r1.dfg.ca.gov/portal/FisherTranslocation/tabid/832/Default.aspx), described the structure (tree) used for 149 den sites and 65 rest sites. A "cross plot" transect system was used to describe the 1.05-acre sites immediately adjacent to these features. Table 6.8.4.1-1 summarizes the data describing SPI den sites.

Table 6.8.4.1-1 Forest Stand Characteristics in the Immediate Vicinity of Den Trees

	Age	Canopy Closure Average	QMD	Basal Area Total	Basal Area Hardwood	Trees/acre ≥ 6" dbh	Conifer TPA ≥ 30" dbh	Hardwood TPA ≥ 22"dbh	Conifer Snags(S) SPA ≥ 24" dbh
average	111	80	14.1	184.97	41.93	174.40	5.68	2.60	1.38
median	90	86	13.1	163.33	30.31	170.31	3.37	-	-
stdev.s	61	16	4.8	111.91	44.00	81.11	7.31	5.43	2.66
min	31	18	-	-	-	-	-	-	-
max	439	98	33.5	866.93	208.66	419.86	40.47	33.72	10.12

Fisher researchers and habitat modelers have consistently stated that a high degree of canopy cover is a very important feature of habitat used by fishers (Zielinski et al. 2004a, p. 488; Thompson et al. 2011, p. 1165; Purcell et al. 2009, p. 2701; Lofroth et al. 2010, sec. 7.2.2). SPI has recognized this need by establishing a canopy cover of ≥60% for HF4, and ≥50% for HF2Hv. The methodology for estimating canopy cover is described in SPI (2013a).

Research on fishers has often described habitat in forests made up of large trees, and modeling of habitat for predictive use has used large tree size as an important variable (Zielinski et al. 2004a, p.485; Zielinski et al. 2006, p.1018). In general, because of past management history, SPI's Mixed forests have a smaller average tree diameter than many of the unmanaged late successional forests where other fisher habitat has been described (Purcell et al. 2009, p.2696; Thompson et al. 2011, p. 1165). Fisher den sites on SPI lands and elsewhere are often in small stands of trees larger than those in the surrounding landscape (Weir and Corbould 2008, p. 103; Niblett et al. 2014).

SPI's descriptions of conditions around nest/den structure trees (Table 6.8.4.1-1) informed the tree size criteria for HF4. To qualify as HF4, a stand must have a Quadratic Mean Diameter (QMD) greater than 13"dbh. (For further discussion of QMD, see Appendix G, SPI (2013a)). This is equivalent to the median QMD at the 1.05-acre sites surrounding known fisher nest dens on SPI lands. Thus, the HF4 definition provides a conservative tree size standard for qualification as denning habitat, which is summarized in Table 6.8.4.1-2.

Table 6.8.4.1-2 Threshold Criteria Values for Habitat Form 4

LAND CLASS	CANOPY COVER	TREE SIZE	TREES /ACRE ≥22 in. dbh
Mixed	≥60 %	Stand QMD ≥13 in. dbh	At least 9 trees
Even	≥60 %	Stand QMD ≥13 in. dbh	At least 20 trees

The HF4 threshold criteria for average tree size (QMD) and canopy cover are the same for Mixed and Even stands. The important difference in the criteria for the two land classes is in the minimum threshold for tpa ≥22 in. dbh. Because of concern over possible reduction in large trees in the Even land class, greater numbers of large trees are required to qualify as HF4 in the Even stands.

It is important to understand the intended use of the HF4 definitions. Fundamentally, the definition is NOT a management standard; i.e., neither the Mixed stands nor the Even stands will be managed with the intent of barely exceeding or being harvested repeatedly down to the minimums

of the definitions. Rather, the definitions provide the threshold for inclusion into the HF4 category for quantitative accounting of the projected change in amount of habitat, as the Mixed stands are steadily removed and eventually replaced by Even stands, and growth continues within the remaining Mixed stands.

The habitat thresholds described in Section 7.1 and the habitat analysis described in Section 7.2 will provide a reasonable general estimate of the change in habitat suitable for fishers during the period of the CCAA. It must be recognized that the use of these Habitat Form thresholds and the methods for estimating future female fisher Territory Opportunities, will not provide a precise estimate of fisher habitat because of the imperfect understanding of what specific habitat thresholds and juxtaposition are necessary to effect fisher vital rates. We acknowledge these thresholds and methods for various reasons may under or over-estimate the actual amount of fisher habitat. For example the method probably under-estimates because fisher are known to den at sites that, in a minority of instances, are in stands that are lower (smaller diameter stands) than the criteria used for this CCAA. It may overestimate the available habitat where required habitat elements are not present even though the stand meets the criteria. Also, habitat actually exists in a spectrum of suitability rather than a yes/no condition. Despite these factors these criteria are necessary to provide a reasonable estimate of occupied habitat in the existing Mixed land class stands.

HF4 in the Mixed land class is and will be the primary habitat type providing denning habitat, and the presence of fishers probably depends on the sustained presence of sufficient amounts of HF4 Mixed land classes that are properly spatially arranged, structurally complex, and contain adequate numbers of den and rest sites. However, SPI's measurements at reproductively successful sites on their ownership, along with scientific literature from elsewhere in the fishers' range, include descriptions of the species' use of stands with somewhat smaller QMDs than those established for inclusion in HF4. In fact, 61 of SPI's den sites and one of the rest sites occurred in HF4 Mixed land class (Table 6.8.4.1-3). The remainder of SPI's sites occurred in Mixed land class stands of HF2Hv (33 den sites and 7 rest sites), and HF2 (21 den sites and 6 rest sites). The HF2 and HF2Hv stand characteristics are further described in Section 6.8.4.2 and 6.8.4.3 below.

Table 6.8.4.1-3 Habitat Type on SPI Lands at Den and Rest Trees

Habitat Form	Natal Den	Maternal Den	Rest Tree	Grand Total
1	4	9	1	14
2L	5	28	6	39
3	0	0	1	1
2H	8	31	7	46
4	24	37	1	62
Grand Total	41	105	16	162

Because stands with the smaller parameters of HF2 supported fewer of the observed denning use, SPI believes that it would not be appropriate to use these site descriptions as the threshold criteria for quantification of the primary denning habitat. However, it may be appropriate to include HF2 stands, from the Mixed land class, as habitat contributing to the presence of fisher territories.

6.8.4.2 Habitat Form 2

Habitat Form 2 (HF2) is the stand condition that is the precursor to HF2Hv. HF2 has moderate to dense canopy cover (40% - 100%) and a QMD of ≥6 in.-11in. dbh.

At present, most of SPI's HF2 stands are in the Mixed land class (see Section 6.4.1 for description of land classes), and are the legacy of various intensities of selection harvest carried out over past decades by various owners. While quite variable in condition, the HF2 stands in the Mixed land class sometimes do contain numbers of large trees, especially hardwoods, and according to sampling, potential den/rest sites occur at the rate of approximately 1 to 2 per acre (SPI 2013b, Appendix H). However, HF2 stands usually have QMD lower than stands typically used for denning by fisher, and while the threshold for HF2 canopy is ≥40%, most of these stands have canopy cover >60%. HF2 stands currently occupy about 30% of the Enrolled Lands. During the period of the CCAA, about 6% of today's acreage of HF2 will be clearcut and converted to Regen and Even land classes. The remainder of today's Mixed HF2 will continue to grow, and much of it will become Mixed HF2Hv and HF4 during the plan period. Meantime, many HF1 Regen stands will grow into Even HF2 and HF2Hv.

6.8.4.3 Habitat Form 2Hv

Habitat Form 2Hv (HF2Hv) is the stand condition that is the precursor to HF4. HF2Hv has moderate to dense canopy cover (50% - 100%) and a QMD of ≥11in. dbh. The broad range of conditions included in HF2 Mixed land class (as described section 6.8.4.2) includes some stands that provide denning habitat for fishers, but in most cases denning use is in HF2Hv Mixed land class. While a component of larger trees may be present in a stand designated as HF2Hv, and/or QMD can be >11in. dbh (and in rare instances ≥13 in. dbh), HF2Hv stands do not satisfy all the criteria of HF4. HF2Hv Mixed stands currently occupy about 30% of the Enrolled Lands. During the term of the CCAA, approximately 6% of today's acreage of HF2Hv will be clearcut and converted to Regen and Even land classes. The remainder of today's Mixed HF2Hv will continue to grow, and much of it will become Mixed HF4 during the plan period. The QMD criterion for inclusion in this category is ≥ 11 in. dbh, and the criterion for canopy cover is ≥50%.

Stands of this description are known to have been used as denning habitat by fisher, but only in a minority of the cases described. Stands of HF2Hv also provide habitat for the prey used by fishers when foraging. However, in HF2Hv stands, denning is largely dependent on presence of remnant elements from previous stands, such as large hardwoods and snags. Appendix I provides more detailed description of the use of HF2Hv by fishers and their prey.

Table 6.8.4.3-1 Threshold Criteria Values for Habitat Form 2Hv in the Mixed Land Class

LAND CLASS	CANOPY COVER	TREE SIZE	TREES /ACRE ≥22" dbh
Mixed	≥50 %	Stand QMD ≥11" dbh	No standard applied

6.8.4.4 Denning Structures

As stated above, the Habitat Form system is based on attributes directly measured in SPI's forest inventory system. These include canopy cover and tree size by species. Other features, especially

cavities suitable for natal and maternal denning and platforms for resting, also are known to be elements of fisher habitat, but have not been identified in the forest inventory system.

To evaluate the presence of denning and resting structures, SPI has visually surveyed a randomly selected sample of 81 stands of HF4 and 74 stands of HF2 to evaluate the presence of cavities and other microsites that appear to be usable by fishers for denning (Appendix H, SPI 2013b). We found an average of 1.9 such microstructures per acre in the HF4 and 2.3 structures per acre in HF2. At least one structure was noted in 92 percent of the stands surveyed. While we cannot be certain that the microstructures found were actually suitable for use by fishers, the widespread presence of visible microsites indicates that most stands of HF4 and HF2 in the Mixed land class contain potential sites for use by fishers.

6.8.4.5 Relative Resting Habitat Suitability (RRHS)

Literature describing fisher habitat often uses terms such as "structural diversity," but this attribute is rarely expressed in a quantified form. The term generally refers to a forest that has trees of varying ages and sizes, snags and down logs, a shrub layer, and a variety of structures provided by large limbs, broken and multiple tops, deformities, parasitic mistletoe infections, and other features that provide micro-habitats for fishers and their prey, but the presence of these features can be quite variable (Zenner 2004). We sought a methodology that might provide an indication of the presence of the attributes of structural diversity for purposes of evaluation and classification, and thus quantify the structural diversity of our forest stands using our existing inventory.

Zielinski et al. (2010) proposed an index of Relative Resting Habitat Suitability (RRHS) for fishers, which evaluated the presence of potential fisher resting structures. Fisher resting structures include large snags, large trees with cavities and deformities, and large limbs. Calculating the RRHS at a point in a stand includes variables that infer the degree of variability and complexity present (Zielinski et al. 2010, p. 1579). The RRHS calculation is intended to interpret inventory plot data that is relevant to fisher habitat management at the microhabitat scale (Zielinski et al. 2012., p. 39). We propose to use the RRHS value as an indicator of the presence of structural diversity contributing to fisher habitat.

Using data (1.05 acre cross plots) from 149 known fisher denning sites and 65 known fisher rest sites on SPI lands, we calculated RRHS values representing these sites (SPI 2014a). The RRHS calculation did not include the den/rest trees. The mean RRHS value at den sites was 0.22, which was slightly higher than at resting sites. Almost 62% of the den site values were lower than the mean value of 0.22. Thus we regard 0.22 as a conservative value (since nearly two thirds of the den sites had lower RRHs values) for representing heterogeneity within denning habitat on SPI lands.

In an effort to examine characteristics of the sites where fishers were known to den or rest at a finer scale, we considered the values at individual plots rather than combining plot data into larger stands. As further described in Appendix J, (SPI (2014a) and in Table 6.8.4.5-1 below, an average of over 30 percent of the inventory plots in HF4 in the Mixed land class have a RRHS value ≥ 0.22. Additionally, an average of over 20 percent of the inventory plots in the Mixed land class that qualify as HF2hv have a RRHS value ≥ 0.22. Thus, we conclude that HF4 and HF2hv have sufficient structural diversity to provide for the needs of fishers.

Table 6.8.4.5-1: RRHS Values for Inventory Plots in HF4, HF2Hv and HF2 Habitat Forms

RRHS Plot Stats (plots with RRHS >= 0.22) for 7 CSCAs and Total									
	RRHS >= 0.22								
	HF4			HF2Hv			HF2		
CSCA	% of plots	Ave RRHS	StDev	% of plots	Ave RRHS	StDev	% of plots	Ave RRHS	StDev
Hayfork Divide - Bully Choop	21.5%	0.3870	0.1368	15.1%	0.3827	0.1372	17.5%	0.3834	0.1358
Trinity Mountains	24.3%	0.3814	0.1315	17.3%	0.3799	0.1299	15.1%	0.3798	0.1241
Redding North	32.0%	0.3494	0.1096	21.5%	0.3079	0.0885	20.0%	0.3203	0.1000
Redding South	31.7%	0.3777	0.1249	20.6%	0.3775	0.1272	22.7%	0.3664	0.1194
Stirling	34.9%	0.4077	0.1407	23.6%	0.3968	0.1370	23.0%	0.3899	0.1364
Camino	39.1%	0.4311	0.1517	29.6%	0.3823	0.1404	21.7%	0.3734	0.1234
Sonora	32.8%	0.4109	0.1430	19.5%	0.3851	0.1323	15.9%	0.3789	0.1315
All Area Weighted Average	33%	0.4018	0.1381	21%	0.3818	0.1323	19%	0.3779	0.1288

6.8.5 Summary of Habitat Conditions and Projected Changes

As noted above the HF2, HF2Hv, and HF4 habitat forms currently comprise about 74% of the Enrolled Lands considered Capable Land. These habitat types will be reduced by about 18%, thus reducing the total amount of Mixed habitat over the term of the permit. The remaining 56% of the Enrolled Lands that are in the Mixed land class will continue to grow and may develop into higher quality fisher habitat.

Table 6.8.5-1: Amount of HF2Hv and HF4 Mixed Land Class over Time

Total SPI Ownership in 5170 Hexagons > 50 acres 1,432,135						
Decade	Amt Mixed	Mixed as % of total lands	Amt HF2Hv in Mixed	Amt HF4 in Mixed	Amt HF2Hv and HF4	HF4 & HF2Hv as % of total lands
Start	1,059,780	74%	398,002	357,011	755,012	53%
10 yrs	801,996	56%	346,405	425,837	772,243	54%
20 yrs	615,818	43%	104,144	511,674	615,818	43%
30 yrs	544,211	38%	5,201	539,010	544,211	38%
40 yrs	501,247	35%	(77,694)	501,247	423,553	30%
	Values from 1999 SPI Option A(where mixed vs even were not tracked)					

7. BIOLOGICAL GOALS AND OBJECTIVES

Introduction to Biological Goals and Objectives

The primary biological goal of this CCAA is to provide aggregations of habitat that are representative of female fisher territories across both the Occupied Range and unoccupied portions of its range at the 10,000 acre scale (See Section 7.2.11). This goal will be addressed through Conservation Measures One through Four found in Sections 7.3.1-7.3.5.

The secondary biological goal is to minimize potential impacts to fishers by avoiding killing, injuring, or disturbing them during their reproductive and rearing periods. This goal will be addressed by Conservation Measure Five, which is presented in more detail in Section 7.3.6.

As stated in the Service's "Five Point Policy Guidance," the biological goals and objectives of an ESA Habitat Conservation Plan may be either habitat or species based (Federal Register Vol.65, No. 106, p. 35251). For several reasons, SPI has chosen to express biological goals of this CCAA in

terms of habitat rather than numbers of fishers. The number of existing fisher territories currently present on the 1.5 million acres in the Enrolled Lands is not accurately known, and the resources and time required to confidently estimate a population baseline and trends are potentially prohibitive. Research on fishers has found large variations in home range size that may be related to temporal, geographic, and physical variations in prey availability and weather, as well as habitats available (Powell 1994, Ch. 5, p. 89, 91, 94; Zielinski et al. 2004b, p.654; Zielinski 2010, p.1580). Based on review of available literature, predicting a population response to changes in habitat variables has not yet been attempted. And, because individual fishers have home ranges large enough to extend beyond ownership boundaries, they may be subject to substantial effects outside of SPI's control.

Therefore, SPI proposes that the primary biological goal will be evaluated in terms of habitat amounts sufficient to provide territories for fisher that include denning stands, territory core areas, and territory support core areas, all of sufficient size to support reproductive fishers and are present at the broader 10,000 acre landscape scale. This approach is based on four important assumptions: 1) that sufficient prey resources are available; 2) that there are sufficient den/rest structures available; 3) that the amount and spatial arrangement of the Mixed land class can be accurately estimated and monitored at the scales relevant to fisher territories; and 4) that the proportional contribution of habitat at the scales of the qualifying hexagon and a 10,000 acre area, adequately addresses the proportion of those habitat threats that SPI can control on its property (USFWS Draft CCAA Handbook 2003, p5).

Regarding the first assumption, fishers are generalist predators and SPI Mixed land class habitat is known to be occupied by fishers. There is an abundance of Mixed land class on the Enrolled Lands; therefore, prey availability should not be a limiting factor.

Second, the assumption that denning opportunities are available in Mixed stands relies on the inventory conducted in the fall of 2012 and reported in *Nesting / Denning Structure Presence and Abundance Survey in Covered Species Conservation Areas* (SPI 2013b). Third, the spatially explicit hexagon analysis indicates that habitat will be aggregated in a manner that is representative of a female fisher territory as described in Section 7.1 below. Lastly, because the SPI's Enrolled Lands comprise only a portion of the occupied range and the SPI lands are in many areas discontinuous, SPI can only contribute amounts of habitat proportional to their ownership. In combination, this means that the habitat accounting discussed in Sections 7.2.5, 7.2.6, and 7.2.7 is supported with carefully reasoned assumptions. The hexagon reasoning supporting the individual hexagon analysis is found in Section 7.2.3. The Conservation Benefit provided at the 10,000- acre scale is discussed in Section 7.2.11.

Throughout the following discussion, it should be remembered that the estimation of the representative size and characteristics of den stands, territory cores, territory support cores and territory opportunities is for the purpose of producing a quantified estimate of the number of female fisher territories that SPI supports through its proportional contribution within each qualifying hexagon and in broader 10,000- acre areas. This method of accounting for fisher habitat also provides a means of estimating harm by habitat modification.

7.1 FISHER HABITAT ANALYSIS

7.1.1 Introduction to Habitat Analysis

The biological goal for the enrolled lands will be expressed as the amount of potential suitable female fisher habitat and territories on the Enrolled Lands, evaluated at the scale of a 10,000- acre area. The larger evaluation area will provide a landscape level assessment of these territories'

connectivity to other potential fisher habitat areas. In most cases, both presently and in the future, the actual occupancy of these potential territories will remain unknown (except for sampling at intervals as described in Section 13.2), but the proportional habitat contribution is and will be present in amounts and configurations suitable to provide territories for use by fishers. Therefore, we will refer to these areas as Territory Opportunities.

Mitchell and Powell (2002, Ch. 5, p.121) suggested that the definition of habitat should be based on the spatial scale and ecological resolution of interest. The intensive spatial analysis applied in the CCAA is based on the component parts of a territory of a reproductive female fisher. The habitat descriptions and amounts are at scales representative of the female fisher's den stand, the surrounding core area, and the necessary additional habitat in the form of support cores, to provide a potential territory. These component parts are and will be used for analyzing the Enrolled Lands for presence of Territory Opportunities that occur within 10,000-acre evaluation areas over the term of the agreement.

The spatial analysis of wildlife habitats often uses hexagons rather than circles to avoid problems of overlap or gaps that would occur if circles were used to represent habitat units. (For examples, see Noon and McKelvey (1996), Franklin and Stephens (1996), Hof and Bevers (2000), and Zielinski et al. (2006)). For our analysis we overlaid a fixed grid of 500-acre hexagons and aggregated data from inventory point plots into analysis areas in a manner that avoids overlap (which would cause double counting errors) and gaps (which would cause omission errors). We aggregated four qualifying hexagons into potential Territory Opportunities as further described below. The following Sections 7.1.3 through 7.1.5 describe the derivation of the scale of Territory Opportunity components. Section 7.1.6 describes the habitat standards that comprise the Territory Opportunity components. Section 7.2.2 describes how each hexagon is classified as a territory component. Section 7.2.5 describes the rule set for classified hexagons being aggregated into Territory Opportunities. Section 7.2.6 describes the rule set for identifying when harm to a Territory Opportunity occurs. How these Territory Opportunities fit into the larger landscape to provide Conservation Benefit is discussed in 7.2.11. The methods used in annual accounting for harm are described in 7.2.10.

7.1.1.1 Data Quality Assumptions for Estimating Habitat Descriptions and Amounts

In the following sections 7.1.2 through 7.1.6, we describe how we derived various thresholds and standards for the inclusion of forest stands into estimates of the number of Territory Opportunities for female fishers. These standards include: 1) minimum levels of forest stand measurements such as stand QMD, canopy cover, and numbers of large trees that describes suitable habitat; 2) the size in acres of the components of a Territory Opportunity, including den stands, core areas, and territories; and 3) amounts of habitat necessary in each component of a Territory Opportunity. In each case, the standards were derived from literature on fishers, from data collected on SPI lands, remotely-sensed data, and where data were insufficient, on reasoned analysis.

Before going into the detail of these standards, we should acknowledge the potential error that is inherent in the estimates. This potential error arises from the methods of habitat typing and quantification that were used in the original works upon which we rely. We have attempted to recognize potential error throughout our analyses, and at various points in the following sections, we will note important sources of error in our estimates and point out some of the implications. In the following paragraphs, we provide a brief general description of the sources of error in habitat measurement and quantification.

Use of vegetation structure inventory is ubiquitous in management of forests and forest wildlife. As stated by Ohmann and Cohen (2002, p. 193), stand level vegetation structure inventory data provides criteria for associating ecological, social, and economic values into an integrated framework for analysis and decision-making. Throughout the scientific literature regarding the fisher (and other wildlife as well), habitat descriptions are generally provided as descriptions of vegetation strata. In forest management, vegetation strata are categories (polygons) that describe groups or stands of trees that have similar species composition, size, and density characteristics.

Interpretation of species habitat associations typically relies on radio telemetry or direct observational data placed into human- (or human-GIS-) delineated polygons of described vegetation (strata). When a species appears to select a vegetation stratum more frequently than the stratum's proportional contribution to some scale of analysis, that stratum is considered preferred by the species. (For general discussion of habitat selection and preference, see Krausman (1999, p. 86). For discussion of selection and preference of habitat by fishers, see Lofroth et al. (2010, Chapter 7)). Thus, the accuracy of the vegetation strata boundaries, descriptions, and quantification are central to a wildlife researcher's ability to correctly describe preferred habitat at any scale.

Many of the sources cited in the following sections derived estimates of habitat type and quantity from interpretation of aerial photography or other remote imagery. The methods used to classify and quantify habitat and to assess accuracy were described to widely varying degrees, but generally did not provide enough specific information regarding the classification rules or mapped polygon data to evaluate the cover type classification system. Several authors (Biging et al. 1991, p. 10, 12, 14; Congalton 1991, p. 42; Magnussen et al. 2000, p. 365; Congalton 2005, p. 151-153) have stated that there is a high possibility of error in the methods that produced the available descriptions of habitat characteristics and quantities. However, it is not feasible for SPI to assess the accuracy of all of these estimates, and in most cases we have accepted them at face value. In a few cases, we have noted the implication of possible error to our process in the appropriate section.

We must note that the one of the strengths of the extensive SPI forest inventory (which is installed at a rate of one point plot approximately every 4 ac.) is that its use reduces the possibility of compounding the error inherent in the application of standards derived from the literature. SPI's stands are delineated using aerial photographs, but the descriptions of tree size, species composition, and canopy cover within those polygons are derived from the SPI forest inventory. Thus, for example, where a description of average tree size derived from literature (which may contain an unknown degree of error) is applied to stands as a threshold in this CCAA, at least there is a high likelihood that the SPI stand actually meets that standard, without compounding any error through additional interpretation of photos or satellite images or modeling. The utility of relying on SPI forest inventory data in lieu of remotely-sensed data is further discussed in Section 7.2.3.

7.1.2 Fisher Territory Components

SPI uses an approach to estimate the number of Territory Opportunities based on habitat amounts defined by scientific literature and available data from SPI lands to 1) define the spatial extent of each territory component, 2) describe the characteristics and amount of suitable habitat at the scale representative of the territory, territory core, and den stand for fisher, 4) estimate the present number of Territory Opportunities based on SPI's contribution of such habitat configurations in hexagons on the Enrolled Land, and 5) establish a rule set for determining when harm via habitat modification occurs. Thus, the analyses will lead to an estimate of the number of available Territory Opportunities for female fishers, using representative values for the amount of SPI HF4 and HF2hv at the three scales: den stand, core, and territory, based on literature and on data gathered on SPI lands.

7.1.3 Den Stand Concepts

As defined in this CCAA, the primary prerequisite for a territory is a den stand. The den stand is a the contiguous forest stand that contains at least one den structure (tree) with a suitable micro-structure (cavity), and presumably provides the escape cover, microclimate, and access to forage necessary for reproductive success. The contiguous forest stand that is considered a fisher den stand is named a Contiguous Core Stand (CCS).

7.1.3.1 Den Stand Size Determination

We found no published literature that described the actual sizes of stands used for denning, leaving us to use inference to derive a stand size sufficient for use by fishers and amenable to analysis. Determining a representative stand size in the field is confounded by the species' tendency to change den sites several times during the period of rearing young. For example, the breeding female fishers at SPI's South Weaverville Study Area (SWSA) switched dens between 4 and 9 times. Niblett et al. (2014) suggested that for evaluative purposes, the den stand size is the area encompassed by a circle whose radius is half the average distance moved by a female fisher between dens (See Appendix M). Niblett et al. (2014) referred to these areas as "neighborhoods," which on SPI's SWSA were 40 ac. in size. We found no other published data on the average distance moved by denning fisher reported in a manner that can provide an estimate of den stand size. Therefore, this CCAA uses the value suggested by Niblett et al. (2014) as a guide, and designates 50 ac. as the minimum CCS for a female fisher.

We recognize that fisher use multiple den trees, and thus multiple den tree stands; however, to satisfy the animals' need for additional den opportunities outside the CCS (primary den stand), we will rely on HF4 and HF2Hv stands within the remaining Territory Opportunity because these habitat forms are most likely to contain additional suitable den and rest trees, have dense canopy and larger trees, and generally are older and more structurally complex than other habitat forms. Additional den stands are reasonably expected to occur, as described in SPI (2013a, 2013b) and Niblett et al. (2014). Such stands need not be contiguous to the CCS, but are connected by areas of high canopy cover as a requirement of inclusion in the designation of the territory and support cores, as described below.

7.1.4 Territory Core and Support Core concepts

The concept of the territory core has been widely applied in published literature. As stated by Samuel and Green (1988) "The existence of core areas within an animal's home range provides an important conceptual framework for delineating selected areas that contain home sites, refuges, and dependable food sources." The concept has often been applied to avian forest raptors ((e.g., the northern and California spotted owls (Franklin et al. 2000; Seamans and Gutiérrez 2006) and the northern goshawk (Woodbridge et al. 2012, Ch. 5, p. 119)). And, the territory core concept has been applied to other mid-size mammalian carnivores, such as the bobcat (Tucker et al. 2010, Riley 2006) and the gray fox (Riley 2006).

The concept of the territory core may apply somewhat differently to fishers than other species, because female fishers annually use multiple den structures to bear and raise young. Den structures may be at varying distances from productive foraging areas, and thus interpretation of the size of the territory core may be influenced by the variability of the forests used by fishers, and

the availability of den structures and the distance between them, as well as by the quality of the data describing the sites utilized.

However, despite these difficulties in interpretation, the concept of the territory core does seem to apply to the fisher. Higley and Matthews (2006, p. 5) reported denning behavior being "characterized by a sudden change in behavior from using numerous rest sites per week across the majority of the home range to more restricted movements in a small portion of the home range and repeated use of the same structure while inactive."

7.1.4.1 Territory Core Size Determination

While the concept of core area has been widely applied, determining the size of areas to represent a core for assessment or management is less straightforward, especially when the central point is not fixed, as is the case for fishers (see below), or when radio-telemetry data are not available to assist in determination of areas actually used. We sought a supportable size of territory core that could be applied in estimation of availability of Territory Opportunities on the Enrolled Lands.

Niblett et al. (unpub. data) described home ranges of five telemetered reproductive female fisher using kernel density estimates (KDE) at SPI's SWSA. The 25% KDE for the female fisher (i.e., the area within which the densest 25% of use locations were observed) consisted of several non-contiguous polygons within portions of the 50% and 75% density kernels. The average total size of the polygons comprising the 25% KDE for the five females at SWSA was 514 ac and ranged from 404 ac. – 676 ac. The 25% KDE was constructed using year-round location data, but about 60% of the observations were during the denning period. Because a substantial portion of the observations were outside the breeding season and because the 25% KDE polygons were not contiguous, the question of whether a 500-ac. area is a reasonable approximation of the size area used during the denning period was investigated further by SPI.

Using the SPI GIS and the fisher locations reported by James et al. (2008) and analyzed by Niblett et al. (unpub. data), we placed a 500-ac. hexagon in a "best fit" manner over each of the five female fisher's natal and maternal den locations observed during the two years they were tracked. The "best fit" placement attempted to situate the 500-acre hexagon over as many of the den sites as possible. The inclusion of den locations within the "best fit" placement of 500-ac. hexagons over the den observations ranged from 66% -100%.

Because a substantial majority of the den sites of each individual fisher could be contained in a 500-ac. hexagon on the SWSA, we inferred that a 500-ac. hexagon is a reasonable representation of the size of a female fisher core area. However, because an important fraction of the denning sites in some territories were not contained in the 500-ac. core, we recognize the need for additional area to adequately represent an appropriately sized territory. We address this need by providing additional area in the form of a "support core" as described in Sections 7.1.6.

7.1.5 Concepts: Home Range and Territory

A commonly cited home range definition is that of Burt (1943, p. 351): "that area traversed by the individual in its normal activities of food gathering, mating and caring for young." The home range can be estimated by radio-telemetry, but because transmitter life is somewhat limited and locations are usually separated in time, the area described may not encompass the animal's actual use area over an extended period. Thus, home range descriptions are usually described as estimates. Home ranges of neighboring individuals often overlap considerably.

Within the home range, there may be great variation in frequency of use of smaller areas (Powell et al. 1997). The analysis of home ranges has evolved over the last several decades, from initially reporting an individual's area of use as a minimum convex polygon (MCP), which encompasses all of the points where an individual was detected, to two dimensional relative frequency distributions in smaller areas, to multi-dimensional, non-parametric kernel estimates of use (Kie et al. 2010, p. 2222). If ecologically relevant associations can be made between animal habitat use and other processes, those associations may be used to develop heuristic models and guidelines for making land use decisions (Fleishman et al. 2002, p. 78).

An animal's territory is the area within its home range that it defends from other animals, thus establishing an area of exclusive use. For more thorough descriptions of the territory concept applied to the fisher and other forest carnivores see Lofroth et al. (2010, p.67), Woodbridge et al. (2012, p. 114-118 & p. 123), Zabel et al. (1992, Ch. 6, p.149), Lee et al. (2012, p. 794), and Powell (1993, Ch. 9, p. 179).

In most cases, the actual limits of a territory cannot be determined, so some authors have estimated the size of the exclusively used territory by halving the distance to the nearest neighbors. This requires extensive knowledge about the spatial distribution of the entire population in the study area, which would be exceedingly difficult to obtain for fishers. Thus, we have used available information to aggregate forest characteristics into modeled representations of areas potentially used by fishers (See Figure 7.2.5-1).

The following sections will describe our attempt to define the size of the component parts of representative fisher territories, in order to derive estimates of the number of potential territories that may be present currently and at various intervals in the future. A Territory Opportunity will use multiple combined core areas to represent a female fisher territory of appropriate size.

7.1.5.1 Determination of Fisher Territory Size

Fishers exhibit intrasexual territoriality (i.e., female territories are different from those of males), which is thought to be necessary based on the availability of prey of appropriate size (Powell 1993, Ch. 9, p. 172). Because resources necessary for breeding (i.e., multiple cavities of suitable size for natal and maternal use) by female fishers are probably limited, and because female home ranges (and presumably territories) are smaller than those of males, we intend to estimate the numbers of Territory Opportunities for female fishers. Fishers identify their territories using scent marking, which if respected by other fishers, should limit overt aggression (Powell 1993, Ch. 9, p.170). Because these scent markers are not detectable by humans, the physical boundaries of exclusively-used territories cannot be practically determined, and the bounds of territories must be inferred by other methods.

We have found no published report of nearest neighbor distances for fishers, so the method of using half the mean nearest neighbor distance for territory estimation is not readily available. And, as discussed below, review of available radio-telemetry studies provided basis for only limited conclusions regarding territory size.

Lofroth et al. (2010) summarized MCP minimum convex polygon estimates of home range size for telemetered female fishers from several studies, but did not address the issue of territory size. Those studies did not report on exclusively used area, which can only be determined where overlap of home ranges has been observed.

Potentially, kernel density estimates (KDE) could be used to discern areas of exclusively-used area among neighboring fisher home ranges. James et al. (2008) and Niblett et al. (unpub. data) both analyzed the data from five fishers radio-tracked by James et al. (2008) in the SWSA. Using different statistical methods, these two studies derived different estimates of the amount of area in

the home range of the same animals. James et al. (2008) calculated a MCP minimum convex polygon and Niblett et al. (unpublished data 2014) calculated the 75% KDE and also the 25%, 50%, and 100% KDE (unpublished data) for these five animals.

Several other fishers also were captured in the SWSA near the five home ranges analyzed, but did not provide sufficient radio-telemetry data to contribute to the analysis. Thus, it is possible that habitat use by unknown fishers overlapped with those analyzed. Among the five, there was only observed overlap between the KDEs of two fishers. Not only did the areas used by these two fishers overlap at the 100% (home-range) KDE scale, they overlapped to a small degree at the 75% and 50% KDEs.

Garner (2013) analyzed KDE's at the 85% and 50% densities for fisher in the southern Sierra Nevada, but did not report the data for the 50% kernel, nor address the issue of overlap. Thompson et al. (2011) reported on the 95% KDEs of fishers in the southern Sierra Nevada, but did not report regarding overlap of home ranges or KDEs at other scales.

Powell et al. (2015) reported data for the 95% probability of use density contours at the northern Sierra Nevada translocation study, but did not report the data for the 25% or 50% kernel. They provided a map of home ranges indicating a high degree of overlap among eleven home ranges in a single year, but did not provide quantitative analysis of overlap.

Due to the observed home range overlap at the SWSA and the Sierra Nevada translocation study, the potentially confounding presence of other fishers that did not contribute to the analysis at the SWSA, and the lack of data from other studies, we are left without a supportable estimate for the exclusively-used territory size for a female fisher (and indeed are left uncertain to what degree the traditional concept of the territory can be applied to the fishers). Therefore, for purpose of estimation of present and future Territory Opportunities, we have concluded that the home-range scale must be used as the metric.

Home ranges are often described by using the MCP encompassed by telemetry observations. In that interpretation, the home range is equivalent to the 100% KDE; i.e., it contains all of the radio telemetry observations for an individual over a described period.

Home ranges reported by various fisher investigations varied by geographic region, by sex, and by year. Buck et al. (1983) reported an average female fisher MCP of 988 ac. in the Big Bar area in Trinity County, CA. Zielinski et al. (2004b, p. 652) reported average female MCPs of 1,303 ac. for the Southern Sierra Nevada and 3,702 ac. for areas of western Trinity and eastern Humboldt Counties, CA. Yeager (2005, p.18) reported an average female MCP of 5,799 ac. in the Shasta-Trinity National Forest and an average female MCP of 415 ac. at the Hoopa Indian Reservation in 1998. However, Matthews et al. (2011, p. 70) reported that the average female fisher MCP on the Hoopa Indian Reservation was 1,798 ac. in 2005. Regarding fishers in the southern Sierra Nevada, Spencer et al. (2011, p. 798) stated: "We believe that population (or carrying capacity) estimates based on the smallest territory size we tested (500 ha, or 1235 ac) are inflated and that estimates based on larger territory sizes (860–1200 ha (2125-2965 ac)) are more defensible." The average 100% KDE among the five female fishers telemetered at the SWSA was 1,865 ac. and the median was 1,932 ac. (Niblett et al. unpub. data). The considerable range of home range sizes and fisher density is, in most occasions, a reflection of the habitat quality present within the bioregion being sampled (R. Powell, pers. comm. 2014).

Amid the uncertainty described above, and considering the wide range of observed home ranges, which is reflective of the of the habitat quality present within the bioregion being sampled (R. Powell, pers. comm. 2014), and considering the site quality across the Enrolled Lands and the territory data collected on SPI property (Niblett et al. 2014 unpublished data) we have decided to use 2,000 ac. as representative of the size of an important portion of a female fisher home range. A Territory Opportunity for a female fisher will be counted on the basis of four 500-acre hexagons

aggregated together. An individual hexagon will not contribute to multiple Territory Opportunities, and thus our Territory Opportunities will be unique. The Territory Opportunity must be a discrete area so that we can count them and evaluate their change over time to estimate harm.

However, because actual home ranges are known to overlap, our estimate of Territory Opportunities may under-estimate the actual number of home ranges to an unknown degree. Conversely, the potential for over- estimating the number of Territory Opportunities may occur where SPI owns a small minority of the Territory Opportunity and therefore the estimated hexagon condition may not match the adjacent ownership condition. A discussion of such an instance as it relates to the habitat contribution and harvest intensity assumptions is provided in Section 7.2.3. The discussion in Section 7.2.3 indicates why the proposed methodology conservatively accounts for and neutralizes this potential for over- estimation of Territory Opportunities.

7.1.5.2 Summary of the Size of Territory Components

The previous sections 7.1.3 through 7.1.5 described how we determined the size of the areas that will comprise Territory Opportunities for the purpose of estimating present and future numbers of Territory Opportunities. In summary, for each fisher Territory Opportunity, the CCS is at least 50 ac. of SPI ownership, the territory core is 500 ac. (classified by the habitat condition on SPI), and the territory is 2,000 ac. A Territory Opportunity for female fishers will be combinations of four 500-acre territory and support cores totaling 2,000 ac. While these acreage limits of 500 and 2,000 are used, the modeling of the habitat within the hexagons is limited to what is available from the SPI portion. Further discussion relating the analysis of habitat within hexagons can be found in Section 7.2.

7.1.6 Habitat Descriptions at the Scales of the Contiguous Core Stand, the Territory Core and Support Core, and the Territory or Home Range.

Lofroth (2010, Chapter 7) summarized the characteristics of forested habitat within fisher home ranges. SPI has incorporated the results of these studies into HF4 (described in detail in SPI (2013a) (Appendix G)) and HF2Hv (described in detail in SPI (2013 c) (Appendix I)). With the exception of areas east of the crest of the Sierra Nevada and southern Cascades (the East Side), further described below, we intend to use the presence of habitat described as HF4 and HF2Hv, in quantities described in sections 7.1.6.1—7.1.6.3, as the standard for inclusion in estimation of the presence of Territory Opportunities for female fishers.

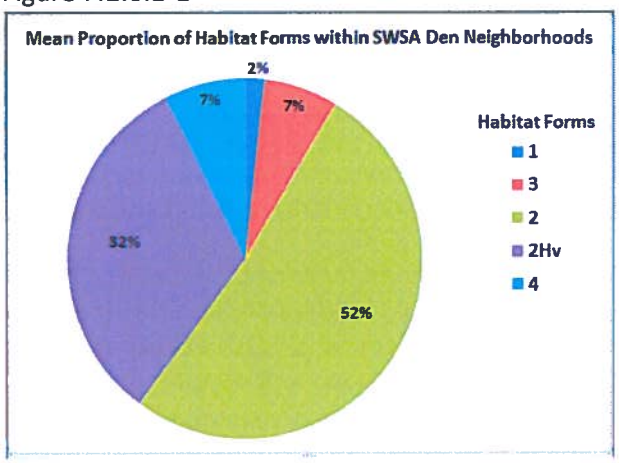
At the present time, the range of the fisher is not known to extend east of the crest of the Sierra Nevada and southern Cascades (the East Side). However, it is possible that fishers could occupy that area during the CCAA period. Because of lower site productivity and colder, drier climate, East Side forest stands generally have smaller QMD and less canopy closure. For instance, East Side territory core habitat for northern goshawks is dominated by forests that generally have lower canopy cover and smaller diameter trees than on the west side of the Sierra (Woodbridge et al. 2012, Ch. 10, p. 320). Lacking specific data for fishers, we assume that HF2Hv will provide the tree size and density sufficient to qualify as habitat for East Side fisher cores, even in the absence of HF4. However, for accounting purposes we utilized the same criteria for estimating presence of Territory Opportunities on the East Side as the other CSCA regions. The proposed delineation between west side and east side forest types is depicted in Figure 7.3.5.1.

7.1.6.1 Threshold Quantity of Den Habitat in a Den Stand

As described in sections 7.1.3.1, we have chosen 50 contiguous acres as the area representative of a CCS for fishers. There is general agreement in the literature that the forest stand values (canopy closure, QMD, presence of large trees) similar to SPI's Habitat Form 4 are usually present in fisher denning stands. Structural complexity is not captured by the SPI habitat classification, but at least RRHS may be calculated from the forest inventory data (see Section 6.8.4.5). SPI's GIS contains spatially explicit stand data that shows the spatial extent and juxtaposition of habitat forms. However, no published information is available to inform selection of meaningful criteria regarding habitat quantity for fisher at this scale.

Using Niblett et al. (unpub.) KDE data, SPI conducted an analysis of Habitat Forms within the den neighborhoods at the SWSA. SPI intersected Niblett et al. (unpub.) Den quadrature point plots with the SPI stand strata to derive the proportional quantity of Habitat Forms in the 47 den quadratures. The results found averages of only 7 percent Habitat Form 4 and 32 percent Habitat Form 2Hv present in the 47 den neighborhoods measured at SWSA (Fig. 7.1.6.1-1). Recognizing that many fisher den sites throughout the range are probably in stands with larger proportions of large timber than in the SWSA, we have decided that a qualifying CCS will consist of a contiguous area of at least 50-acres containing at least 30 ac. of HF4, with the remaining acres consisting of HF2Hv. Defining a den stand thusly avoids arguing whether stands with smaller average QMD qualify as denning habitat, even though it appears that fisher are using those stands at SWSA.

Figure 7.1.6.1-1



7.1.6.2 Threshold Quantity of Den Habitat in a Territory Core

As described in SPI (2013a), Mixed HF4 is representative of den habitat for fishers based on stand measurement criteria (QMD, canopy closure, and the number of trees per acres greater than 22" DBH). SPI (2013a) related these stand measurement criteria to the following publications: Lofroth et al. (2010, sec. 7.2.2), Zielinski et al. (2010), Lofroth et al. (2011, p. 73), Truex et al. (1998), and Zielinski et al. (2004a). While the characteristics of core habitat have been described, there is very limited literature that informs determination of the threshold amount of den habitat necessary for fisher territories to occur and persist on a landscape.

7.1.6.2.1 Habitat Amount in Fisher Territory Core

Using Niblett et al. (unpub.) KDE data, SPI conducted an analysis of Habitat Forms within the 25% KDE at the SWSA, which per section 7.1.4.1 above is equivalent to a 500 ac. core. SPI

intersected Niblett et al. (unpub.) 25% KDE with the SPI stand strata to derive the proportional quantity of Habitat Forms in the 25% KDE. The amounts of Habitat Forms in the 25% KDE at SWSA the mean amount of Habitat Forms are found in Table 7.1.6.2.1-1. At SWSA all acres of HF2, HF2Hv and HF4 are in the Mixed land class.

Table 7.1.6.2.1-1 Mean Amount of Habitat Forms in 25% KDE at SWSA

	SWSA Study Area	25% KDE	
Habitat Form	Percent of Acres.	Ave. Percent of 25% KDE.	Range
1	7%	5%	0-7%
3	9	5%	0-16%
2 (excluding 2Hv)	54%	44%	20-63%
2Hv	27%	39%	32-49%
4	3%	5%	0-17%
Total	100%	100%	

This indicates that the amount of large mature dense forest can be quite low, so long as the requisite numbers of den and rest trees are present and there is sufficient dense canopy cover available. Considering the information above, we have chosen a threshold of 150 ac. (30%) of HF4 and an additional 100 ac. (20%) of HF2Hv and HF4 combined as sufficient representative components of a 500-acre fisher territory core. These thresholds provide significantly more dense forest of large trees in the territory core than exists in the any of the five fisher territories analyzed in the SWSA. Thus, our count of Territory Opportunities will be quite conservative and likely will underestimate the numbers of existing territories.

7.1.6.3 Habitat Amount in Fisher Home Ranges

Zielinski et al. (2004b) described habitat in fisher home ranges in western Trinity and eastern Humboldt Counties, CA. In that study area, which was mostly dominated by true fir and Douglas-fir with a low proportion of hardwood types, a mean of over 70% of female home ranges (mean home range about 3,700 acres (Section 7.1.5.1)) was forested with conifers described as "mid-seral" and "late-seral." These types were not described as to diameter and canopy cover, but we presume they are roughly analogous to SPI's Habitat Forms HF2Hv and HF4. Zielinski et al. (2004b) also reported on canopy density classes and tree size classes in fisher home ranges in the southern Sierra Nevada, but did not combine these metrics into habitat classifications. According to the summary by Lofroth et al. (2010, p.91), female fisher home ranges in the southern Sierra Nevada had an average of about 72% of the area in canopy cover of over 60%, but the size distribution of vegetation contributing was not described. These limitations in available descriptions hamper quantification of habitat types that would inform our effort to describe a threshold amount in a fisher home range.

Using Niblett et al. (unpub.) KDE data, SPI analyzed Habitat Forms within the 100% KDE at the SWSA. SPI intersected Niblett et al. unpublished 100% KDE with the SPI stand strata to derive the proportional quantity of Habitat Forms in the 100% KDE. The Habitat Forms present within the SWSA and the non-overlapping acres for the five female fisher 100% KDE (Niblett unpub. data) are shown in Table 7.1.6.3. Note the relatively low proportion of HF4 within the SWSA and 100% KDE.

Table 7.1.6.3-1 Mean Amount of Habitat Forms in 100%KDE at SWSA

	SWSA Study Area	100% KDE	
Habitat Form	Percent of Acres.	Ave. Percent of 100% KDE	Range
1	7%	4%	0-9%
3	9	7%	2-13%
2 (excluding 2Hv)	54%	46%	25-62%
2Hv	27%	38%	30-53%
4	3%	5%	0-17%
Total	100%	100%	

7.1.6.3.1 Foraging and Cover

Foraging opportunities are presumed to be vital to core habitat suitability. However, habitat used for foraging by fishers has not been well described in the literature. As stated by Lofroth et al. (2012, p.87), "...the most consistent predictor of fisher occurrence at large scales was moderate to high amounts of contiguous canopy cover rather than any particular forest plant community." Summaries in Lofroth et al. (2010) and Lofroth et al. (2011) consistently indicated that areas with canopy cover greater than 50 percent received higher use by fishers, but differences in methodology and the focus of most studies on resting and denning sites limit our ability to draw conclusions about foraging habitat. In general, we assume that foraging habitat is probably more suitable for use by fishers when high degrees of canopy cover are present.

The problem is stated in Raley et al. (2012 p. 241); "Thus, the lack of strong habitat-association patterns for active fishers may be due to the sampling of multiple behaviors, each of which could be linked to different forest conditions. Alternatively, if fishers are primarily foraging when they are active, the lack of consistent patterns could reflect their diverse diets (e.g., Zielinski et al. 1999, Weir et al. 2005, Aubry and Raley 2006) and varying habitat associations among prey species, or the forest conditions in which fishers are most effective at capturing prey (see Buskirk and Powell 1994). Regardless, more focused investigations are needed to understand the habitat associations of active fishers and the relations between fishers and their prey. Improved sampling methods that enable investigators to better distinguish among active behaviors would benefit such efforts."

As described in Appendices G and I, some important fisher prey species are known to be associated with Mixed land class late mature/dense canopy (HF4) and (HF2Hv). The amount of Mixed land class will decline over the term of the permit. Meanwhile, due to growth, the amount of the remaining Mixed land class that is HF2Hv and HF4 will increase. However, as a result of the continuing cycle of harvest and growth of stands, up to 50% of the area within core hexagons may be in other younger Habitat Forms early in the plan period. The regenerating stands and remaining Mixed land class stands may provide prey species diversity as they progress through early-seral seedling/sapling (Habitat Form 1), small tree/pole sized/medium-dense (Habitat Form 2), and open forest/low-medium (Habitat Form 3).

Habitat components that improve prey diversity and abundance in each Habitat Form include down woody debris and logs, snags, hardwoods, large stumps, and brush species. These components are known to occur in Habitat Form 4 and HF2hv in today's Mixed stands (SPI Forest Inventory, SPI 2013b), and the same diversity of plant species in the Mixed land class is expected to

be present in Even stands of those types (James et al. 2012). These elements occur as a result of retention standards, stand growth, and natural recruitment over the decades of stand development, as wind throw, lightning, snow breakage, forest pests, and other factors cause the formation of snags and trees with broken or multiple tops, create brooms, and induce bole decay (Franklin et al. 2002, p. 413). Many of these factors are related to weather and thus are not predictable, so the timing and extent of these disturbances are impossible to model. The role of such disturbances as lethal and sub-lethal agents of damage to trees generates structural complexity and diversifies niches (Franklin et al. 2002, p. 414).

The amount and rate of development of vegetation in the early stages of regenerating clearcuts is variable and depends on plantation management techniques and site quality. The openings and young forests will provide habitat for a diversity of small mammals, passerines, and ungulates. However, for simplicity, newly planted stands less than 10yr of age will be considered non-habitat for fishers. After 10 years, a clearcut will be considered potential habitat for prey species because it will have been fully regenerated with conifer trees and will have ≥50% canopy closure at a height of two feet above ground (Murphy 2008, unpublished, Appendix R), a diversity of other plants would have re-populated the area (James et al. 2012) and small mammals will be present at varying density depending on adjacency of watercourses, older forest, and retained down wood (Gray 2014).

The relatively broad spectrum of prey consumed by fishers includes but is not limited to grey squirrel, brush rabbit, wood rat, mice, ground squirrel, chipmunk, reptiles, carrion, insects, bird young, and bird eggs (Zielinski 1999, pp. 966-967; Campbell 2004 p. 101). The variability in prey resources exploited by fisher is presumed to mean that a broad variation in habitat can be considered suitable for prey production and available for fisher foraging. Because of the variation in fisher food resources and the lack of published quantitative data regarding prey production in various vegetation types, we are unable to predict the amount of prey available for fishers presently or in the future. Thus we have established no threshold for foraging habitat in our standards for Territory Opportunities, except for the thresholds provided for Habitat Forms 4 and 2Hv. We presume that the diversity of timber types provided in both Mixed and Even stands will provide sufficient prey for fishers at densities comparable to those currently observed in forests of the species' existing range.

7.1.6.4 Summary: Territory Opportunity Components

It is infeasible to produce counts of actual territories or individual animals present on the Enrolled Lands. We will use **Territory Opportunity** as the metric for describing the estimated proportional contribution of habitat containing elements to provide present and future female fisher territories. A Territory Opportunity consists of 2,000 acres in the form of four contiguous 500-acre hexagons that satisfy several requirements in terms of habitat types and amounts.

To be counted as a Territory Opportunity, the four contiguous hexagons must include at least one Territory Core, which is a 500-acre hexagon containing a CCS and at least 30% HF4 and an additional 20% HF2Hv or HF4.

The prerequisite CCS has at least 30 ac. of contiguous HF4 that is also contiguous to at least an additional 20 ac. of HF2Hv, for a total of 50 ac. or more.

The remaining three contiguous Support Cores that complete the Territory Opportunity are 500-acre hexagons that might not have a CCS, but each have at least a total of 50% HF4 and/or HF2Hv combined.

Foraging habitat will not be quantified and is not specified as a component of Territory Opportunities, but is expected to be present in all Habitat Forms in Mixed stands and in future Even stands, once regenerating stands are established.

These minimum thresholds are the points at which a forest stands begin to be considered contributing to fisher habitat and/or the minimum configuration on the landscape where combinations of stands begin to function as fisher habitat. However, if the establishment of minimum thresholds is perceived as the intended goal or maximum of such habitat SPI intends to provide, this perception is incorrect. At the stand scale, the habitat threshold is the first point in a stand's life when it can be considered suitable habitat and be counted as such when evaluating the hexagon classification in which it resides. At the hexagon scale, the habitat thresholds are the minimum amounts at which there is enough suitable habitat to begin to function as fisher Support or Den Cores.

7.2 ANALYZING HABITAT WITHIN HEXAGONS

7.2.1 Introduction to the Methods

The hexagon analysis segregates the Enrolled Lands into a seamless layer of 500-acre hexagons. Hexagons in this grid overlay SPI ownership as well as adjacent areas not owned by SPI. To be included in the analysis at least 50 acres of SPI's Capable Land needed to be included within the hexagon. Each hexagon contains stands whose boundaries are delineated using aerial photo interpretation, and assigned to a size and density class based on the SPI forest inventory data. These strata level data provide spatially explicit amounts and juxtaposition of HF2Hv and HF4 existing in all hexagons that meet minimum acreage contribution requirements at the present time. For the projection of growth in the CSCAs, SPI developed a referencing system so that detailed modeled growth projections from a representative 15% sub-sample could be applied to hexagons with similar environmental conditions throughout the ownership. That provided a process that allows us with reasonable confidence to estimate and display spatially the Territory Opportunity trend over time, for the entire hexagon set. Additionally, SPI is continuing the spatial modeling across its land base, and will substantially complete that over the next 5 years. The analytical method is described in more detail in Sec 7.2.4 and in Appendix O.

7.2.2 Hexagon Habitat Contribution Testing Methods

Each modeled or referenced hexagon has been categorized by the values from data gathered on SPI lands within that hexagon, which provides a fisher hexagon classification. In some cases SPI owns the entire hexagon. In other cases SPI owns only a portion of the hexagon. For a hexagon to be included in the analyzed set, SPI must own at least 50 acres of Capable Land. Since the minimum criteria for 2nd order selection is a 50-acre Contiguous Core Stand, if the ownership within the hexagon was not capable of providing a 50-acre den stand at any time in the future, we took it out of the analysis set. Based on the data collected on the portion of SPI ownership within each hexagon, the constituent Habitat Forms and thus its potential contribution to a territory are assigned. The SPI ownership within modeled and referenced individual hexagons has been tested for three conditions that will distinguish them for their fisher hexagon status (i.e. Territory Core, Support Core, or Currently Below Threshold (CBT)). The three variables tested are:

a) At least 30% HF4
b) At least 50% HF4 and/or HF2Hv

c) At least one contiguous 30 ac. stand of HF4, which is also contiguous to at least an additional 20 ac. of HF2Hv, for a total of 50 ac.

Testing using logic expressions that return Yes (Y) or No (N), results in 8 potential outcomes for tests a), b), and c): YYY; YYN; NYY; NNN; NNY; YNN; NYN; YNY.

Hexagons that return YYY for the variables a), b), and c) are considered a Territory Core. Territory Cores have a value score of five. Hexagons that return YYN, NYY, or NYN are considered a Support Core. Support Cores have a value score of one. Hexagons that return YNY, YNN, NNY, or NNN do not meet the Support or Core habitat thresholds, and even though they likely provide foraging habitat, are considered Currently Below Threshold (CBT) for the purposes of Territory Opportunity accounting. Currently Below Threshold hexagons receive a value score of zero. While these hexagons are classified as Currently Below Threshold, this is often because these hexagons do not meet one of the minimum thresholds to qualify as a Territory Core or Support Core. However, they are generally forested areas that are close to the habitat thresholds of HF2Hv and HF4 and contribute some degree of habitat (See Figure 7.2.7-2). Assigning values to individual hexagons and Territory Opportunities is discussed in section 7.2.5.

7.2.3 Habitat Contribution Assumptions

The SPI ownership pattern in the Enrolled Lands is generally discontiguous, with large areas of "checker board" ownership or irregular parcel configurations. Fishers are wide ranging and have a relatively large home range. Therefore, a habitat evaluation must evaluate the landscape in aggregate, at a scale important to fisher survival.

This CCAA uses 2,000 non-overlapping acres, representing the scale of female home ranges, as the primary scale to aggregate habitat and assess potential harm by habitat modification. In order to aggregate habitat at the 2,000-acre scale, where the Enrolled Lands are discontiguous or in irregular parcel configurations, the intervening ownerships need to be accounted for. Accounting for the habitat condition on other ownerships will allow for reasonable estimations of the presence of suitable habitat in aggregate (2,000 acres), and therefore will allow for a reasonable estimation of the available habitat available from SPI's management decisions and of harvest impacts to habitat (harm) at a scale meaningful to fisher.

The random distribution of hexagons across the Enrolled Lands provides a matrix to assess and aggregate the available habitat for fisher at the female territory scale. SPI's inventory data is easily evaluated at this scale. The available data on adjoining properties is sufficient to assess the current habitat condition in a general sense, but cannot be used to project its future condition on those lands.

Because the adjoining property needs to be included in the analysis to aggregate habitat at a meaningful scale for fisher (i.e., the female territory scale) and because SPI must not rely on the other ownerships for providing benefit towards our accounting of fisher habitat, SPI designed its hexagon analysis accordingly.

To accomplish those goals, SPI used two primary assumptions that make the habitat accounting a conservative estimate of the current and future habitat conditions. The first assumption is that the other ownership within each hexagon has an equal or better habitat condition as that found on the portion of the hexagon owned and controlled by SPI. The second assumption is that the neighboring owner will harvest their property at an equal intensity and rate as SPI.

The first assumption is predicated on two observations. First, the other ownerships within a given hexagon are close enough to have similar environmental conditions such as precipitation,

slope, soils, and vegetation type (Mixed Conifer, Sierran Mixed Conifer, Montane Conifer Hardwood, etc.). Second, the primary adjacent landowner, the US Forest Service, has not managed their property as intensively as SPI in the past 20 years, so their mature forest habitats are probably as good as or better than those on SPI within each corresponding hexagon. We evaluated those assumptions as discussed below.

To check the first assumption, the habitat conditions on other ownerships in the Occupied Range were estimated using remotely-sensed data from the CALVEG system (2014). These data do not contain the same detail provided by SPI's forest inventory plot system, and therefore cannot be used to project its future condition; however they do provide the ability to characterize the vegetation in its current condition. The CALVEG data also reports habitat classes, which other remotely sensed data such as Land Fire (2013) and GNN (2012) currently do not. Land Fire and GNN currently can provide estimates of the density of vegetation species occurrence at a site, but those multiple and independent vegetation values have not been synthesized into habitat classifications. The habitat classes reported from CALVEG are the California Wildlife Habitat Relationship (WHR) habitat classes. Using the CALVEG WHR data (2014), SPI assessed all of the other ownerships in each hexagon in the occupied portion of the Enrolled Lands to evaluate the relative accuracy of projecting the SPI forest inventory onto the adjoining property (Other Owner).

The accuracy assessment involved a GIS process that "clipped" theCALVEG WHR habitat classification by the hexagon layer and the SPI ownership layer. TheCALVEG WHR habitat classes were then converted to the appropriate Habitat Form (Cal Veg Habitat Forms) using the associations found in Table 7.2.3-1 below. The Other Owner Habitat Forms on portions of hexagons that are not SPI could then be quantified in acres.

Next, the Other Owner Habitat Form acres were combined with the SPI Habitat Form acres for each hexagon. We called this result the combined ownership habitat values. The combined ownership habitat values were tested against our hexagon classification criteria (see Section 7.2.2) to determine the hexagon's overall fisher hexagon classification (i.e., Currently Below Threshold, Support Core, Den Core). Then the combined ownership fisher hexagon classification (CHC) was compared to the original fisher hexagon classification (OHC) based only on SPI only lands, to determine if the resulting estimate represented an decrease, equal, or increase in the fisher hexagon classification. For example, if the CHC resulted in a Support Core designation, and the OHC resulted in Currently Below Threshold, the test result would be considered an increase in the habitat classification and the OHC would be considered a more conservative classification. If the CHC resulted in a Currently Below Threshold designation and the OHC was Support Core, the OHC classification would be considered a decrease in the habitat classification and the OHC would be considered a less conservative classification.

Overall, the comparison of the CHC to the OHC showed that 95% of the time, the OHC was neutral or more conservative. In other words the CHC was equal or higher than the OHC. This means that using only the data available on the SPI portion of a hexagon to classify the whole hexagon's fisher habitat value, the outcome is a more conservative approach than using other "best available" data for other ownerships in combination with the SPI data. This testing of other "best available" data demonstrates that using only SPI data to classify the fisher habitat in each hexagon is accurate, conservative, and therefore appropriate.

Table 7.2.3-1: SPI Habitat Form association with CAL_Veg CWHR classes.

	Habitat Form						Habitat Form					
CWHR class	1	3	2L	2H	4	CWHR class	1	3	2L	2H	4
_D	x					2S	x				
_M	x					3D			x		
_X	x					3M			x		
0D	x					3P		x			
0P	x					3S		x			
0S	x					3X		x			
1_	x					4D					x
1D	x					4M				x	
1M	x					4P		x			
1P	x					4S		x			
1S	x					5D					x
1X	x					5M				x	
2D	x					5P		x			
2M	x					5S		x			
2P	x					6M					x

We then evaluated our assumption that the adjoining property will be managed at an intensity less than or equal to SPI. We asked specialists at the Bureau of Land Management (BLM) Redding District, and the Shasta-Trinity National Forest (STNF) Supervisor's Office about their future management activities planned in the occupied range of the fisher.

The BLM has designated the fisher as sensitive species, and with the listing decision pending, the BLM seeks and secures technical assistance for fisher from the FWS to achieve a standard of "not likely to adversely affect" (Gary. Diridoni, Fisheries and Wildlife Biologist; pers. comm.). BLM's future vegetation management practices will mostly involve improving forest health. The recent pace of 100 – 300 acres of timber harvesting occurring currently will likely continue into the future (Jeffrey Bellaire, Forester, pers comm.). Mr. Bellaire stated that the acreage of timber harvesting includes pre-commercial thinning and individual tree selection thinning.

The USFS also has designated the fisher as a sensitive species, and with the listing decision pending, attempts to achieve a standard of "not likely to adversely affect" (K. Wolcott, Wildlife Biologist; pers. comm.). The STNF (which manages about 2.2 million acres) annually treats approximately 5-6,000 acres with fuels treatments and 4,000 acres with timber sale or stewardship contacts, and expects a similar amount of treatments in the near future (G. Staudacher, Silviculturist, pers. comm). Fuels treatments include using prescribed fire alone or in conjunction with treating the understory vegetation to modify the potential fire intensity, with the objective of retaining the overstory trees and large down logs. Timber sale or stewardship contacts are almost exclusively thinning prescriptions, which focus on removing ladder fuels (suppressed and intermediate crowns) and thinning of co-dominant trees to increase forest health and resilience. The canopy cover after treatments varies with site conditions and habitat type. In areas designated as late successional, habitat treatments leave forested canopies as high as 50-70%.

Figure 7.2.3-1: Annual Timber Harvest Volume Public and Private (Bonham 2015)

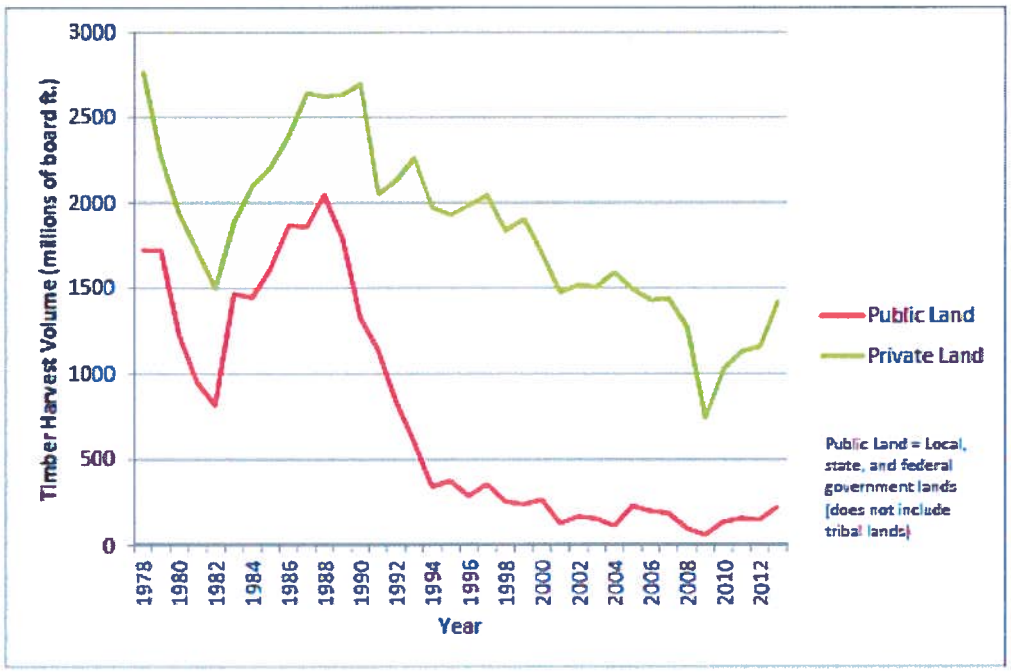
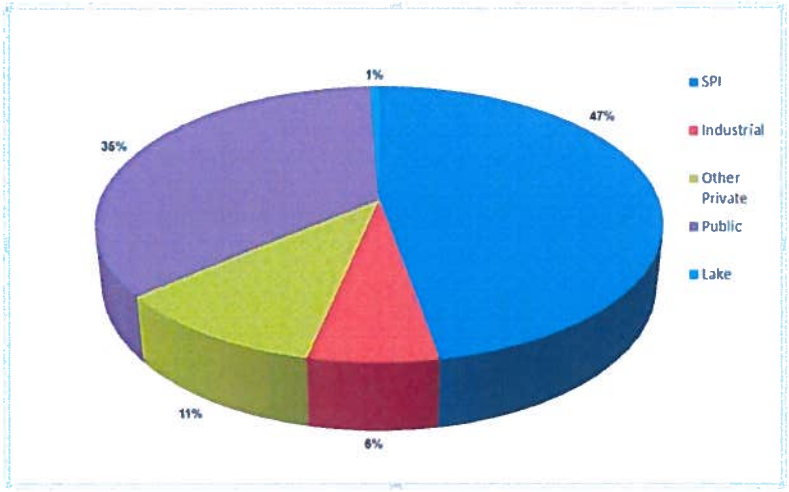


Figure 15. Volume of timber harvested on public and private lands in California (1978-2013) (California Timber Harvest Statistics n.d.).

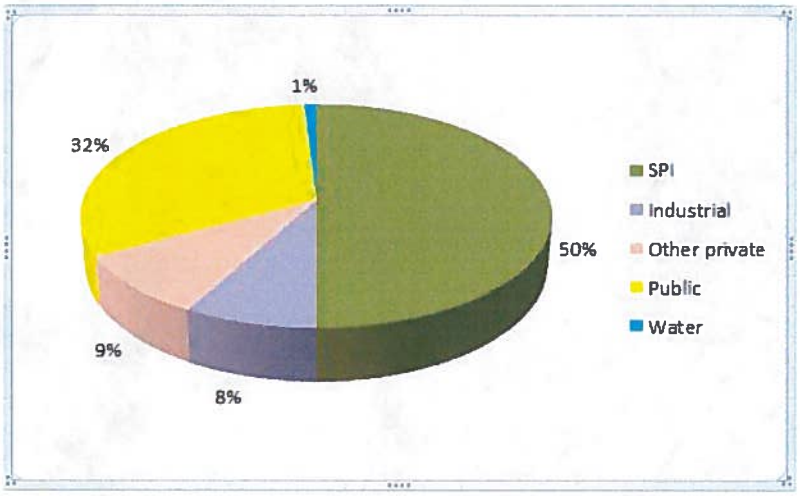
SPI owns approximately 6.4% of the area within the occupied range in northern California, while Federal forests comprise 52% of the total area. However, the proportional SPI forest ownership is higher within the qualifying hexagons. The Federal forest ownership is the next most commonly occurring contributor in qualifying hexagons other than SPI. The following figures show the proportional ownership found within the qualifying hexagons (which must contain ≥50 ac. of SPI Capable Land), analyzed in the Occupied and unoccupied range (Figure 7.2.3-2 and Figure 7.2.3-3). The spatial distribution of ownerships adjoining SPI is shown in Figure 7.2.3-4.

Figure 7.2.3-2: Percentage of Ownership within qualifying hexagons in Occupied and unoccupied range combined



SPI lands are also bordered by other private timberlands. These include both industrial and small timberland owners. Other industrial owners would be expected to employ all silvicultural prescriptions including clear-cutting, as part of their overall forest management plan. Therefore, harvesting timber on other industrial timberlands is anticipated to have an equal impact on fisher habitat as those practices conducted on SPI.

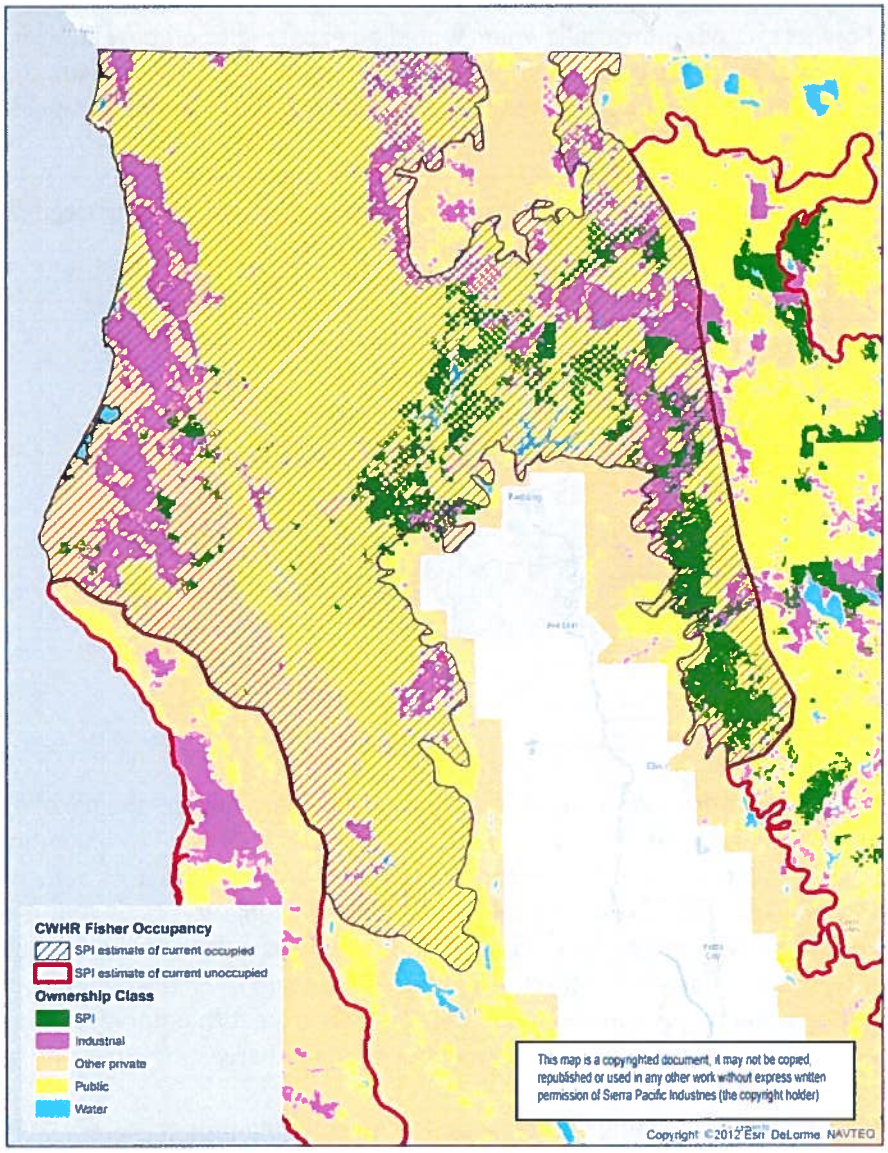
Figure 7.2.3-3: Percentage of Ownership within qualifying hexagons in the Occupied Range



Harvesting timber on other non-industrial private timberlands consists mainly of individual tree selection harvesting. Selection harvesting avoids the capital expense of tree planting required in clearcut harvesting. Due to the basal area stocking requirements of the CFPRs, selection harvesting requires that continuous forest cover be maintained. Removal of any non-merchantable biomass (down logs or hardwoods) is limited because it is rarely feasible to remove it economically; therefore the hardwood component is left relatively unchanged and the heterogeneity of the understory vegetation remains generally intact. Therefore, we expect that harvesting on non-industrial private ownerships is and will be less intensive than the harvesting occurring on SPI parcels.

Thus, considering that harvesting occurring on the neighboring properties will be equal to or less intensive than that planned on SPI property, it is appropriate to use the planned harvest intensity on SPI to estimate the habitat impacts on those other properties.

Figure 7.2.3-4: Ownerships adjoining SPI lands within the occupied range of fishers in northwestern California.



As stated earlier, the hexagon classification using only SPI data provides accurate habitat classification 95% of the time when comparing it to an evaluation that combines SPI data and remotely sensed CALVEG data from other ownerships. The harvesting on SPI is equivalent to or more impactful than the habitat impacts caused by the neighbors' harvesting activity. Therefore a method of analysis that uses 1) only SPI forest inventory data to characterize the habitat in the whole hexagon, and 2) planned SPI harvesting to account for habitat impacts, is appropriate for estimating the current hexagon habitat condition and its trend over time.

The total number of Territory Opportunities will be calculated in whole numbers and will be representative of the number of Territory Opportunities that SPI directly supports through its proportional contribution within each qualifying hexagon. This accounting method recognizes that the habitat condition on the adjoining property is not under the control of SPI, but the analysis accounts for adjoining property by conservatively estimating the likely habitat condition on those properties in a manner that accounts for the "worst case" scenario that involves both the federal lands and other private owners.

This method of quantifying benefit is not intended to estimate the number of female fisher that are or will be present, but instead will demonstrate the change in habitat contribution by SPI at the beginning and completion of the permit period quantitatively and at spatially relevant scales.

7.2.4 Modeling Future Hexagon Conditions

As discussed in section 6.4, SPI has invested in detailed ground-based inventory point plot methodology at an approximate resolution of one sample plot point every 4 ac. of SPI ownership, laid out on a 4-chain by 10-chain grid. The level of detail provided by this measured inventory of point plots allows very precise estimation of stand parameters, and as discussed in Section7.2.3, a good estimate of the other ownerships in each hexagon. This detailed data provides the necessary information to use computer-based growth and yield models to project harvest and growth with high reliability into the future. This data and GIS technology was used by SPI to develop its 100-year plan used to demonstrate long-term sustainability under the California sustained yield regulations. The accuracy of these inventory techniques and growth projections were reviewed and validated by CAL FIRE in its approval process of the SPI Option A sustained yield document. This original effort was non-spatial, and therefore had limited value for examination of distribution and location-specific estimation of territory opportunities for wildlife.

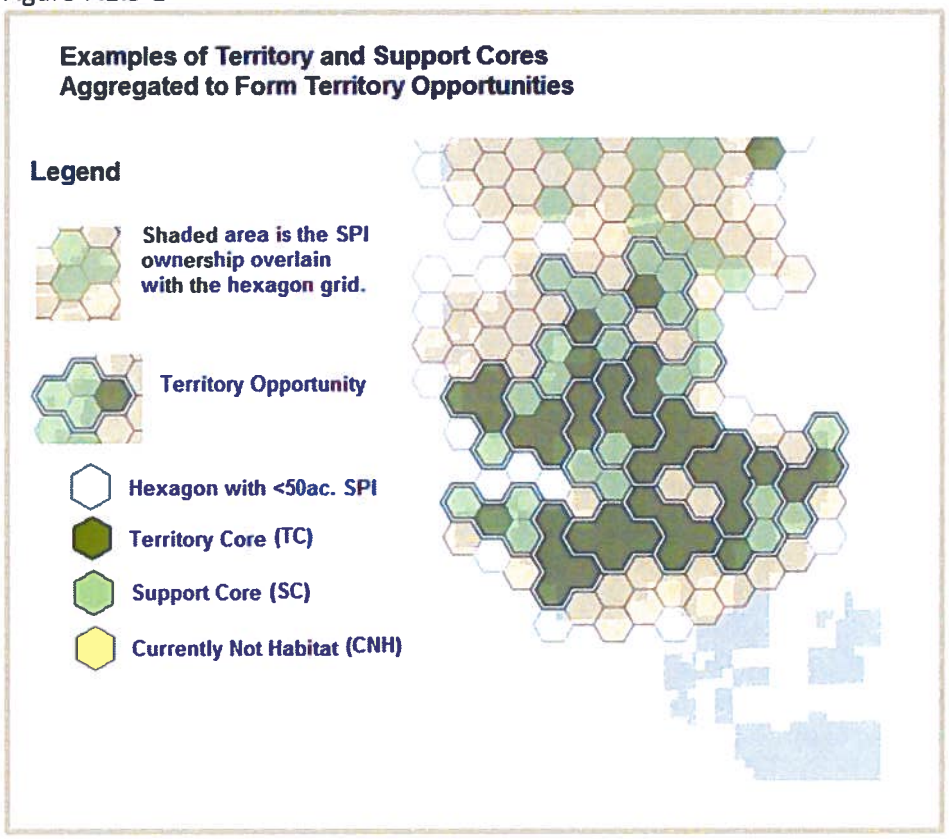
Since that original planning effort, SPI has begun a more detailed spatial application of these GIS tools, both for wildlife habitat analysis and for development of carbon sequestration estimation for the carbon offset market. The individual carbon sequestration projects are referred to by SPI as Carbon Assessment Areas (CAA). The CAAs are evaluated by the California Air Resources Board (CARB) for accuracy and compliance with the Cap-and-Trade Regulation (Title 17, California Code of Regulations, §95800 – 96022). To date SPI has completed seven CAAs including spatially specific level of future projections of harvest, growth and habitat changes over time on 241,783 acres.

Following similar efforts from Raphael et al. (1998, p. 68) for NSO's in the 1990s, who used hexagonal analysis systems to model NSO populations over time, we have developed a hexagon analysis methodology to analyze habitat conditions at various scales overtime. The continuous network of hexagons was overlaid across the Enrolled Lands from a random starting location south and west of SPI's land base in California. The SPI ownership intersected 6,651 hexagons in the hexagon network. Of those, 1,481 had less than 50 ac. of SPI land (totaling 26,753 ac., or 1.8% of the ownership, excluding the eastside CSCAs) within their perimeter, and therefore were not included in any further analysis. The 50-ac. minimum contribution of Capable Land to a hexagon by SPI was established because this is the minimum size of a den stand, which is the smallest piece of strata contributing to a fisher Territory Opportunity. The remaining 5,170 hexagons (1,432,136 ac.) that met the ownership criteria included 802 hexagons (241,783 acres) which had detailed spatial future modeling completed. Using a detailed specific referencing system we were able to use a performance index to reference "adopt" each of the other 4,368 hexagons to one of these 802 hexagons, which do have extensive spatially related inventory data. A detailed description of this methodology is available in Appendix O. The analysis provided a process that allows us with reasonable confidence to estimate and display spatially the change in the entire hexagon set (5170 hexagons) over the term of the permit and the next 30 years beyond that initial 10 years. Additionally, SPI is continuing the spatial future modeling across its land base and will have substantially completed that over the next 5 years.

7.2.5 Identifying Territory Opportunities

As stated in Section 7.1.6.4, a suitable Territory Opportunity for female fishers will be composed of at least one Territory Core and three more adjacent Territory or Support Cores that together make up 2,000 acres. The hexagon value (5, 1, or 0) are inferred based on the stand inventory data (starting condition) on SPI land and the referencing process associated with the hexagon modeling analysis. To count a fisher Territory Opportunity, one Territory Core will need to be adjacent to at least 3 Support or Territory Cores. Adjacency is satisfied when a Support Core is touching the Territory Core or if it is touching another Support Core that is directly touching a Territory Core. Whether in a line or clustered, our adjacency rule requires that a linear distribution of support core hexagons is limited to a maximum length of two, if an additional Territory Core is not present. A representative sample of how hexagons may be aggregated to form Territory Opportunities is shown in Figure 7.2.5-1.

Figure 7.2.5-1



As used by SPI, a Territory Opportunity for fisher (Territory Core + 3 Support Cores) may take on a branched appearance due to the distribution of suitable hexagons. Niblett et al. (unpub. data) reported female fisher at the SWSA had both branched and more circular shaped territories. However, when identifying potential Territory Opportunities the most compact configuration of hexagons has been utilized, while maximizing the Territory Opportunity count.

The hexagon quality score for a Territory Core, Support Core and Currently Below Threshold is five, one and zero respectively. The hexagon quality scores are used to determine the Territory Opportunity quality ranking (Q score). The Q score can be 8, 12, 16, or 20 depending on the number of Territory Cores that contribute to the Territory Opportunity. Because Territory Cores have a higher habitat threshold for average stand diameter (QMD), canopy, and large trees, these hexagons may be considered better habitat than those with a lower score. The relative abundance and

distribution of this higher quality habitat, in amounts and juxtaposition favorable for a female fisher therefore, can be expressed in the Q score of Territory Opportunities in each CSCA (Appendix A).

Using the complete set of modeled hexagons described in section 7.2.4, which classified all the hexagons as Territory Core, Support Core, or Currently Below Threshold and the rules for aggregating hexagons into Territory Opportunities described above, the Enrolled Lands were allocated into Territory Opportunities for the analysis period. The objective for this exercise was to aggregate as many qualifying hexagons as possible into Territory Opportunities at the beginning of each decade of the analysis period. After the Territory Opportunities were identified in each decade, harm accounting (Section 7.2.6) could occur by modeling the anticipated harvest effects on the individual hexagon score (5, 1, 0) and the overall Territory Opportunity Q score.

7.2.5.1 Identifying Barriers to a Territory Opportunity

The Enrolled lands have natural and man-made features that could potentially be barriers to the establishment of a Territory Opportunity. The Occupied CSCAs were evaluated for "Barriers" that could negatively affect the ability of a female fisher to use a Territory Opportunity that spanned such an obstruction. The barriers that were reviewed were highways, rivers, lakes, and towns. The highway identified as a barrier was Interstate 5, due to its 4-lane width and median barrier. Highway 299 was considered a barrier where it was associated with either the Trinity River or large cuts/fills that permanently removed large portions of habitat within the subject hexagons. The Pit River was identified as a barrier where it formed portions of hydroelectric impoundments. There were 7 hexagons considered "barriers" to use along Trinity Lake. All of the identified barriers occur in the Bully Choop, Trinity Mountain and Redding South CSCAs. The hexagons affected by these natural and man-made features were designated "barriers" and excluded from contributing to a Territory Opportunity.

7.2.6 Modeled Harm Accounting

Continued harvesting in fisher habitat has the potential to result in "harm" as defined in the ESA and regulations (see CCAA Section 9 below). Therefore, we must develop criteria for estimation of harm. In this CCAA the existing Territory Opportunities will be used to quantify the amount of harm that occurs as the result of timber harvesting in fisher habitat.

A Territory Opportunity is a set of 4 hexagons that meet the requisite quality class and spatial positioning rules to be considered a Territory Opportunity. While the identification of Territory Opportunities in Section 7.2.5 required maximizing the number of Territory Opportunities, their delineations were arbitrary since numerous different configurations may have been possible while achieving the same number of Territory Opportunities. In order to measure harm consistently the original Territory Opportunity configurations are considered "fixed" for the purposes of harm accounting.

Modeled harm for this CCAA is defined as a negative change in habitat in hexagon(s) that causes a reduction in either habitat quality or spatial arrangement such that an existing Year 0 Territory Opportunity no longer qualifies at the end of the decade. Harm is not considered to have occurred if there is a reduction in habitat quality in hexagon(s) that are not contributing to a Territory Opportunity. This assumes that if there weren't enough suitable habitats available to form a Territory Opportunity, then a female fisher would not den there due to a lack of available resources.

At the beginning of a decade (Year y), the model subjects all hexagons to the entire anticipated decades' harvest. Year 0 is the beginning of the permit period, and y + 10 (Year 10) for

the beginning of the second decade and end of the permit term). The effect on individual stands is calculated, and then stand growth is modeled ("grown") for 10 years. The resulting stand conditions are then evaluated and reclassified to produce the year y +10 hexagon values (5, 1, or 0). The harm accounting process overlays the original Territory Opportunity hexagon configuration at Year 0 onto the subsequent decade's "beginning" hexagon classification (year y + 10 or Year 10). A comparison determines if those same hexagons that formed a Territory Opportunity in Year 0 are capable of forming the same Territory Opportunity following the harvest and growth that occurred during that decade.

Harm accounting for this CCAA relies on the premise that all Territory Opportunities are maximized at each accounting period. This is important because it causes the maximum number of hexagons to be included in a Territory Opportunity and thus the maximum potential for harvest effects on suitable fisher habitat to be evaluated.

The harm analysis identifies two kinds of changes in contributing hexagons that result in the assignment of an instance of harm. The first category of harm pertains to a Territory Core or Support Core, classified in year y, being reduced in habitat quality such that its classification in the subsequent decade (year y+10) is Currently Below Threshold.

The second category of harm pertains to a Territory Core being reduced in habitat quality such that its classification in year y +10 is Support Core. This change in habitat quality may be ameliorated if there is another Territory Core within the Territory Opportunity in Year y and that Territory Core remains in Year y+10.

For the purpose of this exercise, only one instance of harm can be assigned in a given Territory Opportunity within a decade because the modeling only evaluates (harvest and growth) in the Territory Opportunity once a decade. The potential discrepancy between the modeling results and the current vegetation condition and actual effects of a THP will be adjusted through the THP harm accounting described in Section 7.2.10.

The harm accounting tracks and accounts for the overall quality of Territory Opportunities available in year y as compared to those same territory delineations in y+10. This harm accounting is displayed, using patterned symbology, as a stacked column between decades in Appendices B, C, D, and E.

Examples of when harm occurs:

In a Territory Opportunity, if there is a single Territory Core in hexagon 1) and adjacent hexagons 2, 3, and 4 are Support Cores, and hexagon 1 changes to Support and hexagons 2, 3, or 4 become the Territory Core hexagon, "harm" has occurred. This is because the timing of the growth that occurred in hexagons 2, 3, or 4 relative to the timing of the harvest is unknowable at this early stage of the CCAA. This method conservatively accounts for the projected harvesting in a worst case scenario. While this method of harm accounting provides an estimate of the expected level of harm, the actual "real-time" accounting of harm is discussed in Section 7.2.10 below.

In a Territory Opportunity, if there are two Territory Cores (hexagons 1 and 2) and hexagons 3 and 4 are Support Cores, and hexagon 1 changes to Support and hex 2, 3, or 4 remain the same quality, "harm" has NOT occurred. This outcome reflects the persistence of den habitat (Territory Core) through the decade. The reduction of habitat quality within the Territory Opportunity will be reflected by the Territory Opportunity quality score being reduced from Q=12 to Q=8.

7.2.7 Hexagon Analysis Results

The hexagon analysis spans 30 years. While the analysis time frame is much longer than the proposed permit term, it was conducted and included in order to demonstrate the longer term

trend in Territory Opportunities across all of the Enrolled Lands anticipated by SPI's management decisions. The following management decisions are responsible for the positive trend:

1) Restricting the overall harvest rate (Non-declining yield),

2) Restricting the quantity of regeneration harvesting in the Mixed land class (maintaining the Mixed land class) such that >50% of the existing Mixed land class is retained during the first ten years,

3) Placing regeneration units without prioritization by Site, Volume, Age, (i.e., cut according to what's in the landscape, "the average"),

4) Requiring placement of regeneration units adjacent to a previous decade's regeneration unit. This adjacency rule combined with the slowing rate of regeneration harvest, minimizes the fragmentation of the Mixed land class and stabilizes HF4 and HF2Hv stands in large (~200 acre) contiguous areas.

The management decisions, in combination, increase the number of Territory Opportunities through the 10 year permit period and beyond, as represented in Figures 7.2.7-1 and 7.2.7-2. As shown in Figure 7.2.7-1, in the Occupied Range, the number of Territory Opportunities is initially 224 and will grow steadily to 257.

Figure 7.2.7-1: Occupied Range - Net Territory Opportunities, and Territories Lost, and Territory Opportunities per 10,000 ac. (TOD) During the Permit Term.

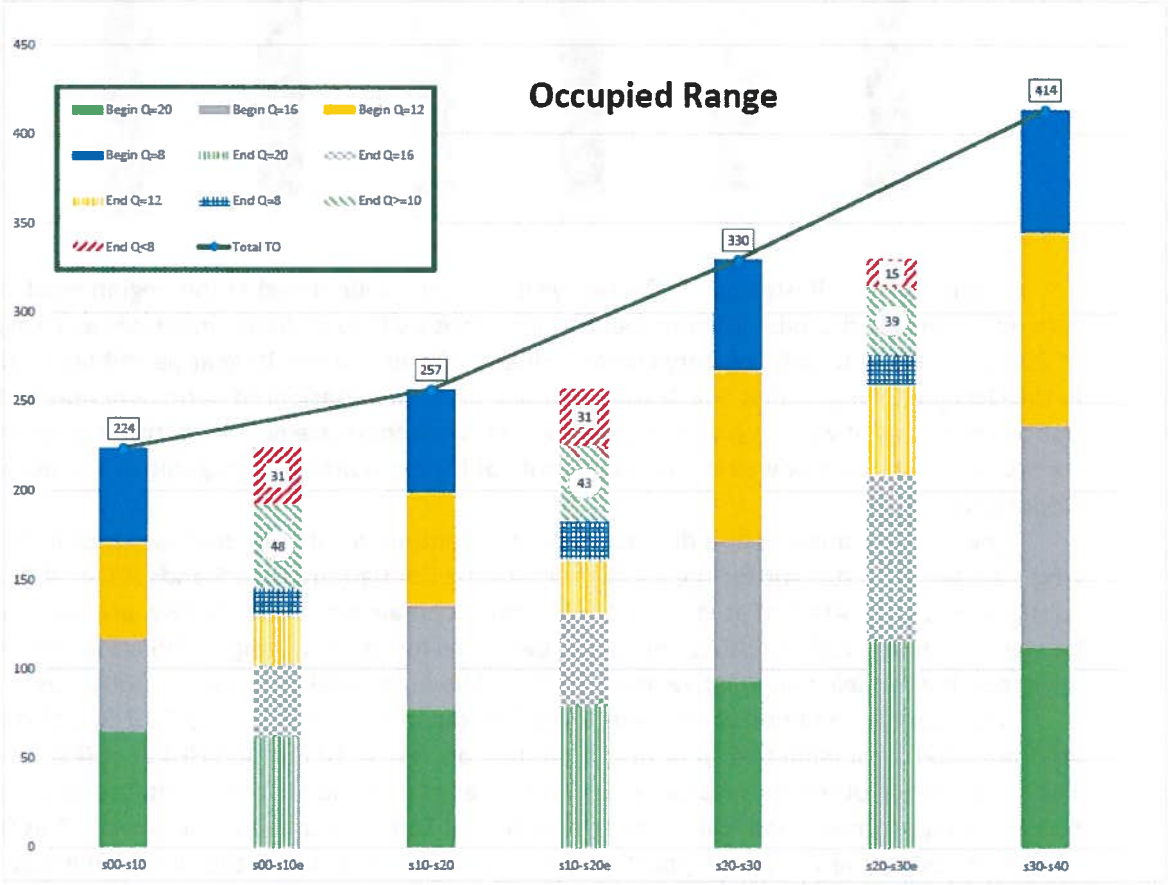


Figure 7.2.7-2 Territory Opportunities trend for the Enrolled Lands

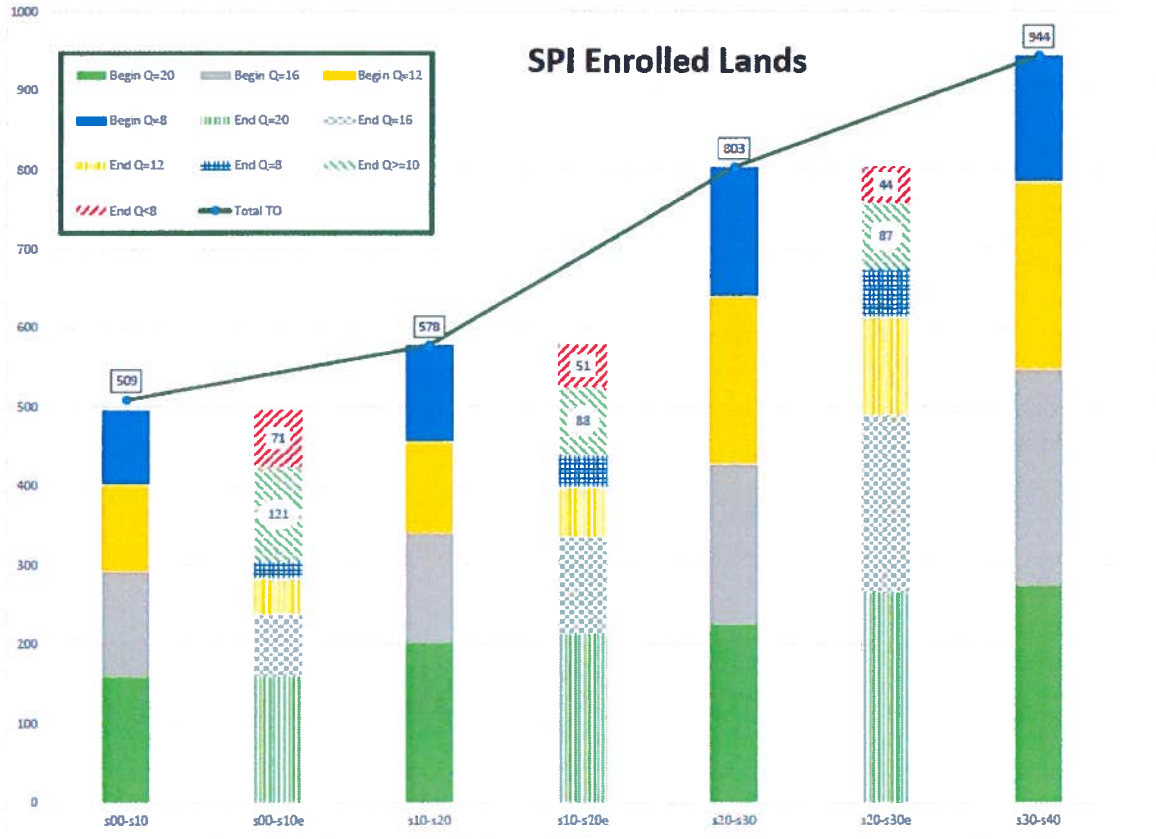


Figure 7.2.7-2 illustrates 514 Territory Opportunities identified at the beginning of the permit term in the Enrolled Lands. The number of total Territory Opportunities increases at an average rate of 26% per decade to 586 Territory Opportunities at the end of the 10 year permit term. Note that in the Occupied Range a loss of a Territory Opportunity was considered harm, whereas in the unoccupied range it was simply recorded as a loss (since there are no fishers there to harm). These trends demonstrate how well the gross quantity of fisher habitat is aggregated in Territory Opportunities.

The hexagon analysis also demonstrated the continued cohesion of den stands in the Mixed land class with the statistic for the average size of the **Contiguous Core Stands** (CCS). A CCS is a contiguous stand ≥50 ac. of at least 30% HF4 and/or containing up to 20% 2Hv, present in a hexagon. In the Occupied CSCAs, the CCS in individual hexagons averages 206 ac. in year zero, and in year 30 the modeled cumulative area of CCS will be quite similar, averaging 200 acres.

The average condition of SPI lands in each hexagon is shown in Table 7.2.7-3, including; amount of SPI ownership and amounts of Habitat Forms HF4, HF2Hv and HF4 and HF2Hv combined. The maintenance of relatively large contiguous areas of den and support habitat, at the scale of a 500-ac. hexagon, means that the number of potential Territory Cores is maintained. This fact is demonstrated by the Territory Opportunity quality scores (Q score) in the Occupied Range remaining steady (see Appendix A).

Table 7.2.7-3 – The Average Acres of SPI Ownership in Each Fisher Hexagon

All Hexagons

	Den Core Hexagons (YYY)					Support Core Hexagons (YYN, NYY, NYN)					Currently Below Threshold (YNY, YNN, NNY, NNN).					
Year	Average Size (ac.)	n	Acres HF4	Acres HF2Hv	% HF4 & 2Hv combined	Average Size (ac.)	n	Acres HF4	Acres HF2Hv	% HF4 & 2Hv combined	Average Size (ac.)	n	Acres HF4	Acres HF2Hv	% HF4 & 2Hv combined	Hexagon # Check
0	324	1476	176	76	76%	247	1414	32	135	72%	265	2280	23	41	23%	5170
10	317	1717	182	50	73%	245	1727	32	141	69%	270	1726	34	44	29%	5170
20	317	2305	170	60	71%	247	1673	47	137	73%	241	1192	35	39	32%	5170
30	316	2721	156	80	74%	235	1642	48	123	74%	231	807	43	34	36%	5170

Occupied Range Hexagons Only

	Den Core Hexagons (YYY)					Support Core Hexagons (YYN, NYY, NYN)					Currently Below Threshold (YNY, YNN, NNY, NNN).					
Year	Average Size (ac.)	n	Acres HF4	Acres HF2Hv	% HF4 & 2Hv combined	Average Size (ac.)	n	Acres HF4	Acres HF2Hv	% HF4 & 2Hv combined	Average Size (ac.)	n	Acres HF4	Acres HF2Hv	% HF4 & 2Hv combined	Hexagon # Check
0	338	606	178	77	77%	257	641	38	134	73%	272	1078	25	41	24%	2325
10	336	718	182	53	71%	246	771	33	131	68%	278	836	37	40	29%	2325
20	329	925	172	56	70%	261	784	47	137	70%	250	616	31	37	31%	2325
30	319	1193	153	89	75%	249	751	53	123	74%	251	381	40	37	36%	2325

Un-Occupied Range Sierra Cascade Hexagons Only

	Den Core Hexagons (YYY)					Support Core Hexagons (YYN, NYY, NYN)					Currently Below Threshold (YNY, YNN, NNY, NNN).					
Year	Average Size (ac.)	n	Acres HF4	Acres HF2Hv	% HF4 & 2Hv combined	Average Size (ac.)	n	Acres HF4	Acres HF2Hv	% HF4 & 2Hv combined	Average Size (ac.)	n	Acres HF4	Acres HF2Hv	% HF4 & 2Hv combined	Hexagon # Check
0	313	840	174	75	75%	209	511	35	116	73%	221	699	33	29	26%	2050
10	299	942	181	47	74%	204	528	31	126	71%	232	580	41	39	31%	2050
20	300	1098	168	55	71%	186	497	39	107	75%	226	455	42	38	33%	2050
30	305	1143	157	74	74%	196	613	43	104	73%	190	294	37	29	35%	2050

Un-Occupied Range Eastside Hexagons Only

	Den Core Hexagons (YYY)					Support Core Hexagons (YYN, NYY, NYN)					Currently Below Threshold (YNY, YNN, NNY, NNN).					
Year	Average Size (ac.)	n	Acres HF4	Acres HF2Hv	% HF4 & 2Hv combined	Average Size (ac.)	n	Acres HF4	Acres HF2Hv	% HF4 & 2Hv combined	Average Size (ac.)	n	Acres HF4	Acres HF2Hv	% HF4 & 2Hv combined	Hexagon # Check
0	373	30	200	112	80%	297	262	11	174	67%	310	503	4	59	19%	795
10	373	57	188	75	71%	293	428	32	177	66%	318	310	12	63	25%	795
20	348	282	171	92	75%	298	392	56	177	75%	251	121	31	59	37%	795
30	340	385	163	71	69%	284	278	48	166	75%	268	132	67	40	38%	795

The overall trend of increasing Territory Opportunities across the Enrolled Lands is due to several factors. First, the increase is due to increasing QMD in today's younger Mixed stands, which will bring them into HF2Hv and HF4. Thus, even while the total amount of Mixed land class decreases due to harvest, the quantity of HF2Hv and HF4 Mixed increases due to growth in the remaining Mixed stands. Over time, a mosaic of relatively large (>50 acre) stands of HF4 and HF2Hv will persist in the Mixed stands as adjacent HF2 and HF2Hv stands grow into the HF4 and HF2Hv categories. These large stands will persist because SPI's even-aged management strategy includes a decrease in the acres regenerated over time, and because our self-imposed constraint places regeneration harvest units adjacent to the previous decade's unit in future decades. The theoretical minimum SPI acreage in hexagons contributing to a Territory Opportunity (200 ac. SPI) never occurs; in fact the average SPI ownership for all individual hexagons is 278 ac. (See Table 7.2.7-3) and the average SPI ownership in Territory Opportunities is 1,275 acres (see Appendix A).

Regarding the available habitat for fisher found in the "remainder" of the hexagon, the Table 7.2.7-3 indicates that the average amount of HF4 and HF2Hv in Territory Core hexagons are 176 acres and 76 acres, respectively. The amount of HF4 and HF2Hv in Territory Support hexagons are 32 acres and 135 acres respectively, and the amount of HF4 and HF2Hv in "Currently Below Threshold" hexagons are 23 acres and 41 acres respectively. The average SPI ownership in Territory Opportunities is 1,318 acres, of which, 551 acres is HF4 (43%) and 339 acres is HF2Hv (27%)(See Appendix A). The vegetation conditions on other ownerships within the hexagon are discussed in Section 7.2.3.

7.2.9 Summary: Territory Opportunity Trends

Overall the trend in Territory Opportunities is increasing across all of the Enrolled Lands. The positive trend occurs due to the following management decisions:

1) Restricting the overall harvest rate (Non-declining yield),

2) Restricting the quantity of regeneration harvesting in the Mixed land class (maintaining the Mixed land class) such that >50% of the existing Mixed is retained during the ten-year permit period,

3) Placing regeneration units without prioritization by Site, Volume, Age, (i.e., cut according to what's in the landscape, "the average"),

4) Requiring placement of regeneration units adjacent to a previous decade's regeneration unit. This adjacency rule combined with the a planned decline in the rate of regeneration harvest, minimizes the fragmentation of the Mixed land class and stabilizes HF4 and HF2Hv stands in large (~200 acre contiguous areas)

The proportion of regeneration harvest in the Mixed land class is small (approximately 1.8% per year or 18% total within the term of the permit) compared to the total, and therefore results in only an incremental decreases in the quality of some hexagons, while the remaining hexagons improve in habitat quality. The "harm accounting" column (Figures 7.2.7-1, 7.2.7-2, and Appendix B) is the column between decades that has the patterned symbology, which depicts this residual habitat quality remaining in the "harmed" and "unharmed" Territory Opportunities. The green, left angled stripe ( ) symbology represents the tally of Territory Opportunities with at least two Territory Cores remaining (Q score of 10, 11, or 15), even though the Territory Opportunity was lost. The resultant individual Q score for each Territory Opportunity where harm occurs is summed and depicted as a label on the colored symbology ( )or ( )in Figures 7.2.7-1 and 7.2.7-2. The net increase in Territory Opportunities is the result of management decisions that maintain these residual, high value hexagons, combining with other hexagons whose habitat has improved during that decade, to form new Territory Opportunities added to those Territory Opportunities that persisted without loss of territory status.

7.2.10 Annual Harvest Harm Accounting

The modeled future harvest harm accounting provides an initial estimate of the likely harm that will occur as the result of implementing the CCAA during the permit period. While the identification of Territory Opportunities in Section7.2.5 attempted to maximize the number of Territory Opportunities, their delineations were somewhat arbitrary, and other possible configurations might have achieved the same number of Territory Opportunities. However, the original Territory Opportunities delineations are considered fixed for the purposes of harm accounting (also see Section 7.2.6).

Regulations require that the USFWS be notified in advance when take is expected to occur (50 CFR 22(d)(3)(ii). The modeled accounting of potential harm does not provide adequate advance take notification. The actual timing of any harm that may occur will coincide with harvesting of individual timber harvest units. Therefore, in the Occupied Range of the fisher, the impacts of individual timber harvest units implemented during the permit period will be evaluated prior to planned harvesting annually to provide an advance accounting of harm occurrences and a cumulative tally of authorized take.

The annual review of potential harm described in this section will include all Year 0 Territory Opportunities. This review of potential harm occurrences associated with individual harvest units (regeneration and non-regeneration harvest areas) will be conducted in the following manner.

Wherever a proposed harvest unit intersects any portion of the hexagons contributing to a modeled Year 0 Territory Opportunity, SPI will conduct a site-specific analysis of the proposed harvest unit impacts on that Territory Opportunity prior to initiating Timber Operations. This annual harvest unit impact analysis will initially use the spatially explicit Year 0 (2012) stand data to establish a pre-harvest condition and hexagon value. SPI will use the most recent stand inventories if available. The annual proposed harvest units will be intersected with the most current pre-harvest stand data (including growth updates), and the resulting changes in stand condition will be calculated (i.e., subtracting the values of harvested acres from the pre-harvest acres), resulting in a post-harvest stand condition and post-harvest hexagon classification value (i.e. Core, Support, or Currently Below Threshold). The post-harvest hexagon classification values will then be applied to the original Territory Opportunity (using the criteria established in Section 7.2.2) to determine if harm will result from the annual proposed harvest units. Harm is considered to occur when the change in hexagon value causes the Territory Opportunity to no longer qualify, based on the rules established in Section 7.2.5.

Approved THPs are valid for seven years, and, depending on various environmental and business factors, may be operated wholly or partially during that period. Beginning February 28th, 2016 or as soon thereafter as the permit is signed, and on February 28th of each year thereafter, SPI will provide the USFWS a list of all harvest units planned for operations in the current calendar year that intersect a Territory Opportunity and are projected to cause harm (using the criteria established in Section 7.2.6).

Each year the projected harm occurrences will be updated based on actual amount of harvest accomplished. The actual cumulative harm will be compared to the total permitted harm. The updated harm report will be included with the list of current year planned timber harvest units provided to the USFWS by February 28th of each year, commencing after the first year of operations under the permit.

7.2.11 Landscape Evaluation using LEAFs

The Territory Opportunities are aggregations of four 500-acre hexagons, which meet both minimum acreage and habitat thresholds. These minimum acreage and habitat standards might be perceived as insufficient if considered in isolation. Therefore the following landscape scale evaluation is provided.

The successful long-term conservation of fishers is believed to require landscapes that provide habitats at several scales: stand, core, territory, and landscape. Raley (2012, p.26) stated, "Habitat use or selection by fishers was strongest and most consistent at finer spatial scales (third-and fourth-order selection)." The third and fourth order selection scales (i.e., the den/rest stand and den/rest structure (Raley et al. 2012, p. 5) were discussed previously in Section 7.1.6 of this CCAA.

Raley (2012, p. 26-27) stated that "Currently, there is limited information on the factors that may influence the selection of home ranges by fishers (second-order selection)." In this CCAA, we have analyzed habitat at the scale of second order selection in aggregations of suitable amounts of habitat for a reproducing female fisher. As discussed in Section 7.1.5.1 and 7.1.6, these aggregations occur within 2,000-acre areas that form important portions of annual female fisher home ranges and are designated as Territory Opportunities, and used for habitat and harm accounting purposes.

As noted by Lofroth et al. (2011, p.1) "There is no universally appropriate scale for investigating fisher habitat associations because the scale must match the questions being asked." The question at the larger landscape scale for this CCAA is whether the Territory Opportunities are near enough to other suitable fisher habitat that can provide foraging

opportunities, dispersal, and genetic interactions between individuals at a larger (population) scale, and thus influence population performance. For this CCAA, the landscape scale that will incorporate the distribution and connectedness of habitats at a larger landscape scale (first order) is a contiguous 10,000-acre area. The 10,000-acre size is thought to be appropriate because it can contain enough suitable habitat to allow one or more female fishers to reside and reproduce, provide some flexibility in the second order selection of habitat due to its size, and give their offspring the resources to establish their own home range or disperse into adjoining areas.

Our analysis of the first order landscape scale grouped the same hexagons used for evaluating habitat at the second-order scale (Territory Opportunities) into approximately 10,000-acre areas called a "Landscape Evaluation Area-Fisher" (LEAF). Because the Enrolled Lands are discontiguous or have irregular parcel configurations, each LEAF contained lands owned by SPI as well as land owned by others. The LEAF delineations were primarily intended to analyze the habitat composition available on SPI lands, so they focused on hexagons containing SPI ownership. The shape of a LEAF was meant to be compact, but sometimes they were elongated to accomplish connections between LEAFs and maintain a 10,000 acre size. Occasionally hexagons were excluded where they did not contain SPI ownership, even when they occurred in the middle of a LEAF.

The LEAF analysis used remotely-sensed vegetation data for non-SPI lands in combination with the SPI forest inventory plots to evaluate the extent of densely forested Mixed habitats and areas of sparse canopy cover at the 10,000-acre scale. The available remotely-sensed GIS data included CALVEG (2014), GNN (2012), and Landfire (2013). Using several habitat and acreage criteria in combination with the Year 0 Territory Opportunity distribution, the LEAF areas were evaluated for their capacity to provide conservation benefits for fishers. The initial criteria for evaluating LEAFs that might contribute to fisher conservation include the following:

1) The LEAF must be in the currently Occupied Range.
2) The LEAF must have >25% SPI ownership.
3) The LEAF must have at least one Year0 Territory Opportunity
4) The LEAF must have >50% combined HF2, HF2Hv, or HF4 in the Mixed land class, or equivalent vegetation size and density.
5) No more than 20% of the LEAF area may be devoid of vegetative cover.

The LEAF analysis was restricted to the Occupied Range because that is where the most important benefit to fisher can be provided during the term of the permit.

The 25% SPI ownership threshold is meaningful because it represents an area 25% larger than a Territory Opportunity (2,500 ac. versus 2,000 ac.). This amount of ownership is a reasonable threshold because where it is met, SPI's land contribution could support other suitable habitat in the LEAF outside the Territory Opportunity. This also limits consideration of conservation benefit to only those LEAFs in which SPI is a significant owner with respect to the amount of habitat required by fishers.

The quantity of 50% or more of dense forest is important because that habitat characteristic is strongly associated with fisher presence in southwestern Oregon and northern California (Lofroth et al. 2011, p. 42). The available quantities of Mixed HF2, HF2Hv, or HF4 or equivalent vegetation size and density were derived from the SPI forest inventory and a combination of CALVEG, Landfire and GNN. The GNN data estimated tree canopy cover, but provided no data on average stem diameter. Landfire data provided a shrub and tree canopy estimate, grouped into three broad categories.

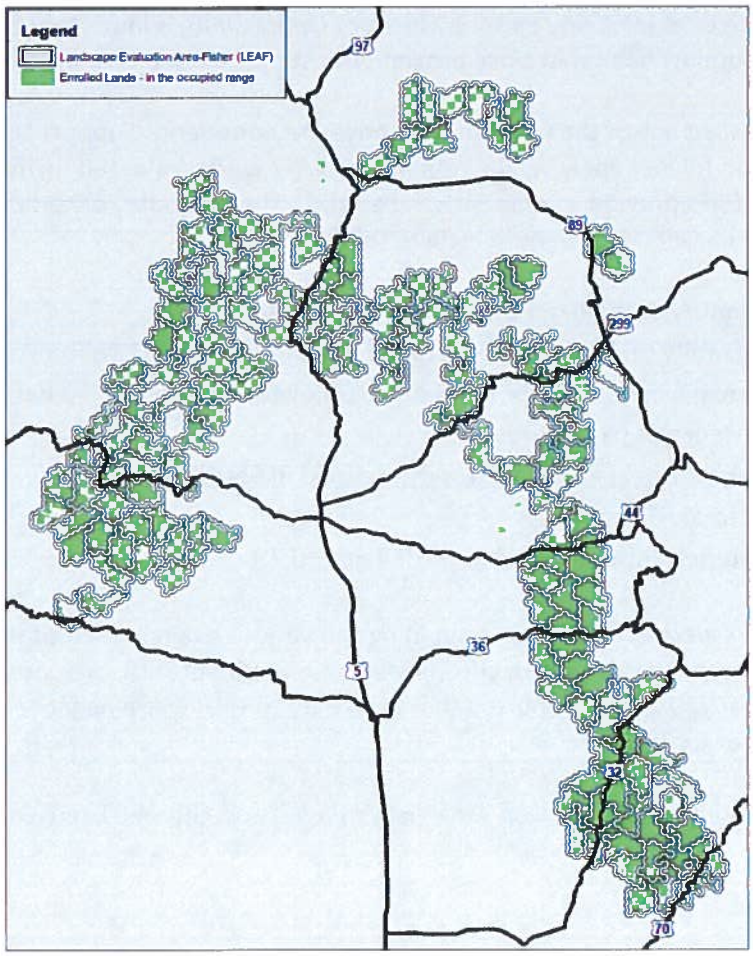
The presence of at least one existing Territory Opportunity is important because it provides enough den and support habitat in close proximity to support a denning female fisher and her offspring.

LEAFs that failed any of the four criteria above are considered Support LEAFs. After dropping Support LEAFs from further analysis, the remaining LEAFs were evaluated further to confirm that those remaining LEAFs provide a conservation benefit. The secondary criteria for confirming LEAFs that contribute to conservation benefit include the following:

1) Quantity of Wildland Urban Interface (WUI)
2) Proximity of Territory Opportunity to other high quality habitat (SPI or other owner)
3) Known fisher presence (FWS data compilation (unpublished data))
4) Presence of hardwoods
5) Presence of Legacy hardwoods (defined in Section 7.3.4.1.3)
6) Ratio of HF4 to HF2Hv
7) Distance between patches of HF4 and HF2Hv

These factors were evaluated by examining the various available remotely-sensed images and data. These other secondary, relative criteria, except quantity of WUI, are considered beneficial to fishers. Naney et al. (2012, p.2) reported that proximity to WUI was a negative factor reducing the suitability of habitat for fishers.

Figure 7.2.11-1: Landscape Evaluation Area-Fisher (LEAF) and Enrolled Lands in the Occupied Range



7.2.11.1 Conservation Benefit LEAFs

Of the 149 LEAFs evaluated, 54 met all of the above criteria (Sec. 7.2.11) and thus are designated Conservation LEAFs. The remaining 95 are designated as Support LEAFs, because they failed one or more of the Conservation LEAF criteria. However, Support LEAFs will provide breeding or dispersal habitat to some degree in association with the Territory Opportunities within them.

A Conservation LEAF will be designated a Conservation Benefit LEAF if it has any four hexagons that meet the definition of one Territory Opportunity in Year 0 and annually throughout the term of the permit. This standard for designation of a Conservation Benefit LEAF is appropriate because the Territory Opportunity (second order of selection) definition supports a denning fisher, and additional third and fourth order of selection habitat is available at the larger landscape scale (i.e., the 10,000-acre LEAF). Meeting the habitat requirements at these different scales will provide a matrix of widely-distributed habitat with the components to allow a female fisher to reproduce successfully and the young to disperse into adjoining areas, to potentially establish their own home ranges (in other Conservation LEAFs or Support LEAFs), and maintain a stable or growing population.

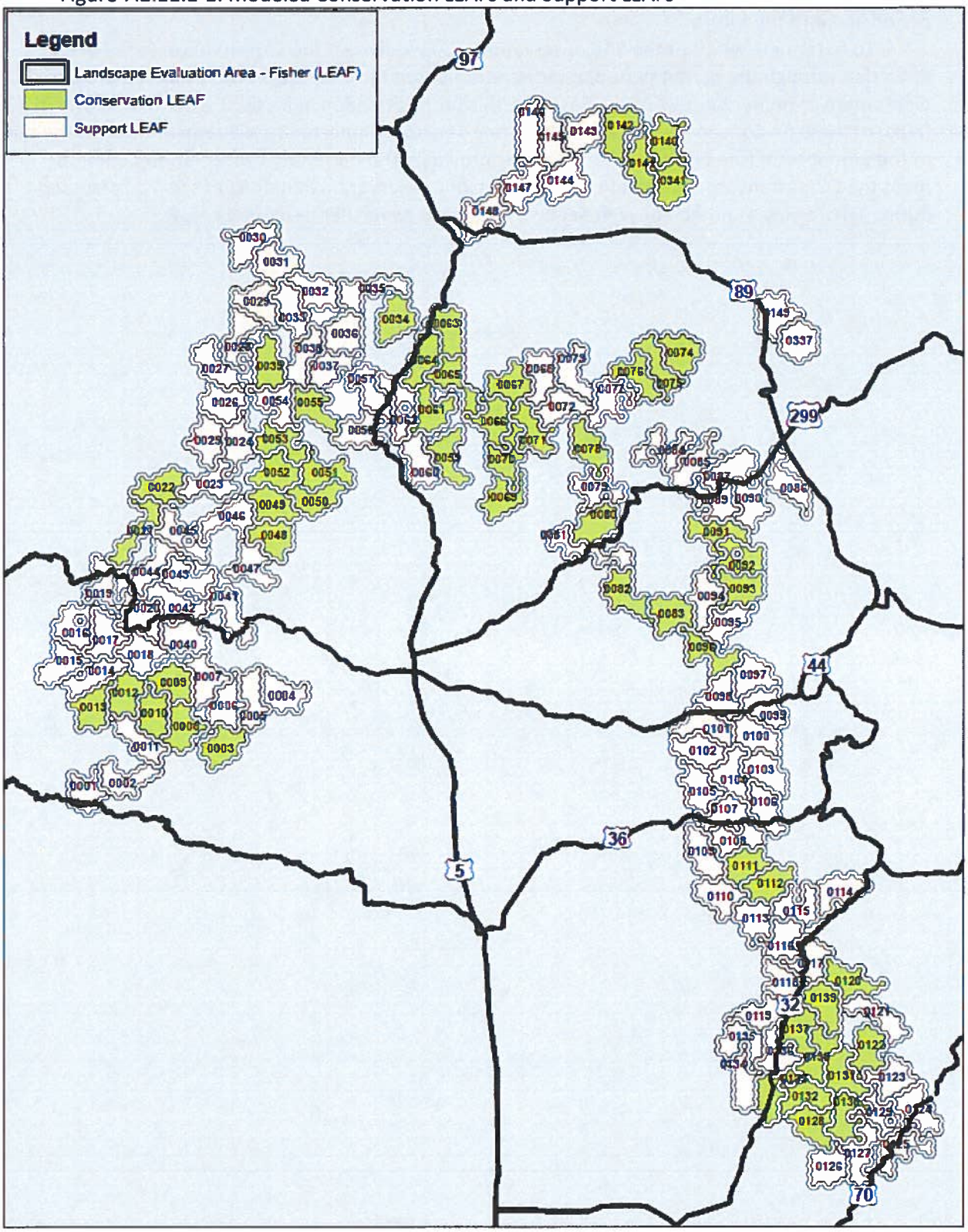
In combination with other measures in this CCAA, the Conservation Benefit LEAFs provide the means of meeting the CCAA policy standard regarding benefits of conservation measures (USFWS 1999; 64 Fed. Reg. , p.32727).

Based on the Draft Fisher Conservation Strategy (Finley et al. 2011) and guidance from the Service, SPI proposes that the CCAA will provide the necessary conservation benefit by maintaining at least 80% of the original Conservation LEAFs as Conservation Benefit LEAFs. These Conservation

Benefit LEAFs will be capable of continuing to support fisher populations throughout the permit period and into the future.

To determine whether the 54 Conservation LEAFs will meet the Conservation Benefit LEAF definition through the permit period, they were evaluated for potential harm, using the projected distribution of timber harvest units. Based on this projected harm analysis, it is estimated that in 43 (80%) of these 54 Conservation LEAFs at least one Territory Opportunity will remain through the end of the permit term (see Figure 7.2.11.1-1), thus providing the necessary conservation benefit to meet the CCAA standard. The continued function of Conservation Benefit LEAFs will be assessed during THP review as noted above in Section 7.2.10 and as further described below.

Figure 7.2.11.1-1: Modeled Conservation LEAFs and Support LEAFs



7.2.11.2 Conservation Benefit LEAF Accounting

As defined above in Section 7.2.11.1, a Conservation LEAF will be designated a Conservation Benefit LEAF if it has any four hexagons that meet the definition of one Territory Opportunity in Year 0 and annually throughout the term of the permit. When a harvest unit is proposed in a Conservation LEAF, a hexagon evaluation will be performed concurrently with the harvest unit(s) harm accounting (Section 7.2.10) to determine whether any four hexagons in the Conservation LEAF continue to meet the definition of a Territory Opportunity. Though take may occur through harvest within a Territory Opportunity, a conservation benefit can still be achieved if another Territory Opportunity can be identified using Year 0 hexagons.

The updated hexagon analysis will indicate whether any hexagon classification (See Section 7.2.2) will be modified to Currently Below Threshold (CBT) by harvesting. Any hexagon that is modified by harvest to CBT during the term of the permit will not qualify as one of the four hexagons contributing to the required Territory Opportunity. If this analysis indicates that a Conservation LEAF maintains a Territory Opportunity, it will remain a potential Conservation Benefit LEAF, pending the analysis of additional future harvest units.

7.3 CONSERVATION MEASURES AND STANDARDS

7.3.1 Introduction

Conservation measures provide the means for achieving the biological goals and objectives of a CCAA (65 Fed. Reg. p. 35251). These conservation measures will be included in individual Timber Harvest Plans (THPs) or Emergency or Exemption Notification in accordance with the CFPR, and related Covered Activities.

The primary biological goal of this CCAA is to provide sufficient habitat for life history needs of fishers to support populations across an important portion of their existing range, and secondarily, across a significant portion of their historic range in California. To achieve this biological goal, this CCAA will carry out four basic Conservation Measures.

Conservation Measure One establishes a goal of maintaining 80% of the 54 Conservation LEAFs as Conservation Benefit LEAFs.

Conservation Measure Two is to maintain at least 50% (roughly 700,000 acres) of the Capable Land in the Mixed Land Class for the duration of the permit.

Conservation Measure Three establishes provisions for retention of habitat elements for both regeneration harvest and non-regeneration silvicultural practices. These measures will provide for the retention and recruitment of desirable elements in future growing stands within and beyond the plan period. These provisions are discussed in sections 7.3.4 and 7.3.4.1 – 7.3.4.4.

Conservation Measure Four establishes standards for the rehabilitation of substantially damaged timberlands. These provisions are discussed in section 7.3.4.5 and include retaining habitat elements that will increase the habitat quality of these regenerating stands.

A second biological goal is minimizing the potential to kill or disturb a fisher. Two conservation measures address this biological goal.

Conservation Measure Five establishes provisions for identifying, avoiding, and protecting potential fisher den and rest structures during harvest operations in the denning period (thus minimizing the potential for taking through killing or harassing). These measures are discussed in sections 7.3.6.

Conservation Measure Six reduces drowning risk related to human facilities. These measures are discussed in section 7.3.7.

A third biological goal is to reduce the potential impact of exposure to hazardous materials or catastrophic fire. Two conservation measures address this biological goal.

Conservation Measure Seven is intended to reduce the potential impact of exposure to materials hazardous to fishers deposited as a result from trespass on the Enrolled lands. These measures are discussed in section 7.3.8.

Conservation Measure Eight is intended to reduce the potential impact of catastrophic fire by creating a strategic and systematic network of fuel breaks. These measures are discussed in section 7.3.9.

7.3.2 Conservation Measure 1: Maintenance of Conservation LEAFs

Conservation Measure One establishes a goal to maintain 80% of the Conservation LEAFs as Conservation Benefit LEAFs.

The Conservation LEAFs have been evaluated quantitatively and qualitatively using criteria important to fisher habitat. The annual evaluation of THPs will track Conservation LEAFs to ensure that 80% of the Conservation LEAFs will have at least one Territory Opportunity throughout the permit term. If the number of Conservation LEAFs falls below 80% of the initial value, this would constitute a Changed Circumstance as described in Section 11.1.2.

7.3.3 Conservation Measure 2: Maintain at least 50% in the Mixed Land Class

Conservation Measure Two is to maintain at least 50% of the Capable Lands in the Mixed Land Class for the duration of the permit. This goal is not spatially explicit and will be measured at the Enrolled Lands scale. This conservation measure provides a coarse measure of the available fisher habitat on the Enrolled Lands. If the amount of habitat in the Mixed land class falls below 50% of the amount of Capable Lands present at the beginning of the term of the agreement (about 700,000 acres), this would constitute a Changed Circumstance as described in Section 11.1.1

7.3.4 Conservation Measure 3: Management for Habitat Elements

The third Conservation Measure for this CCAA incorporates provisions for the retention and recruitment of Habitat Elements into harvest planning and operations. The retention standards are intended to allow the Mixed land class to continue and the Even land class to develop as prey producing, foraging, and denning habitat. As discussed in SPI (2013c, Appendix I), prey species for fishers rely on snags, down logs, brush, and hardwoods capable of significant mast production. Habitat elements are currently adequately represented in HF4, HF2Hv, and HF2 stands in the Mixed land class. By retaining habitat elements amid the climatic forces and biological processes that are formative to their natural development, the 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 Even land class stands to better function as prey production habitat as they develop through HF1, 2, and 2Hv. As these young stands mature, the elements retained from the previous stands, or that develop naturally through time from stochastic climatic forces and biological processes, will not only provide prey habitat, but also provide den structures within future stands of HF2Hv and HF4. These future HF2Hv and HF4 habitats are not expected to contribute to the fisher Territory Opportunities during the term of the CCAA, but are likely to do so later in time.

The primary provisions of this Conservation Measure are listed here. Further rationale and discussion of each provision is contained in subsequent sections. Provisions will be 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. Because these activities remove all the vegetation and overburden from a site it is infeasible to retain habitat elements.

A. SPI will retain "**Wildlife Trees**" (defined in section 7.3.4.1.2), where available, at a rate of one per 5 acres, in regeneration units, rehabilitation areas, fire salvage areas, and non-regeneration harvest. Regardless of harvest type, Wildlife Trees may be unevenly distributed with the objective of leaving an average of 4 per 20 acres. Wildlife Trees will be selected from among the oldest and largest available with a target size of >30 in. dbh for a live conifer and >22 in. dbh for hardwood species. These Wildlife Trees should be selected for their potential to function as a den structure either presently or in the future. Known den trees will be included as Wildlife Trees. If Wildlife Trees of the requisite minimum diameters are unavailable, then the next highest value Wildlife Trees will be selected and may include smaller diameter trees; preference will be given to hardwoods and other trees with wildlife characteristics.

In the rare 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 Habitat Retention Areas (HRA) (see below).

Wildlife Trees will be preferentially retained within or at the edge of a HRA.

B. SPI will retain **Habitat Retention Areas** (HRA) (defined in section 7.3.4.1.1) at a rate of 2% of each harvest area. In regeneration harvest areas HRAs will occur at a rate of 2% of the regeneration area. The distribution of HRAs in other harvest areas larger than 20 acres will occur at a rate of 2% per each 20 ac. In all harvest areas of greater than 2.5 acres and less than 20 acres HRAs will occur at 2% of the harvest area. No HRAs are required in harvest areas less than 2.5 ac. Acreage of required WLPZs is excluded from both the calculation of the unit area and the 2% retention standard. HRAs will preferentially contain one or more Wildlife Trees, Legacy Trees, and if available, large woody debris that contributes towards fisher habitat. HRAs will consist of representative co-dominant and dominant trees based on tree diameter classes present before harvest. In regeneration and rehabilitation or fire salvage areas the HRAs will remain un-entered through the end of the designated rotation. In non-regeneration harvest areas the HRAs will remain un-entered until the next harvest entry, at which time they will be retained or re-designated. HRAs will not be entered for salvage harvesting.

C. SPI will retain **Legacy Trees** (as defined in section 7.3.4.1.3), wherever they exist. Legacy Trees will be preferentially retained 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, and the exception specified in Management for Den Structures (Section 7.3.4.1).

D. SPI will retain fisher den structures, wherever they exist. Fisher den structures known to be currently or previously active will be identified with a SPI wildlife tag. These den structures shall be retained in HRAs.

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

F. In regeneration harvest units, SPI will retain small hardwoods (<6"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.

G. During all regeneration or non-regeneration harvest activities, SPI will retain, as feasible, non-merchantable snags and green culls (≥ 15 in. dbh) unless determined to be a safety hazard or a regulation requires their removal. "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 contains <25% merchantable volume that can be recovered as lumber. SPI does not pay 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 fishers. 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 road right-of-ways.

H. During pre-commercial and commercial thinning of plantations, SPI will leave 2% of the area un-thinned, which will remain for the rotation. Preferentially, such areas would contain previously retained habitat elements (See section 7.3.4.2.3).

I. In regeneration harvest units, SPI will retain additional small hardwoods (>6"dbh) or conifers (>10" dbh) such that there are no locations that exceed a distance of 150' to any two 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 a stand that is HF2, HF3, HF2Hv, or HF4. Where such a forest edge does not exist, additional small hardwoods or conifers shall be retained along that edge every 150' to meet the desired spacing between retained elements. Preference will be given to hardwoods.

7.3.4.1 Management for Den Structures

Trees containing fisher den structures known to be currently or formerly active will be identified with a SPI wildlife tag. Such trees shall be retained in HRAs, with the following exception. In the rare circumstance where required HRAs around den trees and HRAs surrounding Legacy Trees would exceed 3% of the unit area (example 0.6 acres in a 20 acre unit), SPI may notify the Service and propose that specified Legacy Trees and their proposed HRAs be available for harvest. The overall objective will be to maximize conservation value while limiting impacts to re-stocking the unit. The Service will determine whether field review is warranted in order to render a decision. If the Service has not replied in 10 working days, Timber Operations may proceed as proposed by SPI.

7.3.4.1.1 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. A HRA will consist of 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% of the total harvest unit area, excluding acres within WLPZs. HRAs will be retained for the life of the plantation and thus are intended to become potential rest and den sites within those stands over the next 80 to 100 years as the crop trees grow larger and the stand becomes denser.

The cross plot inventory SPI conducted on known den sites in its forests (SPI 2013a, Appendix G), as well as other literature, showed that a den site is often a small dense stand of large trees surrounding the den structure. Thus, known den sites, and whenever possible Wildlife Trees (potential den structures), will be included within or at the edge of a HRA, so that the retained HRA patch influences the physical conditions around the potential den structure in the eventual potential denning stand. 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 0.1-0.4 ac., which will consist of a representative sample of retained co-dominant and dominant trees based on tree diameter classes 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 will be retained for the entire stand rotation period and not be thinned or salvage harvested.

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, as replacement for these structural components.

7.3.4.1.2 Wildlife Trees

The retention of Wildlife Trees is specifically intended to provide potential den and rest structures in all future stands outside WLPZs.

A Wildlife Tree is a hardwood ≥22 in. dbh or a non-merchantable live green conifer ≥30 in. dbh with the characteristics described below. If Wildlife Trees of the requisite minimum diameters are unavailable, preference will be given to hardwoods that have the next highest wildlife value. Next highest value Wildlife Trees may include smaller diameter trees, in which case the priority is on other wildlife characteristics. Wildlife characteristics include: age, diameter, longevity/persistence, signs of previous use by wildlife (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 den trees will be included as Wildlife Trees. Prior to the unit being harvested, Wildlife Trees will be marked for retention and monitoring.

7.3.4.1.3 Legacy Trees

A Legacy Tree is any hardwood tree ≥36 in. dbh or non-merchantable live green conifer ≥30 in. dbh. Prior to the unit being harvested, Legacy Trees will be marked for retention and monitoring.

7.3.4.1.4 Additionally Retained Trees

The spatial distribution of structural elements and areas of dense cover are important components of fisher habitat, and fishers have been shown to avoid large openings (Lofroth et al. 2011 pp 14). In order to limit the distance to a Wildlife Tree, Legacy Tree, hardwood, HRA, or a forested edge (as described above) to a maximum of 150 feet (approximately one per two acres), additional trees will be retained in regeneration units. These additionally retained trees can be conifers at least 10" dbh or hardwoods that are at least 6" dbh. Hardwoods are preferred, and in practice, the minimum diameters probably will be exceeded in many cases due to the irregular

distribution of candidate trees in a given harvest unit. The retention of these trees provides conservation benefits for fishers both immediately following harvesting and into the future as the retained trees and the surrounding forest stands mature. These additionally retained trees will provide cover for fishers foraging in younger stands and may develop den or rest site characteristics over time. If additionally retained conifers are allowed to persist in an "open grown" condition, they are more likely to develop characteristics often found in fisher den and rest trees, such as large lateral branches, high live crown ratios, and low height to diameter ratios (Sensenig et al. 2013 p. 97). Habitat for fishers will be further enhanced, as these additionally retained trees create another scattered height class to promote vertical heterogeneity.

7.3.4.2 Enhancement of Heterogeneity to Promote Fisher Habitat

The intent of all the retention measures is to allow fisher den/rest sites, habitat for prey production, and stand structural complexity to be maintained or developed across the Enrolled Lands. Retention and recruitment of habitat elements that provide cover or are known to support prey production will also enhance the reproductive output and survival of fishers.

7.3.4.2.1 Results of Retention in Regeneration Units

As described elsewhere in this CCAA, hardwoods are important to fishers for den and rest 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 denning and resting structures and mast production. Regenerating sprouting hardwoods may or may not be evenly distributed within the unit, 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 tree retained by each of the measures is shown below in Table 7.3.4-1. The estimate for the number of trees ≥ 12" dbh per unit that will be found in HRAs at 2% area retention was based on inventory plot data from HF4 and HF2 Mixed land class stands within a sample of seven CSCAs, covering approximately 760,000 acres. Among these CSCAs, the retention standards will result in an average per 20 acres of 32.1 trees being retained (3.8 trees/acre averaged over the unit) and contributing to future stand structural heterogeneity (See Diameter Distributions_Zoom_CSCA_Structure -Supplement 3_V2). These trees will be retained for the entire 80 year rotation. Also, these values are based upon retention standard minimums, which quite often are exceeded in practice, and do not include existing retained snags and other scattered residual or advanced stocking.

While these elements are expressed in average values as shown in Table 7.3.4-1, their actual distribution within the harvest units will be highly variable, depending on the pre-harvest distribution of key elements within those units.

Table 7.3.4-1

Estimated Trees per Acre Retained in Even-aged Harvest Unit, by Retention Category				
HRA: Trees per acre ≥12 in. dbh averaged over 20ac.unit.	**Wildlife Trees:** Total number of (4) averaged over 20ac. unit per acre.	**Regenerated Hardwood Trees:** Hardwood <6"dbh or stump sprouting per acre.	**Legacy Trees:** Hardwoods ≥ 36" dbh or Conifer Wildlife Trees ≥ 30" dbh	**Additionally Retained Trees:** A maximum of 150 feet, approximately one per two acres. (6" dbh hardwood or 10" dbh conifer)
1.6	0.2	2.0	0 to 0.3	0 to 1

Note: The distribution of the 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 retained (averaged over the unit).

7.3.4.2.2 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. Snags will be retained that are not hazardous or are not obstructions to timber operations in regeneration and non-regeneration harvest units. Hazardous or obstructive snags ≥15 in. dbh that are felled (and others toppled by operations) will be left on the ground as operationally feasible for the purposes of providing down wood. Wherever they exist, large non-merchantable logs (≥20 in. large end) will be retained during harvesting and site preparation activities. A non-merchantable log contains <25% merchantable volume that can be recovered as lumber. To the extent practicable, these logs should be left undisturbed. If accumulations of snags and down wood create excessive fuel loading and thus prevent meeting the purposes of CFPR 14 CCR §915/935/955 (Site Preparation), the RPF may propose treatments to alleviate those conditions. In such cases, the RPF must balance snag and log retention with management of excess fuels. Large cull logs or trees may be removed if they are a safety hazard or detrimental to the future health of the plantation. It should be noted that green cull trees felled due to the multiple risks (shading, disease vectors, safety hazard) they represent would then be treated as down logs, and retained or treated as described above.

7.3.4.2.3 Tree Density Control to Promote Vegetation Heterogeneity

Numerous authors have suggested that "structural complexity" (or other equivalent terminology) is an important part of habitat for fishers. However, our literature review finds that this attribute has never been well defined in quantified terms relative to fishers.

Spies (1998) suggested four important components of forest structure: 1) tree size and distribution, 2) vertical foliage distribution, 3) horizontal canopy distribution, and 4) dead wood. Other components that occur in fisher habitat that might contribute to "complexity" could include understory brush, and a diversity of tree species that includes both hardwoods and conifers. Obviously each of these components can be measured in quantitative terms. But "structural complexity" expressed as some combination of these components apparently has never been actually measured as a variable in fisher habitat, or in habitat for prominent fisher prey

species, and thus has not been correlated with any measure of fisher occupancy or performance. Thus, proposals for provision of structural complexity must be based on judgment and feasibility.

Along with the retention of elements from previous stands as described above, measures will be taken in growing Even stands to promote structural complexity. Even stands are those that grow from Regen (i.e. planted) stands. The shift from Regen to Even is basically a record-keeping exercise in the SPI timber inventory that occurs when a plantation (Regen) reaches an age where it is cruised (measured) for inventory volume and reclassified as Even.

In Regen units, newly planted areas will be stocked to a density of approximately 258 to 360 trees per acre (13' x 13' spacing for pine and Douglas-fir, 11' x11' for true fir). The wide spacing between planted conifers will provide adequate sunlight between the conifer seedlings to promote and maintain the establishment of a second layer of vegetation. The second layer of vegetation will generally be composed of a mix of grass, herbs, brush, and volunteer conifer and oak seedlings. The preponderance of this vegetation will become established following the herbicide release treatment that some plantations will receive in their second year of growth. The effects of the herbicide treatment on the plant community species diversity have been shown to last for only two years (James et al. 2012, p. 67). The subsequent establishment of understory vegetation provides the "over fisher" canopy levels reported in Murphy (2008), and habitat for small mammals and birds.

The conifers will be pre-commercially thinned to 18' x 18' spacing (approximately 134 trees per acre) by at least age 10. As well as encouraging rapid diameter growth of the crop trees, this wide spacing will encourage additional growth in the understory vegetation and promote vertical structural complexity. It is anticipated that the 18' x 18' spacing will prevent the "competitive exclusion phase" (Franklin et al. 2002, p. 411) of stand development (where conifer crowns totally dominate and exclude understory plants) until the end of the third decade, and although some understory vegetation will be lost (run over, crushed) during treatments, it will not be intentionally removed, bladed off, uprooted etc., and will quickly return to pre-treatment condition.

During the pre-commercial thin, two percent of the treated stand (0.4 acre/20 acres) will be retained at 13' x 13' spacing. This retention is intended to promote natural density-induced mortality, which will increase the likelihood of recruitment of snags, estimated to be 16"-18" dbh, in each of the retained islands. While snags of this size may be of limited value as fisher den or rest sites, they will provide habitat for fisher prey species and important forest ecosystem function. Pre-commercial thinning also will maintain the regenerating hardwood trees (2 per acre) in a co-dominant / dominant crown position. HRAs retained in the previous clearcuts will remain un-entered.

When they reach an average height of approximately 70 feet (i.e., approximately 40 years old), the crop trees will be commercially thinned to 26' x 26' spacing (approximately 65 trees per acre). This thinning is timed to avoid tree mortality predicted to occur by the University of California Research Cooperative G-space tree growth model. During the commercial thin, two percent of the treated stand (or 0.4 acre/20acres) will be retained at the 18' x 18' spacing. 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"dbh or larger in each of the retained islands. This tree spacing will again allow sunlight to reach the forest floor and rejuvenate and reinvigorate the understory vegetation. Commercial thinning of Even stands also will maintain the regenerating hardwood trees (2/acre) in a co-dominant/dominant crown position.

Thus, this Conservation Measure will increase the plant diversity in the understory of planted stands (James et al. 2012). It is anticipated that adequate cover will persist for fishers to hunt and travel though these stands and avoid predation.

7.3.5 Conservation Measure 4: Mitigation of Substantially Damaged Timberlands

Conservation Measure Four 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 fisher in these areas. Substantially Damaged Timberlands are the result of unpredictable events that kill trees. Under the CFPRs, all dead, dying, or damaged trees may be harvested immediately to recover their economic value. SPI typically conducts an Emergency Notice of Timber Operations on Substantially Damaged Timberlands as soon as possible. Un-damaged green trees within the Substantially Damaged Timberlands are not allowed to be cut under an Emergency Notice of Timber Operations and will be left where they exist.

For this CCAA, SPI commits to retention of snags, wildlife trees and HRAs within an Emergency Notice of Timber Operations. Retention within an Emergency Notice of Timber Operations on Substantially Damaged Timberlands will include the retention standards in sections 7.3.4.1, 7.3.4.1.1, 7.3.4.1.2, 7.3.4.1.3, 7.3.4.1.4, and 7.3.4.2.2, and all undamaged green trees within the Substantially Damaged Timberland. If all the trees are dead, these standards will be met with dead trees. Where known den structures are located within a burned area and all the surrounding trees are dead, the den structure does not need to be included in a HRA.

As in the regeneration harvest standard, HRAs will be established at a frequency of 0.4 ac. in every 20 ac. salvaged, excluding required WLPZs. HRAs will be established around individual Wildlife Trees where available and will include un-damaged green trees that are likely to persist. The dead, dying, damaged or diseased conifer trees in Substantially Damaged Timberlands usually have >25% merchantable wood, and thus are not snags as defined and would not be retained.

The standards for Additionally Retained Trees (Section 7.3.4.1.4) are not useful in a fire-killed environment. The minimum diameters of the Additionally Retained Trees are too small for them to persist and they will not grow larger because they are dead; therefore the following standard will apply. The fire-killed hardwood trees in a burn area will be retained at a density of 1 per 2 acres. The target diameter for hardwood retention is 12" dbh. If larger hardwoods are available (>22"dbh) those should be preferentially retained. This standard is an exception to Section 7.3.4.1.4.

If Substantially Damaged Timberlands occurs across an area larger than 2,500 acres the USFWS will be notified and the event will be evaluated as a Changed Circumstance per Section 11.1.1

Note: Reforestation is not a CFPR requirement for an Emergency Notice of Timber Operations on Substantially Damaged Timberlands and is not a condition of this CCAA. SPI has voluntarily reforested the timber capable areas where salvage harvest operations occurred in the past.

7.3.6 Conservation Measure 5: Reduction of Potential Impacts at Reproductive Sites

The second biological goal is minimizing the potential to take fishers by killing or disturbing them in their natal and maternal dens. This objective, which applies only in the Occupied Range, will be addressed through Conservation Measure Five.

7.3.6.1 Feasibility of Detecting Fishers

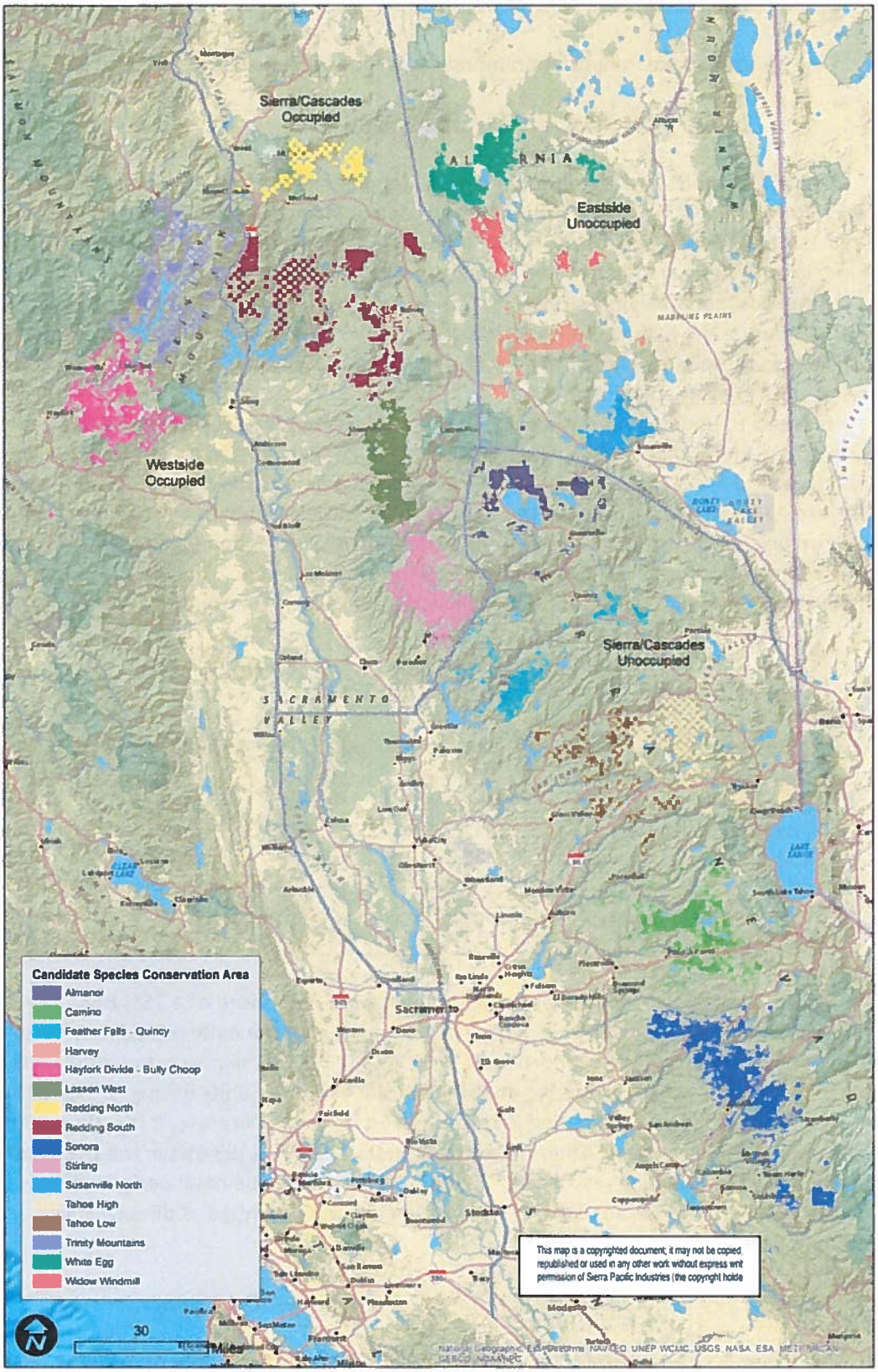
Pre-operational surveys for fisher were considered as an alternative to minimize take; however, investigation into this option revealed issues that made surveys infeasible. Because of the difficulty, probability of error, and expense of obtaining location-specific data on fisher dens using any known method, including those discussed below, within the Occupied Range of the fisher (see figure 7.3.6.1) SPI will assume that fisher may be present in harvest units and plan protective measures accordingly.

Fisher are elusive, are not easily detected visually, and do not respond to an auditory call. Fishers are normally detected using cameras at bait stations, which may attract fishers into the area from denning sites of unknown distance. Thus, detection of a fisher at a bait station is inconclusive as to presence of a den near the harvest unit. Also fishers have been known to elude detection at den trees even with camera stations deployed. Because fishers are a highly mobile animal, its main risk of injury or death from timber harvest operations is when it and/or its kits are residing in a den. Dens are nearly always a cavity in a standing live or dead tree, which can rarely be located without attaching a radio telemetry device to the animal.

Scat detector dogs are capable of locating fisher scats and thus indicating where a fisher has been present. However, their success rate depends heavily on the training and skills of the dog and its handler. Genetic testing of scats collected by experienced scat detector dogs and their handlers in the southern Sierra Nevada indicated approximately 55% of collected scats were actually from fishers (Thompson et al. 2012, p. 4,). Without genetic testing of scats, it is likely that "false positive" errors will be commonplace (Peter Figura, DFW, pers. comm.). Additionally, the use of scat detector dogs to conduct presence/absence surveys is challenging in difficult terrain. To some extent, both dog and handler generally follow the path of least resistance when surveying, even when trying to cover all ground within a survey unit. Therefore, unless a fixed, systematic survey grid is followed, the likelihood that detector dogs will fail to detect existing fisher scats is likely to increase with increasing terrain complexity (e.g., steep slopes, thick brush, extensive woody debris, etc.).

Because of the above issues, we have decided that it is not feasible to implement surveys to detect the presence of fisher dens in advance of timber harvest. Thus, protective measures are based on assumptions regarding the likelihood of presence and are detailed below.

Figure 7.3.6.1 Regions and Covered Species Conservation Areas



7.3.6.2 Fisher Take Minimization

The following take minimization measures will be applied within the Occupied Range.

7.3.6.2.1 Seasonal Restrictions

To minimize disturbance during the natal denning season (the time most likely to have a direct impact), timber harvest activities within the Occupied Range during the natal denning period of March 1st to May 15 (Appendix N) will be limited to no more than 25% of SPI's yearly planned volume in any one year, and a rolling 3-year average will not exceed 20%.

As an additional minimization measure, SPI will not harvest tractor harvest units that have ≥75% HF4 during the natal denning period of March 1st to May 15th. This presumes that denning is most likely in these older stands. This will apply to tractor harvest units only, due to the cost of moving cable logging equipment.

In order to understand the context of this conservation measure, roughly two years of approved regeneration harvest units in the Occupied Range were evaluated for their respective yarding method and percentage of HF4. The results showed 23.8% were cable units and only 27% of those had ≥75% HF4. To confirm if this sample reflects the amount of tractor and cable acreage that occurs in the occupied land, the estimated proportion of Tractor and Cable acreage, based on the percent slope of the land in the Occupied Range, is found in Table 7.3.5.2.1-1. The approved unit sample is nearly double the amount of cable acreage available and thus is a conservative estimate.

Table 7.3.6.2.1-1. Percent Tractor and Cable in the Occupied CSCAs

Sum of GIS_ACRES	Slope class (percent)				
CSCA	<55	55+	Grand Total	Percent Tractor	Percent Cable
Hayfork Divide - Bully Choop	91,580	33,072	124,652	73%	27%
Lassen West	113,207	3,418	116,625	97%	3%
Redding North	42,525	713	43,238	98%	2%
Redding South	125,396	35,095	160,491	78%	22%
Stirling	144,676	14,122	158,798	91%	9%
Trinity Mountains	96,045	21,964	118,009	81%	19%
Grand Total	613,430	108,383	721,813	**89%**	**11%**

Approximately 33% of approved tractor units were comprised of ≥ 75% HF4. Therefore, the estimated percentage of cable units where harvesting during the natal period may occur was calculated by multiplying the proportion of ≥75% HF4 (27%) by the proportion of units that were cable (0.27*0.238), which resulted in an estimate of 6.4% of the units having ≥75% HF4 that might be harvested during the natal period in the Occupied Range. Therefore, it is estimated that take will be minimized in nearly all other units that contain ≥75% HF4 (93.6%) in the Occupied Range by applying this harvest timing restriction. Tractor logging during the natal period will only occur in units with <75% HF4. This adjustment would minimize the likelihood of directly killing or injuring denning fishers.

7.3.6.2.2 Sighting Fishers During Harvest Operations

If a fisher is sighted within the vicinity of a THP area during timber operations, all vegetation disturbing activities that could affect the site will be immediately suspended until a company

biologist determines whether further surveys or operational restriction are necessary or prudent. If a den site of a fisher is discovered or strongly suspected because of visual evidence, all vegetation disturbing activities will be suspended within a 375-foot radius and the FWS will be immediately notified.

Following confirmation of a den site, all vegetation disturbing activities will be suspended until August 1 of that year. The den structure will receive a wildlife tag and a HRA will be designated around the site (see Section 7.3.4.1).

7.3.6.2.3 Definitions of Potential Den Tree

Minimization measures relating to the cutting of potential den trees are provided in Section 7.3.6.2.4. We define a hardwood tree as a potential den tree when it is ≥15 in. dbh (dead or alive) and has indications of cavity formation or visible cavity openings of the size (≥3.5") that can accommodate fishers. We define a green conifer as a potential den tree when it is ≥22 in. dbh and has the same cavity indications as above.

7.3.6.2.4 Take Minimization During the Natal and Maternal Den Periods

Potential den trees will not be felled during the natal den period of March 1 to May 15. In a few select instances, a tree meeting the definition of a potential den tree may be felled in a cable unit to allow for feasible yarding. In those instances, a SPI wildlife biologist will assess the tree visually for cavities that might be used as a natal den. If a suitable cavity is not visually apparent the tree may be felled; however, if a cavity is present, felling will be avoided until after May 15.

During the maternal den period of May 16 to July 31, potential den trees will not be cut until the day after all other trees intended to be felled within a ten-acre area (a 375-ft. radius) have been felled. This will allow fishers to move from the area in response to the harvest disturbance. SPI's RPF will specifically instruct the Licensed Timber Operator (LTO) detailing these take avoidance measures, including the LTO's required implementation of these felling restrictions with their employees and timber fallers.

For more information related to these minimization and mitigation measures, please see *"Fisher Natal Den Use on Managed Timberland in California"* (2012) (Appendix N).

7.3.7 Conservation Measure 6: Minimize Risk of Drowning in Water Tanks

Fishers have been documented drowning in uncovered water tanks. Thus, a water tank in occupied fisher habitat is a threat to fishers if the openings of the tank are large enough to allow entry but do not provide a means of escape.

The placement and maintenance of a water tank for dust abatement is a Covered Activity. Water tanks are situated on stable, level ground near watercourses. Construction or reconstruction of water diversions require a Fish and Game Code 1600 permit from the California Department of Fish and Wildlife, which includes a CEQA analysis as part of an associated THP approval.

Currently there are no known tanks within the Enrolled Lands that are a drowning threat to fishers. If SPI installs or discovers a tank on its lands, its opening(s) will be adequately screened or closed to prevent a fisher from entering or animal escape ramps will be installed to allow these tanks to be "fisher safe". If the tank is no longer needed, it will be opened/breached in a way that allows fishers an exit route. SPI, through its normal operational activities will continue to identify, and if necessary remediate, water tanks that are a threat to fishers within the term of the permit. It

is anticipated that all water tanks on the Enrolled Lands will be inspected and made "fisher safe" within the term of the permit.

7.3.8 Conservation Measure 7: Reduction of Potential Impact from Illegal Marijuana Cultivation and Firewood cutting.

Illegal uses of the property may negatively impact fishers. Among the known illegal activities, toxicants associated with the cultivation of marijuana probably pose the largest risk to fishers (Higley 2013). Fishers may be directly or indirectly exposed to toxicants when they consume contaminated baits or animals. Illegal planting sites on SPI lands are uncommon and cover small acreages, and are usually at the outer periphery of our ownership. Results from the Stirling Management Area (SMA) translocation project have not shown toxicants to be a significant threat to fishers (A. Facka, pers. comm.), perhaps in part due to access control and cooperative law enforcement activities. A secondary risk to fishers from the cultivation of marijuana could be the cutting of a den tree by growers preparing a site or tending their plants. Because marijuana cultivation on SPI property is infrequent, it is unlikely that the loss of a den structure in this manner is a significant threat.

The other illegal use of SPI property that is a risk to fishers is firewood cutting. Illegal firewood cutting tends to target snags and green hardwood trees that are near access roads. This activity also involves the concomitant additional risk of human caused wildfires.

Illegal use of the property is limited by controlling access where feasible. Illegal use of the property is identified wherever it is evident. Foresters, biologists, loggers, and patrolmen all keep an eye out for suspicious trails, road use, illegal firewood cutting, and altered vegetation that is not part of a THP. When an illegal activity is identified, the appropriate law enforcement personnel are contacted. Following the conclusion of the law enforcement activity, SPI participates in the restoration and remediation of the site. Remediation can include re-establishing erosion control measures, and removal and proper disposal of trash and hazardous materials. The handling of hazardous materials is done in compliance with the appropriate regulating agency.

7.3.9 Conservation Measure 8: 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 rapidly. The threat to a species can occur where loss of habitat due to catastrophic fire out-paces the regrowth of habitat.

Reduction of the risk of catastrophic fire consuming suitable fisher habitat will be accomplished through the continued use of even-age management. Harvesting in an even-aged system dramatically reduces ladder fuels and, over time, creates stands that reduce the tendency for ground fires to become large crown fires. As more of the landscape is placed in an adjacency-driven pattern of Even land class, the resulting fuel structure conditions create a landscape that becomes increasingly resistant to crown-propagated wildfire.

Initially, young even-aged stands, like any early seral stage, are quite flammable, but compared to forests with continuous ladder fuels, they grow out of this state of flammability, especially with created spacing (pre-commercial and commercial thinnings). Even-structured stands are generally discontinuous in relation to the adjoining stands due to differing heights, and thus slow the spread of crown fires. Even units also provide for greater firefighting efficiency and safety, as the young planted forests provide safer locations for firefighters to escape to and stage from.

Given many other constraints, the rate at which the landscape can be converted into these Even structures is limited. To reach a more resilient state more quickly, this approach will be supported by the systematic construction of a network of fuelbreaks. Fuelbreaks provide some reduction in spread of low-intensity fire, but often are not effective in reducing spread of high intensity wind-blown fire. 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. Fuelbreaks can be effective because they strategically address sources of ignition (lightning and human-caused) and focus on locations with access by suppression forces.

In evaluating the application of fuelbreaks, our land managers analyze the environmental and investment resources at risk, regional historic fire patterns, regional climate patterns, forest type, topography, usefulness to fire suppression resources, and how the project may be incorporated into a larger landscape scale fire risk management strategy. Where fuelbreaks 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 prohibit an advancing crown fire from continuing to propagate through the fuelbreak.

It is estimated that fuelbreaks will compose approximately 2-3% of SPI lands over the term of the permit. Investment in a fuelbreak will only be made when its potential effectiveness is commensurate with the values at risk. CCAA retention standards will not be applied in fuelbreaks.

In combination, Even units and the fuelbreaks will reduce the ability of large crown fires to spread rapidly across large areas, because the tree crowns are generally discontinuous in relation to the adjoining stands at a linear landscape scale.

8. EXPECTED BENEFITS FOR FISHERS

The proposed CCAA is expected to provide the following benefits for fishers: 1) Maintain suitable fisher habitat in the occupied range, as measured by the Conservation LEAFs (See Section 7.2.11). 2) Provide sufficient amounts of suitable fisher habitat, as measured by maintaining at least 50% of the Capable Land available when the permit begins (roughly 700,000 acres) in the Mixed land class, for the duration of the permit. 3) Manage habitat elements important to fishers and its prey, in all existing and harvested stands. 4) Manage HRAs. 5) Support fisher conservation efforts on Federal land and private land, and provide an in-place regulatory mechanism to deliver these benefits across a large portion of the private land in the fishers' range in California. 6) Implement take minimization measures to protect existing fisher populations. 7) Manage water tanks to minimize accidental drowning of fishers. 8) Prevent illegal use of the property and remediate sites that have hazardous materials considered harmful to fisher. 9) Reduce the potential for catastrophic fire.

8.1 MANAGE AND MAINTAIN SUITABLE FISHER HABITAT

The delineation and evaluation of LEAF areas is discussed in Section 7.2.11. Conservation LEAFs are the primary mechanism for achieving conservation benefit for this CCAA. In combination with other measures in this CCAA, they provide the means of meeting the CCAA policy standard regarding benefits of conservation measures (USFWS 1999 CCAA Policy; 64 FR 116, p.32727).

Using the Draft Fisher Conservation Strategy (Finely et al., 2011) and guidance from the Service, SPI proposes that the conservation benefit threshold will be maintenance of 80% of the

Conservation LEAFs in a condition that is likely capable of supporting reproductive female fishers and as a result fisher populations.

Meeting the habitat requirements at the different scales evaluated in LEAFs and embedded in the Territory Opportunity analysis will provide a matrix of widely-distributed habitat, and also includes maintaining at least 50% of the currently available Capable Land in the Mixed land class for the duration of the permit. This abundant habitat will have the components to allow a female fisher to reproduce successfully and the young to disperse into adjoining areas, to establish their own home ranges, and maintain a stable or growing population.

SPI's maintenance of Conservation LEAFs will alleviate the threat of the excessive loss of den/rest habitat, and will allow these lands to continue to support fishers in the occupied range.

8.2 MANAGE HABITAT ELEMENTS

Maintaining and recruiting habitat elements (see Section 7.3.4) that either exhibit or will likely develop suitable den structures will ensure that stands harvested using a variety of silvicultural systems, including emergency salvage operations, will have den structures present during the life of the future stand. This is important considering that many den trees are >150 yr. old and the average rotation age for the Enrolled Land is 80 years. Maintaining and recruiting habitat elements will also allow the Even-aged stands to function as prey producing habitat, since many of the features to be retained are associated with the habitat of fisher prey (Woodbridge et al. 2012, Table 8.1, p176). SPI's retention and recruitment of habitat elements will alleviate the threat of loss of structures essential to den/rest habitat.

8.3 MANAGE HABITAT RETENTION AREAS

The management of HRAs, in the near term and in the future, will provide small groups of residual trees that are generally more closely spaced and larger than trees present in the surrounding future stand. The HRAs will provide edge habitat between mature and younger stands, and will be capable of producing seed or acorn mast immediately. HRAs left in a dense condition will also promote density-induced mortality contributing to natural snag recruitment. Where HRAs contain one or more suitable den structures, it is anticipated that these sites may become active den sites sometime in the future. SPI's retention of HRAs will alleviate the threat of lack of den/rest habitat in the future.

8.4 SUPPORT CONSERVATION EFFORTS ON PUBLIC AND PRIVATE LANDS

SPI owns approximately 4% of the forests in California, while in the occupied range it owns approximately 6.4%. In comparison, the Federal forests comprise 55% and 52% respectively. An important region of the fisher's California range includes low elevation forests with relatively high numbers of hardwoods. In the unoccupied range, a relatively small portion of these low elevation forests are in federal ownership, and a substantial portion is owned by small non-industrial forest landowners, along with SPI. Within the mixed ownership pattern, this CCAA will provide important linkages for fishers between lower elevation private land and Federal forests, and thus will contribute to conservation efforts on Federal forests. The CCAA will support conservation practices on non-industrial private lands because those ownerships are much smaller, and may provide habitat that functionally satisfies only one life requisite behavior. SPI forests will support all three life requisite behaviors (cover, forage, and breeding), and therefore will augment the habitats found on small non-industrial landowners, potentially allowing those lands to be exploited by fishers.

The conservation actions combined in this CCAA will provide an in-place regulatory mechanism that the Service can rely on for the term of the permit. The strength of this cooperative effort is that it delivers benefits for the species in an immediate time frame. Absent this CCAA, there would be no in-place regulatory mechanism for maintaining habitat for fisher expansion on non-federal land. The CCAA will provide habitat in currently unoccupied areas to support fishers should they expand their range or be reintroduced.

The USFWS CCAA Policy recognizes that early implementation of meaningful conservation measures is more likely to successfully conserve species and avoid further species declines and listing actions (USFWS 1999, 64 Fed. Reg. 64 p. 32731).

8.5 MINIMIZE THE TAKE OF INDIVIDUALS

While there are numerous fisher den sites known to have been used on SPI lands (n=162), the likelihood of an occupied fisher den within a planned harvest unit is very small (as described in Appendix F). The low probability of harvest unit overlap is because fishers occur at a relatively low density, and the SPI harvest acreage is small as a percentage of the total available habitat. During the denning period, SPI will limit the total volume of timber harvested and avoid cutting potential den trees, and will limit harvesting in the best den habitat (HF4) during the natal denning period. These and other proposed measures for minimization of take will further reduce the chance that harvest activities will kill, injure, or harass fishers, and thus provide conservation benefit.

8.6 MINIMIZE FISHER DROWNINGS

If SPI installs any water tanks, they will be designed to prevent entrapment of fishers. If SPI discovers a tank capable of entrapping a fisher on its lands, the opening(s) will be adequately screened or closed to prevent a fisher from entering or animal escape ramps will be installed to allow these tanks to be "fisher safe". SPI, through its normal operational activities, will continue to identify and remediate water tanks that are a threat to fishers within the term of the permit. Identifying and eliminating water facilities that pose a risk of fisher mortality will reduce a known threat, and thus provide a conservation benefit.

8.7 PREVENTING ILLEGAL PROPERTY USE AND REMEDIATION OF SITES

Illegal use of the Enrolled Lands is limited by controlling access where feasible. Illegal uses of the property that are a threats to fishers primarily include illegal marijuana grows and firewood cutting. When any illegal activity is identified, the appropriate law enforcement personnel will be contacted. Following the conclusion of the law enforcement activity, SPI will participate in the restoration and remediation of the site. Identifying and eliminating illegal uses of the property will reduce a threat of fisher mortality, and thus provide a conservation benefit.

8.8 REDUCTION OF POTENTIAL FOR CATASTROPHIC FIRE

The use of Even-aged management will cause the forest stands' structural characteristics to reach a more fire resilient state over the course of several decades. In the interim, and in support of this ongoing process, the systematic construction of a network of fuelbreaks will be established. Fuelbreaks provide some reduction in spread of low-intensity fire, but often are not effective in reducing spread of high intensity wind-blown fire. 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. Fuelbreaks can be effective because they strategically address sources of ignition (lightning- and human-caused) and focus on locations with access for suppression forces. The use of Even-aged management and strategically placed fuelbreaks will aid in preventing the potential for catastrophic fire destroying large areas of fisher habitat, and thus provide a conservation benefit.

9. INCIDENTAL TAKE

Under Section 9 of the U.S. ESA, take of listed species is prohibited. Under Sec. 3(19) of the US ESA, the term "take" means to" harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." "Incidental take" is defined at 50 CFR 17.3 as "any taking otherwise prohibited, if such taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity."

Under ESA Sections 10(a)(1)(A) and (B), private parties can receive authorization for various forms of incidental take. Under the CCAA policy (USFWS 1999; 64 Fed. Reg. p. 32731), private parties can establish plans that establish conditions in advance under which incidental take of unlisted species is authorized at such time as they become listed. Under the CCAA policy, a CCAA must determine the extent and impact of the proposed incidental taking, in a manner similar to that specified under ESA section 10(a)(1)(B).

SPI foresees the potential that Covered Activities may incidentally take the fisher by killing, injuring, harassing, or harming. While the statute and regulations use the terms "kill" and "injure," those terms are not further defined in the regulations (apparently being self-explanatory.) "Harass" and "harm" are defined in 50 CFR 17.3 as follows:

Harass means "an intentional or negligent act or omission which 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 means "an act which actually kills or injures wildlife. Such act 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."

In the following sections we evaluate the potential that various types of incidental take might occur, estimate the amount of such taking, and assess the impact of the taking to the fisher. This evaluation does not take into account the measures in CCAA Section 7.3.6, which are designed to substantially reduce the likelihood that incidental take in the form of killing, injuring, harassing, or harming might occur. Instead, the evaluation assumes that no minimization measures are in place, in order to derive an estimate of the maximum amount that might reasonably be expected to occur, for the purposes of estimating overall impact and seeking incidental take authorization.

As proposed in this CCAA, these categories are not additive in determining the amount of incidental take, because harvest at certain units may reach the threshold for multiple forms of take, and thus double-count fishers taken. Also, the timing of occurrence of killing, injuring, and harassing is separate from that of harming. For purposes of accounting of take, we assume that killing, injuring, or harassing takes place during the reproductive season, while harm results from long-term conditions. Therefore, the impact of killing, injuring, and harassing will be evaluated separately from the impact of harm.

The CCAA guidance requires an assessment of the impacts of the taking. However, the total fisher population in California, as well as that on the Enrolled Lands, is unknown, as is the true impact of timber harvest on fishers at the individual and population levels. Thus, the impacts of the taking at either the individual or population levels are speculative. We have made a reasoned attempt to estimate and quantify impacts, but each of the values produced to contribute to this analysis is based on multiple assumptions and judgments, and the error in these values may be compounded as they are combined arithmetically. Even the rounding of values following decimal points has substantial influence on the outcome. These caveats must be fully recognized in the interpretation of the following analysis.

In the following sections, we estimate the number of fishers that may be taken under each of the categories: kill/injure, harass, and harm. We then evaluate the impact of this estimated take at the population scale on SPI lands and on the entire population.

9.1 POTENTIAL FOR COVERED ACTIVITIES KILLING, INJURING, OR HARASSING FISHERS

The regulatory guidance for CCAAs and associated recovery permits requires quantification of and description of the impacts of authorized incidental taking (64 FR p. 32733, 32735); (USFWS draft handbook 2003, p. 15); (50 CFR 17.22(b)(1)(iii)(A); (50 CFR 17.32(b)(iii)(B) &(C)(1) .

Fishers can be detected using cameras, track plates, or hair snares, but these detection locations do not delineate boundaries of a territory. Fisher territories cannot be identified without radio telemetry, and few radio telemetry studies have been conducted within the region of the CCAA. Therefore, the locations of fisher territories are not known throughout most of the fisher's occupied range in northern California, including most of SPI's property. Because of cost and the limitations of survey results, SPI does not intend to survey proposed timber harvest units for presence of fishers.

Thus, the numbers, locations, and territories of fishers on SPI lands are presently unknown and will remain so, except for limited areas that will be sampled under the monitoring program described in Section 13. And, as stated above, no information is available on the effects of site-specific habitat modification on fishers. As a result of these issues, evaluation of habitat modification on specific existing territories in specific landscapes will not be possible.

For much of the year, fisher adults and young are quite mobile and capable of avoiding Covered Activities that might subject them being killed, injured, or harassed. In general, adult fishers have acute hearing and vision, and are attentive, reclusive, and highly mobile, so they are presumably much less vulnerable than juveniles that have not yet left their mother's care (about six months old) to being killed, injured, or harassed by the Covered Activities. The likelihood of impacts from Covered Activities increases during the breeding period, when the reproductive activities are focused within specific locations for several weeks or months, and mobility is constrained. The variety of fisher behaviors during this time creates different types and degrees of vulnerability to being killed, injured, or harassed. The behaviors that create vulnerability to being killed, injured, harassed are discussed below, along with estimates of the expected amount of take due to killing, injuring, or harassing.

9.1.1 Risk of Killing, Injuring, or Harassing Adult or Juvenile Fishers

Because adult male fishers are highly mobile and not constrained to any particular physical location at any time of year, we assume that their relative risk of being killed, injured, or harassed by Covered Activities is very low. We further assume that adult female fishers and their kits would only be vulnerable to being killed, injured, or harassed by the Covered Activities during the period that

they are confined to reproductive dens, which, as defined by Lofroth et al. (2010, p. 59), includes all dens used during the reproductive season: natal; pre-weaning; and post-weaning. Several reproductive dens are often used over a period of about seven months, from birth of kits in March or April, to separation of kits from their mother in late fall (Lofroth et al. 2010, pp. 55-59). Although juvenile dependence lasts through late fall (Lofroth 2010, p. 56) the focus of the minimization of direct kill and harass relies on SPI's den data (Fisher Natal Den Use On Managed Timberland In California, 2012) that suggests most denning activity is over by mid-July.

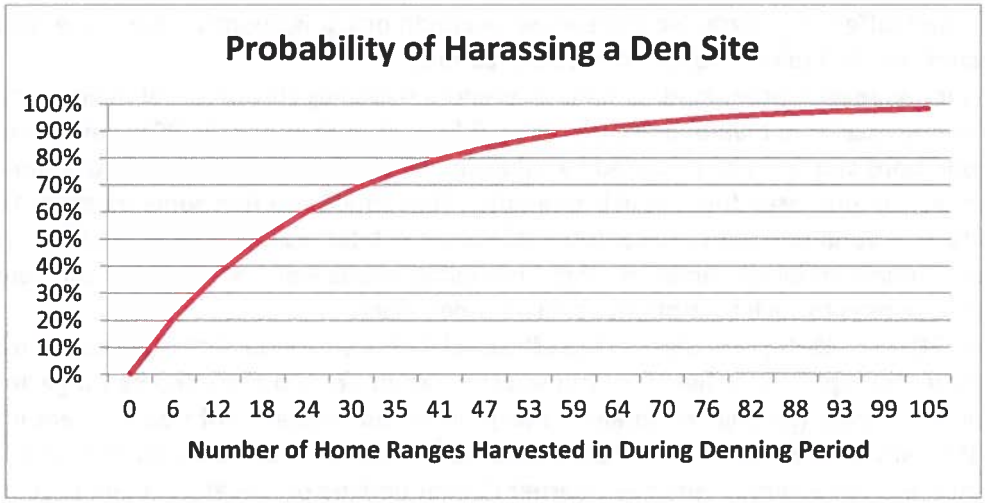
There is no information in the literature regarding direct disturbance effects of timber harvest on denning fishers. We assume the removal of mature trees and the associated noise and human activity during timber harvesting in an occupied female fisher home range will alter the way that that resident female perceives and uses that portion of her home range. Because adult female fishers typically move their young several times during rearing, we assume that they are capable of moving young away from sources of disturbing timber harvest activities. The difficultly with estimating the impacts to fishers is that the effect of the disturbance is unknown.

On average, SPI has about 21 harvest operations underway in a year within the occupied range. For purposes of this analysis, we assume that the operations are distributed across the landscape such that not more than one of the 21 operations occurs within a 5000-acre area. Our calculation used an assumed density of two reproductive female fishers per 10,000 acres, and assumed that an occupied den site contains an adult female and two kits. Thus the 21 harvest operations are operating within approximately 21 female fisher home ranges (the "Distributed Harvest" scenario in Appendix F.)

We assume that timber harvest will kill or injure fishers if the harvest occurs during the denning season within the same acre that contains an active den site. The likelihood that a timber harvest unit would include an acre that contains an active fisher reproductive den (and thus resulting in a directly killed or injured fisher) is very low. An assessment of the statistical probability is included in Appendix F (Table F-1, cell XVII). This calculation used an assumed density of two reproductive female fishers per 10,000 acres. This analysis found that at the beginning of the permit term, the probability that harvest may directly impact an occupied den site is less than three-hundredths of one percent per year for SPI's entire annual harvest in the Occupied Range.

For purposes of this analysis, we assume that timber harvest will harass fishers if the harvest occurs during the denning season within the same 50-acre stand that contains an active den site. The likelihood that a timber harvest unit would intersect a portion of one active 50-acre den stand (and thus harass fishers) is approximately 55% when harvesting is occurring within 21 home ranges. The function used for this calculation is expressed in graphical form below. A detailed description of the harass calculations can be found in Appendix F (Table F-1).

Figure F-1: Probability of harassing a fisher den site, based on the number of 5,000-acre home ranges harvested in during the denning period.



Based on the analysis in Appendix F, we propose to seek incidental take coverage for the possibility of accidental killing or injuring of two adult female fishers and four kits or juvenile fishers per year (60 over the ten year permit period), and for an additional 18 fishers (180 over the ten-year permit period) that might accidentally be harassed. These estimates do not account for the likely reduction that would result from seasonal restrictions on harvest area and protection of potential den trees contained in the minimization efforts included in the CCAA Conservation Measures, which would be expected to substantially reduce the chances of killing, injuring, or harassing fishers.

9.2 ESTIMATING POTENTIAL HARM

For any species, the evaluation of the likelihood of taking through harm, per the definition of harm provided in Section 7.2.6, requires understanding of the effects of habitat modification on the species. Unfortunately, no studies have directly addressed questions regarding impacts of habitat modification on fishers. Moreover, conclusive determination of thresholds is very difficult, due to natural variation in habitat conditions and animal response to habitat change, along with the challenges of conducting large-scale, long-term field studies. Therefore, we will use the limited available information and reasoned analysis to estimate the potential that habitat modification will impair breeding, feeding, or sheltering, to the extent that a fisher will be killed or injured as the result of Covered Activities.

9.2.1 Impact of Habitat Modification on Fishers

We found no studies that attempted to attribute changes in survival or reproductive success of individual fishers to changes in habitat at local scales. Studies summarized by Lofroth et al. (2010, p. 91) reporting on habitat selection and avoidance varied in the strength of their conclusions, but generally indicated that fishers avoided open habitats, such as will be created by activities under this CCAA. However, the degree to which varying amounts of habitat modification may affect fishers in our area is unknown. Following, we provide a brief review of the most relevant literature.

Weir and Courbold (2010, pp. 407-408), evaluated home ranges of ten female fishers located about once per ten days over a two-year period in British Columbia. They reported that estimated relative probability of occupancy by fishers at the landscape scale decreased by 50% with every modeled increase of 5% in wetland or recently harvested forest, and that potential home ranges with greater than 20% in openings without forest canopy were not occupied by fishers. Given the

small sample and different geographic and ecological conditions, it is doubtful that these results can be appropriately applied to our area (R. Weir, pers. comm.).

More locally, several other studies made inferences regarding thresholds of habitat conditions required at various scales to maintain occupancy by fishers. Thompson et al. (2011) used the range of habitat conditions known to be occupied by fishers in the southern Sierra Nevada to estimate projected impacts of proposed forest fuel treatments. They concluded that some treatments would modify habitat to a condition not representative of known habitat, especially where canopy cover would be substantially reduced. However, these modeling results were not tested in the field, and actual fisher responses to such treatments remain un-described.

Garner (2013, p. 42-44) investigated the effects of fuels treatments that reduced stem density in fisher habitat. He reported on fisher habitat selection at the second order (home range and core-use area) and third order (resting and foraging sites). He noted avoidance of treated areas in forests composed of mostly conifers, but where hardwoods were retained within a mixed-conifer forest, such avoidance was not evident. However, Garner did not provide pre-treatment and post-treatment stand inventory data that might inform the establishment of a habitat retention threshold for consideration of harm.

Niblett et al. (2014) analyzed radio-telemetry data collected by James et al. (2008) and SPI's forest inventory data to evaluate habitat conditions in five known female fisher home ranges at SWSA. These home ranges (100% KDE) consisted of up to 9% open areas, including burns and recent clearcuts. Whether these fishers would have tolerated more openings in their home range is unknown.

Subsequent to the SWSA telemetry study of 2006-2007 (James et al. 2008), SPI has harvested an additional 12% of the area (7% clearcut and 5% Alternative prescription). In January of 2015 approximately 41% of the SWSA was surveyed using camera stations that included hair snares. The area surveyed overlaid the two female fisher home ranges found in 2006-2007 in the southern portion of the SWSA. The genetic analysis of the 2015 hair samples showed a minimum of two unique females and six unique males occupying the area. This sex ratio is similar to the number of females to males captured during the trapping done during the initial trapping stage of the SWSA telemetry work (James et al. 2008, p.9). This study area lies within the occupied range of fisher in northwestern California, but the extent to which the habitat conditions at the SWSA can be applied to other parts of the fisher's range on SPI lands is unknown.

All of these studies described apparent selection of territories related to landscape condition, rather than fishers' response to habitat modification events, which might proceed differently. None of these studies established a lower threshold of forested habitat necessary to maintain occupancy, so the degree of habitat modification that actually crosses the threshold of harm to individual fishers is unknown. Even if a clear threshold had been described for a given study area, the area of landscape over which it could be applied would be unknown.

The issue of estimating harm is complicated further by the fact that displacement of fishers (or any species) in response to habitat modification does not in itself constitute harm as defined at 50 CFR 17.3, if the displacement does not result in killing or injuring "by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering." Thus, if sufficient habitat exists to support breeding, feeding, or sheltering after Covered Activities are completed and the fisher's use this habitat without a substantial impairment of these life functions, harm has not occurred.

The preceding discussion demonstrates the difficulty in establishing a standard by which likelihood of harm can be evaluated. We are unlikely to know whether specific Covered Activities are actually taking place within the territory of a fisher, or the boundaries of that territory. But, given the broad distribution of habitat and fishers in the occupied range in California and the large

size of home ranges, it is reasonable to expect that our activities will regularly occur within fisher territories to some extent.

9.2.2 Estimating Harm

Estimating the amount of incidental take in the form of harm (defined at the beginning of Section 9 above) that may be caused by Covered Activities requires incorporating a threshold of habitat modification beyond which harm is assumed to occur. The following discussion describes our process for deriving a threshold for estimating and projecting the amount of harm for this CCAA.

As stated above, the location of fisher territories is unknown, and no information is available on the effects of habitat modification on fishers at the home range scale. As a result of these issues, evaluation of habitat modification on specific existing territories in specific landscapes will not be possible. Thus, we must rely on reported patterns of habitat selection to make inferences as to quantity and characteristics of habitat where fishers may occur, establish a general estimated habitat threshold on that basis, and estimate the number of instances when Covered Activities might reduce habitat to below that threshold.

As a result, any habitat threshold selected for estimating the amount of harm is subject to considerable error, and any estimated amount of harm over time will be imprecise. With these caveats, in the following discussion we provide a reasonable and replicable method for estimating harm, based on assumptions about habitat occupancy and impacts of habitat modification.

The overall quantity of habitat on SPI and on adjacent owners within the Occupied Range has been considered in our assumptions regarding harm. Within the hexagons in the Occupied Range that include more than 50 acres of SPI ownership, SPI owns approximately 47% of the habitat. Another 35 % is in public ownership. Outside the area of intermixed ownership, the proportion of public ownership is even higher. The distribution of habitat on SPI was evaluated by the Territory Opportunity method, and in combination with other ownerships in the LEAF evaluation. Based on these analyses, we conclude that at the landscape level, fisher habitat is abundant and well distributed. Adult males and juveniles that are no longer dependent on their mothers (>6 months old), are highly mobile and not constrained to limited areas by the requirements of bearing and raising young. Therefore, for purposes of estimating harm, we assume that neither adult male fishers nor juveniles >6 months old are subject to harm by the Covered Activities. Thus we did not establish a harm threshold for adult male and juveniles >6 months of age.

We incorporate only adult females in the estimate of harm, because we assume that any juveniles that are too young to escape harvest activities would be accounted for in the kill and harass estimate. Outside the denning period juveniles are assumed to be mobile enough to disperse from the affected territory before being harmed.

In Sections 6.8.1 through 7.2.6, we explained our use of a hexagonal grid and the SPI timber inventory system with specified amounts of contiguous habitat to delineate Territory Opportunities. To estimate the projected quantity of harm, we used the hexagon analysis described in Section 7.2.1-7.2.6 to calculate the number of Territory Opportunities, beginning in year 2012 (Year 0, the most recent modeling interval) and projected through the ten-year period of the CCAA. For the purpose of modeling harm, when a Territory Opportunity is affected by projected timber harvest to the extent that it no longer qualifies as a Territory Opportunity, one instance of projected harm has occurred.

For the purposes of this estimation, we will assume that a female fisher occupies every Territory Opportunity on the landscape, and we will assume that harm will occur any time timber harvest changes an existing Territory Opportunity to a condition where it no longer qualifies as a Territory Opportunity. This provides an estimate of harm based on a density of females that is

higher than the presumed density for the kill/injure /harass calculation (i.e., 224 Territory Opportunities based on habitat quality vs. 133 breeding females based on two breeding sites per 10,000 acres.) This approach incorporates the premise that harm is related to habitat, and a territorial female can be subject to harm even in a year when she is not present in a reproductive den subject to kill/injure/harass. Based on the hexagon analysis described in Section 7.2 and summarized in Appendix A, we estimate that 79 of the 224 Year 0 Territory Opportunities (35%) will be reduced to a condition that no longer qualifies as a Territory Opportunity, and thus, 79 adult female fishers will be incidentally taken due to harm.

This method probably overestimates the actual amount of harm that will occur for several reasons. In particular, it seems unlikely that every Territory Opportunity is actually occupied by a unique female fisher in every year. And, this analysis ignores nearby Federal lands, which in many cases provides substantial amounts of habitat that will remain available after SPI's harvest nearby. Also, it is seems unlikely that a small amount of habitat modification that changes the status of a Territory Opportunity will always result in harm.

Conversely, harm might be underestimated using our proposed methodology if harvested habitat being used by fishers did not initially qualify as a Territory Opportunity. As an example, at the SWSA, several fisher territories (located by radio telemetry) did not meet our minimum habitat threshold for designation as a Territory Opportunity, primarily because the average tree diameter (QMD) was below the criteria for HF4 or HF2Hv.

We recognize that these potential errors of overestimation and underestimation are related to the choice of criteria for habitat description and the required amount. Given the range of biological variation and the very limited data available, we believe our choices of criteria are reasonable, but we can only estimate the effects of habitat modification. Therefore the projected amount of harm is only an estimate.

We propose to seek authorization for incidental take due to harm for all of the estimated loss of Territory Opportunities. Assuming that each Territory Opportunity is occupied by an adult female fisher, this translates to 79 adult female fishers that we estimate will be harmed over the 10-year CCAA period within the Occupied Range.

9.3 SUMMARY OF REQUESTED INCIDENTAL TAKE

Based on the preceding analyses, we are seeking authorization for incidental take of up to 60 fishers via kill/injure, and up to 180 via harass over the term of the permit. We are also seeking authorization for incidental take of up to 79 fishers via harm over the term of the permit. Regardless of the uncertainty as to when or whether incidental take will actually occur via kill/injure or harass, we will assume that these levels of take will occur, barring other circumstances. Therefore, the total incidental take requested is 319 fishers. The take is anticipated to be distributed approximately equally on an annual basis. As stated previously, because of possible double counting of incidental take, this total may be an overestimate to an unknown degree.

9.4 IMPACTS OF THE TAKING

As described in Appendix F for the purposes of this evaluation, we assume that there are 133 territories occupied by female fishers annually on SPI lands (one per 5,000 acres on 663,278 acres of Mixed land class available in the Occupied Range) and that each has two kits in a den site during the reproductive season. Assuming a sex ratio of one adult male to two adult females (Truex et al. 1998 and Zielinski et al. 2004 cited in Self et al. 2008), there are about 66 adult males in the population under consideration. In assessing the impact of the taking during the permit period, it is not

appropriate to compare the total take over the ten-year period against the initial population size, because annual reproduction and mortality in the remaining population is not accounted for over the period. Therefore, we regard the annual proportional impact as the most accurate representation of the impact to the population.

To examine the potential effects of SPI's projected incidental take via kill and harass or harm during the term of the CCAA, we investigated other studies involving removal of fishers. In California there is only one source that estimated effects of removal. Swiers (2013) evaluated the effects of removal of adult fishers during two consecutive years from the Eastern Klamath study area (EKSA) in northern California for reintroduction in the Stirling Management Area. The results are not directly comparable to SPI's projected take because of differences in the removal rate, the period of effect, the population density, the amount of area involved, and possible difference in timber harvest regimes. However, the study by Swiers (2013) does provide valuable perspective, and we will refer to it in several ways in the following discussion.

9.4.1 Impacts of Killing and Harass

Based on the assumptions stated above and all the other assumptions incorporated into Appendix F and Sections 9.1 and 9.2, 398 adult female and juvenile fishers are associated with occupied den sites during the reproductive season in the population under consideration, of which about 24 fishers may be killed, injured, or harassed annually. Expressed as a percentage, this comprises about 6.0% of the assumed total female fisher and kit population estimate on SPI lands annually, and about 2.6% of the total population including adult males.

Importantly, Conservation Measures in 7.3.6.2 are designed to substantially minimize the amount of taking by killing, injuring, or harassing, so we do not expect take by these means to occur at the level projected in Appendix F and Section 9.1.1, even though we are seeking authorization for the projected amount.

9.4.2 Impacts of Harm

In terms of overall impact to a population, the relative effect of take by harm is probably greater than take by killing, injuring, or harassing, because harm through habitat modification eliminates or substantially modifies a basic resource for population stability. Conversely, where the habitat is not removed during population reductions, (e.g. see Swiers 2013), the remaining population of adults and annual recruitment of offspring can reoccupy the habitat where individuals have been removed.

Based on estimated values produced in Section 7.2 and Figure 7.2.7-2, harvesting would annually cause about eight of the 224 Territory Opportunities to fall below the threshold for inclusion as a Territory Opportunity (an estimated total of 79, or 35%, during the ten-year permit period). This change would result in assumed harm to about 3.5% annually of the adult females on all ownerships in the Occupied Range hexagons.

The modeled loss of Territory Opportunities is estimated to change 11 of the 54 Conservation LEAFs to non-Conservation LEAF status, leaving approximately 80% of the Conservation LEAFs functioning. Harm will occur in Support and Conservation LEAFs at similar rates, approximately 36%, as a proportion of the total number of Territory Opportunities in those LEAF categories. Conservation LEAFs that persist to provide Conservation Benefit will be distributed across the Occupied Range (see Appendix E).

Changes in one geographic location deserve further discussion. In the South Redding CSCA there are five Conservation LEAFs that will not persist according to the projections. The apparent

impact of these modeled instances of harm on fishers would likely be greater than the actual impact, due to the preponderance of USFS ownership in those LEAFs. The average amount of USFS ownership in these five Conservation LEAFs is 51% (Appendix E; Redding South CSCA Ownership Map: Conservation LEAFs to Support LEAFs).

Swiers (2013) did not discuss existing amounts of habitat or ongoing habitat modification within his study area during the period of his analysis. Because the amount of habitat removed is germane to a comparison with the effects of SPI's projected harvest during the term of this CCAA, we analyzed the amount of timber harvesting in the EKSA. Our review of CAL FIRE timber harvest records indicated that timber harvesting was occurring in the study area throughout the study period (Table 9.3-1). Assuming that there were no retention measures specifically intended to maintain fisher denning/resting habitat, an unknown portion of the non-regeneration harvesting could have made those areas unsuitable in addition to the effects of the regeneration harvest. Using the CAL FIRE THP records and SPI's GIS, and assuming that no harvest took place on federal land, we estimate that the amount of habitat removed was approximately 11.5% of the total EKSA acres in the ten-year period preceding and including the fisher removals from the study area.

Table 9.4.2 –1 Private timber harvest 12 years prior to, and during fisher removals in the EKSA.

	Silvicultural Treatments										
Harvest Year	Alternative Practice	Clearcut	Commercial Thin	Rehabilitation	Sanitation Salvage	Shelterwood Prep Cut	Shelter-wood Removal	Shelter-wood Seed Cut	Selection	Seed Tree Removal	Total Acres Harvested
1997	303	270	59				217	25	142		1017
1998	93	315	126		10		144	85			774
1999	278	18	85		8	36	103		6		533
2000	92	58	86				95			38	371
2001	3		46	85	69		80				284
2002	2505	751	256			12	443	9	605		4693
2003	417	539	56		72		208	13			1306
2004	133	278									411
2005	850	384					494				1660
2006	83	517				8			13		620
2007	85	176	59								321
2008	154	418					63		57		698
2009	833	479					116				1428
2010	1739	382					5		5		2151
Total Acres	7566	4586	774	85	159	56	1856	132	827	38	16265
Percent EKSA	6.0%	3.6%	0.6%	0.1%	0.1%	0.0%	1.5%	0.1%	0.7%	0.0%	12.9%

Using Swiers' (2013) population estimate, and an assumed sex ratio of 2 females to 1 male as estimated above, the crude landscape density of female fishers in his study area prior to removal was about one per 3,743 acres, or roughly 2.7 per 10,000 acres. This density is about 35% higher than the presumed density of Territory Opportunities at the beginning of the analysis period across SPI's lands within the fisher's occupied range in northern California.

Given lack of data regarding habitat condition, the differences in rate of harvest, and the different population density, we conclude that valid comparisons cannot be drawn between the population effects of habitat modification in Swiers' (2013) study and the proposed amount of habitat removal in this CCAA.

9.4.3 Summary of Impacts of Taking Fishers Under the CCAA

Swiers' (2013) analysis and the available timber harvest data for his study area indicate that regional fisher populations can withstand removal of individuals equivalent to killing the animals and can persist in forests that are subject to ongoing management. However, the limited available data and the differences in the situations preclude meaningful comparison between his study and the proposed effects of the CCAA. And we have no rigorous population estimates for the species. Thus we have no quantitative basis for comparing the impacts of taking under this CCAA and other studies.

As shown in Figure 7.2.3-3, SPI owns about 47% of the available habitat in the hexagons in the Occupied Range. Only SPI inventory data is used for classifying hexagons in the establishment of Territory Opportunities and in our criteria for harm based on modification of Territory Opportunities. In reality, considerably more habitat exists on other ownerships in the Occupied Range, including 32% federal ownership. We do not wish to make explicit assumptions about persistence of this habitat, but it is possible that sufficient habitat will remain in these Territory Opportunities to avoid actual take of fishers.

SPI's ownership provides a substantial fraction of available habitat in the areas of mixed ownership. However, there are large areas of the fisher's range where the U.S Forest Service is the dominant owner, and overall, SPI owns only about six percent of the area within the fisher's occupied range in northern California. Thus the area where the take will occur is limited, and the amount of take is quite small in proportion to the potential population of the entire occupied range.

In the remaining Mixed stands, continued growth and the influence of natural forces would be expected to improve forage habitat for fisher prey species by creating more snags and down logs, and further increase the number and size of available denning cavities. Thus, habitat improvement through growth should help offset the impact of the taking.

Despite the loss of Territory Opportunities, 80% of all the existing Conservation LEAFs will be maintained with habitat on SPI lands, providing for a remaining population distributed throughout the Occupied Range. And, the amount of habitat retained on the Enrolled Lands will be in excess of 50% of the entire Capable Land present at the beginning of the permit.

Therefore, we anticipate no important population impacts of the proposed taking by either habitat modification or impacts to occupied den sites and stands.

10. ASSURANCES PROVIDED

In accordance with the ESA regulation 50 CFR 17.22(d)(5), through this CCAA SPI seeks assurances from the Service that no additional conservation measures or additional land, water, or resource use restrictions, beyond those voluntarily agreed to and described in this CCAA, will be required should fishers become listed as a threatened or endangered species during the permit period. In the event the fisher is listed under the U.S. ESA, of listing the fisher, we anticipate that these assurances will be authorized with the issuance of an enhancement of survival permit under section 10(a)(1)(A) of the ESA.

11. ASSURANCES PROVIDED TO PROPERTY OWNER IN CASE OF CHANGED OR UNFORESEEN CIRCUMSTANCES

The regulatory assurances provided by the Permit are linked to the existence of changed circumstances and unforeseen circumstances. As defined in 50 CFR 17.3, "Changed circumstances means changes in circumstances affecting a species or geographic area covered by a conservation

plan or agreement that can reasonably be anticipated by plan or agreement developers and the Service 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)."

As also defined in 50 CFR 17.3, "Unforeseen circumstances means changes in circumstances affecting a species or geographic area covered by a conservation plan or agreement that could not reasonably have been anticipated by plan or agreement developers and the Service at the time of the conservation plan's or agreement's negotiation and development, and that result in a substantial and adverse change in the status of the covered species."

The proposed assurances listed below apply only to SPI's Enrolled Lands where the Section 10(a)(1)(A) permit and the CCAA itself are being properly implemented, and are applicable only with respect to fishers, the species covered by this CCAA.

11.1 CHANGED CIRCUMSTANCES NOT PROVIDED FOR IN THE CCAA

The threat of effects to fishers related to climate change, while anticipated, is not considered a Changed Circumstance for this CCAA. We cannot describe the likely conditions caused by climate change with enough detail to select a threshold for creating a changed circumstance. Potential effects of climate change will be gradual and likely be unmeasurable during the term of this CCAA. We do acknowledge that climate change may affect SPI forests and operations, primarily due to changes in the natural disturbance regimes. The potential outcomes of climate change are incorporated within the sections describing natural disturbances as changed circumstances.

11.2 CHANGED CIRCUMSTANCES PROVIDED FOR IN THE CCAA

Service CCAA guidance (USFWS 2003, p.16-17) states the following regarding Changed Circumstances:

Changed circumstances provided for in the Agreement. If additional conservation measures are necessary to respond to changed circumstances and the measures were set forth in the Agreement's operating conservation program, the Permittee will implement the measures specified in the Agreement.

Changed circumstances not provided for in the Agreement. If additional conservation measures not provided for in the CCAA's operating conservation program are necessary to respond to changed circumstances, the Service will not require any conservation measures in addition to those provided for in the CCAA without the consent of the Permittee, provided the CCAA is being properly implemented.

The Changed Circumstances provided for in the Agreement are: 1) Substantially damaged timberlands; 2) Changed Circumstance: Failure to maintain Conservation LEAFs; 3) Listing of other species; and 4) Lack of Wildlife Trees Identified in Harvest Units. There are no other Changed Circumstances provided for in the Agreement.

Conditions that may result in a determination of Changed Circumstances, and measures to address such circumstances are discussed below.

11.2.1 Changed Circumstance: Natural Disturbance Causing Substantially Damaged Timberlands

The potential natural disturbances addressed in this CCAA are: fire, wind throw, hail storm, drought, pathogens, and pests. Each of these threats can kill or damage large numbers of mature trees over extensive areas. Where natural disturbance has killed or damaged trees to the extent

that the stocking requirements of the FPRs are not met, the area is referred to as Substantially Damaged Timberlands in the FPR (14 CCR 895.1). The location, timing, and extent of the impacts to the Enrolled Lands from such natural disturbances are not predictable.

A natural disturbance of 2,500 contiguous acres or larger on the Enrolled Lands that creates the condition of Substantially Damaged Timberlands will be considered a Changed Circumstance.

In SPI's view, replanting a new forest is most important for rapidly restoring the area as suitable fisher habitat, as well as for erosion control and economic productivity. Therefore, the mitigation for substantially damaged timberlands will usually include salvage harvesting. Salvage harvesting in Substantially Damaged Timberland will include the Conservation Measures specified in Section 7.3.5. Typically, emergency salvage harvesting will begin as soon as possible on Substantially Damaged Timberland. SPI will conduct salvage harvest operations as necessary and in compliance with the FPRs (14 CCR, 931-949.7), to recover the dead and dying timber and complete restoration work.

SPI will notify the Service within 30 days of such events. Notification will include a map including the area affected by the natural disturbance and the approximate area where emergency salvage harvesting is to occur. The notification will include a statement that estimates the number of Conservation LEAFs that exist and percentage of Mixed expected to persist on the Enrolled Lands following the salvage operations. The USFWS may observe active Emergency Salvage operations concurrent with Timber Operations, contingent upon 48-hr notification to SPI so that personnel safety can be adequately addressed.

SPI anticipates that if 43 or more Conservation LEAFs are intact and are likely to persist for the term of the permit, after the Substantially Damaged Timberlands have been salvaged, the conservation benefit is considered met. If the Substantially Damaged Timberlands results in a reduction of Conservation LEAFs below 43, then the USFWS will need to determine in writing whether the conservation benefit derived from the CCAA in total continues to contribute substantially to the conservation of fishers or whether the impacts of the Substantially Damaged Timberlands are so significant that the Service must re-evaluate the Permit.

SPI anticipates that if more than 50% of the Mixed land class available at the beginning of the permit is intact and are likely to persist, after the Substantially Damaged Timberlands have been salvaged, and all other CCAA measures remain in place, the conservation benefit is still considered met. If the substantially damaged timberlands results in a reduction of Mixed below 50% of the Enrolled Lands, then the Service will need to determine in writing whether the conservation benefit derived from the CCAA in total continues to contribute substantially to the conservation of fishers, or whether the impacts of the Substantially Damaged Timberlands are so significant that the Service must re-evaluate the Permit. SPI's standard practice of SPI shifting logging operations from "green" sales to salvage reduces the loss of Mixed land class and should prevent the 50% limit from being exceeded.

11.2.2 Changed Circumstance: Failure to Maintain Conservation LEAFs

As described in Section 7.3.1, a goal of the CCAA is to maintain at least 43 of the 54 Conservation LEAFs (80%) during the permit term. If the number of Conservation LEAFs maintained falls below 43, this will constitute a Changed Circumstance. SPI will notify the Service if proposed harvesting and/or a natural disturbance will cause the number of Conservation LEAFs to fall below 43. The Service will determine in writing whether the conservation benefit derived from the CCAA in total continues to contribute substantially to the conservation of fishers, or whether the impacts of the loss of Conservation LEAFs are so significant that the Service must re-evaluate the Permit.

11.2.3 Changed Circumstance: Changes in Enrolled Lands

Substantial decreases or increases in the amount of Enrolled Lands covered under the CCAA could potentially change the value of the CCAA to fishers. SPI regularly acquires more timberlands than it sells, and needs flexibility for such practices. To address SPI's need to purchase and dispose of property, the following measures apply.

Disposal of lands resulting in a decrease of 10% or more in SPI's ownership within the Occupied Range during the permit period will constitute a Changed Circumstance, unless the new owner adopts the provisions of this CCAA. Also, the disposal of lands that results in SPI's inability to meet the Conservation LEAF requirements (at least 43 Conservation LEAFs maintained) and/or contribution towards the Mixed Land class land base (50% of the initial Mixed land class) will be considered a Changed Circumstance. In this event, the Service will retain the right to determine in writing whether the conservation benefit derived from the CCAA in total continues to contribute substantially to the conservation of the fisher, or whether the effects of the transaction are so significant that the Service must re-evaluate the Permit.

SPI will notify the Service within 60 days if disposal of lands constitutes a Changed Circumstance. All changes in Enrolled Lands, whether acquisition or disposal, will be described in the annual CCAA monitoring reports.

11.2.4 Changed Circumstance: Listing of other species

Listing of an additional species within the Enrolled Lands as threatened or endangered under the U.S. ESA, subsequent to the approval of this CCAA, will be considered a Changed Circumstance.

In the event the Service lists a new species that might occur on the Enrolled Lands and may be "taken" by the Covered Activities, SPI will request technical assistance with the Service for the newly listed species such that unauthorized take is avoided.

11.2.5 Changed Circumstance: Lack of Wildlife Trees Identified in Harvest Units

As described in Section 7.3.4, Wildlife Trees are to be identified in all harvest units at a rate of 1 per 5 acres or 4 per 20 acres. The SPI structure inventory (SPI 2013b & Appendix H) (Nesting / Denning Structure Presence and Abundance Survey in Covered Species Conservation Areas) indicates a high frequency of potentially suitable den trees in the Mixed land class (2 per acre). Because the frequency of potential Wildlife Trees is high, the expectation is that Wildlife Trees will be identified in nearly all harvest units and the retention standard will be met.

The intent of the conservation measure is to meet the Wildlife Tree standard in all harvest units. If monitoring as described in section 12.2.3.2 determines that the appropriate number of Wildlife Trees is lacking in more than 5% of the harvest units, it will constitute a Changed Circumstance. Failure to meet this standard will require the parties to meet and discuss why Wildlife Trees were not available and/or what corrective actions will be implemented to ensure the full complement of Wildlife Trees are retained. The annual third party certification (SFI) report will include a provision tracking the fulfillment of the Wildlife Tree requirements.

11.3 UNFORESEEN CIRCUMSTANCES

If natural disturbances result in substantially damaged timberland on more than 250,000 ac. cumulatively of SPI's Enrolled Land, during the permit period, it will constitute an Unforeseen

Circumstance. In the event of an Unforeseen Circumstance, SPI and the Service will meet and confer regarding a course of action.

(A) If additional conservation measures are necessary to respond to unforeseen circumstances, the Director may require additional measures of the permittee where the Agreement is being properly implemented, but only if such measures are limited to modifications within the Agreement conservation strategy for the affected species, and only if those measures maintain the original terms of the Agreement to the maximum extent possible. Additional conservation 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 available for development or use under the original terms of the Agreement without the consent of the permittee.

(B) The Service will have the burden of demonstrating that unforeseen circumstances exist, using the best scientific and commercial data available. These findings must be clearly documented and based upon reliable technical information regarding the status and habitat requirements of the affected species. The Service will consider, but not be limited to, the following factors:

(1) Size of the current range of the affected species;
(2) Percentage of range adversely affected by the Agreement;
(3) Percentage of range conserved by the Agreement;
(4) Ecological significance of that portion of the range affected by the Agreement;
(5) Level of knowledge about the affected species and the degree of specificity of the species' conservation program under the Agreement; and
(6) Whether failure to adopt additional conservation measures would appreciably reduce the likelihood of survival and recovery of the affected species in the wild.

12. IMPLEMENTATION MONITORING & REPORTING

12.1 MONITORING & REPORTING

Monitoring of the conservation measures proposed in Section 7.3 is intended to ensure that SPI's commitments to and progress towards meeting the standards established in the CCAA. Monitoring will be done systematically, efficiently, and utilize methods and timing that provide accurate and reliable information. The timing for monitoring will vary depending on the measure being evaluated. Some monitoring will be conducted by third party certification entities already conducting audits of SPI practices, and some will be done by CAL FIRE during THP administration. Third party certification monitoring will include annual reports that are provided to the Service by June 30th of each year. CAL FIRE monitoring will only generate a report (Notice of Violation) only when the implementation of a Conservation Measure is not met. The retention measures described in 7.3 and other conservations measures provided for in this CCAA will become part of the operational requirements of individual THPs submitted by SPI for operations on the Enrolled Lands. Once these measures are incorporated into THPs, the CAL FIRE regulatory monitoring methodology can be relied on such that compliance is assumed unless a violation of an enforceable standard (conservation measure) is identified. SPI and FWS will work cooperatively to accomplish the intent of the Conservation Measures in section 7.3.4. This cooperative effort should entail an educational exchange of information during pre-operational or post-operational field reviews.

12.1.1 USFWS Compliance Monitoring

The USFWS has the prerogative to inspect any of the Enrolled Lands at any time following 48 hrs. notice to SPI for the purpose of confirming that the Conservation Measures in this CCAA are being implemented.

12.2 REPORTING ON CONSERVATION MEASURES, HARM, AND TAKE MINIMIZATION

Reporting will be scheduled such that the USFWS US Fish and Wildlife Service is informed in a timely manner regarding the minimization of take, implementation of Conservation Measures, the accounting for incidental take and Changed Circumstances.

The purpose of reporting is to verify that the conservation measures are being implemented, to ensure that the level of take authorized is not exceeded, and to provide the FWS with the opportunity to remove fishers when take is imminent (although this is an unlikely scenario). The reporting for this conservation agreement is structured to efficiently provide the Service with this important information at the appropriate time or stand age/condition, such that the results are a reliable estimation of the conditions that will persist in harvested areas across the Enrolled Lands.

Attainment of the standards committed to in Section 7.3.4 will be monitored by a third party during audits conducted as part of the Sustainable Forestry Initiative (SFI) certification process. Currently one-third of SPI's land base is audited each year, such that every 3 years all lands have been audited under the third party Sustainable Forestry Initiative (SFI) certification program. SFI audit reporting will be summarized and reported annually in the fall of the year following their summer field audits of the property. The third party SFI audit report is published on the internet and SPI will provide the Service with copies of this report when it is published each year. In addition, as noted above SPI will include the management of den structures (see Section 7.3.4.1) and snags, green culls, and down logs (see Section 7.3.4.2.2) as enforceable language in our THPs, which therefore will be monitored by CAL FIRE. CAL FIRE administrative review of active THPs is done annually and concurrent with operations. CAL FIRE violations (should any occur) that relate to these conservation measures will be forwarded to USFWS within 7 days of being received by SPI.

During the term of the permit SPI commits to continuing audits in the SFI or other third party certification process acceptable to both SPI and the Service. Data that will be used for reporting will be collected in a manner that mutually satisfies the SFI or other third party certification process and the USFWS.

An annual report of the findings compiled by the third party sustainability certification auditors will be prepared by SPI and delivered to the Service in a hard copy and electronic copy by June 30th of each year that this CCAA is in effect. This report will include the following:

- The amount of the Mixed land class persisting using the most up to date inventory data.
- A map of the Conservation LEAFs, showing where harm was assumed to have occurred in a Territory Opportunity and where the Territory Opportunities within each Conservation LEAF persist.
- A summary and quantification of the application of retention standards.
- A summary description and quantification of take minimization practices.
- A summary of water tanks that were remediated.
- A summary of marijuana grow sites that were identified and remediated.
- A summary of implementation of strategic fuels reduction.

- A summary of any observed strengths or weaknesses SPI perceives in the implementation of the CCAA and suggestions for improvements.

It is SPI's intent to maximize the use of the Conservation Measures in this CCAA. To accomplish this, SPI will implement these measures on all harvest units that have not commenced silvicultural operational activities before January 1, 2016. A list of harvest units in THPs that are not yet completed and where silvicultural operational activities have commenced prior to January 1, 2016 will be provided to the Service.

12.2.1 Harm Accounting

Annual impacts of harm occurrences associated with the implementation of covered activities in individual harvest units will be reported in the manner detailed in Section 7.2.10 (Annual Harvest Harm Accounting). Other covered activities that may result in harm via changes in Territory Opportunities shall also be reported. Each year the projected harm occurrences will be updated based on actual amount of harvest accomplished and other Covered Activities undertaken. The actual cumulative harm will be compared to the total permitted harm. The updated harm report will be included with the list of current year planned timber harvest units provided to the USFWS by February 28th of each year, commencing after the first year of operations under the permit.

Beginning February 28th, 2016 or as soon thereafter as the permit is signed, and on February 28th of each year thereafter, SPI will provide the USFWS a list of all harvest units and other covered activities that are planned for operations in the current calendar year that intersect a Territory Opportunity and are projected to cause harm (using the criteria established in Section 7.2.5).

12.2.2 Take Minimization

Take minimization monitoring reports will be summarized at the scale of the occupied range. Reporting will occur annually for harvest minimization actions. Natal den period harvest volume minimization (see Section 7.3.6.2.1) includes limits on harvest volume occurring between February 15th and May 15th. SPI will maintain a cumulative summary of these harvest amounts and they will be reported with the annual harm report. Since all harvest volume is required to be reported to the California State Board of Equalization (SBE), the SPI log accounting system which produces the SBE reports also produces the bi-weekly logger payments, there is significant third party oversight to these reports, but if necessary SPI could make these records available to the Service to verify these volumes.

SPI will include the potential den avoidance felling practices (see Section 7.3.6.2.4) as enforceable language in our THPs. Therefore, these measures will be monitored by CAL FIRE and thus would not require reporting, except that SPI will provide the Service any CAL FIRE violation issued that indicates these measures were not implemented. CAL FIRE also maintains a violation database that the Service could audit if necessary.

SPI will in the annual harm report also include a listing of all proposed tractor units that meet the ≥75% HF4 standard, which precludes commencing harvesting prior to May 15th. THPs that contain these units will include enforceable language that will preclude them from being harvested between March 1 and May 15th. Instances where operational limits require the falling of adjacent trees prior to falling potential den trees during the maternal denning period (May 16 through July 31) shall also be reported. Reports of observations of fishers in the vicinity of timber operations as described in Section 7.3.6.2.2 and the outcome of the follow-up investigation shall be reported to the Service immediately.

12.2.3 Retention

12.2.3.1 Timing Issues in Monitoring and Reporting Retention

In even-aged harvest units, following timber harvest, site preparation usually occurs. Site preparation can involve one or more of the following: clear felling all sub-merchantable trees, deep tilling of compacted soil, tractor piling, and broadcast burning. These site preparation activities usually occur immediately following harvesting activities, if weather permits, and each treatment has the potential to degrade or remove retained structures in the even aged harvest units. The even-aged units are planted with conifer tree seedlings, generally in the spring of the year, following site preparation. Following site preparation activities SPI generally files a "Completion Report" with CAL FIRE. The Completion Report indicates to CAL FIRE that Timber Operations are complete and all erosion control, fuel hazard reduction, crossing facilities and roads are in a condition that complies with CFPRs and the specific requirements stated in the THP. Upon certification of the Completion Report by CAL FIRE, the maintenance period for the THP begins and timber operations can no longer be conducted on the THP, except for routine road maintenance.

Following the planting of even-aged units, the next management activity may be one or more herbicide treatments to control competing vegetation that is impacting the survival and growth of the conifer tree seedlings. These herbicide applications have the potential to reduce the number of regenerating hardwood trees in the even-aged unit. Herbicide treatments usually occur 1- 4 yr. following the planting of conifer seedlings, if deemed necessary. When the conifer trees are approximately 8-12 yr. old, the even-aged unit will be pre-commercially thinned. Pre-commercial thinning is done to reduce the tree density in the even-aged unit. Pre-commercial thinning also has the potential to reduce the number of regenerating hardwood trees in the even-aged unit. Even-aged units are considered free to grow following pre-commercial thinning and no further management activities will occur, for the next several decades, until the first commercial thin.

During the time period between site preparation and the pre-commercial thinning, there is the risk of incidental/illegal harvesting of standing hardwoods, retained conifers, or snags for firewood. This is because tractor skid roads are not yet overgrown with brush and saplings and the retained hardwoods or snags are easily seen and present an inviting target to would-be firewood cutters. SPI has a policy of controlling firewood cutting to only very limited areas of its ownership and restricting the cutting to dead or downed wood. Firewood cutting is by permit only. When a permit to harvest firewood is issued, the harvesting area is described and limited to personal use firewood cutting. The process of managing firewood cutting is intended to reduce the amount of illegal firewood cutting while providing an opportunity for the public to utilize some of the waste material. Although SPI controls vehicle access wherever feasible, and prohibits firewood cutting of standing trees or snags, there are many areas (checker board ownership) where the public can and does drive roads that cross SPI forestland. SPI employs forest patrolmen to make sure its access gates are locked and persons are following the company firewood cutting policy.

12.2.3.2 Individual Element Retention

Attainment of the postharvest implementation of habitat elements standards committed to in Section 7.3.4 will be monitored by a third party during audits conducted as part of the Sustainable Forestry Initiative (SFI) certification process.

Monitoring will confirm that SPI is implementing these habitat element standards. SPI proposes that monitoring and reporting on the successful retention of individual wildlife trees,

snags, and down logs, and the regeneration of hardwoods, within even-aged units and emergency fire salvage areas be completed after such areas have been pre-commercially thinned (PCT). A post pre-commercial thinning unit report would be the most meaningful because it would be completed at a time beyond which most of the risks to those trees and structures would have passed, allowing the report to be more indicative of what will persist until the commercial thin. Given the permit term, it is unlikely that many (any) harvest units operated conducted under these standards will reach pre-commercial age, so SPI would be ready to implement a more detailed post PCT report if the CCAA is extended beyond 10 years.

Audits and reporting would be completed on a randomly chosen sample of SPI regeneration and non-regeneration units annually, from approximately 30% of the Enrolled Lands. Audits would be conducted as part of the sustainability certification program SPI is participating in. Currently 1/3 of SPI's land base is audited each year such that every 3 years all lands have been audited under the third party Sustainable Forestry Initiative (SFI) certification program. Such auditors will confirm whether the required retention standards have been met at sites where their audit occurs. These annual "early audit" areas will ensure that the retention standards are being implemented.

Additionally, ongoing monitoring by CAL FIRE during their THP compliance reviews will confirm annually whether the Conservation Measures in 7.3.4.1.2 – 7.3.4.1.4 and 7.3.4.2.2 are being implemented correctly.

12.2.3.3 Habitat Retention Areas

SPI recommends that monitoring on Habitat Retention Area establishment in all harvest areas will be done in a manner that satisfies the SFI or other third party certification process. SPI proposes additionally that it will provide a more complete numerical support for this annual monitoring at a five year interval for regeneration harvests. In regeneration harvesting this numerical report timing should allow for completion of all site preparation activities that might negatively affect the persistence of the established HRAs. Reporting for the Habitat Retention Area (HRA) standards in regeneration units will require SPI to maintain a complete list of all units harvested after 1/1/2016. After five years of CCAA implementation, and using the latest National Agricultural Imagery Program (NAIP) image available that shows a subset of units that were harvested after 1/1/2016, in conjunction with the SPI GIS system, will be used to calculate the size of the HRA islands retained in this subset of regeneration units. This sample will be used to report compliance with the HRA area retention requirement.

Additionally, ongoing monitoring by CAL FIRE during their THP compliance reviews will confirm annually whether the Conservation Measures in 7.3.4.1.1 is being implemented correctly.

12.2.3.4 Instances of suspected exposure to toxicants

SPI shall report via live voice communication to the USFWS, any instances of potential fisher exposure to toxicants that are discovered on the Enrolled Property within 24 hours of discovery. The USFWS may respond to investigate the likely impact to fishers including conducting a carcass search of the area. Exposure to toxicants will be assumed in any instance where toxic material (fertilizer, pesticides, etc.) is located such that fishers would have access to this material.

12.2.3.5 Water tanks posing a risk of entrapment

SPI shall within 7 days report the discovery of and remedy applied to any water tank that poses an entrapment risk to fishers on the Enrolled Lands.

12.2.3.6 Mortality reporting

SPI shall report via live voice communication to the USFWS, any incidence of known fisher mortality, regardless of cause, on the Enrolled Lands (within 24 hours) of discovery.

13. BIOLOGICAL EFFECTIVENESS MONITORING

13.1 INTRODUCTION

In order to help assess the effectiveness of the Conservation Measures on the fisher population, monitoring will be conducted for the continued presence of fishers. It is anticipated that implementing the CCAA conservation measures will sustain fishers use of the SPI forest land for all requisite life processes, and provide for increasing use of the non-occupied forestland should immigration or translocation of fishers occur in the future. SPI and the Service recognize that while much is known about the biology and behavior of fishers, a well-considered population occurrence reporting methodology will improve our knowledge of use of managed landscapes and provide information to guide adaptive management strategies that improve the suitability of the SPI managed timberlands for fishers.

In addition to a formal occupancy monitoring sample, SPI will also report any sightings/occurrences of fisher confirmed by SPI biology staff to the California Fish and Wildlife Natural Diversity Data Base (NDDB). A NDDB query will therefore reflect accurately the observations of this species across the extent of the SPI ownership.

13.2 FISHER OCCUPANCY MONITORING

Monitoring fisher occupancy will be done prior to the end of the 10 year permit period through some type of sampling effort. To sample the Occupied Range as defined in this CCAA, SPI anticipates using a non-invasive survey strategy presently being developed by the Stirling Fisher Translocation project, if it is determined to be both reliable and cost effective. Alternatively, SPI will conduct detection sampling per Zielinski and Kucera (1995, Appendix P) to monitor the presence of fisher on its ownership. The initial survey will be initiated by the spring of 2021.

In the unoccupied range, SPI will sample portions of the leading edges of the extant populations on the Enrolled Lands prior to the end of the 10-year permit term to help determine if the current populations are expanding. The reporting for this sample of the population distribution will begin within five years of the date of permit signing and be completed prior to the end of the 10-year term of the permit.

Over the course of the 10-yr agreement, it is likely that improved monitoring methodology will be developed. Therefore the parties will meet two years in advance of selecting the methodology and locations for these sampling efforts, to discuss which methodology should be used to monitor fisher populations, such that the most efficient and cost effective technique is employed. All sampling efforts will be conducted after soliciting information and attempting to coordinate with other parties conducting fisher investigations, such that efforts are not confounded or duplicated.

13.3 ADAPTIVE MANAGEMENT

SPI has submitted a CCAA with a proposed term of 10 years. Given that limited duration, it is unlikely that SPI or the Service will be able to conduct monitoring and analysis of fisher populations upon which to base adaptive management changes to the CCAA. Nevertheless, SPI commits to continue its involvement in on-going research into many aspects of forest and wildlife management as they relate to sustainable forest management. If that continuing commitment leads to the ability to achieve greater or equal benefit at equal or lower costs, SPI will propose such adaptive management changes to the Service for its consideration. Similarly, SPI expects the Service will continue fostering new research and increased knowledge, and expects that the Service would propose changes to the CCAA that achieve greater or equal benefit at equal or lower costs. SPI will consider those under the assurances policy and adopt those it finds appropriate.

If efforts to detect fishers in areas that are currently known (as of 2015) to be occupied fishers are not successful, an evaluation of potential reasons for presumed fisher absence will be conducted to develop an adaptive management strategy. The failure to detect fishers in areas where they have been previously known to occur may trigger the need to re-evaluate the ability of the agreement to achieve the CCAA standard.

If monitoring indicates that the agreed upon retention standards are not being applied or that their application is not resulting in the desired condition (for example if many retained trees blow over or do not remain standing, or if retained hardwoods are killed by herbicides), the Service and SPI will meet and cooperatively determine how to correct this situation by retaining additional trees, trees with different characteristics, or by altering practices such as the placement of retained elements as part of an adaptive management strategy.

14. NOTIFICATION OF TAKE REQUIREMENT

By signature of this CCAA, SPI, to the extent they can determine in advance that a potential take is going to occur, agrees to notify the Service at least 30 days in advance of an activity that would cause such a take. Potentially, actual take of fisher in the form of killing, injuring, or harassing could occur due to harvesting in or near a known occupied den stand. If possible the Service will be notified at least 30 days in advance of the activity that could cause such a take. If the potential take is imminent, the relevant Covered Activity will cease and the Service will be notified immediately. Due to the low likelihood of detecting fishers that are present, and especially due to the very low probability of a harvest unit overlapping a fisher den, this situation is extremely unlikely to occur.

Instances of projected harm as described in Section 7.2.10, or related to other Covered Activities, will be identified during planning by SPI. A comprehensive list of THPs and other Covered Activities that are projected to cause harm within the fisher Occupied Range will be provided to the Service on February 28th of each year. Assessment of other Covered Activities will be done on a project by project basis by a SPI Registered Professional Forester. In addition to the February 28th list of THPs where harm has been projected, the Service will be notified of any other potential take of fisher 30-days prior to the commencement of timber operations on approved THPs where projected harm has been modeled to occur.

15. DURATION OF CCAA AND PERMIT

This CCAA will be for the duration of 10 years from the date the Service signs and enters into the Agreement and issues the permit. The section 10(a)(1)(A) permit will become effective on the date of a final rule that lists fishers as threatened or endangered and continues through the end of the

CCAA term. Should the permit become effective due to listing of the fisher, SPI will be allowed to take fishers, so long as the take is consistent with the terms of the CCAA. The Enrolled lands will be maintained in their existing and/or improved states as described above, from the date the land is enrolled under the CCAA until the end of the 10 year permit term. The permit and CCAA may be extended beyond the specified terms prior to permit expiration, with the agreement of the Parties in accordance with those USFWS regulations in place at the time of permit renewal.

16. MODIFICATION OF THE CCAA

During the term of the CCAA, the Service shall adhere to the Assurances described above and act in good faith according to the "No Surprises" policy and guidance provided for in 50 CFR 17.22(d)(5). Any party to this CCAA may propose modifications or amendments to this CCAA by providing written notice to, and obtaining the written concurrence of, the other Parties. Such notice shall include a statement of the proposed modification, the reason for it, and its expected results. The Parties will use their best efforts to respond to proposed modifications within 60 days of receipt of such notice. Proposed modifications will become effective upon the other Parties' written concurrence.

Modifications to the CCAA will occur occasionally, through the removals or additions of land to the enrolled lands through sale, purchases, or land exchanges. These changes are not expected to annually comprise more than 5% of the aggregate acreage of the enrolled lands. These changes are considered minor in nature, and at the landowner's discretion, and shall be included or excluded from the CCAA, with written notification to the Service in the annual take minimization report. Removals of land from the Enrolled Lands exceeding 10% cumulatively, in the Occupied Range, over the life of the permit, which will not continue to be bound by the requirements of this CCAA, will require SPI to provide written notice and obtain written concurrence from the Service and may require the Service to amend the permit in accordance with all applicable legal requirements. The changes in the land base as described above shall not alter the expected conservation benefits for fisher, shall not alter the amount of incidental take authorized, the accompanying analysis of the impacts of such taking, or the commitment by SPI to provide the prescribed amount of habitat over the term of the permit, or the commitment by SPI to maintain 80% of the Conservation LEAFs over the term of the permit.

17. AMENDMENT OF THE PERMIT

The permit may be amended in accordance with all applicable legal requirements including, but not limited to the ESA, the National Environmental Policy Act, and the Service's permit regulations at 50 CFR 13 and 50 CFR 17. Either SPI or the Service can propose an amendment. The party proposing the amendment shall provide a statement describing the proposed amendment and the reasons.

18. TERMINATION OF THE CCAA

As provided for in Part 8 of the Service's CCAA Policy (64 Fed. Reg. p. 32726), SPI may, for good cause, terminate implementation of the CCAA's voluntary management actions prior to the

CCAA's expiration date, even if the expected benefits have not been realized. If the CCAA is terminated, SPI is required to surrender the enhancement of survival permit at termination, thus relinquishing take authority (if fishers have become listed at time of termination) and the assurances granted by the permit. SPI is required to give 60 days written notice to the other Parties of intent to terminate the CCAA. SPI must give the Service and CDFW an opportunity to relocate affected fishers. Relocation of such affected fishers is not mandatory.

If SPI and the Service agree to a subsequent HCP or CCAA that includes the enrolled lands in this HCP or CCAA, this CCAA may terminate upon signing of such a new HCP or CCAA pursuant to terms established therein, and SPI will surrender the permit for this CCAA in accordance with 50 CFR 13.26.

This CCAA analyzes the Stirling Management Area (SMA) CCAA Enrolled Lands in anticipation of incorporating those lands into this CCAA and thereby superseding the terms of the SMA CCAA. The terms associated with the surrender of the ESA section 10(a)(1)(A) enhancement of survival permit, issued under 50 CFR part 17, for the Stirling CCAA shall be adhered to as described in that CCAA (CCAA number TE166855-0).

19. PERMIT SUSPENSION OR REVOCATION

The Service may suspend or revoke the permit for cause in accordance with the laws and regulations in force at the time of such suspension or revocation (50 CFR 13.28(a)). The Service may also revoke the permit if continuation of permitted activities would likely result in jeopardy to any listed species, or directly or indirectly alter designated critical habitat such that it would result in adverse modification or destruction of the critical habitat, in accordance with 50 CFR 17.22(d)(7). Before revoking a permit, the Service, with work cooperatively with SPI to pursue all appropriate options to avoid revocation.

20. REMEDIES

Each party shall have all remedies otherwise available to enforce the terms of this CCAA and the permit, except that no party shall be liable in damages for any breach of this CCAA, any performance or failure to perform an obligation under this CCAA or any other cause of action arising from this CCAA.

21. DISPUTE RESOLUTION

The Service and SPI agree to work together in good faith to resolve any disputes, using dispute resolution procedures agreed upon by all Parties.

22. SUCCESSION AND TRANSFER

This CCAA and its ESA section 10(a)(1)(A) permit shall be binding on and shall inure to the benefit of SPI and respective successors and transferees in accordance with applicable regulations in 50 CFR 13.24 and 13.25.

In accordance with 50 CFR 13.24, successors other than the permittee will have the same obligations and rights with respect to the enrolled lands under the CCAA and ESA section 10(a)(1)(A) permit if all provisions and qualifications for a successor are met.

Pursuant to 50 CFR 13.25, the rights and obligations under this CCAA and the ESA section 10(a)(1)(A) permit are transferable to subsequent nonfederal property owners. If the CCAA and permit are transferred, the new landowner(s) will have the same obligations and rights with respect to enrolled lands as SPI. The new landowner(s) must agree, in writing, to become a Party to the original agreement and permit. In accordance with 50 CFR 17.22(d)(3)(i), SPI shall notify the Service, in writing, of any transfer of ownership of any portion of CCAA enrolled lands.

23. AVAILABILITY OF FUNDS

The Parties acknowledge that the Service will not be required under this CCAA to expend any federal agency's appropriated funds unless and until an authorized official of that agency affirmatively acts to commit to such expenditures as evidenced in writing. Implementation of this CCAA is subject to the requirements of the Anti-Deficiency Act and the availability of appropriated funds. Nothing in this CCAA will be construed by the Parties to require the obligation, appropriation, or expenditure of any money from the U.S. Treasury.

24. RELATIONSHIP TO OTHER AGREEMENTS

25. NO THIRD-PARTY BENEFICIARIES

This CCAA does not create any new right or interest in any member of the public as a third-party beneficiary, nor shall it authorize anyone not a party to this CCAA to maintain a suit for personal injuries or damages pursuant to the provisions of this CCAA. The duties, obligations, and responsibilities of the Parties, SPI and Service, to this CCAA with respect to third Parties shall remain as imposed under existing law.

26. NOTICES AND REPORTS

A list of items to be included in the annual implementation report can be found in Section 12.2. Any notices and reports, including monitoring and annual reports, required by this CCAA shall be delivered to the persons/position listed below, as appropriate:

Sierra Pacific Industries designee:

11/4/2016

Date

Dan Tomascheski
Vice President for Resources
Sierra Pacific Industries
P.O. Box 496014
Redding, CA 96049-6014
19794 Riverside Ave.
Anderson, CA 96007

Service designee:

11/3/16

Date

Jenny Ericson
Acting Field Supervisor
Yreka Fish and Wildlife Office
1829 South Oregon St.
Yreka, CA 96097

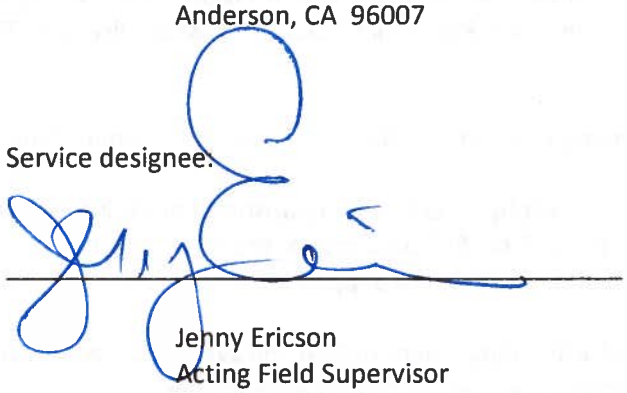
IN WITNESS WHEREOF, THE PARTIES HERETO have executed this Agreement to be in effect as of the date that the Service issues the permit.

Sierra Pacific Industries designee:

_____ _____
Date

Dan Tomascheski
Vice President for Resources
Sierra Pacific Industries
P.O. Box 496014
Redding, CA 96049-6014
19794 Riverside Ave.
Anderson, CA 96007

Service designee:



11/3/16
Date

Jenny Ericson
Acting Field Supervisor
Yreka Fish and Wildlife Office
1829 South Oregon St.
Yreka, CA 96097

IN WITNESS WHEREOF, THE PARTIES HERETO have executed this Agreement to be in effect as of the date that the Service issues the permit.

References Cited

Aubry, K. B., and J. C. Lewis. 2003. Extirpation and reintroduction of Fisher (Martes pennanti) in Oregon: implications for their conservation in the Pacific states. Biological Conservation 114(1):79-90.

Aubry, K. B., and C. M. Raley. 2006. Ecological Characteristics of Fisher (Martes pennanti) in the Southern Oregon Cascade Range. USDA Forest Service, Pacific Northwest Research Station, Olympia Forestry Sciences Laboratory, 3625 93rd Ave. SW, Olympia, WA98512.,Olympia. Pages 31.

Bechtold, W.A., and Patterson, P.L. 2005. The Enhanced Forest Inventory and Analysis Program: National Sampling Design and Estimation Procedures. USDA Forest Service Gen. Tech. Rep. GTR-SRS-80, Asheville, NC.

Bellaire, J., Bureau of Land Management, Redding Office, Forester, pers. comm. June 2015

Biging, G.S; R.G. Congalton, and E.C. Murphy. 1991. A comparison of photointerpretation and ground measurements of forest structure. In: Proc. 56th ann. mtg of the Am. Soc. of Photogrammetry and Remote Sensing. Baltimore, MD. Vol 3, pp. 6-15.

Bonham Charlton H., Director, California Department of Fish and Wildlife. May 12, 2015. A Status Review of the Fisher *(Pekania [formerly Martes] pennanti)* in California.

Buskirk, S. W. and R. A. Powell. Habitat ecology of fishers and American martens. In S. W. Buskirk, A. S. Harestad, M. G. Raphael, and R. A. Powell, editors, Martens, sables and fishers: biology and conservation, pages 283{296. Cornell University Press, Ithaca, New York, USA, 1994.

Burt, W. H. 1943. Territoriality and home range concepts as applied to mammals. Journal of Mammology 24:346-352.

Buck, S. G., C. Mullis, and A. S. Mossman. 1983. Corral Bottom-Hayfork Bally Target Species study: Final report. Humboldt State University, USDA Forest Service, Arcata, California, USA. Pages 138.

California Department of Fish and Game. December 2008a. Initial Study/Negative Declaration. Translocation Plan for the Reintroduction of Fishers (*Martes Pennanti*) to Sierra Pacific Industries Lands in the Northern Sierra Nevada and Southern Cascades. Pages 82.

California Department of Fish and Game. December 2008b. Initial Study/Negative Declaration. Reintroduction of Fishers to the SPI Stirling Management Area. Pages 38.

CALVEG: Existing Vegetation, USDA Forest Service, Pacific Southwest Region, Vegetation Ecology, Remote Sensing Lab, August 2014
http://www.fs.usda.gov/main/r5/landmanagement/resourcemanagement

Campbell, Lori, A. 2004. Distribution and Habitat Associations of Mammalian Carnivores in the Central and Southern Sierra Nevada. Davis, California: Univ. of California; Ph. D. Dissertation. p. 177.

Congalton R. G. 1991. A Review of Assessing the Accuracy of Classifications of Remotely Sensed Data. Remote Sensing of Environment, Volume 37, Pages 35-46.

Congalton, R.G. 2005. Thematic and Positional Accuracy Assessment of Digital Remotely Sensed Data Proceedings of the Seventh Annual Forest Inventory and Analysis Symposium 1

Davis, Raymond J., Dugger, Katie M., Mohoric, Shawne, Evers, Louisa, Aney, William C. 2011. Northwest Forest Plan—the first 15 years (1994–2008): status and trends of northern spotted owl populations and habitats. Gen. Tech. Rep. PNWGTR-850. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 147 p.

Diridoni, Gary., Bureau of Land Management, Redding Office, Fisheries and Wildlife Biologist; pers. comm. May 2015.

Facka, A., 2014, Personal communication regarding toxicant threat at the fisher translocation study area.

Fleishman, Erica., Betrus, Christopher J., Blair, Robert B., Mac Nally, Ralph., Murphy, Dennis D. 2002. Nestedness analysis and conservation planning: the importance of place, environment, and life history across taxonomic groups. Oecologia (2002) 133:78-89

Finley, L. L., R. H. Naney, P. J. Happe, A. L. Krause, R. L. Truex, L. J. Hale, J. M. Higley, A. D. Kosic, J. C. Lewis, S. A. Livingston, E. C. Lofroth, D. C. Macfarlane, A. M. Myers, and J. S. Yaeger. 2011. Conservation of fishers (*Martes pennanti*) in south-central British Columbia, Western Washington, Western Oregon, and California—Volume IV: Conservation Strategy. USDI Bureau of Land Management.

Finley, Laura L., 2012, Personal communication regarding the status of the Vol. IV: Conservation Strategy 2012.

Franklin, J. F., Spies T. A., Van Pelt R., Carey A. B., Thornburgh D. A., Berg D. R., Lindenmayer D. B., Harmon M. E., Keeton W. S., Shaw D. C., Bible K., Chen J. 2002. Disturbances and structural development of natural forest ecosystems with silvicultural implications, using Douglas-fir forests as an example. Forest Ecology and Management 155:399–423

Franklin, J., and J. Stephenson, 1996. Integrating GIs and remote sensing to produce regional vegetation databases: Attributes related to environmental modeling, Proceedings of the Third International Conference/Workshop on Integrating GIs and Environmental Modeling, 21-25 January, Santa Fe, New Mexico, http://www.ncgia.ucsb.edu/conf/SANTA_FE_CD-ROM/santa_fe.html.

Furnas, Brett. 2013. Personal Communication regarding the positive camera detection of a fisher west of Highway 101.

Gabriel, M.W., L.W. Woods, R. Poppenga, R.A. Sweitzer, C. Thompson, S.M. Matthews, J.M. Higley ET AL. 2012. Anticoagulant rodenticides on our public and community lands: Spatial distribution of exposure and poisoning of a rare forest carnivore. *PLoS One* 7(7):1–15.

Gabriel MW, Woods LW, Wengert GM, Stephenson N, Higley JM, Thompson C, et al. (2015) Patterns of Natural and Human-Caused Mortality Factors of a Rare Forest Carnivore, the Fisher (Pekania pennanti) in California. PLoS ONE 10(11): e0140640. doi:10.1371/journal.pone.0140640

Garner, James. 2013. Selection of disturbed habitat by fishers (Martes pennant) in the Sierra National Forest.

Goforth, B.R.; Minnich, R.A. 2008. Densification, stand-replacement wildfire, and extirpation of mixed conifer forest in Cuyamaca Rancho State Park, southern California. Forest Ecology and Management. 256: 36–45.

GNN: Gradient Nearest Neighbor http://lemma.forestry.oregonstate.edu/data.

Gray, Steven, M., 2014. Small Mammals and Forest Management in Northern California., M.S. Thesis, Michigan State University, Ann Arbor, Michigan, USA.

Grinnell, J., J. S. Dixon, and J. M. Linsdale. 1937. Furbearing mammals of California, Volume I. University of California Press, Berkeley, California, USA. Pages 375.

Higley, J. M., and S. Matthews. 2006. Demographic rates and denning ecology of female Pacific Target Species (Martes pennanti) in northwestern California: Preliminary report October 2004 - July 2006. Hoopa Valley Tribe, Hoopa. Pages 14.

John Hof and Michael Bevers, 2000, Linear Approaches to Spatial Optimization. USDA Forest Service, Rocky Mountain Research Station, Fort Collins, CO.

Innes, R. J., D.H. Van Vuren, D.A. Kelt, M.L. Johnson, J. A. Wilson, and P.A. Stine. 2007. Habitat associations of Dusky-footed woodrats (Neotomafuscipes) in mixed-conifer forest of the northern Sierra Nevada., Journal of Mammalogy, Vol. 88, Number 6, pp.1523–1531.

James, C.E., Reno, M.A., and K. Rulon. 2008. Fisher monitoring within two industrially managed forests of northern California. Progress report to California Dept. of Fish and Game. Sierra Pacific Industries, Anderson, CA.

James, C.E., B. Krumland, D. W. Taylor. 2012. Comparison of Floristic Diversity between Young Conifer Plantations and Second-Growth Adjacent Forests in California's Northern Interior. Western Journal of Applied Forestry Vol. 27, Number 2, pp. 60-71.

Kie, John G., Jason Matthiopoulos, John Fieberg, Roger A. Powell, Francesca Cagnacci, Michael S. Mitchell, Jean-Michel Gaillard, and Paul R. Moorcroft. 2010. The home-range concept: Are traditional estimators still relevant with modern telemetry technology? Philosophical Transactions of the Royal Society B, 365:2221-2231.

Krausman, P.R. 1999. Some Basic Principles of Habitat Use. Idaho Forest, Wildlife & Range Exp. Sta. Bull.#70,Univ. of Idaho, Moscow, ID. Editors: K.L. Launchbaugh, K.D. Sanders, J.C. Mosley.

LANDFIRE: LANDFIRE Existing Vegetation Type layer. (2013, June - last update). U.S. Department of Interior, Geological Survey. [Online]. Available: http://landfire.cr.usgs.gov/viewer/ [2015,May 13].

Lamberson, R. H., R. L. Truex, W. J. Zielinski, and D. C. Macfarlane. 2000. Preliminary analysis of Target Species population viability in the southern Sierra Nevada. Humboldt State University, Arcata, California, USA.

Lee, D. E., M.L. Bond, R.B. Siegel. 2012. Dynamics of Breeding Season Site Occupancy of the California Spotted Owl in Burned Forests. The Condor, Vol. 114, Number 4, pages 792–802.

Lewis, J. C., P.J. Happe, K.J Jenkins, D.J. Manson. 2012. Olympic Fisher Reintroduction Project: Progress Report 2008-2011.

Lofroth, E. C., C. M. Raley, J. M. Higley, R. L. Truex, J. S. Yaeger, J. C. Lewis, P. J. Happe, L. L. Finley, R. H. Naney, L. J. Hale, A. L. Krause, S. A. Livingston, A. M. Myers, and R. N. Brown. 2010. Conservation of Fishers (*Martes pennanti*) in South-Central British Columbia, Western Washington, Western Oregon, and California–Volume I: Conservation Assessment. USDI Bureau of Land Management, Denver, Colorado, USA.

Lofroth, E. C., J. M. Higley, R. H. Naney, C. M. Raley, J. S. Yaeger, S. A. Livingston, and R. L. Truex. 2011. Conservation of Fishers (*Martes pennanti*) in South-Central British Columbia, Western Washington, Western Oregon, and California–Volume II: Key Findings From Fisher Habitat Studies in British Columbia, Montana, Idaho, Oregon, and California. USDI Bureau of Land Management, Denver, Colorado, USA.

Magnussen, S., Boudewyn, P., Wulder, M. & Seemann, D. 2000. Predictions of forest inventory cover type proportions using Landsat TM. Silva Fennica 34(4): 351–370.

Matthews, S.M., Higley, M.J., Yaeger, S.J., and Fuller, T.F. 2011. Density of Fishers and the Efficacy of Relative Abundance Indices and Small-Scale Occupancy Estimation to Detect a Population Decline on the Hoopa Valley Indian Reservation, California. Wildlife Society Bulletin 35(2): 69–75.

McCamman J., Director, California Department of Fish and Game. 2010. A Status Review of the Fisher *(Martes pennanti)* in California.

McNab, W. H., and P. E. Avers. 1994. Ecological subregions of the United States: section descriptions. USDA Forest Service, Washington, D.C. Report Admin Publication WO-WSA., Pages 267. http://www.fs.fed.us/land/pubs/ecoregions/ch33.html.

Minnich, R.A.; Barbour, M.G.; Burk, J.H.; Fernau, R.F. 1995. Sixty years of change in Californian conifer forests of the San Bernardino Mountains. Conservation Biology. 9: 902–914.

Mitchell, M.S., Powell, R.A. 2002. Linking fitness landscapes with the behavior and distribution of animals. In: Bissonette, J.A., Storch, I. (Eds.), Landscape Ecology and Resource Management: Linking Theory with Practice. Island Press, pp. 93–124.

Moeur, Melinda; Ohmann, Janet L.; Kennedy, Robert E.; Cohen, Warren B.; Gregory, Matthew J.; Yang, Zhiqiang; Roberts, Heather M.; Spies, Thomas A.; Fiorella, Maria. 2011. Northwest Forest Plan–the first 15 years (1994–2008): status and trends of late-successional and old-growth forests. Gen. Tech. Rep. PNW-GTR-853. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 48 p.

Murphy, E. C. 2008. Canopy Regrowth in Planted Forests on Sierra Pacific Land. Unpublished.

Naney, R. H., L. L Finley, E. C. Lofroth, P. J. Happe, A. L. Krause, C. M. Raley, R. L. Truex, L. J. Hale, J. M. Higley, A. D. Kosic, J. C. Lewis, S. A. Livingston, D. C. Macfarlane, A. M. Myers, and J. S. Yaeger. 2012. Conservation of Fishers (Martes pennanti) in South-Central British Columbia, Western Washington, Western Oregon, and California–Volume III: Threat Assessment. USDI Bureau of Land Management, Denver, Colorado, USA.

Niblett, M.R., S.H. Sweeney, R.L. Church, and K.H. Barber (2014). Structure of Fisher (*Pekania pennanti*) Habitat in a Managed Forest in an Interior Northern California Coast Range. Forest Science. Online Preprint: http://www.ingentaconnect.com/content/saf/fs/pre-prints/content-forsci13086.

Noon, B.R. and K. S. McKelvey. 1996. Management of the Spotted owl: A Case History in Conservation Biology. US Department of Agriculture, Forest Service, Redwood Sciences Laboratory, 1700 Bayview Drive, Arcata, California 95521.

North, Malcolm, ed. 2012. Managing Sierra Nevada forests. Gen. Tech. Rep. PSW-GTR-237. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 184 p.

Ohmann J. L. Cohen W. B. 2002. Inventories of Stand Structure: An Ecosystem Perspective, Pacific Northwest Research Station, Publication 1435.

Powell, R. A. 1993. The Fisher: life history, ecology and behavior. 2nd edition., University of Minnesota Press, Minneapolis, Minnesota, USA.237 Pages.

Powell, R. A. and W. J. Zielinski. 1994. Target Species. Pages 38-73 in L. F. Ruggiero, K. B. Aubry, S. W. Buskirk, and W. J. Zielinski, editors. The scientific basis for conserving forest carnivores: American marten, Target Species, lynx, and wolverine. USDA Forest Service, Rocky Mountain Forest and Range Experimental Station, Fort Collins, Colorado, USA.

Powell, Roger A., Aaron N. Facka, Deana Clifford, Colin Beach and Kevin Smith., Reintroduction of fisher into the Northern Sierra Nevada of California: Annual Report for 2012; Submitted to USFWS Yreka, California Department of Fish and Wildlife, Redding and Sierra Pacific Industries., May 2013.

Powell, Roger A., Aaron N. Facka, Deana Clifford, Colin Beach and Kevin Smith. May 2013. Reintroduction of fisher into the Northern Sierra Nevada of California: Annual Report for October

2009 to January 2013; Submitted to USFWS Yreka, California Department of Fish and Wildlife, Redding and Sierra Pacific Industries.

Powell, Roger A., Robert C. Swiers, Aaron N. Facka, Sean Matthews, and Deana Clifford. November 2014. Reintroduction of fisher into the Northern Sierra Nevada of California: Annual Report for 2013; Submitted to USFWS Yreka, California Department of Fish and Wildlife, Redding and Sierra Pacific Industries.

Powell, Roger A., Deana Clifford, Aaron N. Facka, Sean Matthews, Kevin Smith and Robert Swiers. April 2015. Reintroduction of fisher into the Northern Sierra Nevada of California: Annual Report for 2014; Submitted to USFWS Yreka, California Department of Fish and Wildlife, Redding and Sierra Pacific Industries.

Raphael, M.G., K.S. McKelvey, and B.M. Galleher. 1998. Using geographic information systems and spatially explicit population models for avian conservation: A case study. Pages 65-74 in Avian Conservation: Research and Management (J. M. Marzluff and R. Sallabanks, Editors). Island Press, Washington, D.C.

Raley, C.M., E.C. Lofroth, R.L. Truex, J.S. Yaeger, and J.M. Higley. 2012. Habitat ecology of fishers in western North America: a new synthesis. Biology and conservation of 2 martens, sables, and fishers: a new synthesis. K.B. Aubry, W.J. Zielinski, M.G. Raphael, G. 3 Proulx, and S.W. Buskirk, editors. Cornell University Press, Ithaca, New York, USA.

Seamans M.E. and R.J. Gutiérrez. 2006. Spatial dispersion of spotted owl sites and the role of conspecific attraction on settlement patterns. Ethology Ecology & Evolution 18: 99-111.

Self, S. E. and S. J. Kerns. 2001. Pacific Target Species use of a managed forest landscape in northern California. Sierra Pacific Industries, Redding, California, USA.

Self, S., S. Farber, and E. Murphy 2008. Preliminary estimate of fisher populations in California and southern Oregon, Sierra Pacific Industries. Redding Ca.

Slauson, K. M. and W. J. Zielinski., 2007. Strategic Surveys for Martes Populations In Northwestern California: Mendocino National Forest U.S.D.A. Forest Service, Pacific Southwest Research Station, Redwood Sciences Laboratory, Arcata, California. Pages 22.

Spencer W, Rustigian-Romsos H, Strittholt J, Scheller R, Zielinski W, Truex R. 2011. Using occupancy and population models to assess habitat conservation opportunities for an isolated carnivore population. Biological Conservation 144:788–803.

Spencer, W.D., S.C. Sawyer, H.L. Romsos, W.J. Zielinski, R.A. Sweitzer, C.M. Thompson, K.L. Purcell, D.L. Clifford, L. Cline, H.D. Safford, S.A. Britting, and J.M. Tucker. 2015. Southern Sierra Nevada fisher conservation assessment. Unpublished report produced by Conservation Biology Institute.

SPI Northern District Option A. 2002. A demonstration of Maximum Sustained Production of High Quality Timber Products pursuant to 14 CCR 933.11(a). Approved on September 16th 2002

after being filed with THP 2-97-359 SHA(4). Available to the public from SPI, California Department of Forestry and Fire Protection, Redding Office, USFWS (Yreka).

Sierra Pacific Industries. 2012. Fisher Natal Den Use On Managed Timberland In California. Data from Study Cooperators: California Department of Fish and Wildlife, Sierra Pacific Industries, US Fish and Wildlife Service, North Carolina State University, http://www.spi-ind.com/html/pdf_forests/FisherNatalDenUse_Dec2012.pdf.

Staudacher, G., United States Forest Service, Shasta Trinity Ranger District, Silviculturist, pers. comm., May 2015.

Swiers, R. C. 2013. Non-Invasive Genetic Sampling and Mark-Recapture Analysis of a Fisher (Martes pennanti) Population in Northern California used as a Reintroduction Source. M.S. North Carolina State University, Raleigh, North Carolina, USA.

Rick A. Sweitzer, Viorel D. Popescu, Reginald H. Barrett, Kathryn L. Purcell, and Craig M. Thompson. 2015. Reproduction, abundance, and population growth for a fisher (Pekania pennanti) population in the Sierra National Forest, California Journal of Mammalogy, In Press.

Thompson, C.M., Zielinski W. J., Purcell K. L. 2011. Evaluating Management Risks Using Landscape Trajectory Analysis: A Case Study of California Fisher. The Journal of Wildlife Management. 75(5):1164–1176.

Truex, R. L., W. J. Zielinski, R. T. Golightly, R. H. Barrett, and S. M. Wisely. 1998. A meta-analysis of regional variation in Target Species morphology, demography, and habitat ecology in California. Draft report submitted to California Department of Fish and Game. USDA Forest Service, Pacific Southwest Research Station, Arcata, California, USA.

Tucker JM, Schwartz MK, Truex RL, Pilgrim KL, Allendorf FW (2012) Historical and Contemporary DNA Indicate Fisher Decline and Isolation Occurred Prior to the European Settlement of California. PLoS ONE 7(12): e52803. doi:10.1371/journal.pone.0052803.

USDA/USDI. 1994a. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl. Available at www.reo.ordvac.com. Accessed 7/10/14.

USDA/USDI. 1994b. Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl. Available at www.reo.ordvac.com. Accessed 7/10/14.

U.S. Fish and Wildlife Service. 1999. Final Policy for Candidate Conservation Agreements with Assurances, Federal Register, Vol. 64, pages. 32726-32736.

U.S. Fish and Wildlife Service. 2004. 12-month finding for a petition to list the west coast distinct population segment of the Target Species (Martes pennanti). Federal Register 69(68):18770-18792.

U.S. Fish and Wildlife Service. 2006. 12-month Finding for a Petition to List the California Spotted Owl (Strix occidentalis occidentalis) as Threatened or Endangered. Federal Register Vol. 71, No. 100, pages 29886-29908.

U.S. Fish and Wildlife Service. 2008. Final Environmental Action Statement Screening Form for Candidate Conservation Agreement with Assurances. pages 15.

U.S. Fish and Wildlife Service 2014. Draft Species Report for Fisher (*Pekania pennanti*), West Coast Population, January 13, 2014., pages 243.

U.S. Fish and Wildlife Service 2014, Notice of Proposed Rule for the West Coast Distinct Population Segment of Fisher. Federal Register, Vol. 79, p. 60419.

Weir, R. D., and A. S. Harestad. 1997. Landscape-level selectivity by Target Species in south-central British Columbia. Pages 252-264 in G. Proulx, H. N. Bryant and P. M. Woodard, editors. 1997. Martes: taxonomy, ecology, techniques, and management. Pages 252-264.

Weir, R. D., and F. B. Corbould. 2005. Density of Target Species in the sub-boreal spruce biogeoclimatic zone of British Columbia. Northwestern Naturalist 87:118-127.

Weir, R.D., and F.B. Corbould. 2008. Ecology of fishers in the Sub-boreal forests of north-central British Columbia, Final Report. Peace/Williston Fish and Wildlife Compensation Program Report No. 315. 178 pp plus appendices.

Weir, R.D., and F.B. Corbould. 2010. Factors Affecting Landscape Occupancy by Fishers in North-Central British Columbia. Journal of Wildlife Management 74(3):405–410.

Weir, R. D., M. Phinney, and E. C. Lofroth. 2012. Big, sick, and rotting: Why tree size, damage, and decay are important to fisher reproductive habitat. Forest Ecology and Management 265: 230-240.

Weir, R.D., pers. comm. May 2015.

Wolcott, K., United Stated Forest Service, Shasta Trinity Ranger District, Wildlife Biologist; pers. comm. May 2015.

Woodbridge, B., D.L. Hansen, and J.R. Dunk (tech. coords.). 2012. The Northern Goshawk in California: A Technical Assessment of Its Ecology and Status. Report to Region 5 of the USDA Forest Service: June 4, 2012.

Yaeger, J. S. 2012. Population Inferences and Historical and Contemporary Distribution of Fisher in Northwestern California: Up, Down, Stable, or a Pointless Exercise?, West Coast Fisher Symposium, Sacramento, California, USA.

Zabel, Cynthia J., George N. Steger, Kevin S. McKelvey, Gary P. Eberlein, Barry R. Noon, and Jared Verner, 1992. Home-Range Size and Habitat-Use Patterns of California Spotted Owls in the Sierra Nevada, Chapter 6, Verner et al. 1992.

Zenner, E.K., 2004. Does old-growth condition imply high live-tree structural complexity? Forest Ecology and Management 195 (2004) 243–258.

Zielinski, William J.; Kucera, Thomas E., technical editors. 1995. American marten, fisher, lynx, and wolverine: survey methods for their detection. Gen. Tech. Rep. PSW-GTR-157. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; 163 p.

Zielinski, W. J., T. E. Kucera, and R.H. Barrett. 1995. Current distribution of the Target Species, Martes pennanti, in California. California Fish and Game 81(3):104-112.

Zielinski, W. J., N. P. Duncan. R. L. Truex, E. C. Farmer, R. L. Truex, A. P. Clevenger, R. H. Barrett. 1999. Diet of Fishers (*Martes Pennanti*) at the Southernmost Extent of their Range. Journal of Mammalogy, 80(3):961-971.

Zielinski, W. J., R. L. Truex, G. A. Schmidt, F. V. Schlexer, K. N. Schmidt, and R. H. Barrett. 2004a. Resting habitat selection by Target Species in California. Journal of Wildlife Management 68(3):475-492.

Zielinski, W. J., R. L. Truex, G. A. Schmidt, F. V. Schlexer, K. N. Schmidt, R. H. Barrett, and T. J. O'Shea. 2004b. Home range characteristics of Target Species in California. Journal of Mammalogy 85(4):649-657.

Zielinski, W. J., R. L. Truex, F. V. Schlexer, L. A. Campbell, and C. R. Carroll. 2005. Historical and contemporary distributions of carnivores in forests of the Sierra Nevada, California, USA. Journal of Biogeography 32(8):1385-1407.

Zielinski, W. J., R. L. Truex, J. R. Dunk, T. Gaman. 2006. Using Forest Inventory Data to Assess Fisher Resting Habitat Suitability. Ecological Applications, 16(3), 2006, pp. 1010–1025.

Zielinski, W.J., J.R. Dunk, J.S. Yaeger, and D. W. LaPlante. 2010. Developing and testing a landscape-scale habitat suitability model for fisher (Martes pennanti) in forests of interior northern California. Forest Ecology and Management 260 (2010) 1579–1591.

Zielinski, William J., Jeffrey R. Dunk, and Andrew N. Gray. 2012. Estimating habitat value using forest inventory data: The fisher (Martes pennanti) in northwestern California. Forest Ecology and Management (Elsevier) 275:35-42.

Zielinski WJ, Baldwin JA, Truex RL, Tucker JM, Flebbe PA. 2013. Estimating trend in occupancy for the southern Sierra fisher *Martes pennanti* population. Journal of Fish and Wildlife Management 4(1):3–19; e1944-687X. doi: 10.3996/012012-JFWM-002 dix A: Trend in CSCA Territory Opportunities for the Sierra/Cascades Unoccupied Region