DRAFT ENVIRONMENTAL ASSESSMENT

SIERRA PACIFIC LAND & TIMBER COMPANY AND SIERRA PACIFIC INDUSTRIES FORESTLAND MANAGEMENT PROGRAM

HABITAT CONSERVATION PLAN AND SAFE HARBOR AGREEMENT

SACRAMENTO RIVER AND TRINITY RIVER BASINS, CALIFORNIA

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List of Abbreviations and Acronyms

°C	degrees Celsius
ASP	Anadromous Salmonid Protection
BMP	best management practice
CAL FIRE	California Department of Forestry and Fire Protection
CalWater	California Department of Water Resources
CDFW	California Department of Fish and Wildlife (formerly known as California Department of Fish and Game)
CESA	California Endangered Species Act
CFPRs	California Forest Practice Rules
CFR	Code of Federal Regulations
cfs	cubic feet per second
dbh	diameter at breast height
DPS	Distinct Population Segment
EA	environmental assessment
ESA	Endangered Species Act
ESP	Enhancement of Survival Permit
ESU	Evolutionarily Significant Unit
FR	Federal Register
HCP	Habitat Conservation Plan
ITP	Incidental Take Permit
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NTU	nephelometric turbidity unit(s)
PBFs	physical and biological features
Permits	Incidental Take Permit and Enhancement of Survival Permit
READI	Road Erosion and Sediment Delivery Index (Model)
SHA	Safe Harbor Agreement
SONCC	Southern Oregon/Northern California Coast
SPI	Sierra Pacific Industries
SPL&T	Sierra Pacific Land & Timber Company

TMDL	total maximum daily load
US	United States
US EPA	US Environmental Protection Agency
USGS	US Geological Survey
WLPZ	watercourse and lake protection zone

1.0 Introduction

Sierra Pacific Land & Timber Company (SPL&T) is the largest private forest land owner in the state of California, with ownership currently encompassing approximately 2,562 square miles (1.64 million acres) of timberland throughout the northern and central portions of the state. Sierra Pacific Industries (SPI) is the authorized representative and manager of SPL&T lands. Rivers and streams on portions of SPL&T lands in the Sacramento River and Trinity River basins currently provide habitat for anadromous salmonids, including species listed under the ESA. SPI forestland management activities have the potential to adversely affect fish species and their habitats that are listed, or may be at risk of listing, under the ESA.

SPL&T (the applicant) is applying to the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) for an incidental take permit (ITP) under Endangered Species Act (ESA) Section 10(a)(1)(B) for a 50-year period. The ITP would authorize the incidental take of Central Valley spring-run Evolutionarily Significant Unit (ESU) Chinook salmon (*Oncorhynchus tshawytscha*) and Sacramento River winter-run ESU Chinook salmon, which are listed as endangered and threatened, respectively, under the ESA; California Central Valley Distinct Population Segment (DPS) steelhead (*O. mykiss*), which is listed as threatened under the ESA; and Southern Oregon/Northern California Coast (SONCC) ESU coho salmon (*O. kisutch*), which is listed as threatened under the ESA. Additionally, SPL&T's ITP application includes Central Valley fall- and late fall-run ESU Chinook salmon, which are designated as species of concern by NMFS; Upper Klamath/Trinity River spring-run ESU Chinook salmon, which have been previously petitioned as threatened under the ESA and are currently petitioned for listing as threatened or endangered under the ESA and endangered under the California Endangered Species Act (CESA); and Klamath Mountains Province DPS steelhead, which have no current regulatory status.

SPL&T is also applying to NMFS for an enhancement of survival permit (ESP) under ESA Section 10(a)(1)(A) for a 50-year period. The ESP would authorize the potential future incidental take of species that NMFS proposes to reintroduce into rivers and streams on SPL&T lands that are upstream of constructed man-made barriers to anadromous fish in the Sacramento River and Trinity River basins. Those species include: Central Valley spring-run ESU Chinook salmon, Sacramento River winter-run ESU Chinook salmon, California Central Valley DPS steelhead, and SONCC ESU coho salmon.

The ITP and ESP (Permits) would require implementation of a Habitat Conservation Plan and Safe Harbor Agreement (HCP/SHA) with measures to conserve, monitor, mitigate, and minimize potential effects of SPI's forestland management activities on these species for the term of the Permits. This environmental assessment (EA) analyzes the potential effects of NMFS' proposed action of issuance of an ITP and ESP to SPL&T as provided under the National Environmental Policy Act (NEPA) and associated agency implementing regulations and policy.

As further described in this EA and the HCP/SHA, NMFS expects that SPI's continued compliance with the California Forest Practice Rules (CFPRs), its proposed additional mitigation measures, and conservation measures supporting the proposed NMFS reintroduction efforts will provide conservation benefits to covered species during the term of the ITP and ESP.

SPI has also applied to the US Fish and Wildlife Service (USFWS) for an ITP covering Northern spotted owl and California spotted owl. The USFWS has produced a draft Environmental Impact Statement (DEIS) that evaluates the environmental consequences of issuing an incidental take permit for the northern spotted owl and California spotted owl (collectively the "Covered Species") under the federal Endangered Species Act within the state of California where SPI timber management operations occur, pursuant to a proposed Habitat Conservation Plan. (USFWS 2019). The full DEIS is available at https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/search;jsessionid=8936CFD3225C1454DD61260D86C1D373?search=&commonSearch=openComment#results.

1.1 Purpose and Need for Action

The purpose of NMFS' proposed action – issuing an ITP and an ESP – is to provide long-term comprehensive conservation and protection of the Covered Species and their habitats at ecologically appropriate scales on SPI lands in California. This action is needed in response to an application from SPI for an ITP and ESP for the Covered Species, covering take which would result from its proposed timber harvest and management activities.

The proposed action is needed because normal, otherwise lawful operations of SPI's land management activities and proposed NMFS reintroduction efforts could result in incidental take of the ESA listed species, and the species need protection as required in the ESA.

2.0 Description of Proposed Action and Alternatives

2.1 Alternative 1: Issue Incidental Take Permit and Enhancement of Survival Permit

Alternative 1 is the proposed action, under which NMFS would issue an ITP and an ESP to SPL&T for listed Chinook and coho salmon and steelhead, as well as non-listed Chinook salmon and steelhead that may be listed in the future. The ITP would authorize incidental take of Chinook salmon (Central Valley spring-, fall-, and late fall-run ESU and Upper Klamath/Trinity River spring-run ESU; Sacramento River winter-run ESU, coho salmon (SONCC ESU), and steelhead (California Central Valley DPS and Klamath Mountains Province DPS) during the proposed 50-year term of the ITP. The ESP would ensure SPL&T that no commitments of land or other resources beyond what is agreed to in the SHA would be required. The term of the proposed ITP and ESP is 50 years, as described in the HCP/SHA which is explained in 2.1.3 *Permit Term*.

The ITP and ESP would require the implementation of measures contained in the HCP/SHA developed by the applicant in consultation with the agencies (SPL&T 2019). The HCP/SHA includes measures to monitor, minimize, and mitigate the impacts of incidental take resulting from SPI's timberland management activities to the maximum extent practicable pursuant to ESA Sections 10(a)(1)(B) and 10(a)(1)(A). The HCP/SHA also includes measures intended to support NMFS' planned efforts to reintroduce listed anadromous salmonids to rivers and streams on SPL&T property, above currently impassable man-made barriers. Reintroduction of listed salmonid populations in historically occupied or suitable habitat is a key objective of the recovery strategy described in NMFS's recovery plans for the listed salmonid species (NMFS 2014a, 2014b).

Under Alternative 1, SPI would continue forestland management activities on behalf of SPL&T following the CFPRs, including Anadromous Salmonid Protection (ASP) watershed rules and other plans and guidelines required under State laws as described in the HCP/SHA, as well as additional effectiveness, implementation, and compliance monitoring and habitat improvements. The CFPRs for ASP watersheds and other relevant Articles pertaining to watercourse protections can be found in the California Forest Practices Rules (CFPR 2019).

2.1.1 Covered Activities

Activities covered under the ITP and ESP (Covered Activities) include those activities that are necessary to conduct forestland management activities and support NMFS reintroduction efforts during the Permit(s) duration and certain mitigation and conservation measures identified in the HCP/SHA. Forestland management is the primary activity conducted on SPL&T lands by SPI. All of these activities are governed by the existing CFPRs and other SPI management plans and certification guidelines. Descriptions of SPL&T's lands, the regulatory framework under which SPI manages SPL&T lands, existing conditions, and monitoring activities are provided in Sections 1 and 4 of the SPL&T HCP/SHA (SPL&T 2019). As described in more detail in the HCP/SHA, the Covered Activities are:

- Timber felling and bucking
- Timber yarding

- Loading and landing operations
- Transportation of forest products and equipment
- Chipping
- Timber salvage
- Road construction, reconstruction, maintenance, and abandonment
- Water drafting
- Watercourse crossing facility placement and maintenance
- Site preparation
- Prescribed burning
- Machinery maintenance, fueling, and fuel storage
- Rock pit development and rock processing
- Watercourse crossing installations not covered by Timber Harvest Plans
- Mastication of roadway rights-of-way
- Fuel break construction and maintenance
- Fire suppression
- Harvest of minor forest products
- Grazing
- Transportation of materials and heavy equipment
- Conversion of brush fields to timber plantations

In addition to the Covered Activities listed above, SPI is facilitating the following conservation measures to provide further benefits to Chinook and coho salmon, and steelhead as further mitigation for potential effects of the action:

- Supporting NMFS reintroduction of listed salmonids on SPL&T lands above currently impassable constructed barriers by providing physical access to SHA Plan Area lands and related items such as specific access information, maps, gate key/combo information, physical escort, and relevant existing data.
- Improving watershed conditions and stream habitats considered high quality by NMFS for proposed reintroduction efforts. SPI will collect road inventory data to use its READI model to identify sediment sources from road runoff and will apply road improvements to further reduce potential sediment delivery to aquatic habitats and provide elevated habitat baseline conditions. Further details are provided in Appendix J – *SPI Road Survey and Inventory Standard Operating Procedures* of the HCP/SHA (SPL&T 2019).

Detailed descriptions of the minimization, mitigation, and conservation measures in the categories listed above are provided in Section 6 of the HCP/SHA (SPL&T 2019), and discussed below in Section 4.1.

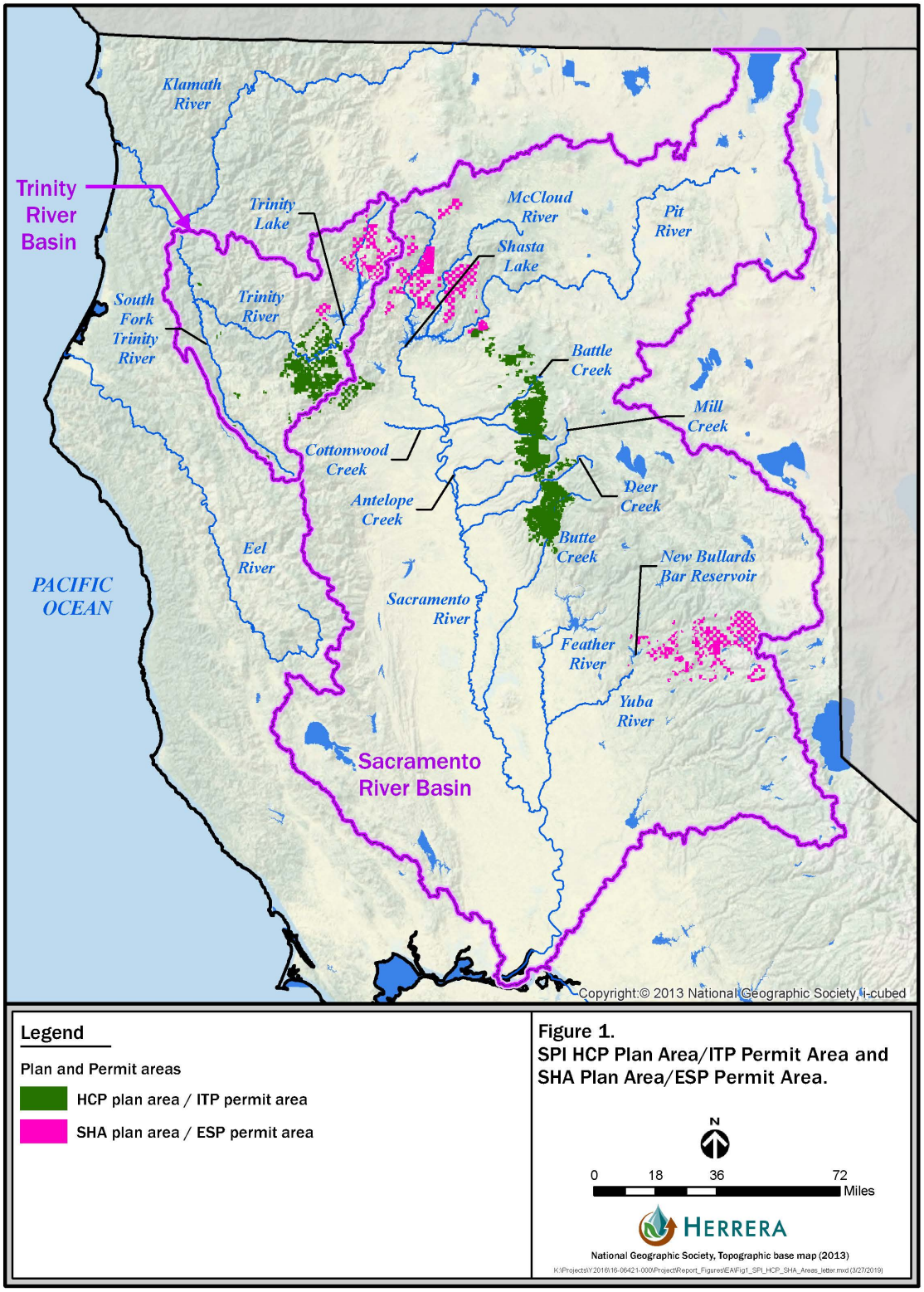
2.1.2 Plan Areas, Permit Areas, and Action Areas

The ITP and ESP areas include SPL&T lands in the Sacramento River and Trinity River basins. The HCP/SHA includes a Plan Area for each of the permits (Figure 1). The HCP component of the HCP/SHA includes lands covered by the ITP, while the SHA component includes lands covered by the ESP. The HCP lands include watersheds currently supporting anadromous fish populations; while the SHA lands include watersheds with historically occupied anadromous salmonid habitat proposed by NMFS for reintroductions. The ITP and ESP each have defined Permit Areas, as described below and shown on Figure 1. The HCP Action Area and the SHA Action Area are larger areas that include all the watersheds potentially affected by the proposed action. These are the areas used to analyze all potential impacts of the proposed action, except as noted, and extend outside SPL&T ownership.

The ITP Area comprises all SPL&T lands currently accessible to anadromous salmonids in which SPI conducts forestland management activities. The ITP (Action) Area occurs within 159 planning watersheds covering approximately 1,485,099 acres in the Sacramento River and Trinity River basins (Figure 1). The ITP (Plan) Area encompasses approximately 355,061 acres of SPL&T lands in those basins (Figure 1). All planning watersheds within the current limits of anadromy are subject to the ASP rules of the CFPRs. Portions of watersheds that are immediately upstream of areas accessible to anadromous salmonids are also included under ASP rules because of potential effects on water quality downstream.

SPI proposes to support the reintroduction of listed salmonids in watersheds with SPL&T ownership above several constructed barriers in the Sacramento River and Trinity River basins consistent with reintroduction efforts described in NMFS recovery plans (NMFS 2014a, 2014b) The ESP (Action) Area comprises 130 planning watersheds covering approximately 1,057,266 acres currently inaccessible to anadromous salmonids in which SPL&T owns lands and SPI conducts forestland management activities. These watersheds are within historically occupied habitat and above currently impassable barriers to anadromy. The ESP (Plan) Area encompasses approximately 211,824 acres of SPL&T lands in the Trinity River and Sacramento River basins (Figure 1). These planning watersheds are above the current limits of anadromy and are not subject to the ASP rules; however, they are managed under the standard CFPRs including measures minimizing erosion, protecting water quality, and maintaining riparian cover. The ESP Area includes: (1) SPI-managed lands that will be accessible to reintroduced salmonids, and (2) other SPI-managed lands that are upstream of the estimated upper limit of anadromy, which are included in the ESP Area because of potential downstream impacts on water quality associated with Covered Activities.

Figure 1. SPI HCP Plan Area/ITP Permit Area and SHA Plan Area/ESP Permit Area.



2.1.3 Permit Term

The term of the proposed ITP and ESP will be for 50 years, with the opportunity for permit renewal. SPL&T requests that the ITP and ESP associated with the HCP/SHA be renewable pursuant to 50 CFR § 222.304. If SPL&T seeks to renew the ITP and ESP, then SPI will file in writing a renewal request at least 30 days prior to the permit expiration of the ITP and ESP in accordance with the requirements of 50 CFR § 222.304.

2.1.4 Conservation Strategy

The SPL&T HCP/SHA describes actions to conserve Central Valley spring-run ESU Chinook salmon and Sacramento River winter-run ESU Chinook salmon, California Central Valley DPS steelhead, and SONCC ESU coho salmon. The proposed actions will also benefit currently non-listed species including Central Valley fall- and late fall-run ESU Chinook salmon, Upper Klamath/Trinity River spring-run ESU Chinook salmon, and Klamath Mountains Province DPS steelhead. The proposed actions will support NMFS reintroduction efforts for listed anadromous fish into historical habitat currently inaccessible due to impassible barriers. The SPL&T HCP/SHA includes nine biological goals to aid the viability of these species during the permit term:

Goal I: Improve habitat for covered species on SPL&T lands.

Goal II: Provide cold, clean water to downstream watersheds supporting anadromous species.

Goal III: Improve riparian habitat structure.

Goal IV: Reduce sediment delivery at the planning watershed scale to promote high quality habitat.

Goal V: Monitor overall management and aquatic habitat quality performance at five continuous monitoring stations.

Goal VI: Enhance watershed resiliency by identifying and implementing projects designed to reduce wildfire behavior, intensity, and magnitude.

Goal VII: Improve stream crossings at existing or new roads during post-fire salvage and reforestation.

Goal VIII: Reduce delivery of flow and sediment from the existing SPI road system.

Goal IX: Provide an elevated habitat baseline in the SHA Plan Area supporting NMFS' listed salmonid species reintroduction efforts. SPI will use the READI model to identify locations of road and drainage improvement projects. Once implemented, these improvements become permanent features in the SHA Plan Area, regardless of current NMFS reintroduction efforts, resulting in improved, or elevated, habitat conditions.

The HCP/SHA provides objectives and specific measures to implement these goals. They are fully described in the HCP/SHA and summarized in this EA.

2.2 Alternative 2: No Action

Under the No Action Alternative, NMFS would not issue an ITP or ESP. The current management practices are assumed to continue to guide management of SPI Covered Lands. No additional conservation measures beyond what is required by the CFPRs, the SPI Fisher Candidate Conservation Agreement with Assurances, and the SFI standards (SFI 2015), would be implemented to accomplish HCP/SHA goals. That is, the road inventory data collection, implementation of the READI model, and similar mitigation measures supporting NMFS' reintroduction efforts and habitat improvements in the SHA Plan Area that would occur under the proposed action would not be conducted. SPI would continue forestland management activities on behalf of SPL&T following the CFPRs, including ASP watershed rules and other plans and guidelines.

The No Action Alternative does not assume future action by the NMFS. Essentially, this alternative presents a way to legally harvest timber without issuance of an ITP/ESP by NMFS (i.e., this alternative avoids incidental "take" of listed species). The Covered Activities described in 2.1.1 would continue to occur on SPI Covered Lands under the No Action Alternative, provided they avoid incidental take of listed animals.

2.3 Alternatives Considered but Dismissed from Further Analysis

With the established CFPR regulatory program regulating SPI timberland management activities, particularly regarding lands in the ITP Area, and the conservation objective of supporting NMFS' reintroduction efforts in the ESP Area, limited alternatives are possible given the legal requirements and conservation objectives. As described above, SPI has been implementing forestland management activities following the CFPRs and other relevant plans and guidelines. As described in the HCP/SHA Section 1, during discussions in development of the HCP/SHA, SPI considered an alternative in which SPI would implement conservation measures supporting NMFS' planned reintroduction efforts and habitat improvement (such as road inventory data collection and READI modeling) without receiving an ITP and ESP from NMFS. However, SPI determined that it could not continue expenditures on such conservation measures without the assurances provided by the ITP and ESP. Therefore, the alternative was dropped from further consideration and is not addressed further in this EA.

SPI and NMFS also discussed considering other potential alternatives, including an alternative for increased timber management activities in riparian zones, and an alternative including analyses to develop a formal sediment budget for HCP and SHA planning watersheds. The riparian management alternative consists of increasing timber management activities in riparian areas. High levels of dense canopy closure designated for riparian area protection has been identified by some fisheries managers as an issue potentially detrimental to stream habitats due to reduced detrital input and resulting lower food production (e.g., Newton and Ice 2016). SPI and NMFS discussed measures designed to reduce canopy closure, and increase deciduous hardwood recruitment (i.e., increase detrital input) and growth, but ultimately determined these

measures would be inconsistent with the CFPRs, and therefore inconsistent with the HCP/SHA purpose and need. This potential alternative was rejected.

NMFS and SPI also discussed sediment budget development for planning watersheds covered in the HCP/SHA, but favored the READI model approach, which better identifies potential sediment input sources and prioritizes locations for improvement measure implementation (see Sections 2.1 and 6.5.1 in the HCP/SHA for a discussion of the READI model). The sediment budget development was also determined inconsistent with the HCP/SHA purpose and need and rejected as a potential alternative.

3.0 Affected Environment

This section describes existing environmental conditions within the HCP Plan Area and the SHA Plan Area. The subsections below provide descriptions of the natural and human-built environment that could be affected by approval of the proposed action (the issuance of the ITP and ESP for SPI's management of SPL&T lands, which would include timber harvest activities) or the No Action Alternative. Environmental elements described below includes the watershed conditions and biological resources.

3.1 Geology and Soils

3.1.1 Habitat Conservation Plan Area

The Sierra Nevada borders the eastern portion of the HCP Plan Area in the Sacramento River basin and is characterized by the Tuscan Formation. The Pliocene Tuscan Formation consists primarily of ancient volcanic mudflows and dominates the geology of the watersheds of the northeastern California tributaries of the Sacramento River and Yuba River (Armentrout et al. 1998). North of the Sierra Nevada, the Cascade Ranges creates the northeastern boundary of the HCP Plan Area along the northern portion of the Sacramento River basins. The Cascade Ranges, which extend from southern British Columbia to northern California, is a chain of volcanic cones created through tectonic activity (TCRCD 2010). Glacial processes shaped some of the higher elevation landforms (Armentrout et al. 1998). The Klamath Mountains and Coast Ranges bound the northwestern and western portions of the HCP Plan Area, including the westward-draining Trinity River Basin and the eastward-draining tributaries to the Sacramento River basin (Figure 1).

3.1.2 Safe Harbor Agreement Area

The SHA Plan Area includes portions of the Trinity River and Sacramento River basins. The geology and soils for much of the SHA Plan Area are as described above in Section 3.1.1, *Habitat Conservation Plan Area*.

3.2 Water Quality and Quantity

3.2.1 Habitat Conservation Plan Area

Water quality conditions are described for portions of the HCP Plan Area, as available; however, most available data are from areas well downstream of the HCP Plan Area. Data from sources upstream of anadromous salmonid occupancy are relevant to baseline conditions and are included in the analysis.

Water quantity is measured by water flow, in cubic feet per second (cfs). Many flow monitoring stations are downstream of the HCP Plan Area but provide information on the stream profile and general trends, including monthly averages and annual peak and minimum flow.

3.2.1.1 Sacramento River Basin

Within the Sacramento River basin, there are water quality issues resulting from forest management operations, including temperature, suspended sediment, and turbidity. The US Environmental Protection Agency (US EPA) has taken water quality measurements at several water bodies that flow through the HCP Plan Area, but all sample locations were located downstream of the HCP Plan Area. No watershed in the Sacramento River basin portion of the HCP Area was listed on the Clean Water Act (CWA) 303(d) list for impaired water bodies (California EPA 2017). Section 303(d) of the CWA requires states to identify waters that are impaired by pollution, even after application of pollution controls. For those waters, states must establish a total maximum daily load (TMDL) of pollutants to ensure that water quality standards can be attained. A TMDL is both a planning process for attaining water quality standards and a quantitative assessment of issues, pollution sources, and pollutant reductions needed to restore and protect a water body.

SPI monitors water temperature at two water quality monitoring stations that are representative of SPI management in the HCP Plan Area (Upper San Antonio Creek and Judd Creek) and one in the SHA Plan Area (Hazel Creek), as well as several stations outside the HCP Plan Area (see HCP/SHA Figure 17). Monthly average daily water temperatures for water years 2008 to 2017 were similar for each station and ranged from -1°C in the winter to 18°C in the summer (SPL&T 2019). Monthly maximum daily water temperatures were slightly higher, ranging from 0°C in the winter to 21°C in the summer (SPL&T 2019).

In water quality parameters, suspended sediment refers to the particulate matter moved by water and is typically measured as milligrams of particulate matter to liters of water. Although the watersheds within the Sacramento River basin HCP Plan Area have not been sampled for suspended sediment (California EPA 2017), several watersheds have evidence of increased sedimentation. The Deer Creek and Mill Creek watersheds had increased sedimentation due to road construction and clearcutting within the HCP Action Area in the past (Armentrout et al. 1998). More recently, several timber harvest roads have been decommissioned, reducing the sediment loads from previously recorded levels (NMFS 2014a). Sacramento River basin streams of the northwestern portion of the HCP Plan Area, including the Cottonwood Creek and Clear Creek watersheds, have large quantities of fine sediment in the river system because of historical gold mining activity that used dredge, hydraulic, and ground-sluicing techniques (NMFS 2014a).

Turbidity, the measure of cloudiness of a liquid by organic matter or inorganic particles, is quantified in nephelometric turbidity units (NTU). Criteria prescribed by the California Regional Water Quality Control Board require that the increases in turbidity attributable to controllable water quality factors shall not exceed the following limits (CRWQCB 2016):

- Where natural turbidity is between 0 and 5 NTU, increases shall not exceed 1 NTU.
- Where natural turbidity is between 5 and 50 NTU, increases shall not exceed 20 percent.
- Where natural turbidity is between 50 and 100 NTU, increases shall not exceed 10 NTU.

SPI monitors turbidity in the HCP Plan Area at the three water quality monitoring stations described above. Average daily NTU is generally very low (0 to 10 NTU); however, several measurements in 2016 and 2017 exceeded 10 NTU and reached as high as 35 NTU (SPL&T

2019). Average daily maximum NTU is usually less than 20 NTU, but values as high as approximately 110 NTU occurred in 2017 (SPL&T 2019).

Surface water quantity has been measured by agencies in several streams downstream of the HCP Plan Area within the Sacramento River basin (Table 1; USGS 2019). In general, flows are lowest in September, increase through October and November, and decrease again in late-spring and summer (Kondolf 2001). Peak flows from the watershed are dominated by rain-on-snow events, with most flow events occurring during winter months (December through February) when snow is present in the transient zone (above approximately 3,000 feet in elevation). Earlier season peaks in flow (September through November) are most likely rain events with little snow influence. Later peaks (mid-March through May) are most likely snowmelt-generated peaks (NMFS 2014a).

Table 1. Quarterly Average Streamflow Downstream of the HCP Plan Area, Sacramento River Basin.

Stream Gauge Station	Station Number	Data Years	Quarter 1 Average[a] (cfs)	Quarter 2 Average[b] (cfs)	Quarter 3 Average[c] (cfs)	Quarter 4 Average[d] (cfs)
Cottonwood Creek	11374305	1997–2014[e]	na	7	6	na
Clear Creek	11372000	1940–2018	179	328	167	53
Old Cow Creek	11372350	1990–2018	36	50	47	26
South Cow Creek	11372080	1984–2017	5	5	5	5
North Fork Battle Creek below division to Al Smith Canal	11376040	2004–2016	9	10	11	10
North Fork Battle Creek below division to Cross Country Canal	11376140	1986–2017	12	12	36	15
North Fork Battle Creek below division to Wildcat	11376160	1987–2017	27	21	31	21

[a] Average flows for October, November, December

[b] Average flows for January, February, March

[c] Average flows for April, May, June

[d] Average flows for July, August, September

[e] Incomplete data set

cfs = cubic feet per second

na = not available

Source = USGS (2019)

There are no water diversions associated with SPI lands or operations, except for pumped drafting of water into tank trucks for dust control on roads associated with forest management operations. These withdrawals are subject to measures of the CFPRs, follow NMFS guidelines, and have insignificant effects on overall streamflow. Measures in the rules and guidelines include selecting stream locations with deep, flowing water; terminating pumping when the tank is full; screening pump intakes with 3/32-in (2.38 mm) openings for perforated plate or woven wire mesh screens, and less than 1/16-in (1.75 mm) slot openings for wedge wire screens; a

minimum 2.5 ft2 screen size; regular cleaning and inspection; maximum drafting velocity of 0.3 ft/second; and a diversion rate less than 350 gallons per minute.

3.2.1.2 Trinity River Basin

The tributaries within the Trinity River basin have been modified to various degrees by timber harvest, mining, and road building (US EPA 2001). Water quality ranges from excellent in the Trinity Alps Wilderness and northern main stem tributaries, to various degrees of human-caused impairment in the Middle and South Fork Trinity River watersheds (US EPA 2001). Potential sources of water quality impacts in stream reaches downstream from the HCP Plan Area include increased suspended sediment concentration and turbidity. SPI has not routinely measured water quality parameters on streams in the Trinity River basin and does not have data on the metrics discussed in this section. SPI will install two permanent water quality monitoring stations as part of the HCP/SHA which will help provide this type of data.

Water temperature is listed on the CWA 303(d) list for the Trinity River system (California EPA 2017). Based on more recent samples collected from outside the HCP Plan Area, temperature may be removed from the CWA 303(d) list because the river is no longer meeting the minimum 26 samples required for listing (California Environmental Protection Agency 2017).

Both the main stem Trinity River and South Fork Trinity River are listed as impaired under CWA Section 303(d) due to fine sediment impacts. The wet, uplifted marine sedimentary geology of the Trinity River basin is like other areas that have been shown to produce more frequent sediment when logged (Bunn and Montgomery 2004). The South Fork Trinity River watershed experienced extensive timber harvesting in the past that has caused erosion and sedimentation of streams and the river, especially following the flood of 1964. The area is also susceptible to naturally occurring landslides and other mass-wasting events because of steep terrain, loosely consolidated soils (decomposed granite), and heavy precipitation. Mass wasting events also contribute a significant source of sediment to tributary streams and may explain the high sediment loading of Trinity River basin streams, particularly in the South Fork Trinity River watershed. The US EPA has established total maximum daily loads (TMDLs) for both the Trinity River and the South Fork (US EPA 1998, 2001). While noting that conditions were improving in some areas, the TMDLs set sediment load allocations that specify the amount of fine sediment reduction needed to meet the water quality objectives.

Surface water quantity has been measured by agencies in several streams near the HCP Plan Area within the Trinity River basin (Table 2; USGS 2019). In the Trinity River, flows start to rise in Quarter 2 of the water year (January, February, March) and are highest in Quarter 3 (April, May, June), coinciding with precipitation and rain-on-snow events. The low flows in Quarter 4 (July, August, September) and Quarter 1 (October, November, December) are correlated with the drier summer season, but the steady flow indicates there is a groundwater source to supplement the background flows and the regulated Trinity River flows from Lewiston Dam releases.

Table 2. Quarterly Average Streamflow Downstream of the HCP Plan Area, Trinity River Basin.

Stream Gauge Station	Station Number	Data Years	Quarter 1 Average[a] (cfs)	Quarter 2 Average[b] (cfs)	Quarter 3 Average[c] (cfs)	Quarter 4 Average[d] (cfs)
Grass Valley Creek	11525630	2004–2018	23	71	54	12
Indian Creek	11525670	2004–2018	17	46	49	6
Rush Creek	11525530	2002–2018	26	70	59	5
Trinity River at Douglas City	11525854	2002–2018	466	862	2,333	744
Trinity River at Lewiston	11525500	1961–2018	326	580	3,474	453
Trinity River at Limekiln Gulch	11525655	1981–2018	443	750	1,625	622
Trinity River at Junction City	11526250	2002–2018	546	1,180	2,433	756

[a] Average flows for October, November, December

[b] Average flows for January, February, March

[c] Average flows for April, May, June

[d] Average flows for July, August, September

cfs = cubic feet per second

Source = USGS (2019)

3.2.2 Safe Harbor Agreement Area

The SHA Plan Area is located in upper watershed reaches, which are relatively undeveloped. Generally, water quality (suspended sediment concentration and turbidity) in upper reaches and watershed headwaters is very good.

3.2.2.1 Sacramento River Basin

Water quality in the SHA Plan Area, upstream of the HCP Plan Area, is better than the water quality lower in the Sacramento River basin described in Section 3.2.1.1, *Water Quality and Quantity, Habitat Conservation Plan Area, Sacramento River Basin*.

In the Upper Sacramento and McCloud Rivers, the US Bureau of Reclamation's recent assessment of stream habitats for potential reintroduction of winter-run Chinook salmon above Shasta Lake has included evaluation of water quality parameters (USBR 2014, 2016, 2017). These evaluations were confined to the mainstems of the two rivers. Most SPL&T lands in the SHA Plan Area are in watersheds of tributaries to these two rivers. The following presents quoted excerpts relevant to the SHA Action area.

<u>Upper Sacramento River</u>

"*The water quality of the Upper Sacramento River and its major tributaries supports nearly all beneficial uses most of the time (Domagalski et al. 2000). In general, water quality is exceptional in the watershed."*

"The Upper Sacramento River above Shasta Lake has no listed water quality impairments of beneficial uses as defined under Section 303(d) of the CWA (State Water Board 2010) … The Upper Sacramento River supports all of the designated beneficial uses identified in the Basin Plan (Table 4-1); however, a report by the University of California, Davis (UC Davis) in 2010 (as cited in NSR 2010) listed all the beneficial uses of the Upper Sacramento River as threatened. The UC Davis report described this threatened status as being related to the suspicion that heavy metals occurring in urban runoff and storm sewers are degrading water quality, but most notably, that heavy metal contamination continues to occur in the form of acid mine drainage from abandoned mines in the historic mining districts surrounding Shasta Lake. [Note that all the streams named in these assessments as to this issue flow directly into Shasta Lake and not into the Upper Sacramento or McCloud River]... *Surface water of the Upper Sacramento River upstream from Shasta Lake does not exceed any of the Basin Plan thresholds for important metal pollutants, including dissolved cadmium, copper, or zinc (NSR 2010)."*

"There are no suspended sediment or bedload data available for the Upper Sacramento River upstream from Shasta Lake. There are, however, some turbidity data commonly used as a surrogate for suspended sediment. The turbidity data available for the Upper Sacramento River at the United States Geological Survey (USGS) gage at Delta (above Shasta Lake) and for Hazel Creek, a tributary midway between Box Canyon Dam and Shasta Lake, suggest that since 1998, during low-flow conditions, the water clarity has met the Basin Plan objective for turbidity."

"*Water temperature in the Upper Sacramento River fluctuates seasonally and spatially between Box Canyon Dam and Shasta Lake … The longest water temperature record for the Upper Sacramento River is limited to the location of the USGS gage at Delta, located immediately upstream from Shasta Lake. Seasonal patterns of average daily and maximum water temperatures for Water Years 2000 to 2014 are shown in Figure 4-1 and Figure 4-2.* [These figures are included below as Figures 2 and 3.] *An examination of daily average and annual maximum water temperatures indicated that the Basin Plan's seasonally-specific water temperature thresholds are regularly exceeded at that location (NSR 2010).*"

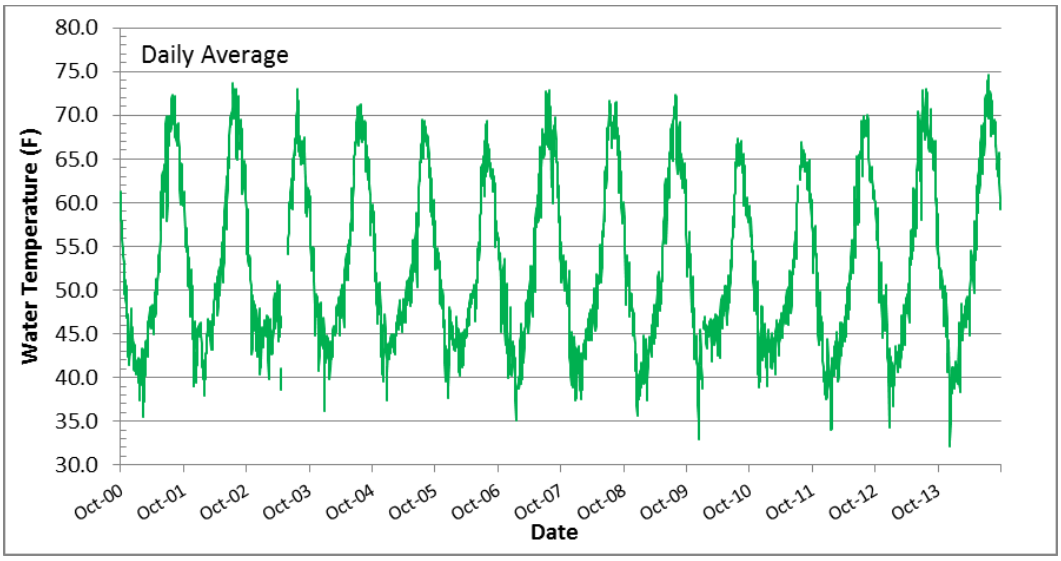


Figure 2. Average Daily Water Temperature Record for Water Years 2000 to 2014 at the US Geological Survey Stream Gage at Delta on the Upper Sacramento River (USGS Gage Number 11341500).

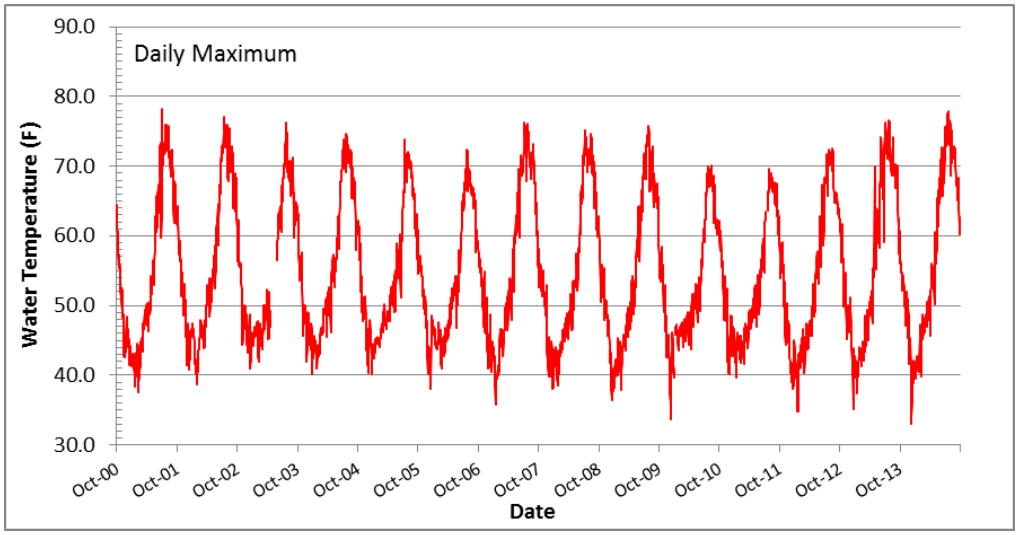


Figure 3. Daily Maximum Water Temperature Record for Water Years 2000 to 2014 at the US Geological Survey Stream Gage at Delta on the Upper Sacramento River (USGS Gage Number 1134150).

These assessments concluded that water temperature was generally sufficient for salmon throughout the upper Sacramento River, with a few important exceptions related to water temperatures. Water temperatures during late-summer were cool enough to provide for salmon egg survival only in the upper nine miles of the upper Sacramento River below Box Canyon Dam. This is the period when winter run salmon eggs would be present (USBR 2017). Also, as noted in USBR (2014, 2016), water temperatures in the lower reach near the Delta Gage just above Shasta Lake were warm enough to create chronic negative effects for downstream-migrating juveniles during early-fall.

McCloud River

"The water quality of the McCloud River supports all of its designated beneficial uses most of the time. In general, water quality is exceptional in the watershed. The McCloud River has no listed water quality impairments to its designated beneficial uses under CWA Section 303(d)."

"Under base-flow conditions, suspended sediment values typically range from less than 2.0 to 4 milligrams per liter of total suspended solids (0.5 to 3.6 Nephelometric Turbidity Units (NTU)) in the McCloud River. Continuous monitoring of turbidity over five events in August-October 2007, and August-September 2008, showed downstream turbidity levels in the McCloud River ranging from 65 to 300 NTU below McCloud Dam, 12 to 155 NTU above Claiborne Creek, and 5 to 72 NTU above Shasta Lake (PG&E 2011)."

"Water quality contaminants (e.g., metals, bacterial, biostimulatory, chemical) have not been reported to occur in the McCloud River. Heavy metal contamination, as described previously for the Upper Sacramento River, is an issue in the greater Sacramento watershed, but is restricted to the vicinity of Shasta Lake, and is not identified as a water quality impairment of the McCloud River upstream from Shasta Lake."

Temperatures in McCloud Reservoir and the McCloud River downstream from McCloud Dam reflect the large volume of cold water entering the reservoir from the spring-fed upper McCloud River and the relatively short residence time of water in the reservoir. Groundwater springs provide a large and relatively stable source of cold water to the upper McCloud River. Flow in the McCloud River is regulated by releases from McCloud Dam, but receives significant inflow in the form of groundwater discharge from springs and runoff from tributaries; both contribute to a water temperature regime that supports year round coldwater fish habitat throughout much of the length of the lower river. This cold water supports a viable trout fishery throughout the entire 24-mile-long reach of the McCloud River (PG&E 2011).

No additional, watershed-specific water temperature objectives for the McCloud River are identified in the Basin Plan. The Basin Plan states that increases in water temperatures must be less than 5°F (2.8°C) above natural receiving-water temperature. Temperatures vary seasonally in the McCloud River, increasing from June to mid-July, remaining warmest in mid-summer, and declining from mid- to late-August through September. Typically, daily average water temperature in the McCloud River remains below 68°F (20°C).3 Seasonally, water temperature in the lower reaches of McCloud River can rise to around 68°F (Figure 4-4 and Figure 4-5) (presented here as Figures 4 and 5)*, especially in hot, critically dry water years, under both the previous and new hydropower operating licenses (FERC 2011).*

Similar to the Sacramento River, the thermal regime along much of the McCloud River (upstream from Shasta Lake), except in the immediate vicinity of the head of Shasta Lake, appears to be highly suitable for coldwater fishes and generally meets Basin Plan objectives for coldwater fishery beneficial uses (Figure 4-6). Based on a limited set of long-term thermographic records and Pacific Gas and Electric Company's (PG&E) (2008) temperature modeling for the McCloud River below McCloud Dam, optimal temperatures for Chinook Salmon egg incubation through the summer months is limited to approximately 11.6 miles of the upper reaches of the river below McCloud Dam under both the previous and new hydropower

licenses (Figure 4-5) (FERC 2011, Reclamation 2014). Thermal conditions remain within the suitable range for juvenile Chinook salmon growth and survival throughout the summer, not exceeding an MMWAT of 66°F (19°C), for all 23 miles of the McCloud River from McCloud Dam to Shasta Lake (Reclamation 2014). Upstream from McCloud Reservoir, considerable coldwater spring inflows maintain relatively cold and consistent water temperatures.

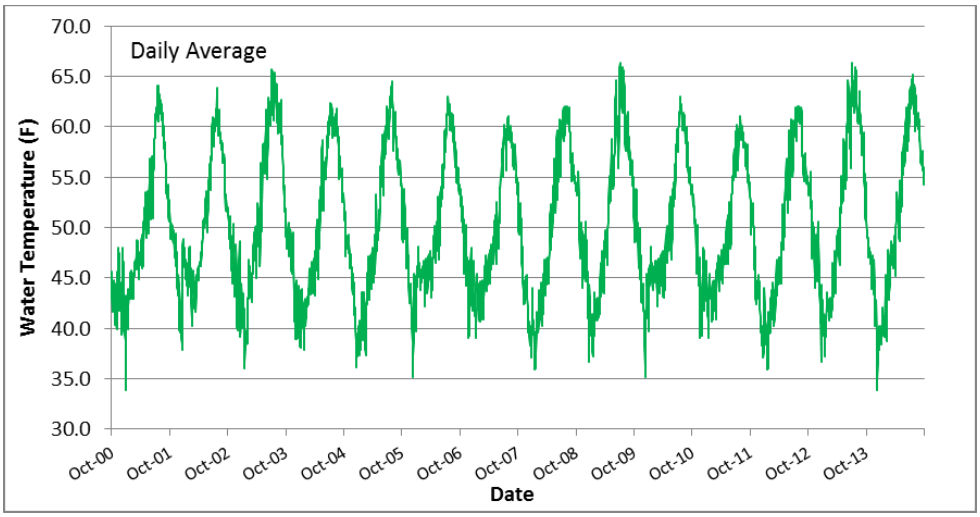


Figure 4. Average Daily Water Temperature Record for Water Years 2000 to 2014 at the US Geological Survey Stream Gage Above Shasta Lake on the McCloud River (USGS Gage No. 1136800).

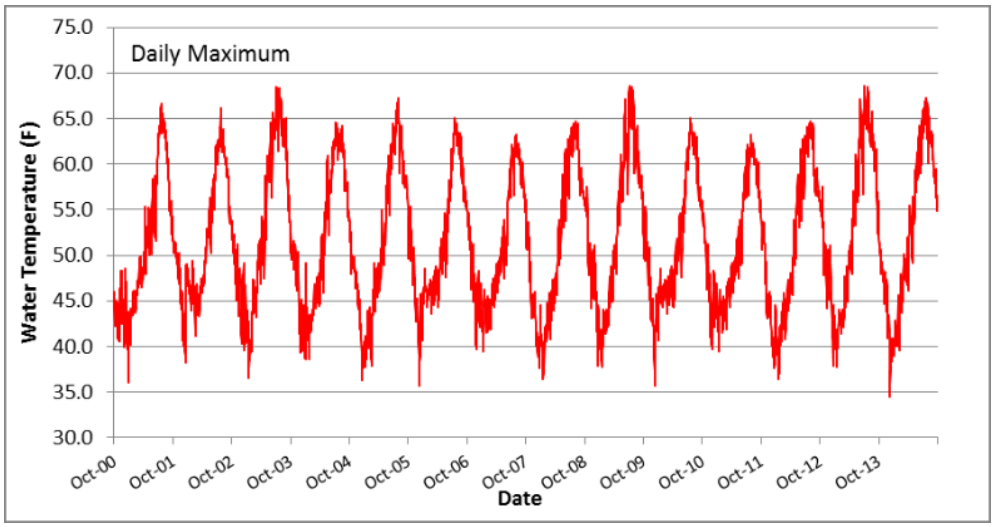


Figure 5. Daily Maximum Water Temperature Record for Water Years 2000 to 2014 at the US Geological Survey Stream Gage Above Shasta Lake on the McCloud River (USGS Gage No. 1136800).

The California Environmental Protection Agency has collected water quality data in Yuba River tributaries. In the 270 samples collected during standard water quality monitoring by the California Environmental Protection Agency exceeded US EPA temperature guidelines for the South Yuba River watershed (California Environmental Protection Agency 2017). The Middle Yuba River watershed did not meet the required sample size of 26 samples and is, therefore, not

listed on the CWA 303(d) list. In the North Yuba River basin, 1 of 361 samples exceeded the US EPA temperature guidelines (California EPA 2017).

Sediment loads in the Yuba River basin can be attributed to historical mining and human activities, such as road construction associated with rural housing development, logging, and recreation (Heiman and Knecht 2010).

Surface water quantity was measured in several streams near the SHA Plan Area (Table 3; USGS 2019). To be expected, the areas immediately below dams in upper portions of watersheds (McCloud River below McCloud Dam and Yuba River below Milton Dam) had significantly less flows than waters flowing into lakes at lower elevations (Sacramento River at Delta, McCloud River above Shasta Lake, Yuba River below Goodyears Bar). As with the Sacramento River basin and Trinity River basin, Quarters 2 and 3 have the strongest flows, indicating flows are driven by precipitation and rain-on-snow events.

Table 3. Quarterly Average Streamflow in or Downstream of the SHA Plan Area, Sacramento River Basin.

Stream Gauge Station	Station Number	Data Years	Quarter 1 Average[a] (cfs)	Quarter 2 Average[b] (cfs)	Quarter 3 Average[c] (cfs)	Quarter 4 Average[d] (cfs)
Sacramento River, Delta	11342000	1944–2018	805	2,147	1,534	273
McCloud River above Shasta Lake	11368000	1945–2017	858	1,733	1,084	525
McCloud River	11367500	1931–2017	806	976	1,066	805
McCloud River below McCloud Dam	11367760	1966–2017	180	113	142	187
Yuba River below Goodyears Bar	11413000	1930–2018	394	975	1,410	231
Yuba River	11407815	1994–2017	58	344	111	123
Yuba River below Milton Dam	11408550	1987–2017	5	33	90	6

[a] Average flows for October, November, December

[b] Average flows for January, February, March

[c] Average flows for April, May, June

[d] Average flows for July, August, September

cfs = cubic feet per second

Source = USGS (2019)

3.2.2.2 Trinity River Basin

In the Trinity River Basin, water quality in the SHA Plan Area upstream of the HCP Plan Area and upstream of Trinity and Lewiston Dams, is better than the water quality as described in Section 3.2.1.2 *Water Quality and Quantity, Habitat Conservation Plan Area, Trinity River Basin*.

Surface water quantity has been measured by agencies in several streams near the SHA Plan Area (Table 4; USGS 2019). Similar to the other basins described, Quarters 2 and 3 have the strongest flows, indicating flows are driven by precipitation and rain-on-snow events.

Table 4. Quarterly Average Streamflow in the SHA Plan Area, Trinity River Basin.

Stream Gauge Station	Station Number	Data Years	Quarter 1 Average[a] (cfs)	Quarter 2 Average[b] (cfs)	Quarter 3 Average[c] (cfs)	Quarter 4 Average[d] (cfs)
Trinity River above Coffee Creek	11523200	1957–2018	201	564	814	75

[a] Average flows for October, November, December

[b] Average flows for January, February, March

[c] Average flows for April, May, June

[d] Average flows for July, August, September

cfs = cubic feet per second

Source = USGS (2019)

3.3 Aquatic Habitat

3.3.1 Habitat Conservation Plan Area

Within each HCP Plan Area watershed, aquatic habitat has been degraded to varying degrees by dam construction and operation, water diversions, livestock grazing, mining, and development, particularly in the lower reaches.

3.3.1.1 Sacramento River Basin

In the Sacramento River basin, dam construction has rendered hundreds of miles of historical spawning and rearing habitat inaccessible to anadromous salmonids. The HCP Plan Area is in the upper reaches and headwaters of remaining undammed tributaries, which typically provide high quality habitat when fish access is not restricted by water diversions and barriers caused by poor water quality at lower elevations. SPI does not have data on the aquatic habitat condition of these watersheds below SPL&T ownership.

Given the limited data and information available on aquatic habitat, several parameters with known metrics are used to inform potential aquatic conditions within the HCP Plan Area. These include miles of stream habitat (perennial, seasonal, and anadromous), road length, stream crossings, area burned by wildfire, and distance to anadromy (Table 5).

Several streams within the HCP Plan Area are upstream from areas used by anadromous salmonids; however, the aquatic habitat conditions are not limited to the immediate area and are conveyed downstream to waters used by anadromous salmonids for spawning, rearing, or migration. Distance to anadromy provides information on how likely actions within the HCP Plan Area would affect downstream salmon, based on proximity to the proposed actions.

Table 5. Watershed Metrics on SPL&T Lands for Sacramento River Tributaries in the HCP Plan Area.

Watershed	Number of Watersheds with SPL&T Ownership	Miles of Anadromous Stream Habitat	Miles of Perennial Stream	Miles of Seasonal Stream	Road Length (mile)	Road Length in Anadromous Stream and 300-foot Corridor (mile)	Number of Stream Crossings	Number of Stream Crossings in Anadromous Stream Habitat	Range of Percent Road Length Potentially Delivering to Streams	Range of Percent Planning Watershed Burned by Wildfire (2007–2018)	Range of Percent Planning Watershed in SPL&T Ownership	Distance to Anadromy (miles)
Antelope Creek	7	5.44	80.30	99.20	374.20	0.90	313	2	9.60–23.30	0–0.21	20.60–98.60	0–3.90
Battle Creek	14	0.00	89.66	232.54	611.20	0.00	622	0	0–28.11	0–100	0.06–78.50	0–to 16.38
Bear Creek	2	0.00	3.73	3.27	23.11	0.00	24	0	13.84	0	2.72–25.40	2.70–25.40
Big Chico Creek	7	0.00	111.00	152.30	320.40	0.00	675	0	NA	0–15.08	3.05–95.2	2.3–19.9
Butte Creek	7	0.00	126.14	100.54	278.25	0.00	574	0	NA	0–0.68	0.01–98.99	4.31–25.82
Clear Creek	1	0.00	6.59	6.19	3.24	0.00	5	0	8.24	100.00	16.70	6.10
Cottonwood Creek	12	0.43	92.03	120.36	113.77	0.15	385	2	0–40.21	0–100	4.70–55.29	0–19.51
Cow Creek	17	1.36	61.92	84.78	194.49	5.20	343	0	0–38.61	0	1.05–48.05	0–16.36
Deer Creek	8	0.77	42.50	64.80	189.20	0.00	285	0	14.40	0–24.41	0.15–75.30	0–5.37
Mill Creek	2	3.08	11.92	19.48	19.87	0.31	23	0	0–12.11	8.33–19.06	8.83–32.53	0
Paynes Creek	2	0.00	13.44	20.82	41.81	0.00	48	0	8.67–15.87	0	20.58–54.30	3.75–3.92

The road length, number of stream crossings, and area burned by wildfire can be used to estimate aquatic impacts. For example, a greater number of stream crossings, average percent of road potentially delivering to streams, and area burned by wildfire (2007 to 2016) might indicate lower quality aquatic habitat condition due to increased suspended sediment delivery and mass wasting risk.

3.3.1.2 Trinity River Basin

Many streams within the Trinity River system begin in the Trinity Alps Wilderness area and the upper portions of these watersheds are in very good condition. Outside these areas, the quality of riparian areas and instream habitat are generally lower due to habitat degradation from historic hydraulic mining, water diversions, timber harvest, and road construction. The HCP Plan Area is in the upper reaches and headwaters of streams that join the Trinity below Trinity and Lewiston Dams. SPI does not presently have data on the aquatic habitat condition of these watersheds, but stream habitat in the HCP area generally appears to be of high quality.

Table 6 provides information on miles of stream habitat (perennial, seasonal, and anadromous), road length, stream crossings, area burned by wildfire, and distance to anadromy to estimate aquatic conditions within watersheds in the Trinity River basin.

Table 6. Watershed Metrics on SPL&T Lands for Trinity River Tributaries in the HCP Plan Area.

Watershed	Number of Planning Watersheds with SPL&T Ownership	Miles of Anadromous Stream Habitat	Miles of Perennial Stream	Miles of Seasonal Stream	Road Length (mile)	Road Length in Anadromous Stream and 300-foot Corridor (mile)	Number of Stream Crossings	Number of Stream Crossings in Anadromous Stream Habitat	Range of Percent Road Length Potentially Delivering to Streams	Range of Percent Planning Watershed Burned by Wildfire (2007–2018)	Range of Percent Planning Watershed in SPL&T Ownership	Distance to Anadromy (miles)
Lower Trinity River	6	4.38	26.56	30.21	70.63	1.02	171	1	0–31.95	0–58.16	2.60–74.22	0– 3.34
Middle Trinity River	23	57.57	257.20	334.23	560.92	23.73	1,622	23	0–32.65	0–98.39	1.32–95.27	0– 6.26
South Fork Trinity River	18	7.41	58.57	81.82	288.17	4.01	424	5	0–39.3	0–100	0.11–61.18	0.83–39.45

The Middle Trinity River area has the most anadromous stream miles in the HCP area, as well as the greatest road length and number of stream crossings, and therefore has the highest potential to affect salmonid habitat. At the time of HCP development, 6 of 29 existing crossings were fords and 23 remaining crossings were bridge or culvert crossings with a low likelihood of direct impact. The HCP Plan Area within the Middle Trinity River may also have the greatest opportunity to improve conditions through the implementation of conservation measures under the issuance of the ITP.

3.3.2 Safe Harbor Agreement Area

3.3.2.1 Sacramento River Basin

The headwaters of the McCloud River and Upper Sacramento River watersheds above Shasta Dam historically provided clean, loose gravel; cold, well-oxygenated water; and optimal stream flow in riffle habitats for anadromous salmonid spawning and incubation. They also provided the cold, productive waters necessary for egg and fry development and survival, and juvenile rearing over the summer. Nearly 300 miles of tributary spawning habitat is now inaccessible to winter-run Chinook salmon and other anadromous species due to Shasta Dam (NMFS 2014a). In general, water bodies above the dam provide good quality, aquatic habitat. The quality of physical spawning and rearing habitat attributes in the upper Sacramento River generally improve progressing downstream from Dunsmuir to Lake Shasta (USDOI 2014).

Table 7 provides information on miles of stream habitat (perennial, seasonal, and anadromous), road length, stream crossings, and area burned by wildfire to estimate aquatic conditions within watersheds in the Sacramento River basin SHA Plan Area. Each watershed has a similar road density, numerous road crossings, and a small area burned by wildfires. Because these streams are no longer accessible to anadromous fish, this table contains no data on distance to anadromy.

Table 7. Watershed Metrics on SPL&T Lands for Sacramento River Tributaries in the SHA Plan Area.

Watershed	Watershed Area (square miles)	Area Within SHA Plan Area (square miles)	Miles of Perennial Stream	Miles of Seasonal Stream	Number of Stream Crossings	Road Density (road miles per square mile)	Area Harvested 2007–2016 (square miles)	Area Burned by Wildfire 2007–2016 (square miles)
Upper Sacramento	423	60	138	147	943	6.1	9.8	0.8
McCloud River	684	47	119	123	650	5.7	13.6	18.0
Shasta Dam	373	35	87	127	656	4.9	2.9	NA[a]
Yuba River	1,495	126	238	443	2,067	5.7	46.1	0.8

[a] No wildfires occurred in this CalWater Hydrologic Unit (watershed) on SPL&T lands in the SHA Plan Area during this time period.

3.3.2.2 Trinity River Basin

Table 8 provides information on miles of stream habitat (perennial, seasonal, and anadromous), road length, stream crossings, area burned by wildfire, and distance to anadromy to estimate aquatic conditions within watersheds in the Trinity River basin SHA Plan Area. The SHA Plan Area is located exclusively above impassable dams and does not currently support anadromous salmonid populations; therefore, there are no data on distance to anadromy.

Table 8. Watershed Metrics on SPL&T Lands for Trinity River Tributaries in the SHA Plan Area.

Watershed	Watershed Area (square miles)	Area Within SHA Plan Area (square miles)	Miles of Perennial Stream	Miles of Seasonal Stream	Number of Stream Crossings	Road Density (road miles per square mile)	Area Harvested 2007–2016 (square miles)	Area Burned by Wildfire 2007–2016 (square miles)
Upper Trinity River	2,970	63	209	190	1,669	6.3	12.5	NA[a]

[a] No wildfires occurred in this CalWater Hydrologic Unit (watershed) on SPL&T lands in the SHA Plan Area during this time period.

3.4 Riparian Function

Riparian corridors serve multiple purposes and functions for protecting streams. They preserve water quality by creating shade to maintain cooler water temperatures and by filtering sediment from runoff before it enters streams and rivers; protect stream banks from erosion; provide a storage area for flood waters; and provide food and habitat for fish and wildlife. The purpose and function of the riparian corridors designated by the CFPRs is to provide habitat functions in fish bearing streams. Habitat functions include hardwood canopy retention to provide detritus as a food source for benthic macroinvertebrates, which in turn become a food source for fish. Large diameter trees maintained near the watercourses provide potential large woody debris, thus increasing stream complexity, pool formation, and a cold-water refuge for salmonids. Maintaining cold-water inputs from springs and smaller watercourses (accomplished using CFPRs canopy retention requirements) provide temperature modifications for the larger, wider fish-bearing stream channels.

A combination of CFPRs provide protection for water temperature control, streambed and flow modification by large woody debris, filtration of organic and inorganic material, upslope stability, bank and channel stabilization, spawning and rearing habitat for salmonids, and vegetation structure diversity for fish and wildlife habitat. Components of wildlife habitat include vertical diversity, microclimate modification, migration corridors, nesting and roosting opportunities, surface cover, and food abundance. The CFPRs were established in the early 1970s and help protect riparian conditions and function within the areas of timber harvest on private lands. Initial rules focused on reducing activities within near proximity to streams and retaining live canopy to produce shade. With the establishment of the Threatened and Impaired Watershed Rules in the late 1990s and the ASP rules in 2010, the goals for improved riparian

corridors include higher canopy closure, greater numbers of large diameter trees, greater retention of high value wildlife features, and less exposed soil in the vicinity of watercourses. Jointly, the rules reduce activities within proximity to streams to protect riparian corridors and increase hardwood canopy retention and forage material for salmonids, maintain cold-water inputs from springs and smaller streams, and provide a source of large woody debris for improving habitat complexity.

Protections for riparian corridors vary depending on watercourse type, zone, and presence of anadromous species. For example, in Class I watercourses (confined channels within the coastal anadromy zone with permanent or seasonal fish presence), the watercourse and lake protection zone (WLPZ) width ranges from 100 to 150 feet slope distance, depending on the silviculture system applied above the WLPZ.

Three zones are established within the WLPZs: 1) the Core Zone is nearest to the water, 2) the Inner Zone is in the middle, and 3) the Outer Zone is furthest from the water. The Core Zone must be a minimum of 30 feet wide and is restricted from harvest. The Inner Zone is a minimum of 70 feet measured from the landward edge of the Core Zone. Timber operations are permitted for commercial thinning or single tree selection only, and postharvest stand must have a minimum 70 percent overstory canopy cover in the Northern Forest District. The postharvest canopy must be composed of both conifers and hardwood species and have at least 25 percent overstory conifer canopy. The 13 largest trees/per acre must be retained. The minimum width of the Outer Zone is 50 feet from the landward edge of the Inner Zone. Timber operations are permitted in this zone for commercial thinning or single tree selection only and must have a minimum 50 percent overstory canopy cover. All wind firm trees must be retained. The postharvest canopy must be composed of both conifers and hardwood species and have at least 25 percent overstory conifer canopy (see CFPRs, Article 6).

3.4.1 Habitat Conservation Plan Area

Riparian corridors within THPs on SPL&T lands meet the CFPRs and are regularly verified during post-harvest inspections. Additionally, THPs that include riparian corridors in the HCP Plan Area occupied by anadromous fish and portions of the immediately upstream watersheds meet the CFPRs' ASP rules for anadromous watersheds. The most recent SPI plot data in WLPZs from the HCP Plan Area, (5,564 plots covering 22,256 acres in both the Sacramento River and Trinity river basins) show on average 16.9 trees per acre ≥ 22 inches diameter at breast height (DBH); of those, 14 are conifers and 2.9 are hardwoods. These areas are within 100 feet of the stream edge and average 310 trees per acre (TPA) and 153 square feet of basal area (BA). These areas also have ecological shade canopy cover of 85 percent or greater.

Given the long history of riparian harvest regulation under the CFPRs, the average conditions described likely apply equally to lands in the HCP Plan Area in either the Sacramento River or the Trinity River basins. Collectively, the combination of the CFPRs, and ASP rules, and the Conservation Measures in the HCP, assure these conditions will persist throughout the life of the HCP and will continue to provide high quality and functional riparian habitat.

3.4.2 Safe Harbor Agreement Area

Similar to the HCP Plan Area, riparian corridors within SPL&T lands in the SHA Plan Area also meet the CFPRs and are regularly verified during post-harvest inspections; however, riparian corridors in the SHA Plan Area above man-made barriers to anadromy have not been subject to the ASP rules for anadromous watersheds. Despite lacking additional ASP rule protections, conditions in these riparian areas are similar to those in the HCP Plan Area that have been subject to the ASP rules.

Given the CFPRs and the Conservation Measures included in the SHA, these conditions will persist throughout the life of the SHA and will continue to provide high quality and functional riparian habitat.

3.5 Biological Resources

Covered species within the HCP Plan Area include Chinook salmon, coho salmon, and steelhead populations.

Detailed descriptions of the covered species and their habitats in the ITP Permit Area and ESP Permit Area are included in Section 3 of the SPL&T HCP/SHA (SPL&T 2019). Covered species in the ITP Permit Area include Upper Klamath/Trinity River Chinook salmon ESU, SONCC coho salmon ESU, Klamath Mountains Province steelhead DPS, Central Valley fall- and late fall-run Chinook salmon ESU, Central Valley spring-run Chinook salmon ESU, Sacramento River winter-run Chinook salmon ESU, and California Central Valley steelhead DPS.

In general, salmonids have similar habitat requirements for spawning, rearing, and migration, although there are some specific habitat preferences that may vary between species and populations. Spawning habitat requirements for salmonids include sufficient water quality and quantity to support spawning, incubation, and larval development, as well as suitable substrate for creating redds, sufficient flow to provide oxygen to incubating eggs, and adequate water quantity to protect the eggs from predators.

3.6 Socioeconomics and Environmental Justice

Development in the HCP Plan Area and the SHA Plan Area is limited to forest roads and use includes timberland management. There are no human residential, urban, or commercial properties within the HCP Plan Area or SHA Plan Area.

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, signed by President Clinton on February 11, 1994, directs Federal agencies to take the appropriate and necessary steps to identify and address disproportionately high and adverse effects of Federal projects on the health or environment of minority and low-income populations to the greatest extent practicable and permitted by law.

Because there are no minority or low-income populations in the HCP Plan Area and the SHA Plan Area, adverse effects on the health or environment of minority and low-income populations are not expected to occur.

3.6.1 Populations, Race, and Ethnicity

No human individuals legally reside full-time within the HCP Plan Area and SHA Plan Area. A limited number of SPI patrol personnel and some employees of logging and forest management contractors live in mobile trailers on the property during late spring, summer, and autumn.

3.6.1.1 Employment

Nearly all employment within the HCP and SHA Plan Areas is through SPI, which employs approximately 3,400 full time employees and 25 seasonal employees in California. Employees live outside the HCP Plan Area and the SHA Plan Area in a broad area covering various portions of the eight-county area adjacent to the HCP Plan Area and the SHA Plan Area. Employment related to managing the limited cattle grazing occurring on SPL&T lands consists of owners or employees from small, local, non-corporate ranches (Ed Murphy, SPI, pers. comm.).

3.6.1.2 Tribes

There are presently no tribal lands within the HCP Plan Area or the SHA Plan Area. Three federally recognized Native American tribes have historical lands in proximity to the HCP Plan Area and the SHA Plan Area.

- The Hoopa Tribe are indigenous to northwestern California, in Humboldt County. The 2013–2017, 5-year census for the Hoopa Valley Reservation estimated a total population of 3,393 (US Department of Commerce 2018). The Hoopa Valley Reservation is downstream of HCP Plan Area in the Trinity River basin.
- The Yuki Tribe, also known as Yukiah, are indigenous to the Round Valley in Mendocino County. The tribe is enrolled in the Round Valley Indian Tribes of the Round Valley Reservation. According to the 2013–2017, 5-year census, the Round Valley Reservation and Off-Reservation Trust Land had a total population of 391 (US Department of Commerce 2018). The Round Valley Reservation is in the Eel River basin and does not overlap with the HCP Plan Area or SHA Plan Area.
- The Nomlaki Tribe are native to the area of the Sacramento Valley, westward from the Coast Range in northern California. Data regarding the Paskenta Band of Nomlaki Indians were not included in the most recent (2013–2017) census (US Department of Commerce 2018). The Paskenta Band of Nomlaki Indians are located south of the HCP Plan Area in the interior coast range.

Although not federally recognized, four other tribes with historical presence in the Sacramento and Trinity River basins are petitioning for federal recognition. None of these tribes presently have lands with the HCP Plan Area and the SHA Plan Area.

- The Nisenan Tribe, also called the Southern Maidu, is in east central California (Sutter, Yuba, Nevada, Placer, El Dorado counties, and parts of Sierra and Sacramento counties); however, the tribe is not recognized by the federal government, and do not receive federal protection or financial aid (Schueller and White 2018; Nevada City Rancheria 2019; Brady v. Nisenan 2011).
- The Konkow Tribe is in north central California (Butte County and eastern Glenn County) and is often considered the northwestern Maidu Tribe. The Konkow Tribe is not

currently a federally recognized tribe. The remaining members of the tribe live near Chico, California (Hacking 2016; ACTA 2019).

- The Chimariko Tribe was one of the smallest native groups in California and their territory in historic times was a 20-mile stretch of canyon on the Trinity River. According to the 2010 census, only 60 people remained in the Chimariko ancestry, of which 19 were full-blooded (US Department of Commerce 2010).
- Prior to construction of Shasta Dam, the Winnemem Wintu lived along the McCloud River, bounded by the Upper Sacramento to the west and the Pit River to the east (Winnemem Winto 2019; Dadigan 2012).

3.6.2 Recreation

There are no private, city, county, state, or Federal recreational facilities within the HCP Plan Area and the SHA Plan Area. SPI has no data on recreational use within the HCP Plan Area and the SHA Plan Area. SPI allows dispersed, non-motorized recreation, with seasonal closures for high fire risk and adverse weather conditions. Lands within the HCP Plan Area and the SHA Plan Area are used for dispersed recreation via US Forest Service and SPL&T roads.

Streams and rivers in the Sacramento River and Trinity River basins are used for recreational boating, recreational fishing, wildlife observation, hiking, and camping. There are no local, state, or national parks located within the HCP Plan Area and the SHA Plan Area. A fishing license is required to fish for salmonids in the inland waters of Sacramento River basin, and report cards and stamps are also required. At present, all the tributaries of the Sacramento River and the Trinity River covered under the HCP/SHA are closed to fishing for salmon and steelhead. Other fishing in the HCP/SHA area is subject to various closures and seasonal restrictions per the CDFW regulations.

3.6.3 Land Use, Ownership, and Management

Land use jurisdiction and management within the HCP Plan Area and the SHA Plan Area is described for the Sacramento River basin and Trinity River basin, in the subsections below.

3.6.3.1 Sacramento River Basin

Land use in the Sacramento River HCP Plan Area and the SHA Plan Area includes timberland management and limited grazing. There are no towns, incorporated municipalities, commercial businesses, or residences in the HCP Plan Area and the SHA Plan Area. The upper reaches of the watersheds are characterized by moderate to steep slopes and are, therefore, less affected by human activity (Armentrout et al. 1998; NMFS 2014a).

The upper watersheds of the Sacramento River basin have historically been used for timber harvest, which has influenced the dominant vegetation. In many locations, coniferous forests are now characterized by dense, small-diameter, shade-tolerant trees with thick understory (Heiman and Knecht 2010). Timber has always played a large role in the economy of the area, but rates of timber harvest on Federal lands are about half of what they were in 1980s (Heiman and Knecht 2010).

Cattle ranchers use foothills in eastern and western portions of the Sacramento Valley as winter grazing land (Heiman and Knecht 2010). The number of animals grazing has declined substantially over the past 100 years but ranching still provides limited employment (Heiman and Knecht 2010). The foothills used for winter grazing are not on SPL&T lands and are outside the HCP Plan Area and the SHA Plan Area. There is minimal grazing within the HCP Plan Area and the SHA Plan Area under permits from SPI. In the Sacramento River Basin, there are up to 125 head of cattle grazing on SPL&T lands for 4.5 months.

Across the Sacramento Basin there are cultural sites, including some on the HCP Plan Area and the SHA Plan Area, that are protected under the archaeology rules of the CFPRs and State Historic Preservation Act (SHPA). These include historic artifacts from Native Americans and the gold rush era. Evidence of prehistoric uses in the area, such as camps, along with activities such as pioneer trails, ridges, mining features, and logging camps are scattered throughout the basin (Heiman and Knecht 2010).

3.6.3.2 Trinity River Basin

Land use in the Trinity River HCP Plan Area and the SHA Plan Area includes timberland management and limited grazing. There are no towns, incorporated municipalities, commercial businesses, or residences in the HCP Plan Area and the SHA Plan Area. In the Trinity River Basin, there are up to 65 head of cattle grazing under permits from SPI for four months. Like the Sacramento Basin, there are cultural sites across the basin, including some in the HCP/SHA Plan Area. They are also protected under CPPRs CFPRs and SHPA, and artifacts are similar to those in the Sacramento Basin.

4.0 Environmental Consequences

The environmental consequences of the two alternatives evaluated in this EA are described in this section:

1. Issue Incidental Take Permit (ITP) and Enhancement of Survival Permit (ESP)
2. No Action (No Issuance of Permits)

4.1 Alternative 1: Issue Incidental Take Permit and Enhancement of Survival Permit

Alternative 1 would continue timberland management activities following the CFPRs and implement specific measures and mitigation for the conservation of covered species of the ITP and ESP. These conservation measures and mitigation include:

- Improve habitat for covered species on SPL&T lands by maintaining or improving fish passage and stream flows, reducing potential sediment sources; and maintaining or improving conditions providing wood, heat, and nutrients at levels supporting high quality habitats on SPL&T lands and habitats and further downstream.
- Provide cold, clean water to downstream watersheds supporting anadromous species by maintaining stream shade, limiting potential diversions caused by road systems, and maintaining stream temperatures.
- Improve riparian structure and function by assuring natural recruitment processes of riparian vegetation, including hardwoods and conifers, will continue.
- Identify and reduce sources of suspended sediment stemming from covered activities by:
    - Minimizing stream channel network extension by maintaining existing SPL&T roads in proper function, increasing hydrologic disconnection, constructing new roads meeting CFPRs design and function, upgrading stream crossings, and decommissioning roads no longer required for forest management activities.
    - Implementing road improvement projects at those locations where new drains and surfacing will have the greatest effect in reducing sediment production and delivery to streams. Use SPI's READI model to identify sediment sources from road runoff.
- Provide for reduced watershed impacts from fire by implementing safe practices and creating fuel break networks and participating in multi-stakeholder fuel reduction strategies; such as SPI's Memorandum of Understanding (MOU) with the USFS, the National Fish and Wildlife Foundation, and CAL FIRE to coordinate protection of habitat to reduce potential impacts from large-scale, high-severity wildfire, and to coordinate fire suppression planning and response efforts on federal, state, and SPL&T lands with an emphasis on preserving habitat.
- Install two continuous water quality monitoring stations in the Trinity River basin HCP Plan Area or SHA Plan Area to monitor overall management and aquatic habitat quality performance.
- Establish (SPL&T) road systems in each HCP Plan Area watershed that are between 85 to 90 percent hydrologically disconnected by completing the READI model field work, analysis, and specific site improvements. In the Trinity River basin HCP/SHA Plan Areas, SPI will prioritize road improvements on unstable lands based on the landslide

risk assessment results and known or potential distribution of covered species. Sacramento River basin HCP/SHA Plan Area lands will be prioritized using the NMFS Core and reintroduction classifications, beginning with Core 1 and Core 2 watersheds, followed by Primary and Candidate classifications.

- Provide an elevated habitat baseline in the SHA Plan Area supporting NMFS listed salmonid species reintroduction efforts. SPI will use the READI model to identify locations of road and drainage improvement projects. Once implemented, these improvements become permanent features in the SHA Plan Area, regardless of current NMFS reintroduction efforts, resulting in improved, or elevated, habitat conditions.

The impacts described in subsections below focus on the potential effects of timberland management activities, anadromous salmonid relocation to historical habitat, and implementation of conservation measures that would provide proactive improvements outside the CFPRs' framework.

4.1.1 Geology and Soil

Under the proposed action, erosion would be decreased over time, but current timber activities have the potential to cause erosion and turbidity impacts and therefore are considered indirect effects. They would be short in duration and are expected to decrease over time. Indirect effects related to the proposed action include the potential to decrease erosion delivering to stream and rivers within the HCP Plan Area and SHA Plan Area, especially associated with road use and maintenance. Erosion contributes to water quality issues (described in Section 4.1.3, *Water Quality and Quantity*), channel structure, and bank condition. Existing relevant erosion control measures include slope and water body restrictions on tractor operations, seasonal restrictions on timber harvest restrictions during the winter period, construction of waterbreaks, and minimizing road crossings.

Covered activities would continue complying with the CFPRs. Potential effects to geology and soils would continue to be mitigated to the greatest extent practicable by following the CFPRs and participating in the CFPR review process. The CFPRs and other timber harvest BMPs are designed to reduce the indirect impact of erosion and delivery to watercourses; however, BMPs cannot prevent all erosion from forest roads (Keppeler et al. 2008). There would likely be some short-term indirect effects associated with erosion and road crossings under the proposed action, such as increased sediment delivery, disturbances to habitat, reductions in habitat connectivity and/or availability, loss of ground cover, and compaction of soils resulting in increased runoff. These potential effects will be reduced over time through implementation of the READI model. Under the preferred alternative, the READI model would identify potential areas of concern related to changes in hydrology and road use, prioritizing further improvement of habitat conditions. Protection from erosion would improve stream channel conditions and habitat connectivity for rearing and migrating anadromous salmonids.

SPI conducted a GIS-based land stability analysis for planning watersheds in the Trinity River Basin HCP Plan Area and SHA Plan area to aid conservation strategy and mitigation planning efforts (SPL&T 2019). The analysis used data that incorporates landslide inventory, geology, rock strength, and slope to analyze landslide susceptibility. The data create classes of landslide susceptibility from zero to ten, low to high. SPI overlaid the GIS dataset onto the Trinity River

Basin HCP and SHA planning watershed boundaries and summarized landslide risk categories for all HCP Plan Area and SHA Plan Area lands. This summary provides criteria for prioritizing mitigation strategies by planning watersheds and enables SPI to select planning watersheds most prone to slope failure in conjunction with READI model results for road improvement treatments. This allows SPI the ability to reduce the greatest risk and most likely potential sediment sources during the permit period. (See SPL&T 2019, Appendix E, Tables E-3 and E-4, for the land stability analysis summaries by HCP Plan Area and SHA Plan Area planning watersheds).

4.1.2 Topography

SPI has a large network of unpaved forest roads and has minor direct effects on topography with the creation of new roads or skid trails. Slope stability is highly correlated to geology, topography, and land use, particularly forest road density and location. SPI designed a forest road model called READI to address forest road sediment production and delivery to streams that is also used to identify risk areas, such as where roads intersect with headwall swales or stream crossings. These risk areas with a potential to deliver sediment to stream courses are significantly reduced as the percentage of disconnected road segments increases in a watershed. Implementation of the results of the READI model would be a positive effect of the issuance of the ITP and ESP.

SPI would also decommission roads that are no longer required for timber harvest activities or forest maintenance, indirectly reducing the risk of sediment delivery and mass wasting events. Geology, soil, and topography all contribute to the risk of mass wasting. Mass wasting risk originates from inner gorge stream side destabilization due to over-steepened slopes adjacent to watercourses or concave headwall swales located in the steepest, highest reaches of a watershed.

Mass wasting events generally occur during episodic events with either high duration, high intensity rainfall or warm atmospheric river events causing rain on snow melting. Unpaved roads are likely the dominant source of unstable slopes and land use-related sediment pollution in forested landscapes in the United States, with the potential to impact water quality and aquatic biota (Megahan and Ketcheson 1996; Goode et al. 2012). The contribution of roads to sediment pollution (Gucinski et al. 2001) has led the State of California to impose BMPs to hydrologically disconnect forest roads from streams and reduce sediment delivery. Under the proposed ITP and ESP, the indirect effect of reducing the risk of mass wasting events by decommissioning unused roads would enhance anadromous salmonid survival.

4.1.3 Water Quality and Quantity

Under the proposed action, implementing the READI model and installing two new continuous water quality monitoring stations in the Trinity River basin would have a beneficial indirect effect by identifying potential water quality issues, including suspended sediment and temperature. Any potential problems identified using the READI model and water quality stations would be corrected and mitigated to the extent practicable by SPI.

Fish typically avoid waters with high suspended sediment levels, potentially displacing themselves from preferred habitat (Bash and Berman 2001). Fish unable to avoid elevated

suspended sediment can experience adverse effects, such as increased energy expenditure, elevated blood sugars and cough rates (Servizi and Martens 1987), and reduced growth rates (Bash and Berman 2001). However, sediment concentrations causing fatalities are far higher than what is normally produced by erosion of road surfaces and stream banks (Bilby and Ward 1989).

Water temperature affects metabolism, behavior, and survival of both adults and juvenile fish as well as other aquatic organisms that may be food sources (Carter 2005). Temperature influences growth and feeding rates, metabolism, development of embryos and alevins, timing of life history events, and the availability of food (Carter 2005). Temperatures at sub-lethal levels can effectively block migration, lead to reduced growth, stress fish, affect reproduction, inhibit smoltification, increase the prevalence and virulence of disease, and alter competitive dominance (US EPA 1999).

The implementation of additional conservation measures beyond the CFPRs would have the indirect effect of reducing sources of suspended sediment stemming from timber harvest activities. SPI would minimize the channel network extension by maintaining existing roads in proper functioning condition, construct new roads that meet the CFPRs' design standards, and decommission roads that are no longer required for timber operation or forest management activities.

The proposed action would not result in changes to water quantity. Under both Alternatives, water drafting would continue to be regulated by CFPRs and NMFS standards that minimize potential effects to riparian habitat and stream flow, including standards relating to drafting location, screen and intake sizes, inspection, drafting rate and velocity.

4.1.4 Aquatic Habitat

Under the proposed action, there would be a direct beneficial effect on aquatic habitat by using the READI model to identify potential hydrology and sediment transport issues associated with SPI's road network and using this information to guide remediation at high priority sites. In the Sacramento River basin HCP Plan Area, levels of chronic sediment delivery is anticipated to potentially remain above natural levels due to the high density of both roads and road crossings, but is expected to diminish over the permit term as road improvements continue. Levels of episodic sediment delivery is also anticipated to remain above natural levels following rare natural events, due to the high density of both roads and road crossings, but is also expected to diminish over the permit term as the number of potential locations at which these events could cause sediment delivery are reduced during continuous upgrades over time.

The same general habitat effects are expected to occur in the Trinity River basin HCP Plan Area as the Sacramento River basin HCP Plan Area. Chronic and episodic sediment delivery are anticipated to remain above natural levels due to the high density of both roads and road crossings, particularly in areas characterized by high landslide risk due to unstable geology, but reduced delivery levels are expected over the permit term as road improvements continue.

The proposed action is also expected to have a direct beneficial effect on aquatic habitat in the SHA Plan Area through implementation of the READI model, once ESA-listed salmonids are

reintroduced into historically occupied habitat. Timber harvest activities on SPL&T lands in the SHA Plan Area meet the CFPRs and are regularly verified during post-harvest inspections; however, aquatic habitat in the SHA Plan Area above man-made barriers to anadromy have not been subject to the ASP rules for anadromous watersheds.

Despite the lack of ASP protections in the SHA Plan Area, the CFPRs and the Conservation Measures included in the SHA will help to ensure that the existing conditions will persist throughout the life of the SHA and will continue to provide high quality and functional aquatic habitat to reintroduced salmonids.

4.1.5 Riparian Function

Under the proposed action, there would be no new direct effects, either beneficial or adverse, on riparian function, since timber harvest activities either outside or inside riparian buffers would continue only as regulated by the CFPRs. Activities in riparian areas will continue to follow the CFPR ASP rules where appropriate, minimizing potential effects to riparian areas. While harvest within a riparian zone may reduce canopy cover, possibly increasing water temperatures, there would be no difference in this effect between Alternatives 1 and 2. Additionally, the conservation measures in the HCP/SHA include effectiveness monitoring of riparian habitats for circumstances where timber harvest activities occur in these areas when adjacent to stream reaches occupied by listed covered species.

The use of the READI model in Alternative 1 would have a beneficial indirect effect of reducing the suspended sediment input into streams over time by identifying potential sources associated with roads. This benefit is described more fully in Section 4.1.3, *Water Quality and Quantity*.

4.1.6 Biological Resources

There would be no direct effects on biological resources from the proposed action. The potential effects would be indirect and may include changes in behavior, reduced feeding, growth, and survival, and decreased habitat availability. Implementing the READI model and installing/redirecting water quality monitoring stations would have a beneficial indirect effect in the HCP Plan Area by identifying potential water quality issues and allowing for the prioritization of actions that would reduce the impacts associated with those issues. As practicable, potential problems identified using the READI model and water quality stations would be corrected and mitigated by SPI though implementation of the following:

- Minimizing stream channel network extension by maintaining existing SPL&T roads in proper function, increasing hydrologic disconnection, constructing new roads meeting CFPRs design and function, upgrading stream crossings, and decommissioning roads no longer required for forest management activities, and

- Implementing road improvement projects at those locations where new drains and surfacing will have the greatest effect in reducing sediment production and delivery to streams.

Also, under the proposed action, there would be a beneficial indirect effect on anadromous salmonid populations through cooperation with the NMFS reintroduction of populations above

impassable dams in each basin. As part of the mitigation for implementing the ITP and ESP, SPI would support the reintroduction of Chinook and coho salmon and steelhead to the SHA Plan Area and assist NMFS in meeting key objectives of the recovery strategy described in the NMFS species recovery plans (NMFS 2014a, 2014b). Central Valley Chinook salmon and steelhead would be potentially be reintroduced to the Upper Sacramento and McCloud Rivers above Shasta Dam and reservoir; Battle Creek, downstream from Whispering Falls and Angel Falls; and the Yuba River above New Bullards Bar Dam and reservoir. Above the Trinity Dam and reservoir, SONCC coho salmon would potentially be reintroduced to Stuart's Fork, upper Trinity River, and East Fork Trinity River. Access to reaches upstream of impassable dams would enhance anadromous salmonid survival and bolster diminishing populations (NMFS 2014a, 2014b).

The overall effects of the proposed action would be beneficial. Continued timberland management under the CFPRs, the addition of READI model completion and implementation, including related road system improvements, additional water quality monitoring stations in the Trinity River basin, and support for NMFS reintroduction efforts all would be beneficial effects to the covered species. The largest increment of benefit to the covered species would arise from the cooperation with the reintroduction effort within the SHA Action Area.

4.1.7 Socioeconomics and Environmental Justice

There are no individuals residing within the HCP Plan Area and SHA Plan Area; therefore, there would be no direct or indirect effect on the distribution of individuals by race or ethnicity in the HCP Plan Area and SHA Plan Area under the proposed action. No minority or low-income populations have been identified that would be adversely impacted by the proposed project as determined above.

The collection of READI model data in the remaining areas would require the hiring of five individuals for three summers of work. Implementing the proposed action would not affect employment related to grazing. Therefore, there would be a slight direct effect on employment under Alternative 1.

The proposed action would have no direct or indirect effect on tribal membership, enrollment, or distribution. Tribes in California have no formal treaty rights for fishing except on the Lower Klamath River and lower Trinity River, which are not within the HCP Plan Area or SHA Plan Area. The related beneficial effects of the proposed action would be to potentially increase the number of juvenile outmigrant salmon and steelhead in the Trinity River system and thereby in the Lower Klamath River. However, it would be speculative to state how such relatively small increases might be reflected in eventual larger returns of adult fish that could be utilized by tribal fisheries on the Lower Trinity and Lower Klamath Rivers. Tribal members would experience a beneficial indirect impact due to the positive effect of the incremental decrease in sediment which would improve the overall well-being of fish populations, and from knowing habitat conditions and fish populations are improving.

The informal, dispersed recreation that occurs throughout the HCP Plan Area and SHA Plan Area would not be affected by the proposed action, unless roads are decommissioned or use is

restricted related to improvements in road conditions. Therefore, there could be small direct or indirect effects on recreation under Alternative 1.

Under the proposed action, land use, ownership, and management would stay the same, or would change gradually over the 50-year period due to factors separate from the proposed action. Therefore, there would be no direct or indirect effects on land use, ownership, and management under the proposed action.

4.2 Alternative 2: No Action

In Alternative 2, the impact of Covered Activities would be the same as described for Alternative 1 (see Section 4.1, *Alternative 1: Issue Incidental Take Permit and Enhancement of Survival Permit*); however, without the issuance of the ITP and ESP, additional conservation measures beyond the CFPRs would not be implemented. The effects of not implementing specific conservation measures are described in the subsections below.

4.2.1 Geology and Soil

Under the No Action Alternative, there would be no direct effects on geology and soil beyond those limited effects already occurring with SPI's management under the CFPRs. Those effects may include loss of ground cover and compaction of soil, increased runoff and sediment delivery, disturbance of unstable lands and habitat. Without the implementation of the ITP and ESP, the READI model would not be used to identify and prioritize remediation of existing sources of erosion. Therefore, under the No Action Alternative, there would be an adverse indirect effect on geology and soils through increased erosion and turbidity, in comparison to the Preferred Alternative.

4.2.2 Topography

Management of the existing road network would remain the same and maintained following the CFPR standards, including associated permits and stream crossing agreements. Future road construction would be conducted under the same regulatory framework. There are no direct effects associated with the No Action Alternative. A potential indirect effect may occur by not implementing the READI model, as percent hydrologic disconnection amounts for planning watersheds may not be reduced to the levels provided by the preferred alternative.

4.2.3 Water Quality and Quantity

Water quality and quantity would not change relative to existing effects and conditions; therefore, it is expected that the following would still occur under the No Action Alternative. Soil compaction caused by heavy equipment and yarding may decrease infiltration capabilities, increasing surface runoff. As a result, runoff from roads and other connected compacted surfaces can increase peak flows during rainstorms (Ziemer 1998). Removal of vegetation can reduce evapotranspiration for several years following harvest, which increases the amount of water that infiltrates the soil and ultimately reaches the stream. Streams draining recently logged areas can see increased summer base flows (Keppeler 1998, Lewis et al., 2001).

Without the additional conservation measures and READI model implementation required with the issuance of the ITP and ESP, environmental conditions within the HCP Plan Area would not improve, indirectly affecting water quality for anadromous salmonid populations within the basins. The potential effect to water quality is strongest in the Trinity River basin, which has TMDLs for suspended sediment (US EPA 1998; 2001). The READI model would help identify potential sources of suspended sediment related to road operation and maintenance in the HCP Plan Area and SHA Plan Area.

Similarly, without the issuance of an ITP and ESP, a minimum of two additional water quality monitoring stations would not be installed in Trinity River basin, and the three existing stations in the Sacramento River basin would not be dedicated to monitoring specifically for the purposes of the HCP and SHA. Without the additional monitoring stations, potential issues with temperature and turbidity may go unreported and uncorrected.

4.2.4 Aquatic Habitat

Under the No Action Alternative, there would not be the indirect benefit provided by the READI model, including the identification of potential hydrology and sediment transport issues associated with the forest road network. Measures providing elevated habitat baseline conditions in the SHA Plan Area would not occur.

4.2.5 Riparian Function

Under the No Action Alternative, there would be no direct beneficial or adverse effects on riparian function beyond existing effects and conditions, because timber harvest activities would continue outside and inside the riparian buffer, as regulated by the CFPRs. Riparian conditions are measured using metrics on canopy cover, average diameter of overstory trees, core area harvest restrictions, and harvest restrictions near unstable soils. Although there is limited data available on these metrics within the HCP Plan Area, riparian corridors within SPL&T lands are consistent with CFPRs. Compliance with the CFPRs reduce activities within near proximity to streams to protect riparian corridors that increase hardwood canopy retention and forage material for salmonids, maintain cold-water inputs from springs and smaller streams, and provide a source of LWD for improving habitat complexity.

4.2.6 Biological Resources

Protection of biological resources would continue under existing programs and regulations (i.e., CFPRs and state and federal ESAs). Therefore, there would be no direct or indirect effect on biological resources as compared to existing effects and conditions. The existing direct effects include potential impacts causing harm to individual covered species, most likely occurring during water drafting and instream construction or construction activities at stream crossings in covered species habitat. These impacts are expected to be minimal due to CFPR practices designed to limit impacts to fishes, including implementing NMFS water drafting standards, and compliance with project specific CDFW 1600 Agreements for any instream construction activities.

Indirect effects include potential impacts from sediment due to physical disturbance of anadromous fish habitat and input from road systems. Effects of chronic sediment on eggs and alevins are the most likely impact from covered activities.

Implementation of the READI model would not occur as proposed, nor would the addition of new water quality monitoring stations. Without these improvements, effects to covered species and habitat may go undetected. Additionally, actions supporting reintroduction of listed salmonid populations in historically occupied or suitable habitat and meeting key recovery strategy objectives as described in NMFS's recovery plans for the listed salmonid species would not occur.

4.2.7 Socioeconomics and Environmental Justice

Under Alternative 2, there would be no direct or indirect effect on the distribution of individuals by race or ethnicity in the HCP Plan Area and SHA Plan Area, because there are no individuals residing within the HCP Plan Area and SHA Plan Area. As determined above, no minority or low-income populations have been identified that would be adversely impacted by Alternative 2.

Under Alternative 2, SPI does not anticipate adding or reducing full time or seasonal job positions during the 50-year period. Similarly, grazing permits would not change and there would be no effect on grazing employment. Therefore, there would be no direct or indirect effect on employment.

Alternative 2 would have no direct or indirect effect on tribal membership, enrollment, or distribution. Under Alternative 2, Tribes would not benefit from the potential increased populations for fishing and cultural purposes as they may under Alternative 1. Tribal members would not have the beneficial indirect impact due to the positive effect of the incremental decrease in sediment which would likely benefit fish recovery efforts.

Because only informal, dispersed recreation presently occurs throughout the HCP Plan Area and SHA Plan Area, and this condition is not expected to change, there would be no direct or indirect effects on recreation under Alternative 2.

Under Alternative 2, land use, ownership, and management would stay the same, or would change gradually over the 50-year period due to factors separate from the proposed action. Therefore, there would be no direct or indirect effects on land use, ownership, and management under Alternative 2.

4.3 Cumulative Effects

This section describes what NMFS believes are cumulative effects resulting from the proposed action. The analysis followed the 11 steps in cumulative effects analysis described in *Considering Cumulative Effects Under the National Environmental Policy Act* (CEQ 1997).

4.3.1 Geographic Scope

The geographic scope for the cumulative effects analysis for geological resources, water resources, and biological resources includes the HCP Action Area and the SHA Action Area

(which includes the ITP Permit Area and the ESP Permit Area). This encompasses the areas where cumulative effects may occur for these elements. For socioeconomics and environmental justice, the geographic scope of analysis for cumulative effects is reduced and includes the HCP Plan Area and the SHA Plan Area (i.e., the ITP Permit Area and ESP Permit Area), as it is unlikely that effects would extend into the HCP Action Area and the SHA Action Area.

4.3.2 Timeframe

The timeframe for the cumulative effects analysis is from the beginning of European settlement through the proposed 50-year permit timeframe.

4.3.3 Past, Present, and Reasonably Foreseeable Future Actions

Past actions affecting the resources, ecosystems, and human communities of concern are the long history of timber management throughout the area and the construction of dams and other barriers that are impassible to anadromous fish, along with extensive past grazing, mining, and fishing activities. In the past there were scattered private land holdings and private residences in the cumulative effects analysis area, but they no longer exist.

Present activities that may contribute to cumulative effects include current SPI timber management activities and minor grazing and fishing.

Reasonably Foreseeable Future Actions considered in this analysis are future SPI timber management activities and NMFS' recovery plan actions for species on SPL&T lands.

4.3.4 Rationale for Analysis

Timber harvest and associated activities are regulated under an approved functional equivalent program that was approved by the California Secretary of Resources in 1976. Under the California Environmental Quality Act (CEQA) process, this means that a formal Environmental Impact Report and related process is replaced by the entirety of the functional equivalent program. The approved functional equivalent program includes the California Forest Practice Act, California Forest Practice Rules, the Board of Forestry (BOF), the BOF rule making process, Timber Harvest Plan (THP) documents, a multi-disciplinary Review Team (Review Team), a pre-harvest inspection by the Review Team, the public comment period, and if necessary, the CalFire Official Response to issues raised. The BOF rule making process includes public participation and comment periods, and the Board also conducts a CEQA analysis for each rule making effort.

Each Review Team has standing members of CalFire, CDFW, and the California Regional Water Quality Control Board; additionally, as local circumstances dictate, the Review Team can also include the California Geologic Survey, US Forest Service, National Park Service, California State Parks, and local Counties. All review team members can raise issues. The land owner and CalFire as lead agency must address all issues deemed potentially significant adverse impacts. This functional equivalent program represents over 42 years of continual advancement in the process by all participating parties and entities.

SPI conducts all forestland management activities in full compliance with the CFPRs, which set prescriptive standards for natural resource protection minimization measures for all privately- and state-owned timberland management activities in California. The CFPRs set even higher standards for activities in ASP watersheds; SPI lands in the ITP permit area presently are considered ASP watersheds. Each THP prepared under the CFPRs includes multi-agency, multi-disciplinary administrative and field review, and public participation. Resource agency approvals include post-project assessment to assure compliance with all appropriate CFPR protection measures. In particular, the process has required that each THP must include a complete cumulative impacts analysis, which is available for public review and comment. As a result of this functional equivalent program, CalFire cannot approve a project that causes a significant environmental impact.

Given that proposed THPs follow the CFPRs and that the entire CFPR process meets CEQA functional equivalent program requirements, all potential project effects, including cumulative effects, are addressed by each proposed THP and these potential effects have been mitigated to insignificance, as defined by CEQA.

4.3.5 Geologic Resources

Geologic resources on SPL&T lands potentially affected by SPI's timberland management activities, including potential sediment delivery into stream habitats, are regulated by the CFPRs. Each THP includes geologic resource analyses of slope stability and erosion potential, and review/approval through the THP process, including by the California Geological Survey (2010). Potential effects related to sediment input from timber management operations, including long-term road maintenance, is managed through application of the CFPRs through the THP process, and through joint management of roads shared with the US Forest Service (USFS).

Actions implemented through the CFPRs are required to meet the CEQA standard of no significant effects, including cumulative effects. Cooperative road management implemented with the USFS is subject to NEPA standards evaluated under Environmental Assessments, Environmental Impact Statements, or other appropriate NEPA analyses prepared by relevant National Forests. Because potential sediment supply is managed and evaluated under the CEQA and NEPA processes, no significant cumulative effects to geologic resources are expected by either the no-action alternative or the proposed action. Additionally, under the proposed action, SPI will implement conservation measures associated with application of the READI model in the ITP Permit Area, further reducing potential effects to aquatic habitats from sediment input compared to the existing condition.

Limited gravel and hard rock mining and quarrying, and associated gravel processing, occurs in the HCP Action Area. SPI assumes these activities will continue during the permit period. The potential effects of mining on aquatic resources in the HCP Action Area depend on the type, size, location, and distance from aquatic habitats. Instream gravel mining can impact sedimentation, erosion, streambank and streambed stability, and substrate. Surface mining may cause soil compaction and loss of vegetative cover. Mining activities may also impact riparian vegetation. Because potential effects of quarries and rock mines depend on numerous variables, the effects of mining within the HCP Action Area to covered species and their habitats are unknown. All mining activities, however, are regulated by the State of California under the Surface Mining and

Reclamation Act of 1975 (SMARA) and additional local and county regulations. This regulatory framework mandates that these activities be mitigated to insignificant levels.

4.3.6 Water Resources

SPI lands in the ITP Permit Area and ESP Permit Area include watersheds in the Trinity River and Sacramento River basins. Watersheds in the ITP Permit Area are within the current range of anadromous salmonids. Watersheds in the ESP Permit Area occur above constructed barriers to anadromy but are within the historic range of anadromous salmonids. These areas contain high-quality salmonid habitat identified by NMFS as potentially suitable locations for reintroduction efforts for listed anadromous salmonid species.

Water resources on SPI lands and water quality issues potentially affected by SPI's timberland management activities are regulated by the CFPRs. Under the proposed action, timberland management activities would continue, and water quantity in form of runoff from rainfall or snowmelt would not be affected by these activities. Potential cumulative water quality effects from timberland management activities (sediment and turbidity) would continue to be mitigated by compliance with the CFPRs. Additionally, under the proposed action, application of the READI model and associated conservation measures would further reduce potential sediment delivery, reduce turbidity, and increase water quality compared to the existing condition.

Flows in most HCP Action Area Sacramento River basin watersheds are impacted by diversions downstream of SPL&T ownership. An unknown number of permanent and temporary water withdrawal facilities exist within the action area, most of which are associated with agricultural lands. Due to the anticipated development and continued agricultural use in the Sacramento River basin HCP Action Area, the number of diversions and amount of water diverted is expected to increase. Potential impacts to covered species and their habitat include entrapment and impingement of younger life stages, localized dewatering of stream reaches, elevated stream temperature, and depleted flows.

Watersheds in the Trinity River basin HCP Action Area above and below SPL&T ownership are also likely impacted by diversions, primarily for agricultural purposes. SPI expects the number of diversions to increase during the permit period, though at a smaller individual scale. All water diversions are expected to be conducted under applicable laws, including the State Water Rights, CDFW regulations, CRWQCB regulations, and other local or county regulations. Current and future salmonid restoration activities to restore flows, especially during critical fish passage periods could result in improved conditions.

4.3.7 Biological Resources

Detailed descriptions of the covered species and their habitats in the ITP Permit Area and ESP Permit Area are included in Section 3 of the SPL&T HCP/SHA (SPL&T 2019). Covered species in the ITP Permit Area include Upper Klamath/Trinity River Chinook salmon ESU, SONCC coho salmon ESU, Klamath Mountains Province steelhead DPS, Central Valley fall- and late fall-run Chinook salmon ESU, Central Valley spring-run Chinook salmon ESU, Sacramento River winter-run Chinook salmon ESU, and California Central Valley steelhead DPS.

Potential cumulative impacts of SPI's timberland management activities in the ITP Permit Area and ESP Permit Area to biological resources such as fish, wildlife, and plants include riparian habitat and vegetation loss, changes to stream channel morphology, altered watershed hydrology (increased storm runoff, localized dewatering of stream reaches), increased sediment loading, pollutants, changes in water temperature, and possible entrapment and/or impingement of younger life stages. These effects are already minimized to the extent possible through application of the CFPRs. This includes protections afforded to watercourses and riparian habitats, and implementation of ASP watershed rules where applicable. This situation would continue under the No-Action Alternative, and under the Preferred Alternative, issuance of the ITP and ESP.

4.3.8 Air Quality

Air quality is generally influenced by the quantities of pollutants released within and upwind of an area and can be highly dependent upon the chemical and physical properties of the pollutants. Air quality standards and regulations limit the allowable quantities of pollutants that may be emitted. Additionally, the topography, weather, and land use in an area also affect how pollutants are transported and dispersed and the resulting ambient concentrations.

Air quality standards are important for protection of the public and environment from harmful pollutants. There are two sets of standards regarding air quality; primary standards involve public health protection, and secondary standards involve public welfare protection, including protection against decreased visibility and damage to animals, plants, and buildings.

National Ambient Air Quality Standards (NAAQS, 40 CFR § 50) and California Ambient Air Quality Standards (CAAQS, 17 CCR §70200) have been established by federal and state governments for six criteria air pollutants:

- Ozone (O3)
- Carbon monoxide (CO)
- Lead (Pb)
- Nitrogen dioxide (NO2)
- Sulfur dioxide (SO2)
- Particulate matter (PM), which is divided into PM with a diameter less than 10 microns (PM10) and PM with a diameter less than 2.5 microns (PM2.5)

Excluding lead pollutants, forestry equipment and operations may contribute emissions of all the above criteria air pollutants (ICF, International 2016). The California Air Resources Board has identified particulate matter from diesel-fueled engines (i.e., Diesel Particulate Matter [DPM]) as a toxic air contaminant. Forestry equipment and operations may also contribute to emissions of greenhouse gases (GHGs).

SPI's timber harvest and management activities that directly affect air quality include: operation of forest vehicles (e.g., cars, pickup trucks, diesel tractor trailer trucks, bulldozers, feller bunchers, and excavators); operation of water trucks for road dust suppression; operation of

chain saws used for tree harvest and thinning; burning of wood slash piles; controlled burns for site preparation and fuel break construction; and fire suppression activities. All equipment is required to meet federal and California emission regulations and standards, but the activities do contribute to emissions of criteria pollutants, toxic air contaminants, and GHGs. Forest burning is always conducted under burn plans and smoke management plans, in accordance with local air quality management district permits and as allowed by the State Air Resources Board. Planned burning is conducted during periods that are identified for broad meteorological conditions that allow smoke and air pollutant dissipation. Additionally, a site-specific meteorological prescription (i.e., burn condition requirements) is identified that provides for smoke dispersion and fire control. All appropriate agencies are contacted prior to a burn project's commencement for coordination and to ensure that the burn versus no burn day condition is followed. Consequently, the burning activities also meet air quality regulations and standards and are expected to have minimal effects on sensitive human populations.

Air quality effects are considered to be of low to moderate intensity at the air basin scale based on the meeting of regulatory emission requirements. Although the activities would be conducted for the foreseeable future, the duration of effects is considered short because meteorological conditions change over short (daily, weekly) and seasonal time periods. Direct effects to air quality would include pollution from vehicles and machinery, and smoke from forest burning management activities. Indirect effects to air quality may include reduced smoke due to the reduction of catastrophic fire intensity and extent through land management activities.

4.3.9 Socioeconomics and Environmental Justice

Under the proposed action, potential cumulative negative effects regarding socioeconomic issues from SPI's timberland management activities are minimal and insignificant.

SPI will continue its current employment levels in California and make necessary adjustments based on its business models and economic conditions. Implementing the proposed action would have a slight direct effect on employment related to additional work by SPI to implement the READI model and perform related improvement projects. An additional slight effect would result from an increased SPI workload associated with the monitoring and reporting requirements of the HCP.

The proposed action would have no potential direct or indirect cumulative effects on tribal membership, enrollment, or distribution. No formal Tribal treaty rights occur in the ITP Permit Area or ESP Permit Area. Tribes may experience beneficial indirect effects of local increases in fish population due to issuance of the ESP and to reintroduction efforts. The positive effect of the incremental decrease in sediment would improve the viability of fish populations.

No potential direct or indirect cumulative effects to land use would occur under the proposed action. Land use, ownership, and management activities would remain the same. Any potential change in land use during the ITP and ESP terms would occur due to factors outside of the proposed action. The proposed action would enhance SPL&T's long-term commitment to timberland resource management and further reduce the already low likelihood of conversion to other land uses.

4.3.10 Other Cumulative Effect Considerations

4.3.10.1 Recreation

Recreation in the HCP Action Area consists of mainly dispersed activities such as hunting, fishing, and camping. SPI allows dispersed, non-motorized recreation, with seasonal closures for high fire risk and adverse weather conditions. Potential impacts to covered species and their habitats from these activities include localized effects on turbidity, water quality, streambanks, riparian vegetation, and spawning redds wherever human use is concentrated and these resources occur.

All hunting and fishing in the HCP Action Area is regulated by CDFW rules. Currently, all the watersheds in the HCP Action Area in the Sacramento River basin are closed to salmon and steelhead fishing. Many tributary streams in the Trinity River basin are subject to similar restrictions. Other fishing in the HCP Action Area is subject to various closures and seasonal restrictions per the CDFW regulations. Potential impacts levels to covered species within the HCP Action Area are unknown, but given limited legal public access, are likely very low and expected to remain at current levels.

4.3.10.2 Residential Development and Infrastructure

Overall the Sacramento River basin HCP Action Area is characterized by rural residential and small community developments. SPI expects this type of development pattern will remain during the permit period; however, it's reasonable to assume continued development and development pressure will persist as growth in the greater populated regions located primarily downslope (westerly) of the Sacramento River basin HCP Action Area continues. The Trinity River basin HCP Action Area is much less populated and remote than the Sacramento River basin. Development in this region includes several small primary communities and scattered rural residential development. SPI also expects this development pattern to also continue, with more growth likely centered near small communities.

Potential impacts to covered species and habitats from development and associated utility and road infrastructure include riparian habitat loss, changes to stream channel morphology, altered watershed hydrology (increased storm runoff), increased sediment loading, pollutants, and water temperature. Potential impacts on covered species and their habitats, including water quality, will be regulated by State and local CEQA requirements. The anticipated impacts to covered species and their habitats from continued residential development are expected to be sustained and locally intense, but are not expected to increase substantially over current levels.

4.3.10.3 Agricultural Activities

Agricultural activities, predominately grazing, occurs on many of the private lands in the Sacramento River basin HCP Action Area. Upward trends in values of dairy-related agricultural products (e.g., milk, cows and calves, pasture, and hay) in the Sierra Nevada and Cascade Range foothills is expected to continue as populations continue to increase. SPI expects the agricultural industry in the HCP Action Area to continue throughout the permit period. Potential impacts on water quality are expected to be regulated under applicable laws. Additional potential impacts to

covered species and habitat, including riparian vegetation, decreased bank stability, loss of overstory shade, increased sediment inputs, and elevated bacteria levels are expected to continue.

Activities in the Trinity River basin HCP Action Area includes similar agricultural practices, but at smaller scales. These lands also include significant landowner participation in California's legal cannabis program. Potential impacts to covered species and their habitat include effects to water quality, stream flow, diversions, riparian vegetation, and sedimentation. These farming operations are regulated by several state and local agencies including the Bureau of Cannabis control, California Department of Food and Agriculture, California Department of Public Health, CDFW, CRWQCB, and Trinity County. SPI expects these activities to continue during the permit period and anticipates the proportion of illegal cannabis to continue decreasing as legal growing and the regulatory framework become more established.

4.3.10.4 Chemical Use

Herbicides are primarily used by SPI to temporarily delay the growth of brush and weeds that compete with conifers for nutrients and sunlight while conifers are young. The application of forest chemicals is not a covered activity in the HCP/SHA; however, some herbicide use is a reasonably foreseeable outcome of even-aged timber harvesting and SPI considers this an interrelated and interdependent activity. Both direct effects from exposure and indirect effects from habitat alteration or changes in primary and secondary production may occur within the HCP Action Area. Therefore, potential effects of herbicide applications are reasonably foreseeable during the permit period.

SPI forest chemical application is regulated by several federal, state, and local agencies and their use is conducted under applicable laws. Each chemical used by SPI has been tested and researched by the Department of Pesticide Regulations (DPR). The DPR regulatory process serves as a CEQA equivalent program and includes use of the U.S. EPA label and additional label restrictions if necessary. Herbicide use requires a formal recommendation by a licensed Pest Control Advisor and application by a licensed Pest Control Operator. The County Agricultural Commissioner also participates in the DPR CEQA functional equivalent program. The CFPRs and chemical labels provide regulations regarding buffers for aquatic habitats and other conditions during application.

By following all chemical label and other regulations regarding the application methods, transport, and fate of the various herbicides, the chance of these chemicals entering a fish-bearing watercourse and impacts to covered species or their habitat is low.

4.3.10.5 Wildfire Suppression on Non-federal Lands

Wildfire is likely to occur in the HCP Action Area watersheds over the permit term. Depending on size, severity, and location, fires could have effects ranging from beneficial (increase water yield, improved riparian condition, reduced fuel loadings) to negative (increased sediment loading, increased water temperatures). Wildfire suppression may include the removal or modification of vegetation due to firebreak construction or setting backfires as fire control measures. An undetermined amount of potential covered species habitat may be removed or modified by this activity. Post-fire rehabilitation is performed by the state or federal incident lead

agency per their guidelines. This HCP/SHA includes mitigation measures to minimize potential impacts post-fire including road crossing upgrades and other relevant BMPs.

4.3.10.6 Climate Change

A factor potentially affecting the condition of watersheds in the Sacramento River and Trinity River basins, and aquatic habitat at large, is climate change. Climate experts predict physical changes to river and stream environments along the West Coast that include rising air temperatures, increased precipitation from rain rather than snow, and diminished snow pack all of which will result in altered stream flow volume and timing, increased winter flooding, lower late summer flows, and a continued rise in stream temperatures (Williams et al. 2016). The increase in air temperatures and decrease in precipitation associated with warmer climate change scenarios also may increase the frequency and severity of wildfires (Sankey et al. 2017). The long-term changes may change salmon and steelhead distribution, behavior, growth, and survival, and are important to consider when evaluating existing conditions and potential future conditions relevant to habitat conservation, and potential effects of covered activities included in the HCP/SHA. The main impacts of climate change relevant to the covered actions include changes in temperature, hydrology, wildfire and associated fine sediment input, and vegetation.

Warmer temperatures associated with climate change may reduce snowpack and alter the seasonality and volume of seasonal hydrograph patterns (Cohen et al. 2000). California has recently experienced record high air temperatures (2013 and 2015; NOAA 2017). Central and north coast California have shown trends toward warmer winters since the 1940s (Dettinger and Cayan 1995). An altered seasonality results in runoff events occurring earlier in the year due to a shift in precipitation falling as rain rather than snow (Roos 1991; Dettinger 2005a). Water temperatures may rise, especially during the summer months when lower streamflow and warmer air temperatures will contribute to warming regional waters. Such changes may not be spatially homogenous. Areas with elevations high enough to maintain temperatures below freezing for most of the winter and early spring are expected to be less affected. Low-lying areas that have historically received scant precipitation contribute little to total streamflow and may be more affected.

In recent years, California has experienced well below average precipitation (2012, 2013, 2014, and 2015; NOAA 2017), record high air temperatures (2014 and 2015; NOAA 2017), and record low snowpack (2015; Seghesio and Wilson 2016). North coast and central California have shown trends toward an increase in the ratio of rain to snow, shortened and delayed snowfall season, and accelerated rates of spring snowmelt (Kiparsky and Gleick 2003). The altered seasonality results in runoff events occurring earlier in the year due to a shift in precipitation falling as rain rather than snow (Roos 1991; Dettinger et al. 2004). Studies suggest that the spring streamflow maximum could occur about 1 month earlier by 2050 (Barnett et al. 2005).

The magnitude of snowpack reductions is subject to annual variability in precipitation and air temperature, particularly in the Cottonwood Creek watershed. Factors modeled by VanRheenen et al. (2004) show that melt season shifts to earlier in the year, leading to a large percent reduction of spring snowmelt (up to 100 percent in shallow snowpack areas). Additionally, an air temperature increase of 3.8°F is expected to result in a loss of about half of the average April snowpack storage (VanRheenen et al. 2004). The decrease in spring snowmelt would be greatest

in the region of the Sacramento River watershed and the Trinity River watershed, where snowpack is shallower than in the San Joaquin River watershed located south of the HCP/SHA Plan Areas.

Climate change effects contributing to warming and reduced snowpack, an increase in the number of fire ignitions, and historical land management practices including timber harvest and fire suppression activities likely have led to an increase in the number of large wildfires (greater than 1 square mile) and the total area burned annually across the western United States (Barr et al. 2010). Along the west coast, 88 percent of the watersheds are projected to have a ten percent increase in sediment yield between 2001 and 2050 due to increases in burning and post-fire hillslope erosion (Sankey et al. 2017). The increase in sediment yield will likely be caused by climate-change-induced increases in frequency and severity of wildfires through 2050 (Hawbaker and Zhu 2012). Other climate change effects may include issues associated with increases to sediment yield resulting from episodic sediment input due to changes in the magnitude and frequency of large storms. These events may cause increased runoff or slope failure on landscape features impacted by roads and timber management.

Central Valley spring- and winter-run Chinook salmon, SONCC coho salmon, and Central Valley steelhead are particularly vulnerable to climate change because they spend summers as prespawn adults and/or rearing juveniles in freshwater streams (Williams et al. 2016). Based on existing climate models, the most plausible projection for warming over northern California is 4.5°F by 2050 and 9°F by 2100 (Dettinger 2005b). Because most existing salmonid runs are restricted to low elevations by impassable dams, if the climate warms by 9°F, it has been questioned whether any Central Valley or Trinity River salmonid populations can persist (Williams 2006; South Fork Trinity River Spring Chinook Subgroup 2013). Tributaries without cold water refugia (usually input from springs) will be more susceptible to impacts of climate change. Even in tributaries with cool water springs, in years of extended drought and warming water temperatures, unsuitable conditions may occur. Additionally, juvenile salmon often rear in the natal stream for one or two summers prior to emigrating and would be susceptible to warming water temperatures.

4.3.10.7 Habitat Restoration Projects

Several salmonid restoration projects occur in the HCP Action Area, such as the Trinity River Resortation Program (TRRP) in the Trinity River basin and active Sacramento River basin programs in the Clear Creek and Battle Creek watersheds. It is reasonable to assume these will continue, and additional projects will occur during the permit period. These restoration projects are subject to CEQA and NEPA analyses and all supporting consultations, permitting, and mitigation planning. SPI assumes this regulatory framework will continue to address potential impacts to covered species and habitat on a project-specific basis. Implementation of this HCP/SHA will augment many of these restoration efforts over time, particularly NMFS planned salmonid reintroduction efforts in the SHA Plan Area.

4.3.11 Summary of Cumulative Effects

While there are adverse impacts to the environment, including to aquatic species, which have occurred from past Federal and non-Federal actions in the basin, NMFS believes that the proposed action will not contribute to significant adverse cumulative impacts.

As described above, in 4.3.1–4.3.10, following the CFPRs within the context of the CEQA functional equivalent program results in conditions where all potential effects associated with proposed timber harvest projects, including cumulative effects, have been mitigated to insignificance. However, this does not preclude potential small-scale or individual impacts that may result in take of covered species.

4.4 Summary of All Effects

Table 9 summarizes NMFS' analysis of effects from the proposed action (issuance of an ITP and ESP, and implementation of the SPL&T HCP/SHA) and no action (no issuance of an ITP and ESP, and no implementation of the SPL&T HCP/SHA). In summary, we expect the Proposed Action to result in many beneficial effects associated with implementation of the proposed conservation measures, including supporting NMFS' reintroduction efforts for listed anadromous salmonids in the Trinity River basin and Sacramento River basin.

Alternative 2 (no action) would not change potential effects of SPI's timberland management activities from those under current conditions, and those activities will continue per the CFPRs. However, NMFS reintroduction efforts designed to aid listed species recovery could be more difficult without landowner support. Additionally, watershed improvements associated with application of the READI model and associated improvement projects would not occur.

Table 9. Comparison of Effects on Resources Associated with the Alternatives.

Resource	Proposed Action	No Action
Geologic Resources	Potential effects to geologic resources from timberland management activities continue to be minimized to the greatest extent practicable by complying with the CFPRs. There would likely be some short-term indirect effects associated with erosion and road crossings under the proposed action, such as increased sediment delivery, disturbances to habitat, reductions in habitat connectivity and/or availability, loss of ground cover, and compaction of soils resulting in increased runoff. Potential improvement to geologic resources in the ESP permit area relating to sediment from forest road systems by implementing the READI model and associated conservation measures.	Potential effects to geologic resources from timberland management activities continue to be minimized to the greatest extent practicable levels by complying with the CFPRs. There would likely be some short-term indirect effects associated with erosion and road crossings under the proposed action, such as increased sediment delivery, disturbances to habitat, reductions in habitat connectivity and/or availability, loss of ground cover, and compaction of soils resulting in increased runoff.

Resource	Proposed Action	No Action
Water Resources	Potential effects to water resources from timberland management activities continue to be minimized to the greatest extent practicable by complying with the CFPRs, including ASP watershed rules. Potential improvement to water resources relating to sediment from forest road systems by implementing the READI model and associated improvement projects. Potential improvement to water resources due to installation of two water quality monitoring stations in the Trinity River basin associated with HCP implementation.	Potential effects to water resources from timberland management activities continue to be minimized to the greatest extent practicable levels by complying with the CFPRs, including ASP watershed rules. No potential water resources improvement, as no permanent water quality monitoring stations would be installed in the Trinity River basin.
Biological Resources	Potential effects to biological resources from timberland management activities continue to be minimized to the greatest extent practicable by complying with the CFPRs, including ASP watershed rules for anadromous salmonids. Beneficial effects to listed salmonid populations resulting from supporting NMFS reintroduction efforts into historical anadromous salmonid habitat currently above impassible barriers. Beneficial effects from watershed condition improvements resulting from implementing the READI model and associated improvement projects.	Potential effects to biological resources from timberland management activities continue to be minimized to the greatest extent practicable by complying with the CFPRs, including ASP watershed rules for anadromous salmonids. NMFS reintroduction efforts designed to aid listed species recovery will be more difficult. Additionally, watershed improvements associated with application of the READI model and associated improvement projects would not occur, including elevated habitat baseline conditions in the SHA Plan Area.
Air Quality	SPI would continue timberland management activities on ITP and ESP permit areas, contributing to overall carbon sequestration. Air quality and climate change would continue to be addressed, and the effects would be minimized and mitigated during the THP process by following the CFPRs.	SPI would continue timberland management activities on ITP and ESP permit areas, contributing to overall carbon sequestration. Air quality and climate change would continue to be addressed, and the effects would be minimized and mitigated during the THP process by following the CFPRs.
Socioeconomics and Environmental Justice	Slight increase in SPI employment due to implementing the READI model and associated improvement projects, and monitoring/reporting requirements associated with the HCP. No potential direct or indirect effects to Tribal, recreation, and land use issues	No slight increase in SPI employment due to implementing the READI model and HCP. No potential direct or indirect effects to Tribal, recreation, and land use issues.

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6.0 List of Preparers and Organizations Consulted

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