Draft Environmental Assessment

Designate and Authorize the Reintroduction of a Nonessential Experimental Population of Central Valley Spring-run Chinook Salmon in the upper Yuba River under Endangered Species Act Section 10(j)

NATIONAL MARINE FISHERIES SERVICE

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2020

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Proposed Action: NOAA's National Marine Fisheries Service (NMFS) proposes to:

(1) Designate and authorize the release of a nonessential experimental population of Central Valley spring-run Chinook salmon pursuant to Endangered Species Act section 10(j) in the upper Yuba River and its tributaries upstream of Englebright Dam; and

(2) Establish take prohibitions for the nonessential experimental population and exceptions for particular activities under ESA section 4(d).

Type of Statement: Environmental Assessment

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List of Acronyms

ASP	Anadromous Salmonid Protection regulations
ac-ft.	Acre-feet
BIA	Bureau of Indian Affairs
BO	Biological Opinion
C	Celsius
CDFW	California Department of Fish and Wildlife
CEQ	Council of Environmental Quality
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	Cubic feet per second
CCV	California Central Valley
CV	Central Valley
CVRWQCB	Central Valley Regional Water Quality Control Board
CWA	Clean Water Act
DPS	Distinct Population Segment
DWR	California Department of Water Resources
EA	Environmental Assessment
EFH	Essential Fish Habitat
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
F	Fahrenheit
FRH	Feather River Hatchery
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
ft	feet
HCP	Habitat Conservation Plan
HGMP	Hatchery and Genetic Management Plan
ITP	Incidental Take Permit
km	Kilometers
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MWAT	Maximum Weekly Average Temperature
msl	Mean sea level
MYR	Middle Yuba River
NBB	New Bullards Bar
NEP	Nonessential Experimental Population
NEPA	National Environmental Policy Act
NID	Nevada Irrigation District
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NYR	North Yuba River
OWTS Policy	Water Quality Control Policy for Sitting, Design, Operation, and Maintenance of Onsite Wastewater Treatment Systems
PCWA	Placer County Water Agency
PG&E	Pacific Gas and Electric
RM	River Mile
RWQCB	Regional Water Quality Control Board
SFWPA	South Feather Water and Power Agency

SYR	South Yuba River
SYRCL	South Yuba River Citizens League
TAG	Technical Advisory Group
TNF	Tahoe National Forest
Corps	U.S. Army Corps of Engineers
UCD	University of California Davis
USFS	U.S. Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
YRDP	Yuba River Development Project
YRERFS	Yuba River Ecosystem Restoration Feasibility Study
YSF	Yuba Salmon Forum
YSP	Yuba Salmon Partnership
YWA	Yuba Water Agency

1.0 INTRODUCTION AND BACKGROUND

The National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) proposes to establish rules pursuant to sections 10(j) and 4(d) of the Endangered Species Act (ESA) (16 United States Code [U.S.C.] 1531 *et seq.*) to designate and authorize the release of a nonessential experimental population (NEP) of Central Valley (CV) spring-run Chinook salmon (*Oncorhynchus tshawytscha*) in the upper Yuba River and its tributaries upstream of Englebright Dam and establish "take" prohibitions for the NEP and exceptions for particular activities. NMFS proposes to generally prohibit take of members of the NEP when in the NEP area, but provide exceptions to take prohibitions for particular activities, including take that is incidental to an otherwise lawful activity and is unintentional, not due to negligent conduct.

NMFS is preparing this Environmental Assessment (EA) pursuant to the National Environmental Policy Act (NEPA) (16 U.S.C. 4321 *et seq.*), Council for Environmental Quality (CEQ) regulations implementing NEPA (40 CFR parts 1500-1508), and NOAA policies and procedures implementing NEPA. This EA is being prepared using the 1978 CEQ NEPA Regulations. NEPA reviews initiated prior to the effective date of the 2020 CEQ regulations may be conducted using the 1978 version of the regulations. The effective date of the 2020 CEQ NEPA Regulations was September 14, 2020. This review began on February 27, 2017, and the agency has decided to proceed under the 1978 regulations.

ESA section 10(j) provides NMFS the authority to designate a population of listed species as an "experimental population." This designation allows NMFS to authorize the release of such a population outside of the species' current range, when doing so will further the conservation of the listed species. Unless we are specifically referring to the requirements of ESA section 10(j), we will describe authorizing release as authorizing reintroduction throughout this EA, because spring-run Chinook salmon historically used habitat in the upper Yuba River upstream of Englebright Dam.

When designating a population as an experimental population, additional classification to the population is required under the ESA. NMFS must determine whether the population is "essential" to the continued existence the listed species (i.e., loss of the experimental population would appreciably reduce the likelihood of the survival of the species in the wild). If not, the population would be classified as "nonessential" (i.e., release of the population will further the conservation of the species, but loss of the population would not appreciably reduce the likelihood of the survival of the species in the wild). Additionally, protective regulations often accompany an experimental population

designation under ESA section 10(j). Under ESA section 4(d), "take" restrictions can be established and limited when doing so would provide for the conservation of the species.

CV spring-run Chinook salmon are listed as a "threatened" species under the ESA. Rates of decline for salmon and California Central Valley (CCV) steelhead (*O. mykiss*) in the Central Valley increased following construction of major dams and water project facilities (NMFS 2014), which primarily occurred around the mid-1900s. These water development projects in general, and dams in particular, block upstream migration of Chinook salmon and steelhead to spawning and rearing habitats, and alter flow, gravel\large wood supply, and water temperature regimes downstream.

In 2014, NMFS issued a recovery plan that prioritized reintroduction into historical habitats as an essential recovery action for the CV spring-run Chinook salmon Evolutionarily Significant Unit (ESU). The upper Yuba River watershed was identified as a high priority for reintroduction in the recovery plan (NMFS 2014). Plans are underway for a reintroduction program for CV spring-run Chinook salmon into the Yuba River above Englebright Dam.

Englebright Dam (260-foot high) is owned and operated by the U.S. Army Corps of Engineers (Corps) on the mainstem Yuba River. Additional large dams are located above Englebright Dam including New Bullards Bar Dam (NBB) (645-foot high) and Our House Dam (75-foot high), both owned and operated by the Yuba Water Agency (YWA) formerly known as the Yuba County Water Agency (YCWA). These dams lack fish passage facilities and block access to upstream habitat historically used by CV spring-run Chinook salmon (and CCV steelhead) for spawning and rearing. Given that reintroduction is a critical part of the recovery strategy for salmon and steelhead in the Central Valley, including the upper Yuba River, NMFS anticipates that regulatory and/or voluntary partnerships and opportunities will emerge to reintroduce anadromous salmonids to historical habitats upstream of Englebright Dam.

As described above, NMFS anticipates a reintroduction effort will occur in the upper Yuba River upstream of Englebright Dam. Therefore, NMFS is proposing to:

(1) Designate and authorize release of a nonessential experimental population of CV spring-run Chinook salmon pursuant to ESA section 10(j) in the upper Yuba River and its tributaries upstream of Englebright Dam; and

(2) Establish take prohibitions for the NEP and exceptions for particular activities under ESA section 4(d).

1.1 Federal Lead and Cooperating Agencies

MFS is the lead agency in this National Environmental Policy Act (NEPA) process. Cooperating agencies in this NEPA process include the U.S. Forest Service (USFS) – Tahoe National Forest (TNF), California Department of Fish and Wildlife (CDFW), and YWA.

1.2 Overview of the ESA Section 10(j) Designation Regulatory Framework

1.2.1 The Endangered Species Act

The ESA authorizes the Secretaries of Interior and Commerce (Secretaries) to list species as threatened and endangered and to provide for their conservation through critical habitat designation, protective regulations, recovery plans, Federal agency consultation, and permitting. As an agency within the Department of Commerce, NMFS has been delegated the authority to implement the Secretary of Commerce's responsibilities under the ESA for marine and anadromous species. CV spring-run Chinook salmon is an ESA-listed anadromous species.

The statutory criteria for designating an experimental population are in ESA section 10(j). ESA section 10(j)(1) provides "the term 'experimental population' means any population (including any offspring arising solely therefrom) authorized by the Secretary for release under paragraph (2), but only when, and at such times as, the population is wholly separate geographically from nonexperimental populations of the same species" (16 U.S.C. 1539(j)(1)). For the designation being considered in this EA, individuals of the experimental population are geographically separate when upstream of Englebright Dam and not geographically separate when downstream of the dam in the lower Yuba River, and all other downstream areas throughout their lifecycle. Consequently, individual CV spring-run Chinook salmon from the experimental population, when downstream of Englebright Dam, are afforded the same take prohibitions and protections as the individuals throughout the designated CV spring-run Chinook salmon ESU.

1.2.2 Central Valley Spring-run Chinook Salmon ESA Listing

NMFS listed the CV spring-run Chinook salmon ESU as threatened on September 16, 1999 (64 Fed. Reg. 50394), and reaffirmed this status in a final rule on June 28, 2005 (70 Fed. Reg. 37160), and five-year reviews announced on August 15, 2011 (76 Fed. Reg. 50447), and May 26, 2016 (81 Fed. Reg. 33468). On January 9, 2002 (67 Fed. Reg. 1116), NMFS issued protective regulations under ESA section 4(d) for the threatened CV spring-run Chinook salmon that apply the take prohibitions of section 9(a)(1) of the ESA except for listed exceptions (50 CFR 223.203) (Subsection 1.5.6). The State

of California listed CV spring-run Chinook salmon as threatened in 1999 under the California Endangered Species Act (CESA).

The listed ESU (Figure 1) includes all naturally spawned populations of CV spring-run Chinook salmon originating from the Sacramento River and its tributaries, as well as the Feather River Hatchery (FRH) CV Spring-run Chinook Salmon Program (79 Fed. Reg. 20802, April 14, 2014). The ESU is currently limited to: (a) independent populations in Mill, Deer, and Butte Creeks, (b) persistent and presumably dependent populations in the Feather and Yuba Rivers, (c) persistent and presumably dependent populations in Big Chico, Antelope, and Battle Creeks, and (d) a few ephemeral or dependent populations in the northwestern California region (e.g., Beegum, Clear, and Thomes Creeks). Significant areas of historical habitat, mostly in the upper watersheds, are blocked by a series of dams in the Sacramento and San Joaquin basins (Figure 1). The San Joaquin River watershed downstream of tributary dams is accessible, but populations were largely extirpated until recent reintroduction efforts in the mainstem of the San Joaquin River went into effect.

Designated critical habitat of CV spring-run Chinook salmon (70 Fed. Reg. 52488, September 2, 2005) occupies 37 hydrologic subareas within the freshwater and estuarine range of the ESU, and includes approximately 1,373 miles (2,197 kilometers (km)) of occupied stream habitat and approximately 427 square miles (1,102 square km) of estuarine habitat in San Francisco-San Pablo-Suisun Bay.

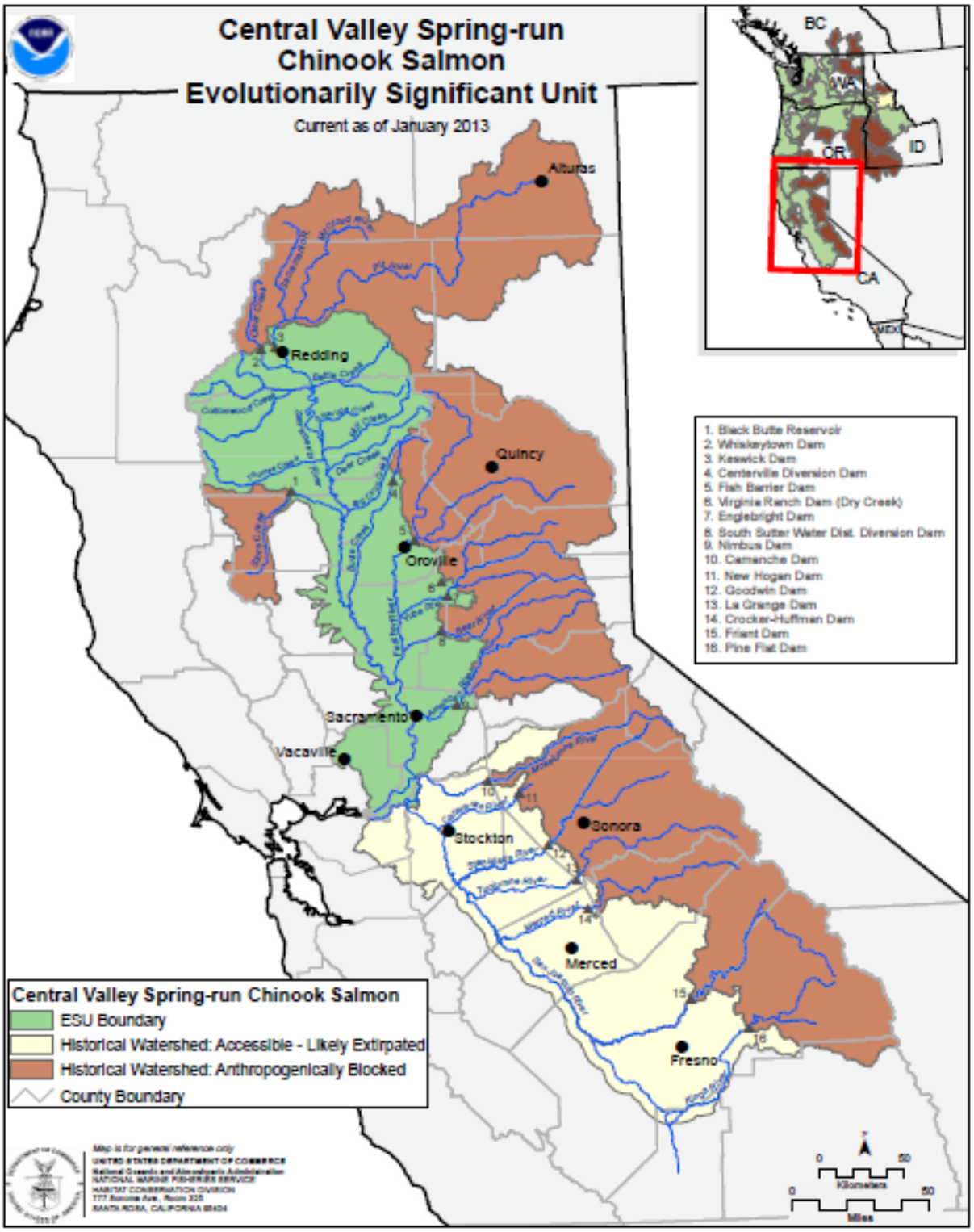

Figure 1. Current and historical range of CV spring-run Chinook salmon.

1.2.3 Experimental Populations under ESA section 10(j)

1.2.3.1 Congressional History and Intent

When Congress enacted the ESA, it intended that Federal agencies would cooperate with states and other interested parties (through Federal financial assistance and a system of incentives) to develop and maintain conservation programs, and to resolve water resource issues in concert with the conservation of listed species (16 U.S.C. 1531(5)(c)(2); 16 U.S.C. 1535). When Congress amended the ESA in 1982, it added section 10(j) to reduce opposition to the reintroduction of listed species outside of their current range, and to give the Secretaries flexibility and discretion in ESA management for purposes of species conservation. "Congress added section 10(j) to the Endangered Species Act in 1982 to address the Fish and Wildlife Service's and other affected agencies' frustration over political opposition to reintroduction efforts perceived to conflict with human activity. Although the Secretary already had authority to conserve a species by introducing it in areas outside its current range, Congress hoped the provisions of section 10(j) would mitigate industry's fears experimental populations would halt development projects, and, with the clarification of the legal responsibilities incumbent with the experimental populations, actually encourage private parties to host such populations on their lands." *Wyoming Farm Bureau Federation v. Babbitt*, 199 F.3d 1224, 1231-1232 (10th Cir. 2000) (citing 16 U.S.C. § 1539(j); H.R. Rep. No. 97–567, at 8 (1982), *reprinted in* 1982 U.S.C.C.A.N. 2807, 2808, 2817); *see also Forest Guardians v. U.S. Fish and Wildlife Service*, 611 F.3d 692, 705 (10th Cir. 2010) (quoting *Wyoming Farm Bureau Federation*, 199 F.3d at 1231-1232). Congress designed ESA section 10(j) to provide Federal agencies with more flexibility and discretion in managing the reintroduction of listed species. *Wyoming Farm Bureau Federation*, 199 F.3d at 1233; *see also Forest Guardians*, 611 F.3d at 705. ESA section 10(j) was also designed to encourage the recovery of species through population re-establishment with the cooperation of state and local entities (Wolok 1996).

Congress viewed ESA section 10(j) as an opportunity "to encourage the recovery of species through population re-establishment with the cooperation of, not despite, state and local groups." (Wolok 1996). As such, Congress intended that regulations promulgated by the Services to designate experimental populations "should be viewed as an agreement among the Federal agencies, the state fish and wildlife agencies and any landowners involved" (Wolok 1996 quoting H.R. Rep. No. 567, 97th Cong., 2d Sess. 34 (1982)).

1.2.3.2 Statutory and Regulatory Framework

Before authorizing the release of any experimental population, NMFS must "by regulation identify the population and determine, on the basis of the best available information, whether or not such population is essential to the continued existence of … [the listed] species" (ESA section 10(j)(2)(B)).

An experimental population is treated as a threatened species, except that non-essential populations do not receive the benefit of certain protections normally applicable to threatened species (ESA section 10(j)(2)(C)). For endangered species, section 9 of the ESA prohibits take of those species. For a threatened species, ESA section 9 does not specifically prohibit take of those species, but the ESA instead authorizes NMFS to adopt regulations under section 4(d) to prohibit take or that it deems necessary and advisable for species conservation. The proposed experimental population of CV spring-run Chinook salmon must generally be treated as a threatened species. Therefore, we propose to issue tailored protective regulations under ESA section 4(d) for the experimental population of CV spring-run Chinook salmon to identify take prohibitions to provide for the conservation of the species with exceptions for particular activities.

1.2.3.3 ESA section 10(j) Regulations

In 2016, NMFS promulgated regulations to guide implementation of ESA section 10(j) (81 Fed. Reg. 33416, May 26, 2016; codified at 50 CFR 222.501-222.504). NMFS must apply these regulations to the Proposed Action considered in this EA. NMFS' regulations define an essential experimental population as one "*whose loss would be likely to appreciably reduce the likelihood of the survival of the species in the wild*." All other experimental populations are classified as nonessential (50 CFR 222.502(b)). This definition was directly derived from the legislative history to the ESA amendments that created section 10(j). In addition, 50 CFR 222.502(b) provides, before authorizing the release of an experimental population, "the Secretary must find by regulation that such release will further the conservation of the species."

1.2.3.4 Nonessential Experimental Population Designation and Regulatory Restrictions

Regulatory restrictions can be limited with a NEP designation. Under the ESA, species listed as endangered or threatened are afforded protection primarily though prohibitions of section 9 and the requirements of section 7. ESA section 9 prohibits take of endangered species and prohibits violation of any protective regulation established for a threatened species under ESA section 4(d). ESA section 10(j)(2)(C) requires that each member of an experimental population shall generally be treated as

threatened. Therefore, and pursuant to NMFS' ESA section 10(j) implementing regulations at 50 CFR 222.503, NMFS proposes to issue tailored protective regulations under ESA section 4(d) for the experimental population of CV spring-run Chinook salmon to identify take prohibitions to provide for the conservation of the species with exceptions for particular activities.

ESA section 10(j)(2)(C) also provides certain exceptions from the requirement that each member of an experimental population shall generally be treated as threatened, including, for purposes of ESA section 7 (other than subsection (a)(1)), a NEP shall be treated as if it were a species "proposed to be listed," rather than a species that is listed (unless it is located within a National Wildlife Refuge or National Park, in which case it is treated as listed). This means the ESA section 7(a)(2) consultation requirement would not apply to Federal agency actions affecting the NEP in the NEP area upstream of Englebright Dam. The NEP would generally be treated as a proposed species for purposes of ESA section 7. In addition, no critical habitat can be designated for a NEP. Only two provisions of ESA section 7 would apply to the NEP: (1) section 7(a)(1) (requiring Federal agencies to use their authorities to further the purposes of the ESA by carrying out programs for the conservation of listed species); and (2) section 7(a)(4) (requiring Federal agencies to confer with NMFS as applicable depending on the species before taking actions that are likely to jeopardize the continued existence of a species proposed to be listed).

1.2.3.5 ESA section 10(a)(1)(A) and Experimental Populations

ESA section 10(a)(1)(A) allows the Secretaries to grant exceptions to the prohibitions of ESA section 9 for scientific purposes and to enhance the propagation or survival of listed species. This includes acts necessary for the establishment and maintenance of experimental populations as specifically noted in ESA section 10(a)(1)(A). ESA section 10(d) requires the Secretaries to grant exemptions under ESA section 10(a)(1)(A) only after publishing a finding in the Federal Register documenting that such exceptions were: (1) applied for in good faith; (2) if granted would not operate to the disadvantage of such endangered species; and (3) will be consistent with the purposes and policies set forth in ESA section 2.

Individuals used to establish an experimental population may be collected from an existing donor population provided appropriate permits are issued in accordance with ESA section 10(a)(1)(A), which would include analysis under NEPA and ESA section 7 for issuance of such permits. Under section 10(a)(1)(A), Federal and non-Federal entities may apply for permits from NMFS to take

ESA-listed species under the jurisdiction of NMFS, if such taking is for scientific purposes or to enhance the propagation or survival of the affected species.

A donor source for reintroduction into the upper Yuba River is preliminarily identified as fish produced from the FRH because they are closely related to extant populations of spring-run Chinook salmon in the lower Yuba River. If CV spring-run Chinook salmon from the FRH are used for the initial reintroduction source population, NMFS may later consider diversifying the donor stock with fish from the natural spawning population in other streams if those populations can sustain removal of fish. Any collection of CV spring-run Chinook salmon would be subject to a Hatchery and Genetic Management Plan (HGMP) for fish from FRH and approval of a permit under ESA section 10(a)(l)(A), which includes analysis under NEPA and ESA section 7. If NMFS considers using CV spring-run Chinook salmon from naturally spawning populations, only small numbers of fish would be removed from natural populations, and collection would require approval of a permit under ESA section 10(a)(l)(A), which includes analysis under NEPA and ESA section 7. Future authorization for the collection of CV spring-run Chinook salmon and issuance of ESA section 10(a)(1)(A) permits would be analyzed under the ESA and NEPA when NMFS receives these permit applications, and therefore is not analyzed in this EA.

1.2.4 ESA section 4(d) Regulations

In January of 2002, NMFS adopted a rule under ESA section 4(d) prohibiting the take of four groups of salmon and steelhead in California listed as threatened under the ESA, including CV spring-run Chinook salmon (67 Fed. Reg. 1116, January 9, 2002; codified at 50 CFR 223.203). In addition to applying the take prohibitions in ESA section 9(a)(1), the ESA section 4(d) rule sets forth specific circumstances when the prohibitions would not apply, known as section 4(d) limits (i.e., "conservation standards").

1.2.5 Relationship of the Proposed Experimental Population to ESA Recovery Efforts

On July 22, 2014, NMFS adopted a final recovery plan for Sacramento River winter-run Chinook salmon (*O. tshawytscha*), CV spring-run Chinook salmon, and CCV steelhead (79 Fed. Reg. 42504, July 22, 2014). The Recovery Plan (NMFS 2014) has the overarching aim of recovering the CV spring-run Chinook salmon ESU to warrant removal from the Federal List of Endangered and Threatened Wildlife (50 CFR 17.11). The objectives and criteria to accomplish this goal build upon technical input and guidance provided by the Technical Recovery Team (Lindley et al. 2004; 2006; 2007) that provided the technical framework for the recovery planning process. The conceptual

recovery strategy for CV spring-run Chinook salmon includes: (1) securing extant populations by implementing key habitat restoration actions; and (2) establishment of additional viable independent populations in the ESU.

The Recovery Plan identifies reintroduction of CV spring-run upstream of Englebright Dam as a priority recovery recommendation. Re-establishing populations above Central Valley rim dams, including in the upper Yuba River, would aid in the conservation and recovery of the CV spring-run Chinook salmon ESU by increasing abundance and productivity, improving spatial structure and diversity, and reducing the risk of extinction.

1.2.6 Relationship to Other Plans and Policies

Federal, state, and local laws, regulations and policies affect CV spring-run Chinook salmon in general. Some of these laws, regulations and policies also aid in meeting the goals of the Recovery Plan (NMFS 2014). Below is a summary of three laws that provide additional context for the proposed NEP designation.

1.2.6.1 The Federal Power Act

The Federal Energy Regulatory Commission (FERC), pursuant to the Federal Power Act (FPA) and the U.S. Department of Energy Organization Act, is authorized to issue licenses for up to 50 years for the construction and operation of non-Federal hydroelectric developments subject to its jurisdiction. Five hydroelectric projects are located within the Yuba River watershed that fall under FERC's regulatory jurisdiction. These projects impound water behind various dams in the watershed, and alter streamflows throughout the Yuba River.

The FPA authorizes NMFS to issue mandatory prescriptions for fish passage and recommend other measures to protect salmon, steelhead, and other anadromous fish. It is presently uncertain what, if any, specific actions NMFS may decide to recommend as part of the ongoing relicensing processes occurring in the upper Yuba River watershed. However, ESA section 10(j) is an important tool to facilitate the potential reintroduction of a population into areas that are outside of the species' current range when doing so fosters that species' conservation. An ESA section 10(j) designation and associated protective regulations under ESA section 4(d) would allow NMFS to provide exceptions to take prohibitions appropriate to the circumstances, including NMFS' proposed exception for take of NEP fish in the NEP area that is incidental to an otherwise lawful activity and unintentional, not due to negligent conduct, which would apply if passage is implemented pursuant to the FPA.

1.2.6.2 Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act)

The Magnuson-Stevens Act (MSA) (16 U.S.C. 1801 *et seq.*) is the principal law governing marine fisheries conservation and management in the United States. Chinook salmon Essential Fish Habitat (EFH) is identified and described to include "*all water bodies currently or historically occupied by… Chinook salmon… in California*," and Chinook salmon EFH was identified within specified United States Geological Survey (USGS) hydrologic units, which includes the upper Yuba River (50 CFR 660.412(a) and part 660, subpart H, table 1). Freshwater EFH for Pacific Coast salmon in the CV includes waters currently accessible to salmon within the CV), as well as historically accessible areas in the case of the Yuba River (Myers et al. 1998). In addition to the lower Yuba River, EFH is designated upstream of Englebright Dam and includes the North Yuba River (NYR), Middle (MYR), and South Yuba Rivers (SYR). Under the MSA, Federal agencies are required to determine whether a Federal action they authorize, fund, or undertake may adversely affect EFH (16 U.S.C. 1855(b)). Therefore, this EA considers the potential for adverse effects to occur to EFH within the NEP area and elsewhere in the fisheries analysis area (Section 5). Alternatives considered in this EA, if implemented, would occur in an area where EFH is designated but is currently unoccupied by native anadromous Pacific salmon.

1.2.6.3 Assembly Bill 1133 California Endangered Species Act - Experimental Populations

CESA prohibits the taking of an endangered or threatened species, unless authorized. CDFW may authorize take of listed species if the take is incidental to an otherwise lawful activity and impacts are minimized and fully mitigated.

On September 25, 2017, Governor Brown approved Assembly Bill No. 1133, which authorizes the incidental take of an endangered, threatened, or candidate species designated as an experimental population under the Federal ESA, without the need for further authorization or approval under CESA, if specified requirements are met. California Fish and Game Code sections 2080.5 and 2080.6 address the authorization of take associated with experimental populations. In addition, California Fish and Game Code section 2080.7 addresses public outreach efforts regarding the introduction of experimental populations.

2.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

2.1 Purpose of the Action

The purpose of the Proposed Action is to support future reintroduction efforts leading to the re-establishment of a population of CV spring-run Chinook salmon in the upper Yuba River upstream of Englebright Dam. The proposed rules under ESA sections 10(j) and 4(d) would facilitate the reintroduction of CV spring-run Chinook salmon in the NEP area. This action would contribute to the conservation of CV spring-run Chinook salmon and to the overall recovery goals provided in the recovery plan (NMFS 2014).

2.2 Need for the Action

The need for the action is to further the conservation of CV spring-run Chinook salmon by increasing the abundance, productivity, spatial structure, and diversity of these species as the reintroduced population becomes established and contributes to the recovery of the ESU.

Designation of the CV spring-run Chinook salmon NEP under ESA section 10(j) and establishment of a rule pursuant to ESA section 4(d) will facilitate reintroduction of CV spring-run Chinook salmon into the upper Yuba River, and thereby advance recovery objectives of re-establishing populations. The proposed designation and ESA section 4(d) rule will also simultaneously protect individuals, private landowners, municipalities, tribes, and local, state, and Federal governments who may incidentally and unintentionally take (including harm) the fish while engaged in otherwise lawful activities.

NMFS is also interested in further developing a cooperative relationship with local entities and affected local landowners regarding the management of listed species for conservation and recovery. NMFS considers this action a means to facilitate partnerships in the upper Yuba River by reducing perceived regulatory constraints associated with reintroduction of an ESA listed species.

3.0 ACTION AREA

Under the ESA, the Action Area is defined as "*all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action*" (50 CFR 402.02). No such term exists under NEPA. However, under NEPA, the Affected Environment "… *should include a description of the environment in which the proposed action and alternatives are to take place... For project-specific analysis, the affected environment typically encompasses the proposed action's site and immediate vicinity. However, the analysis of cumulative impacts may broaden that range*." (NMFS 2009). The action area is described below, whereas the Affected Environment is described for each of the resource topics evaluated in this EA in Section 5.

3.1 Description of the Action Area

For this EA, the term "action area" is used synonymously with the proposed NEP area for the NEP designation under ESA section 10(j).

The NEP area (Figure 2) includes the entire upper Yuba River watershed, which extends from the crest of the Sierra-Nevada Mountains down to Englebright Dam. It is located north of the cities of Grass Valley and Nevada City, and east of the cities of Marysville and Yuba City, California. The upper Yuba River watershed is characterized as snow-covered subalpine zones near the Sierra-Nevada Mountain crest, is largely forested, and has been affected by mining, logging, dams and water diversions, with limited residential development. The patchwork of land ownership in the watershed and numerous abandoned mines present land and watershed management challenges.

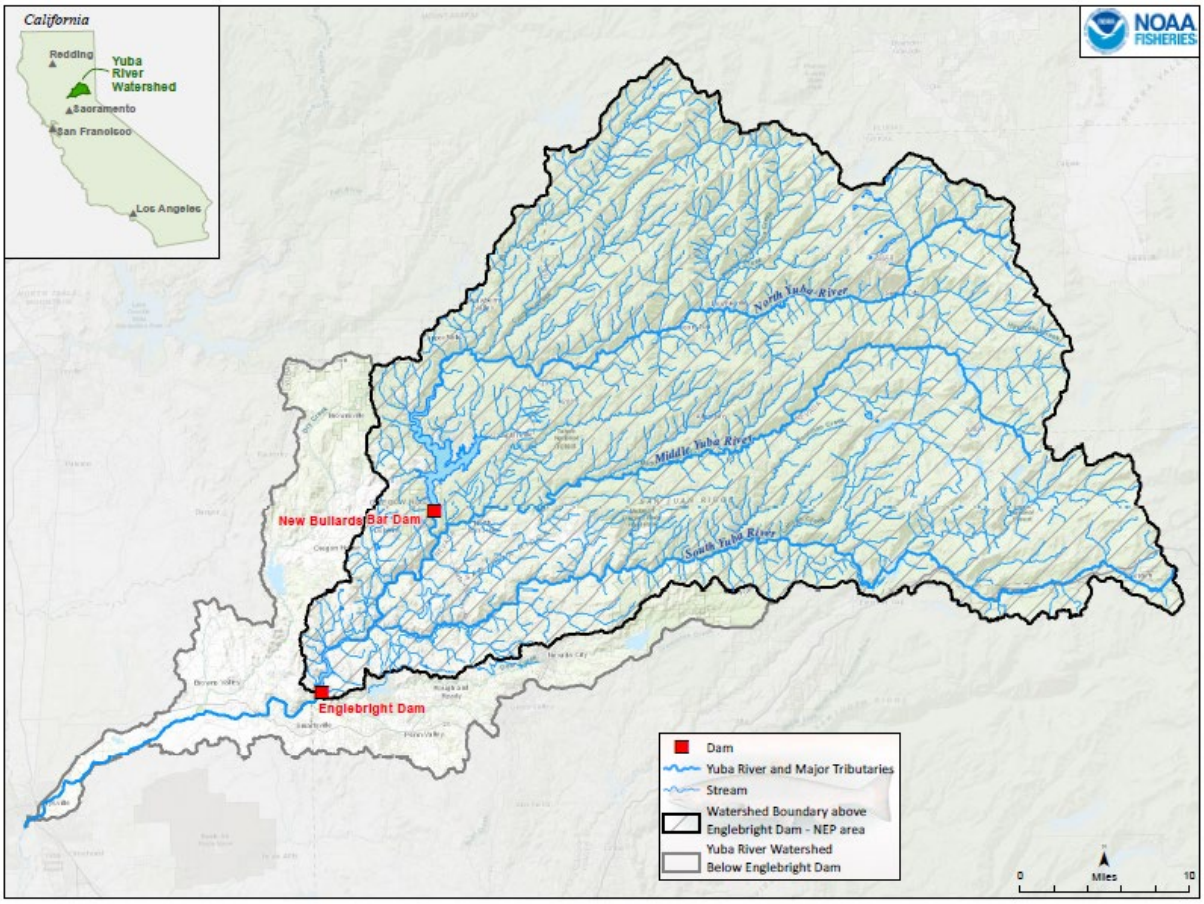

Figure 2. The NEP area in the upper Yuba River watershed for CV spring-run Chinook salmon

The NEP area includes the NYR, and MYR and SYR and their tributaries draining into Englebright Reservoir up to their respective ridgelines. Although the entire upper Yuba River watershed is being considered as part of the NEP area, many areas of the upper watershed currently provide little to no fish access due to the presence of natural and man-made fish passage barriers (Vogel 2006; Gast et al., 2005; YCWA 2013; YSF 2013).

4.0 ALTERNATIVES

This EA describes and evaluates three alternatives. NMFS considered but did not analyze one additional alternative, because it did not meet the purpose and need for the action. This alternative is discussed in Subsection 4.4 (Alternatives Considered but not Analyzed in Detail). Table 1 summarizes key components of each alternative.

4.1 Alternative 1 (No-action) –No Designation of an Experimental Population, No Authorization for Reintroduction, and no Adoption of Protective Regulations

Under the No-action Alternative, NMFS would:

(1) Not designate all CV spring-run Chinook salmon in the NEP area as a NEP under ESA section 10(j);

(2) Not authorize the release of a NEP of CV spring-run Chinook salmon in the NEP area; and

(3) Not establish take prohibitions for the NEP of CV spring-run Chinook salmon in the NEP area and exceptions for particular activities under ESA section 4(d).

Reintroduction of CV spring-run Chinook salmon could occur in the upper Yuba River without a NEP designation. However, a fish passage program without a NEP designation and associated protective regulations is anticipated to result in considerable opposition from landowners and other user groups whose otherwise lawful activities could be impacted by the presence of listed CV spring-run Chinook salmon. Opposition would likely result in significant delays and/or permanently stall reintroduction efforts into the upper Yuba River. Without a reintroduction program, recovery of the CV spring-run Chinook salmon ESU under the No-action Alternative would continue to depend on contributions from the below-dam independent and dependent extant populations of CV spring-run Chinook salmon in the Sacramento River and tributaries.

Under the No-action Alternative, the current take prohibitions and exceptions under ESA section 4(d) protective regulations that apply to the CV spring-run Chinook salmon ESU (50 CFR 223.203) would apply to any CV spring-run Chinook salmon reintroduced to the upper Yuba River. In addition, ESA section 7 requirements for Federal agencies to consult with NMFS to ensure their actions are not likely to jeopardize the continued existence of CV spring-run Chinook salmon would continue to apply to any Federal actions that may affect CV spring-run Chinook salmon reintroduced to the upper Yuba River.

4.2 Alternative 2 (Proposed Action/Preferred Alternative) – Designation of a Nonessential Experimental Population, Authorization for Reintroduction, and Adoption of Limited Protective Regulations

4.2.1 Introduction

Alternative 2 is the NMFS preferred alternative because it would contribute to the conservation and recovery of CV spring-run Chinook salmon by advancing NMFS's recovery objectives for re-establishing populations, while simultaneously protecting individuals, private landowners, municipalities, tribes, and local, state, and Federal governments who may incidentally and unintentionally take (including harm) the fish while engaged in otherwise lawful activities. Under Alternative 2, NMFS would:

(1) Designate all CV spring-run Chinook salmon in the NEP area as an NEP under ESA section 10(j);

(2) Authorize the release of a NEP of CV spring-run Chinook salmon in the NEP area; and

(3) Establish take prohibitions for the NEP of CV spring-run Chinook salmon in the NEP area and exceptions for particular activities under ESA section 4(d).

Under Alternative 2, NMFS would designate a NEP of CV spring-run Chinook salmon in the NEP area, which would generally be treated as a threatened species, and NMFS would be able to establish limited protective regulations under ESA section 4(d) appropriate to the circumstances. Under Alternative 2, proposed ESA section 4(d) protective regulations would provide exceptions for take of NEP fish in the NEP area appropriate to the circumstances, including take that is incidental to an otherwise lawful activity and unintentional, not due to negligent conduct. Downstream of the NEP area (downstream of Englebright Dam) the current ESA take prohibitions and exceptions that apply to CV spring-run Chinook salmon would remain in effect (see 50 CFR 223.203). Activities that could incidentally take CV spring-run Chinook salmon could include recreation, forestry, water management, agriculture, power production, mining, transportation management, rural development, livestock grazing, and other similar activities that are carried out in accordance with Federal, state, and local laws and regulations. In addition, with the NEP designation, ESA section 7 requirements for Federal agencies to consult with NMFS to ensure their actions are not likely to jeopardize the continued existence of CV spring-run Chinook salmon would not apply to any Federal actions that may affect the NEP of CV spring-run Chinook in the NEP area (unless it occurs in a National Wildlife Refuge or National Park). The NEP would generally be treated as a proposed species for purposes of

ESA section 7, and Federal agencies would only need to confer with NMFS as applicable depending on the species before taking actions that are likely to jeopardize the continued existence of a species proposed to be listed. The designation of all CV spring-run Chinook salmon in the NEP area as a NEP and limited protective regulations under ESA section 4(d) would remain in effect until recovery goals for the CV spring-run Chinook salmon ESU have been achieved, and the species is removed from the list of endangered and threatened species under the ESA.

Although a reintroduction program is not part of the Proposed Action, the NEP designation and the limited protective regulations under ESA section 4(d) would provide multiple benefits to and facilitate a future reintroduction program. Therefore, this EA generally analyzes the effects of reintroducing CV spring-run Chinook salmon to the NEP area, which would be facilitated by Alternative 2, but a future reintroduction effort would be subject to future permitting decisions and additional, more specific analysis under NEPA associated with those future permitting decisions. Under a future reintroduction effort, it is anticipated that fish-handling activities associated with the collection, transport, and release of CV spring-run Chinook salmon to the upper Yuba River would occur for either a pilot program and/or for a long-term reintroduction effort. It is also anticipated that the Permittee(s), in coordination with NMFS and potentially other parties, would implement a monitoring and evaluation program specific to the experimental population upstream of Englebright Dam. Specifically, the Permittee(s) would need to collect and analyze the biological and technical information necessary to evaluate the reintroduced juvenile Chinook salmon colonization in tributaries, pre-spawn (adult) survival and movement, and adult spawning. NMFS would need to issue ESA section 10(a)(1)(A) permits for monitoring and evaluation of the experimental population.

4.2.2 Regulatory Process

Under Alternative 2, the ESA section 4(d) regulations would prohibit take of CV spring-run Chinook salmon in the NEP area and provide exceptions for particular activities, which are described below.

4.2.2.1 Take

ESA section 3(19) defines "take" as "*to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct*." Under 50 CFR 222.102, "harm" "may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including, breeding, spawning, rearing, migrating, feeding or sheltering." The ESA does not specifically prohibit the take of species listed as threatened, but instead authorizes NMFS to adopt regulations under section 4(d) it deems necessary and advisable

for species conservation, including prohibiting take. Under ESA section 10(j)(2)(C), experimental populations are generally treated the same as species listed as threatened, and NMFS may issue an ESA section 4(d) rule applying the take prohibitions broadly or more narrowly as appropriate to the circumstances.

4.2.2.2 ESA section 4(d) Regulations

Concurrent with the ESA section 10(j) experimental population designation, NMFS would adopt limited protective regulations under ESA section 4(d) for CV spring-run Chinook salmon in the NEP area. These limited protective regulations would prohibit take of the NEP of CV spring-run Chinook salmon located within the geographic range of the experimental population designation, except in the following circumstances:

1. Any take by authorized governmental personnel acting in compliance with 50 CFR 223.203(b)(3)[1] to aid a sick, injured or stranded fish; dispose of a dead fish; or salvage a dead fish which may be useful for scientific study;

2. Any take that is incidental to an otherwise lawful activity and is unintentional, not due to negligent conduct. Otherwise lawful activities include, but are not limited to, recreation, forestry, water management, agriculture, power production, mining, transportation management, rural development, or livestock grazing, when such activities are in full compliance with all applicable laws and regulations; and

3. Any take that is pursuant to a permit issued by NMFS under section 10 of the ESA (16 U.S.C. 1539) and regulations in 50 CFR part 222 applicable to such a permit.

Outside of the geographic range of the experimental population designation (Figure 2), take of CV spring-run Chinook salmon originating from the ESA section 10(j) designated experimental population would be prohibited in the same manner as other CV spring-run Chinook salmon under the current

[1] According to 50 CFR 223.203(b)(3), the prohibitions relating to the threatened West Coast salmon ESUs and steelhead DPSs do not apply to any employee or designee of NMFS, the United States Fish and Wildlife Service, any Federal land management agency (e.g., USFS), CDFW, or any other governmental entity that has co-management authority for the listed salmonids, when the employee or designee, acting in the course of his or her official duties, takes a threatened salmonid without a permit if such action is necessary to: (1) aid sick, injured, or stranded salmonids; (2) dispose of dead salmonids; or (3) salvage dead salmonids that may be useful for scientific study. Each agency acting under this limit on the take prohibitions is to report to NMFS the numbers of fish handled and their status, on an annual basis. A designee of the listed entities is any individual the Federal or state fishery agency or other co-manager has authorized in writing to perform the listed functions.

ESA section 4(d) rule protective regulations for threatened anadromous species (50 CFR 223.203). For additional background on the ESA section 4(d) regulations, see Subsection 1.2.4 of this EA.

4.2.2.3 ESA Section 7

In accordance with ESA section 10(j)(2)(C), the ESA section 7(a)(2) consultation requirement would not apply to Federal actions that may affect the NEP in the NEP area. For purposes of ESA section 7, the NEP would be treated as a species proposed for ESA listing, and only two provisions of ESA section 7 would apply: (1) section 7(a)(1) (requiring Federal agencies to use their authorities in furtherance of the purposes of the ESA by carrying out programs for the conservation of listed species); and (2) section 7(a)(4) (triggered by Federal actions that are likely to jeopardize the continued existence of a species proposed to be listed). In addition, no critical habitat could be designated for the NEP.

4.2.2.4 ESA section 10

Collection and transport of CV spring-run Chinook salmon as part of a future reintroduction effort would be subject to approval of a permit under ESA section 10(a)(l)(A), which would be subject to an HGMP in relation to a hatchery source and additional analysis under NEPA and ESA section 7. Individuals used to establish an experimental population could be collected from an existing donor population, provided that appropriate permits are issued in accordance with ESA section 10(a)(1)(A), and subject to additional analysis under NEPA and ESA section 7.

4.2.2.5 Federal Power Act

Under the provisions of the FPA, FERC must decide whether to issue licenses to: (1) the Nevada Irrigation District (NID) for the Yuba-Bear Project (Project No. 2266-102); (2) Pacific Gas and Electric (PG&E) for the Drum-Spaulding Project (Project No. 2310-193, Project No. 14531-000 and Project No. 14530-000); and (3) Yuba Water Agency (YWA) for the Yuba River Development (YRDP) (Project No. 2246-065), and what conditions should be placed on any license issued.

The FPA authorizes NMFS to issue mandatory prescriptions for fish passage and to recommend other measures to protect salmon, steelhead, and other ESA-listed fish. Although it is presently uncertain what actions NMFS may recommend as part of the ongoing relicensing processes in the upper Yuba River watershed, ESA section 10(j) of the ESA is an important complementary tool to facilitate the potential reintroduction of a population into areas that are outside of the species' current range when doing so fosters conservation and recovery of the species. If NMFS issues mandatory prescriptions for

fish passage under the FPA, protections provided by an ESA section 10(j) designation and associated ESA section 4(d) rule are anticipated to reduce opposition to reintroduction of CV spring-run Chinook salmon into the upper Yuba River. Opposition to fish passage would be reduced because the proposed ESA section 4(d) rule would provide exceptions to take prohibitions appropriate to the circumstances, including NMFS' proposed exception for take of NEP fish in the NEP area that is incidental to an otherwise lawful activity and unintentional, not due to negligent conduct.

4.3 Alternative 3 – Designation of a Nonessential Experimental Population, Authorization for Reintroduction, and Adoption of Current Protective Regulations

4.3.1 Introduction

Under Alternative 3, NMFS would:

(1) Designate all CV spring-run Chinook salmon in the NEP area as a NEP under ESA section 10(j);

(2) Authorize the release of a NEP of CV spring-run Chinook salmon in the NEP area; and

(3) Establish take prohibitions for the NEP of CV spring-run Chinook salmon in the NEP area and exceptions that are the same as the current ESA section 4(d) rule protective regulations (50 CFR 223.203).

In contrast to the No-action Alternative, but similar to Alternative 2, Alternative 3 proposes that NMFS would designate and authorize the release of a NEP of CV spring-run Chinook in the NEP area under ESA section 10(j). However, unlike Alternative 2, NMFS would apply the current ESA section 4(d) rule protective regulations (50 CFR 223.203) for the reintroduced fish when they are in the NEP area, rather than establishing a separate ESA section 4(d) rule for the NEP area.

Under the current ESA section 4(d) rule protective regulations (50 CFR 223.203), the take prohibitions of ESA section 9(a)(1) that apply to endangered species apply to the threatened CV spring-run Chinook salmon ESU with limits or exceptions for 10 categories of activities when they meet specified criteria. As an alternative to utilizing the 10 limits on the take prohibitions, affected non-Federal entities may choose to seek an ESA section 10 permit from NMFS.

Alternative 3 would contribute to the conservation and recovery of CV spring-run Chinook salmon by advancing NMFS's recovery objectives for re-establishing populations, but would not provide an

exception for take of NEP fish in the NEP area that is incidental to an otherwise lawful activity and unintentional, not due to negligent conduct. Under Alternative 3, an entity proposing to undertake activities (e.g., recreation, forestry, water management, agriculture, power production, mining, transportation management, rural development, or livestock grazing) that could incidentally take CV spring-run Chinook salmon in the NEP area would be required to meet one of the limits or exceptions under the current ESA section 4(d) rule protective regulations (50 CFR 223.203) or obtain a permit from NMFS under ESA section 10(a)(1)(B). The current ESA section 4(d) rule protective regulations would remain in effect until recovery goals for the CV spring-run Chinook salmon ESU are achieved and the species is removed from the list of endangered and threatened species under the ESA.

Although a reintroduction program is not part of the Proposed Action, the NEP designation and the protective regulations under ESA section 4(d) proposed under Alternative 3 would provide multiple benefits to and facilitate a future reintroduction program. Therefore, similar to Alternative 2, this EA generally analyzes the effects of reintroducing CV spring-run Chinook salmon to the NEP area, which would be facilitated by Alternative 3, but a future reintroduction effort would be subject to future permitting decisions and additional, more specific analysis under NEPA associated with those future permitting decisions. Similar to Alternative 2, under a future reintroduction effort, it is anticipated that fish-handling activities associated with the collection, transport, and release of CV spring-run Chinook salmon to the upper Yuba River would occur for either a pilot program and/or for a long-term reintroduction effort. It is also anticipated that the Permittee(s), in coordination with NMFS and potentially other parties, would implement a monitoring and evaluation program specific to the experimental population upstream of Englebright Dam. Specifically, the Permittee(s) would need to collect and analyze the biological and technical information necessary to evaluate the reintroduced juvenile Chinook salmon colonization in tributaries, pre-spawn (adult) survival and movement, and adult spawning. NMFS would need to issue ESA section 10(a)(1)(A) permits for monitoring and evaluation of the experimental population.

4.3.2 Regulatory Process

Under Alternative 3, the ESA section 4(d) regulations under Alternative 3 would prohibit the take of CV spring-run Chinook salmon in the NEP area unless: (1) one of the limits or exceptions in the

current ESA section 4(d) protective regulations applies; or (2) the project proponent obtains an ESA section 10 permit from NMFS.

4.3.2.1 Take

Similar to Alternative 2, under Alternative 3, NMFS would generally establish take prohibitions for the NEP of CV spring-run Chinook salmon in the NEP area. ESA section 3(19) defines "take" as "*to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct*." Under 50 CFR 222.102, "harm" "may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including, breeding, spawning, rearing, migrating, feeding or sheltering."

4.3.2.2 ESA section 4(d) Regulations

In contrast to Alternative 2, under Alternative 3, the current ESA section 4(d) rule protective regulations would apply to the take of CV spring-run Chinook salmon in the NEP area with limits or exceptions for 10 categories of activities when they meet specified criteria (50 CFR 223.203). NMFS would not issue an ESA section 4(d) rule applying the take prohibitions more narrowly as appropriate to the circumstances concurrent with the ESA section 10(j) experimental population designation, including NMFS' proposed exception for take of NEP fish in the NEP area that is incidental to an otherwise lawful activity and unintentional, not due to negligent conduct. NMFS' experience under the current ESA section 4(d) rule protective regulations shows that NMFS does authorize take associated with some otherwise lawful activities, but some activities may not meet one of the 10 categories of activities and some activities may be modified during the authorization process to meet the applicable criteria under the current protective regulations.

Outside of the NEP area, take of CV spring-run Chinook salmon originating from the ESA section 10(j) designated experimental population would be prohibited in the same manner as other CV spring-run Chinook salmon under the current ESA section 4(d) rule protective regulations for threatened anadromous species (50 CFR 223.203).

4.3.2.3 ESA section 7

Similar to Alternative 2, under Alternative 3, in accordance with ESA section 10(j)(2)(C), the ESA section 7(a)(2) consultation requirement would not apply to Federal actions that may affect the NEP in the NEP area. For purposes of ESA section 7, the NEP would be treated as a species proposed for ESA listing, and only two provisions of ESA section 7 would apply: (1) section 7(a)(1) (requiring Federal

agencies to use their authorities in furtherance of the purposes of the ESA by carrying out programs for the conservation of listed species); and (2) section 7(a)(4) (triggered by Federal actions that are likely to jeopardize the continued existence of a species proposed to be listed). In addition, no critical habitat could be designated for the NEP.

4.3.2.4 ESA section 10

Similar to Alternative 2, under Alternative 3, collection and transport of CV spring-run Chinook salmon as part of a future reintroduction effort would be subject to approval of a permit under ESA section 10(a)(l)(A), which would be subject to an HGMP in relation to a hatchery source and additional analysis under NEPA and ESA section 7. Individuals used to establish an experimental population could be collected from an existing donor population, provided that appropriate permits are issued in accordance with ESA section 10(a)(1)(A), and subject to additional analysis under NEPA and ESA section 7.

4.3.2.5 Federal Power Act

Under the provisions of the FPA, FERC must decide whether to issue licenses to: (1) NID for the Yuba-Bear Project (Project No. 2266-102); (2) PG&E for the Drum-Spaulding Project (Project No. 2310-193, Project No. 14531-000 and Project No. 14530-000); and (3) YWA for the YRDP (Project No. 2246-065), and what conditions should be placed on any license issued.

The FPA authorizes NMFS to issue mandatory prescriptions for fish passage and to recommend other measures to protect salmon, steelhead, and other ESA-listed fish. Although it is presently uncertain what actions NMFS may recommend as part of the ongoing relicensing processes in the upper Yuba River watershed, ESA section 10(j) of the ESA is an important complementary tool to facilitate the potential reintroduction of a population into areas that are outside of the species' current range when doing so fosters conservation and recovery of the species. Under Alternative 3, NMFS expects restrictions placed on water resource management in the NEP area would be similar to those that are currently in place outside of the NEP area downstream of Englebright Dam. As described in FERC (2014), "*NMFS recommended minimum instream flows associated with a plan for reintroduction of spring-run Chinook salmon and steelhead to the upper Yuba River upstream of Englebright Dam, including the South Yuba River below Lake Spaulding Dam. NMFS expects these reintroduction efforts may occur sometime during the term of the new license for the Yuba-Bear and Drum-Spaulding Projects. The timing of the reintroduction is highly uncertain, but NMFS recommended the minimum instream flows for future implementation when reintroduction does occur. The NMFS recommended*

flows to support this reintroduction in South Yuba River below Lake Spaulding Dam are generally higher than those proposed by PG&E, Forest Service 4(e) conditions, and recommended by CDFW." Given the uncertain schedule for reintroduction, FERC (2014) stated it was premature to determine appropriate flows for future implementation. When reasonably foreseeable, FERC has sufficient reserved authority under standard article 15 to reopen the license and require, as appropriate, measures to facilitate reintroduction of anadromous fish, ensure that project-related effects are addressed, and consult with NMFS under the ESA. The USFS and the BLM also provided for modifications of the FPA section 4(e) conditions in the event of anadromous fish reintroduction (FERC 2014).

As an example, under Alternative 3, the operations of YWA operations would be subject to the conditions of the FERC license and could incur additional operational constraints necessary to: (1) avoid or minimize potential adverse flow-related effects in the Yuba River in the reach between NBB Dam and the Colgate Powerhouse outlet, and in the reach downstream of the Colgate Powerhouse; or (2) address incidental take of spring-run Chinook salmon in the NEP area. Consequently, FERC or NMFS could require changes to YWA's existing operations, and impose additional operational constraints in the future, of the YRDP as a result of Alternative 3.

4.4 Alternative Considered but Not Analyzed in Detail

4.4.1 Designation as an Essential Experimental Population

Under this scenario, the experimental population of CV spring-run Chinook salmon would be designated as an essential experimental population, rather than a NEP. Under ESA section 10(j)(2)(B), the Secretary must determine, on the basis of the best available information, whether or not an experimental population is essential to the continued existence of an endangered or threatened species. NMFS regulations define an essential experimental population to be an experimental population whose loss would be likely to appreciably reduce the likelihood of the survival of the species in the wild (50 CFR 222.501(b)).

The NMFS (2014) Recovery Plan identifies that re-establishment of populations of CV spring-run Chinook salmon would aid in recovery of the ESU by increasing abundance and productivity, by improving spatial structure and diversity, and by reducing the risk of extinction to the ESU as a whole. Although NMFS must ultimately make this determination through rulemaking, we did not analyze this alternative in detail because of our preliminary determination that the experimental population, if lost, would not be likely to appreciably reduce the likelihood of the survival of the species in the wild. We considered the geographic location of the experimental population in relation to other populations of

CV spring-run Chinook salmon, and the likelihood of the survival of these populations without the existence of the experimental population. The CV spring-run Chinook salmon ESU includes four independent populations and several dependent or establishing populations. Given current protections and restoration efforts, these populations are persisting without the presence of a population in the NEP area. It is expected that the experimental population will exist as a separate population from those in the Sacramento River basin and will not be essential to the survival of those populations.

4.4.2. NEP Area Limited to the North Yuba River

Under this scenario the NEP area would have been limited to the NYR upstream of NBB Dam. Under the YSP effort, reintroduction of CV spring-run Chinook salmon was focused exclusively in the NYR and NMFS considered limiting the NEP area to the NYR watershed. After internal discussion with the YSP the proposed NEP area was expanded to include the entire upper Yuba River watershed upstream of Englebright Dam. The proposed NEP area was expanded to account for concerns of possible straying of juvenile CV spring-run Chinook salmon from the NYR into the MYR and SYR.

Table 1. Comparison of key components among alternatives.

Alternative	CV Spring-run Chinook Salmon Reintroduction	ESA Take Prohibitions on CV Spring-run Chinook Salmon	Experimental Population Designation for CV Spring-run Chinook Salmon
Alternative 1 – No-action alternative.	No authorization for release of CV spring-run Chinook in the upper Yuba River upstream of Englebright Dam under ESA section 10(j).	The current ESA section 4(d) rule protective regulations that apply to the CV spring-run Chinook salmon ESU (50 CFR 223.203) would apply to any CV spring-run Chinook salmon reintroduced to the upper Yuba River.	No NEP designation.
Alternative 2 –Designation and authorization for release of a NEP in the NEP area under ESA section 10(j) with adoption of limited protective regulations under ESA section 4(d).	Authorization for release of a nonessential experimental population of CV spring-run Chinook salmon in the upper Yuba River upstream of Englebright Dam under ESA section 10(j).	Adoption of limited protective regulations under ESA section 4(d) that would prohibit take of CV spring-run Chinook salmon in the NEP area except in the following circumstances: Any take by authorized governmental personnel acting in compliance with 50 CFR 223.203(b)(3) to aid a sick, injured or stranded fish; dispose of a dead fish; or salvage a dead fish which may be useful for scientific study; Any take that is incidental to an otherwise lawful activity and is unintentional, not due to negligent conduct; and Any take that is pursuant to a permit issued by NMFS under section 10 of the ESA (16 U.S.C. 1539) and regulations in 50 CFR part 222 applicable to such a permit.	NEP designation in the NEP area.
Alternative 3 – Designation and authorization for release of a NEP in the NEP area under ESA section 10(j) with adoption of the current ESA section 4(d) rule protective regulations for the NEP area.	Authorization for release of a nonessential experimental population of CV spring-run Chinook salmon in the upper Yuba River upstream of Englebright Dam under ESA section 10(j).	Adoption of the current ESA section 4(d) rule protective regulations that apply to the CV spring-run Chinook salmon ESU (50 CFR 223.203) for the NEP of CV spring-run Chinook salmon in the NEP area.	Same as Alternative 2 – NEP designation in the NEP area.

5.0 AFFECTED ENVIRONMENT

5.1 Description of the Analysis Area

The potentially affected environment is the same as the NEP area for Aquatic Habitat, Fisheries Resources, Wildlife Species (except for Southern Resident killer whale (*Orcinus orca*)), and Land Use and Ownership.

The analysis area differs from the NEP area for some of the resources addressed in this EA, specifically Socioeconomics, Tourism and Recreation, Environmental Justice, Southern Resident killer whale, and Cultural Resources because potential effects to these resources may occur over a broader geographic area than the NEP area

The analysis area for Socioeconomics, Tourism and Recreation, and Environmental Justice comprises all of Yuba, Sierra, and Nevada Counties because local residents within these areas would most likely be affected by the alternatives considered in this EA.

The analysis area for Cultural Resources is broader than the NEP area, and includes the lower Yuba River, the lower Feather River, and the lower Sacramento River watershed to the confluence with the San Joaquin River.

The analysis area for Southern resident killer whale includes the Pacific Ocean off the California coast where this species forages on Chinook salmon.

5.2 Overview and Approach

The NEP area includes the NYR, MYR and SYR upstream of Englebright Dam. This area intersects six counties[2] in northern California and contains large areas of rural private and public lands with habitat for native and non-native fish and wildlife. The majority of public lands within the NEP area are administered by the USFS – TNF and Plumas National Forest.

The alternatives considered in this EA have the potential to affect the physical, biological, sociological, and economic resources within the affected environment. A description of current baseline condition of environmental resources that may be affected by these alternatives is provided below. NMFS conducted an internal scoping process to identify resources within the affected environment that could potentially be affected by the alternatives. During the scoping process, NMFS

[2] Yuba, Nevada, Sierra, Butte, Plumas and Placer.

discussed possible effects to all resources from activities associated with issuing a final rule to designate and authorize the release of a NEP of CV spring-run Chinook salmon in the NEP area.

5.3 Aquatic Habitat

The purpose of this section is to characterize the current quality and quantity of anadromous salmonid aquatic habitat in the NEP area. Considerations addressed in this section focus on aquatic habitat conditions that would be important to support an experimental population of CV spring-run Chinook salmon, including water availability, water quality, fish passage, and habitat availability.

5.3.1 Background

5.3.1.1 Characterization of Watershed Hydrology

The Yuba River watershed encompasses about 1,340 square miles on the western slopes of the Sierra Nevada Mountain Range (Reynolds et al. 1993). The NEP area in the upper Yuba River extends from the crest of the Sierra Nevada (elevation 9,100 feet mean sea level (msl)) to Englebright Dam (elevation 527 feet msl).

Primary watercourses in the upper Yuba River are the North, Middle and South Yuba Rivers (Figure 3). The SYR and MYR flow into Englebright Reservoir. The NYR flows into NBB Reservoir and then into Englebright Reservoir. Below Englebright Dam, the lower Yuba River extends about 24 miles downstream to the confluence with the Feather River. Major tributaries to the lower Yuba River include Deer Creek and Dry Creek (Figure 3).

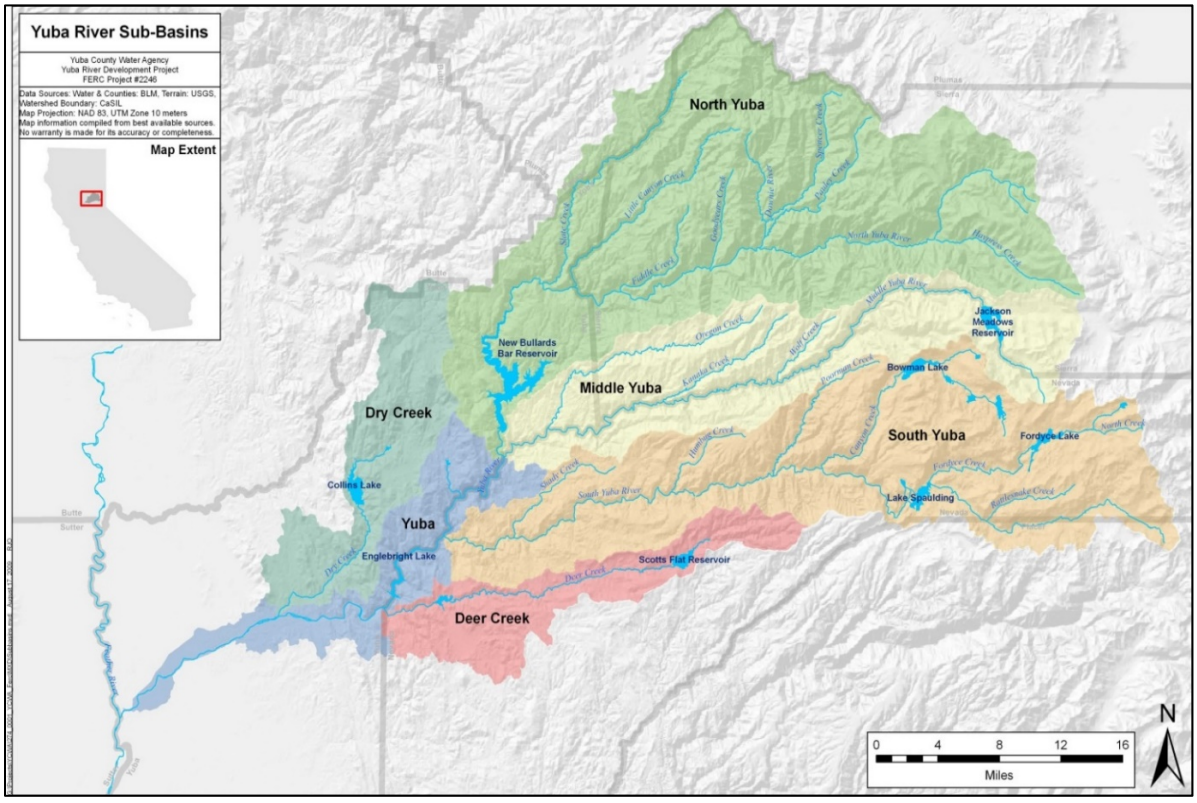

Figure 3. Sub-basins of the Yuba River Watershed (YCWA 2010).

The Yuba River has a Mediterranean climate, with cool, wet winters and hot, dry summers. Approximately 85 percent of the annual precipitation occurs between November and April (Curtis et al. 2006), falling primarily as snow at the higher elevations and rain in the lower portion of the watershed. Vegetation includes mixed conifer forest, pine and oak woodland, and chaparral. The average annual unimpaired flow of the Yuba River from 1975 to 2004 at the USGS's Smartsville Gage at river mile (RM) 23.6 (which is below the confluence with Deer Creek) is 2,340,000 acre-feet (ac-ft.), and ranged from a maximum of approximately 4,700,000 ac-ft. in 1995 to a minimum of approximately 360,000 ac-ft. in 1977.

In regulated systems, such as the Drum-Spaulding and Yuba-Bear Projects[3], cold water from snowmelt is captured and stored in project reservoirs. Managed discharge of cold water to downstream reaches from low-level release structures helps maintain cold-water habitat in these stream reaches throughout the summer. Timing of inflow and stratification, volume of the available cold-water pool, timing and size of downstream releases and diversions, and depth of the low-level outlet and powerhouse intakes all influence the quantity of cold water available for downstream habitat and

[3] Discussed further in Subsection 5.3.1.2 (Dams and Diversions in the Upper Yuba River watershed) of this EA.

availability (FERC 2013). Flows in the MYR and SYR are largely regulated by dams and associated water conveyance facilities, whereas the NYR is largely unregulated upstream of NBB Dam. Appendix A provides a detailed overview of the changes to minimum instream flow requirements in the MYR and SYR that have been agreed upon as part of the FERC relicensing processes for NID's Yuba-Bear Hydroelectric Project and PG&E's Upper Drum-Spaulding Project

North Yuba River

The NYR originates at Yuba Pass at an elevation of 6,701 feet, near State Highway 49 in Sierra County. Highway 49 parallels the upper 28 miles and the river is visible at numerous locations. The NYR basin is steep, rugged, sparsely populated, and mostly vegetated by conifer forests. The NYR flows into NBB Reservoir, which is formed by NBB Dam, located about 2.4 miles upstream of the NYR/MYR confluence (YWA 2017). Flows in the NYR are generally characterized by low and consistent summer flow (generally mid-July through October), winter storm peaks, and spring snowmelt runoff.

Middle Yuba River

The MYR originates at an elevation of approximately 7,200 feet along the northern side of Meadow Lake Hill, and flows westerly for about 41.4 miles to Our House Diversion Dam at River Mile (RM) 12.1[4], near the boundary of Sierra and Nevada Counties. From Our House Diversion Dam, the MYR flows west about 12 miles to where it converges with the NYR at elevation 1,350 feet. Similar to the NYR, the MYR basin is steep, rugged, sparsely populated, and mostly vegetated by conifer forests.

South Yuba River

The SYR originates at an elevation of about 7,200 feet near Castle Peak and Donner Lake, and flows southwest to its confluence with the mainstem Yuba River (RM 30.7) into Englebright Reservoir. The majority of the basin is steep, rugged, and sparsely populated, with small communities in the lower elevation areas.

Streamflows and associated habitat in the SYR downstream of the confluence with Canyon Creek are affected by multiple factors, including flows released at PG&E's Lake Spaulding dam and NID's Bowman-Spaulding diversion dam and various diversions in tributary streams (FERC 2013).

[4] River miles on the Middle Yuba River begin at RM 0.0 at the confluence of the Middle Yuba River with the North Yuba River, and extend upstream on the Middle Yuba River.

5.3.1.2 Dams and Diversions in the Upper Yuba River Watershed

Adequate flow is an important component of adult Chinook salmon upstream migration habitat because it can serve as an immigration cue and provide adequate depths for passage at critical locations (e.g., shallow riffles). Additionally, flow can provide outmigration cues for emigrating juveniles or smolts.

Flows in the NYR upstream of NBB Reservoir are unimpaired from dams and diversions upstream of NBB Dam except for the Slate Creek Diversion Dam, a part of South Feather Water and Power Agency's (SFWPA) South Feather Power Project (FERC Project No. 2088). Two small hydroelectric projects also are located in the NYR above Sierra City - Haypress Creek Hydroelectric Project (FERC 6028, 6061) on Haypress Creek, and Salmon Creek Hydroelectric Project on Salmon Creek (FERC 3730). Salmon Creek is located upstream of Loves Falls, which is a natural fish barrier on the NYR (near RM 51.1), while Haypress Creek is located downstream of Loves Falls. These two projects are exempt from FPA licensing requirements and have Special Use Permits issued by the TNF. Diversions are limited to ongoing riparian and appropriative water rights associated with rural residential development and an out of basin diversion at Slate Creek where exports average 73,601 acre feet or 3.5% of the unimpaired flow of the NYR (YCWA 2010).

NBB Dam provides hydraulic head for approximately 340 megawatts of electric generation at the New Colgate Powerhouse and the smaller NBB Minimum Flow Powerhouse. NBB Reservoir is typically operated by capturing winter and spring runoff from rain and snowmelt. Consequently, NBB Reservoir reaches its peak storage at the end of the spring runoff season, and then is gradually drawn down during summer and fall. The reservoir usually reaches its lowest elevation in mid-winter.

The Yuba-Bear Project and the Drum-Spaulding Project facilities are intermingled among the drainage basins of the MYR, SYR, Bear River, and North Fork American River drainage basins (FERC 2014). NID's Yuba-Bear Project includes 11 reservoirs, 4 major water conduits, 4 powerhouses with associated switchyards, 1 transmission line, and appurtenant facilities and structures (FERC 2013). The Yuba-Bear Project is located in the SYR, MYR, and Bear River Basins. Details on these facilities are reviewed in detail by FERC (2013, 2014), YWA (2017), and Stillwater Sciences (2013).

Englebright Dam on the mainstem Yuba River is approximately 260 feet high and forms Englebright Reservoir, which holds a maximum of 70,000 ac-ft. of water. Construction was completed in 1941 by the California Debris Commission. The dam was constructed primarily to contain hydraulic mining sediments and represents the delineation between the upper and lower Yuba River (Corps 2013). The

dam provides hydraulic head for approximately 67 MW of electric generation at the Narrows 1 and 2 powerhouses. The reservoir has no dedicated flood storage space and only provides incidental flood control benefits. The dam is impassable to anadromous fish in the upstream direction and therefore represent the upstream limit of anadromous fish migration in the Yuba River (NMFS 2014).

5.3.2 Fish Passage Considerations

Since construction in 1941, Englebright Dam[5] has blocked approximately 563 miles of anadromous salmonid habitat (Lindley et al. 2006) in the upper Yuba River. Currently, anadromous salmonids are restricted to the 24.3 miles of the lower Yuba River. Upstream of Englebright Dam natural and man-made barriers to fish migration exist in the NYR, MYR and SYR (Figure 4). Completely impassible man-made barriers to fish passage include: (1) NBB Dam on the NYR; (2) Our House Diversion Dam, Milton Dam and Jackson Meadows Dam on the MYR; and (3) Lake Spaulding Dam on the SYR.

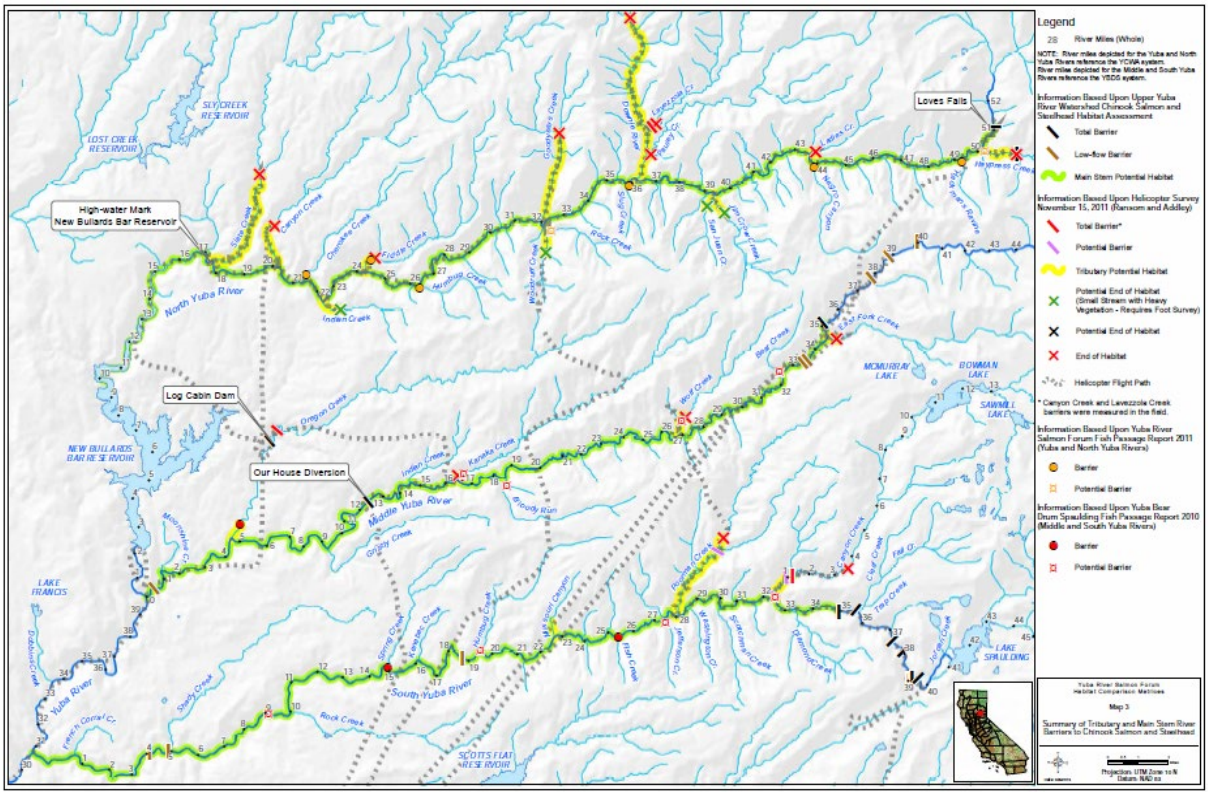

Figure 4. Tributary and main stem river barriers to Chinook salmon and steelhead (YSF 2013).

Barriers to upstream migration of adult Chinook salmon (and steelhead) in the mainstem stream reaches of the Yuba River upstream of Englebright Dam and tributaries were assessed by the Yuba

[5] Located on the lower Yuba River 24.3 RMs upstream of the confluence of the lower Yuba River and the Feather River.

Salmon Forum (YSF 2012). In the NYR, Loves Falls (RM 51.1)[6] is assumed as the end of anadromy prior to dam construction (YSF 2013). Of the 38 tributaries to the NYR, 20 were determined to provide little to no Chinook salmon (or steelhead) spawning habitat. Potential barriers to Chinook salmon (and steelhead) were found at eight tributaries and complete barriers were not identified during partial surveys on five tributaries. Only five of the tributaries that were fully surveyed had significant usable habitat (YSF 2012).

In the MYR, a waterfall at RM 35.1 has been assumed as the end of anadromy prior to dam construction (YSF 2013). Vogel (2006) identified eight sites on the mainstem of the MYR as barriers to salmon and steelhead upstream passage; however, six were considered barriers only during low-flow conditions. The other two were considered total barriers regardless of flow conditions. While Vogel (2006) surveyed the entire MYR, the YSF (2012) assessment surveyed to YWA's Our House Diversion Dam (RM 12.0). In the survey area that overlapped (RM 0.0 –12.0), generally similar findings were documented.

In the SYR, a waterfall at RM 34.9 has been assumed the end of anadromy prior to dam construction (YSF 2013). On tributaries to the SYR, potential barriers (natural and man-made) to adult rainbow trout passage were found on five of seven tributaries assessed (NID and PG&E 2010). Vogel (2006) identified fourteen sites on the mainstem as barriers to upstream passage - three were low-flow barriers and eleven were total barriers regardless of flow conditions.

Prior to the construction of dams in the basin, the NYR, MYR, and SYR (Figure 5) likely provided good habitat for CV spring-run Chinook salmon (and CCV steelhead) (Lindley et al. 2006; Yoshiyama et al. 1996, 1998, 2001).

[6] Two different river mile systems were generated for the Yuba River watershed as part of recent FERC hydroelectric relicensing proceedings. For this EA, the river mile system from the Yuba-Bear Drum-Spaulding (YBDS) projects was used for the SYR and MYR. The river mile system used for the NYR and the Yuba River was developed for the YRDP.

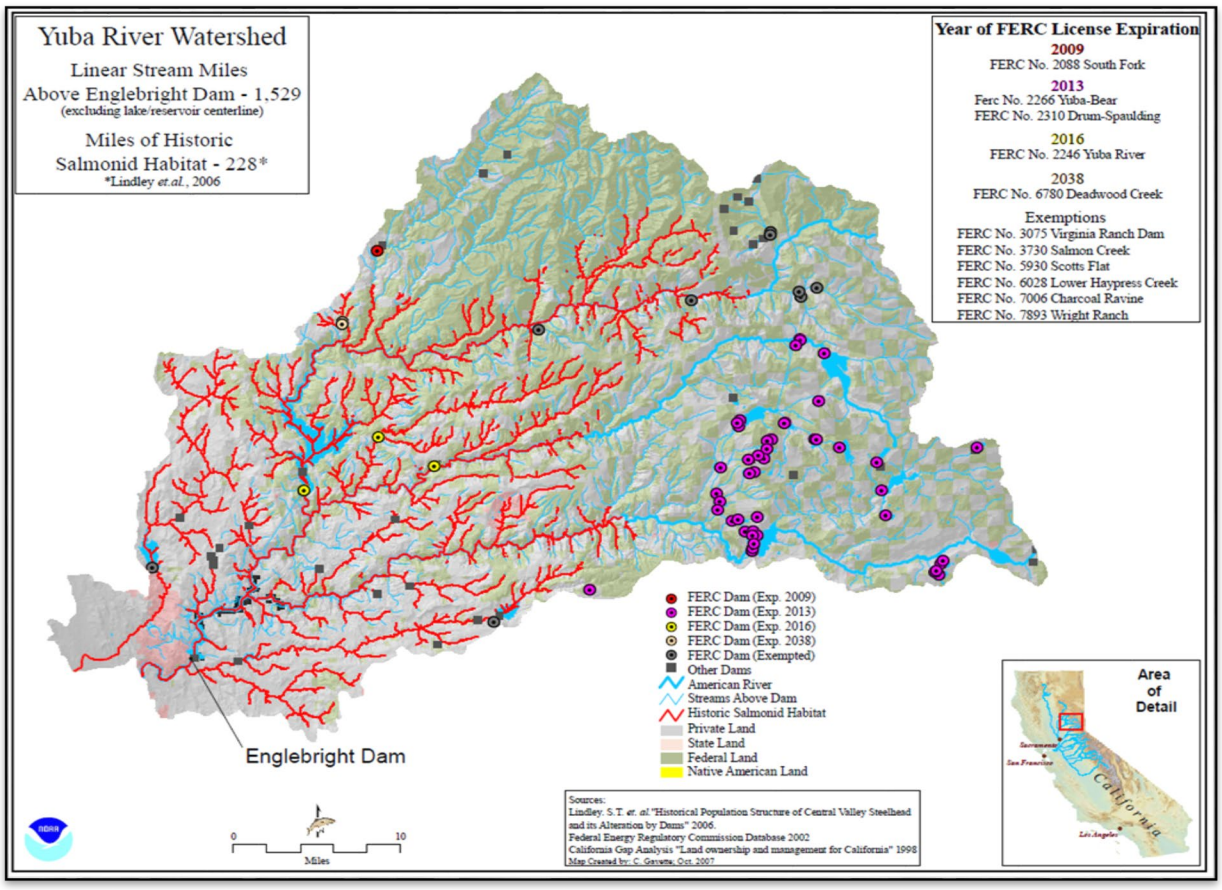

Figure 5. Historical anadromous salmonid habitat above dams in the Yuba River Watershed and projects under FERC regulatory jurisdiction. Historical salmonid habitat existed in 228 of the 1,529 linear stream miles above Englebright Dam, by some estimates.

5.3.3 Water Quality

The upper Yuba River is subject to compliance with the Water Quality Control Plan for the Sacramento and San Joaquin River Basin (Basin Plan) (Central Valley Regional Water Quality Control Board [CVRWQCB] 2018). The Basin Plan applies to the entire geographic extent of the Sacramento and San Joaquin River watersheds, covers 27,210 square miles, and includes the entire area drained by the Sacramento River. State law defines beneficial uses of California's waters that may be protected against quality degradation (California Water Code section 13050(f)). The upper Yuba River has a number of designated beneficial uses, including Municipal and Domestic Supply, Industry (Power), Agricultural Supply (Irrigation and Stock Watering), Recreation (including Water-Contact Recreation and Non-Contact Water Recreation), Freshwater Habitat (Coldwater[7]), Spawning

[7] Resident does not include anadromous.

(Coldwater[8]), and Wildlife Habitat (see CVRWQCB 2018 for a full list of beneficial uses). The Basin Plan identifies numeric and narrative water quality objectives applicable to the waters of the upper Yuba River.

Water temperature is a water quality concern in the upper Yuba River above Englebright Dam. Warming water temperatures can be attributed to impacts from dams, water diversions, inadequate shading by limited riparian canopy, and low instream flows. The SYR (48 miles from Spaulding Reservoir to Englebright Reservoir) is listed as impaired under Clean Water Act section 303(d) for water temperature but with no identified source of impairment (FERC 2013; CEPA 2017).

Water temperature is an important habitat element for salmonid migration. Temperature changes may result in a gradation of potential effects on migrating adults and emigrating juveniles of spring-run Chinook. Water temperatures in the upper Yuba River generally increase during May/June through August/early September before declining in late September and October – a temperature trend that is consistent with the Mediterranean climate patterns of inland northern California (YWA 2017).

The YSF conducted a habitat assessment in the upper Yuba River to quantify the length of river with suitable water temperature for spring-run Chinook salmon and steelhead migration (collect/transport and volitional passage), holding, spawning, embryo incubation, juvenile rearing and downstream movement, and smolt emigration (YSF 2013). The water temperature portion of the assessment was primarily based on a four-year period (2008 – 2011) when empirical water temperature data (and hydrology) were available for the NYR, MYR, SYR and lower Yuba River. Water year types during the period ranged from dry to wet. In addition to the measured water temperature data, modeled water temperature data of potential higher instream flow releases (Subsection 5.1.2) were analyzed for the MYR and SYR (2008 and 2009 only). The water temperature modeling was developed as part of the YBDS relicensing (PG&E and NID 2012).

Cold-water temperatures during summer, suitable for various salmonid lifestages (e.g., <68° F), exist primarily in the upstream portions of the NYR, MYR, and SYR and the lower Yuba River downstream of Englebright Dam (YSF 2013). The amount of cold water increases in the upper basin with increasingly wetter water year types (i.e., from dry 2008 to wet 2011). The amount of cold water on the lower Yuba River remains generally consistent with water year type and encompasses the 24 miles of river below Englebright Dam. The amount of cold-water habitat in the upper Yuba River is typically greatest in the NYR and least in the SYR (YSF 2013). Because the Basin Plan addresses

[8] Salmon and steelhead.

"cold freshwater habitat" and "cold-water spawning for salmon and steelhead" as existing beneficial uses upstream of Englebright Reservoir, additional discussion about water temperature suitability for anadromous salmonids is provided in Subsection 5.3.4.

The Yuba River watershed contains a large amount of sediment and mercury because of historical hydraulic mining and gold processing practices. Mercury is present in the bottoms of rivers and reservoirs in the watershed and is transported by erosion processes. Mercury can be converted into methylmercury and accumulate in the food chain. As mercury becomes concentrated (in larger predatory fish), concentrations can exceed levels of concern for human consumption. Findings in the most recent and comprehensive survey of fish in the Yuba River meet and exceed US Environmental Protection Agency and Food and Drug Administration levels (SRWP 2020).

In addition to the sediment loading in the watershed attributed to historical mining, other anthropogenic sediment sources include activities such as road construction associated with rural housing development, logging, and recreation. The NYR (NBB Reservoir Dam to Englebright Reservoir), MYR and the SYR are listed under section 303(d) of the Clean Water Act (CWA) as impaired waterbodies as a result of mercury concentrations, with resource extraction as the probable sources of impairment (FERC 2013; CEPA 2017). The SYR upstream of Englebright Reservoir is listed as impaired for temperature with completion of a total maximum daily load scheduled for 2021 (FERC 2014). Other tributaries in the NEP area, including Deer Creek (chlorpyrifos, toxicity and pH), Humbug Creek (chromium, copper, iron, mercury, sediment, zinc and pH), Kanaka Creek (arsenic), and Little Deer Creek (mercury, pH) are listed on the CWA section 303(d) list of impaired waterbodies, along with Englebright Reservoir (mercury) and Scotts Flat Reservoir (mercury) (CEPA 2017).

Septic systems treat and dispose of wastewater from residential, commercial or industrial facilities in primarily rural areas not served by community sewers. Septic systems reduce pollution by treating the solids, pathogens, organics, and ammonium (a form of nitrogen) in human waste before it is discharged to the soil. By design, bacteria consume ammonium and convert it to nitrate either in the drain field or through aeration. Wastewater treated by a properly functioning septic system generally contains significant amounts of nitrate. After leaving a properly functioning drain field, nitrified effluent flows through soil and may be: (1) used by plants; (2) consumed by bacteria; or (3) flow to groundwater or surface water. An improperly functioning septic system can result in excessive ammonium/ammonia or nitrates discharged to the soil, where it can flow to groundwater or surface water and impact water quality or cause environmental harm (WDOH 2014). Coliform concentrations

in basin waters are affected by (a) wildlife populations; (b) magnitude and location of recreation use; (c) septic drain fields, and; (d) availability of human waste facilities (FERC 2018).

California law requires the SWRCB regulate discharges (including those from septic systems) to ensure long-term water quality protection (SWRCB 2020). Every new or replacement septic system in the NEP area requires a permit, either through the local jurisdiction (city or county), or from the SWRCB. In 2012, the SWRCB adopted the Water Quality Control Policy for Siting, Design, Operation, and Maintenance of Onsite Wastewater Treatment Systems (OWTS Policy). The OWTS Policy designates regional boards with the principal responsibility for overseeing its implementation, and calls for incorporation of the OWTS Policy requirements into regional boards' basin plans. Sierra and Nevada Counties are regulated by the Lahontan Regional Water Quality Control Board (RWQCB).

5.3.4 Anadromous Salmonid Habitat Availability and Quality

The amount of potentially suitable habitat for anadromous salmonids in the upper Yuba River varies as a function of flow and related environmental conditions such as water temperature. The river channels in the upper Yuba River watershed are incised, with alternating bedrock and alluvial reaches. Sediment in alluvial reaches is stored in the channel bed, active bars, and infrequently inundated floodplains and terraces (Curtis et al. 2006). Beginning in the Gold Rush era, the upper Yuba River watershed was subject to intensive hydraulic mining, logging, water impoundment and diversion, and other anthropogenic disturbances. Hydraulic mining involved the use of high-pressure water to erode gold-bearing gravel deposits. The resulting sediment-laden runoff was processed for gold and conveyed directly into creeks and rivers, causing massive increases in sediment loads and extensive downstream channel aggradation (Mount 1995; Curtis et al. 2006).

Historical habitat conditions upstream of Englebright Dam that supported runs of Chinook salmon have changed due to hydropower development and other anthropogenic activities. With the exception of the NYR above NBB, flow conditions in the upper Yuba River watershed are largely controlled by releases from a series of dams and reservoirs. Waters in the upper watershed with more permanent flow conditions support cold-water fish communities dominated by resident rainbow and/or brown trout (FERC 2013).

Available information indicates the upper Yuba River has potential for supporting the reintroduction of CV spring-run Chinook salmon, and likely CCV steelhead (YSF 2013; Stillwater Sciences 2013). For example, available habitat currently supports relatively high densities of resident rainbow trout in

reaches with suitable summer water temperatures (Stillwater Sciences 2013). These conditions suggest habitat conditions are suitable for salmon and steelhead.

To investigate available habitat quality in the upper Yuba River, NMFS funded an assessment of potential CV spring-run Chinook salmon and CCV steelhead habitat (Stillwater 21013). The purpose of the assessment was to quantify habitat carrying capacity and freshwater productivity to help guide future reintroduction efforts. The assessment used a compilation of physical and biological data from field studies, literature review and scientific consultation, to model carrying capacity for spring-run Chinook salmon and steelhead, as well as the productivity potential for spring-run Chinook salmon in the NYR, MYR, SYR and the reach below NBB Dam. Three scenarios were modeled: a Dry Conditions scenario and two alternative management scenarios designated Scenarios 3 and 4.

Under the Dry Conditions scenario, unsuitably high water temperatures would limit use by CV spring-run Chinook salmon of over 30 miles of otherwise high quality spawning and rearing habitats in the NYR, MYR, and SYR, limiting potential smolt production. However, model results indicate that, in the NYR under all scenarios and the MYR, SYR and below NBB Dam, under Scenarios 3 and 4, sufficient spring-run Chinook salmon holding, spawning, and rearing habitat exists to allow for production of substantial numbers of juveniles and smolts (Table 2).

Table 2. Predicted habitat carrying capacities of spring-run Chinook salmon - holding, spawning (redds), and summer rearing life stages for each modeled sub-basin and scenario in the upper Yuba River watershed.

Carrying Capacity	Scenario[1]	SYR[2]	MYR	NYR	Below NBB
Holding	D	0	914	7,814	4,042
	S3	588	3,050	33,976	20,176
	S4	3,632	5,710	65,777	20,176
Redd[3]	D	0	113	1,347	113
	S3	163	308	3,641	729
	S4	435	807	5,177	2,188
Age-0 summer rearing	D	0	5,568	142,940	281,915[4]
	S3	2,048	22,433	634,715	620,939
	S4	75,016	121,985	1,272,247	620,939

[1] D = Dry Conditions scenario, S3 = Scenario 3, and S4 = Scenario 4.
[2] Under the Dry Conditions scenario the entire SY below a natural fish passage barrier is predicted to be thermally unsuitable for spring-run Chinook salmon holding and rearing; therefore carrying capacity is zero.
[3] Each redd assumed to support one female spawner.
[4] Includes summer rearing carrying capacity of 13,103 from habitat in the thermally suitable reach upstream of the MYR confluence. This carrying capacity does not contribute to smolt production due to lack of spawning habitat in the MYR.

The YSF (2013) also conducted an assessment of potential anadromous spring-run Chinook salmon and steelhead habitat in the Yuba River. Unlike the Stillwater (2013) assessment, the YSF included the lower Yuba River (downstream of Englebright Dam) and did not include the NYR reach below NBB Dam in their assessment. The YSF (2013) synthesized data from various sources for the following parameters: hydrology, water temperature, upstream migration barriers, and migration, holding, spawning, incubation, rearing habitat. The assessment concluded the greatest amount of spawning habitat for spring-run Chinook salmon was in the lower Yuba River, followed by the NYR and the MYR, with lesser amounts of in other reaches.

For the upper Yuba River, the YSF (2013) included a CV spring-run Chinook salmon spawning carrying capacity estimation (Table 3). Carrying capacity was based upon the cumulative amount of suitable spawning gravel corresponding to the length of thermally suitable spawning habitat. This information was divided by the spatial requirements per redd. As described in this Subsection, greater amounts of suitable spawning habitat were estimated available in the NYR than MYR, and greater amounts were estimated available in the MYR than SYR, in a number of water year types occurring from 2008-2014 (Source: Modified from YSP Technical Advisory Group (TAG) Technical Presentation 12/7/15).

Table 3. Estimated length in miles of thermally suitable habitat for adult spring-run Chinook salmon spawning in the Yuba River watershed upstream of Englebright Reservoir.

Length (miles)	North Yuba River	Middle Yuba River	South Yuba River
2008 (D)	7.7	7.5	0
2009 (BN)	7.6	5.5	0
2010 (BN)	24	9.8	0
2011 (W)	23.9	12.3	3
2012 (BN)	13.9	3	0
2013 (BN)	8.5	0	0
2014 (C)	7.6	0	0

Additional information pertaining to thermally suitable CV spring-run Chinook salmon lifestage-specific habitat conditions in the NYR, MYR, and the SYR, as well as other pertinent habitat-related findings from NMFS's investigation are discussed below.

5.3.5 Essential Fish Habitat

EFH is those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity, and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle. These areas are described in terms of ecological characteristics, location, and time (Hanson et al. 2004). The type of habitats available, their attributes, and their functions are important to a species' (e.g., Chinook salmon) productivity, diversity, health, and survival (Hanson et al. 2004).

In the Yuba River, EFH is designated upstream and downstream of Englebright Dam and Reservoir. The downstream extent includes the lower Yuba River to the confluence of the Feather River, the lower Feather River, the lower Sacramento River, and through the Sacramento-San Joaquin Delta to San Francisco Bay. The Proposed Action and alternatives do not include any activities that would affect EFH downstream of Englebright Dam; therefore, this EA does not further discuss EFH outside the NEP area.

5.3.5.1 EFH in the Upper Yuba River

EFH in the upper Yuba River begins at Englebright Dam and extends upstream to the NYR, MYR, and SYR. Currently, EFH in the upper Yuba River is unoccupied because Chinook salmon are prevented from accessing these historically occupied habitats due to Englebright Dam.

5.3.6 Watershed Habitat Restoration Efforts

Several ongoing habitat restoration and conservation projects are located throughout the Yuba River watershed (Figure 6). Many of these restoration projects are located in upland areas. However, in 2014,

the Bear Yuba Land Trust acquired an area known as the Rice's Crossing Preserve, which encompasses 2,707 acres in Nevada and Yuba Counties and includes six miles of Yuba River frontage (Sierra Fund 2014). In addition to providing public access, Rice's Crossing Preserve is intended to protect wildlife corridors and provide opportunities for river restoration of fish habitat disrupted by historical dam building and mining. It is anticipated that river restoration will benefit a variety of riparian species as well as native fish populations (BYLT 2020). Sustainable timber harvests and cattle grazing also are to have an important role in land stewardship within the Rice's Crossing Preserve (Sierra Fund 2014).

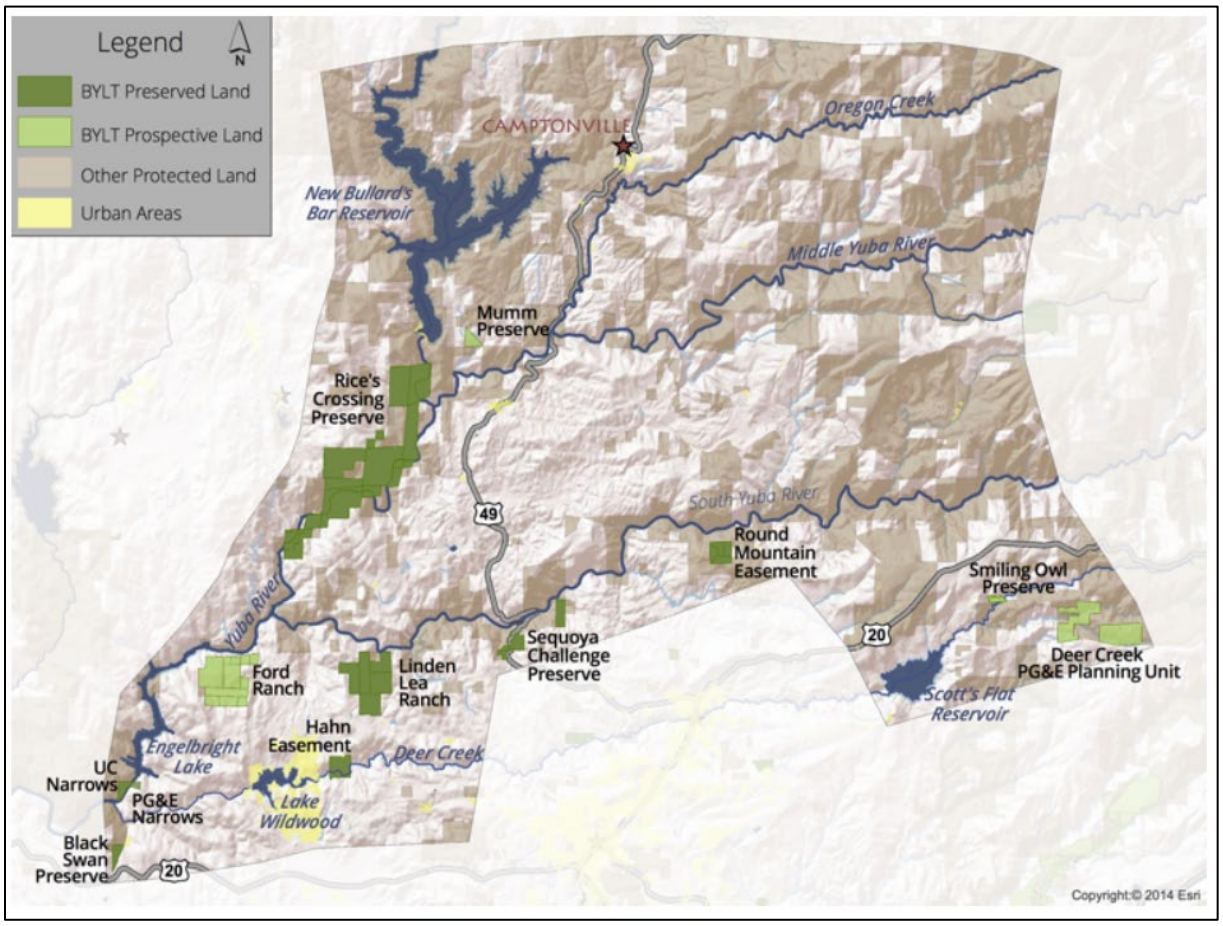

Figure 6. Illustration of conservation projects in the Yuba River watershed, including Rice's Crossing Preserve along the Yuba River downstream of New Bullard's Bar Dam (Source: BYLT 2020).

Road building, fire suppression, and historical grazing and logging activities have affected many meadow habitats in the Sierra Nevada (SYRCL 2018), and several organizations are currently focusing on restoring these important habitats throughout the upper Yuba River. As one example, the TNF and the South Yuba River Citizens League (SYRCL) are in the process of restoring both stream and

wetland habitat across a 50-acre meadow as part of the Loney Meadow Restoration Project[9]. The goals of the project are to (1) improve plant and wildlife habitat; (2) recharge groundwater; (3) reduce stream erosion; and (4) increase carbon sequestration (SYRCL 2020). Other meadow restoration projects occurring within the watershed include Van Norden Meadow, Deer Meadow, and Bear Trap Meadow (SYRCL 2018).

5.4 Fisheries Resources

5.4.1 ESA-listed Fish Species

Due to Englebright Dam, there are no ESA-listed anadromous fish species currently in the NEP area. If either Alternative 2 or Alternative 3 are selected for implementation, then ESA-listed CV spring-run Chinook salmon could be reintroduced to the upper Yuba River under a separate future action.

Lahontan cutthroat trout are listed as threatened under the ESA (35 Fed. Reg. 16047, October 13, 1970 and 40 Fed. Reg. 29863, July 16, 1975) and are native to the Lahontan Basin of central Nevada and mid-eastern California. Lahontan cutthroat trout were previously introduced into the upper Yuba River watershed.

5.4.1.1 CV Spring-run Chinook Salmon

Adult CV spring-run Chinook salmon migrate from a marine environment into their natal freshwater streams and rivers to mate; they spawn once and then die. In the Sacramento River, CV spring-run Chinook salmon spawning occurs between late August and early October (Fisher 1994) depending on water temperatures. Information on life history and some factors for decline are available in in Yoshiyama et al. (1998), Yoshiyama et al. (2001), Fisher (1994), Healey (1991), Moyle (2002), USFWS (1995), CDFG (1998), CDFG (2000), CDFG (2004), Myers et al. (1998), Quinn (2005), NMFS (2014), Lindley et al. (2004), Schick and Lindley (2007), Lindley et al. (2006), and Johnson and Lindley (2016).

5.4.2 Other Native Fish Species

Species discussed in this subsection are organized in taxonomic order with a brief general overview of their life history. Various native fish species occur within the NEP area (Table 4). Limiting factors and

[9] The project is being completed in partnership with the National Fish and Wildlife Foundation, Sierra Nevada Conservancy, National Forest Foundation, USFS, CDFW, Earthwatch, SYRCL, the Nevada County RAC Grant Program, Nevada County, and UCD (SYRCL 2020).

threats to native fish species include: (1) populations of non-native species are affected by inter- and intra-specific competition; (2) water quality and quantity; and (3) climatic conditions.

Table 4 Native fish species (non-ESA/non-CESA listed) within the NEP area and their status. FS = USFS Sensitive Species, SSC = California Species of Special Concern

Common Name	Scientific Name	Special Status
California roach	*Lavinia symmetricus*	SSC
Sacramento hitch	*L. exilicauda*	SSC
Sacramento pikeminnow	*Ptychocheilus grandis*	-
Hardhead	*Mylopharodon cynocephalus*	FS; SSC
Sacramento sucker	*Catostomus occidentalis*	-
Rainbow trout	*Oncorhynchus mykiss*	-
Riffle sculpin	*Cottus gulosus*	-

Source: Moyle 2002; Moyle et al. 2015.

5.4.3 Non-Native Fish Species

There are approximately 17 introduced fish species in the NEP area (Table 5). Limiting factors and threats to non-native fish species are similar to those for native fish species, including: (1) inter- and intra-specific competition; (2) water quality and quantity; and (3) climatic conditions.

Table 5. Fish species present in, but not native to the NEP area. None have special status.

Common Name	Scientific Name
Golden shiner	*Notemigonus crysoleucas*
Common carp	*Cyprinus carpio*
White catfish	*Ameiurus catus*
Black bullhead	*A. melas*
Brown bullhead	*A. nebulosus*
Channel catfish	*Ictalurus punctatus*
Kokanee	*O. nerka*
Brown trout	*Salmo trutta*
Brook trout	*Salvelinus fontinalis*
Green sunfish	*Lepomis cyanellus*
Bluegill sunfish	*L. macrochirus*
Redear sunfish	*L. microlophus*
Smallmouth bass	*Micropterus dolomieui*
Spotted bass	*M. punctulatus*
Largemouth bass	*M. salmoides*
White crappie	*Pomoxis annulauris*
Black crappie	*P. nigromaculatus*
White crappie	*Pomoxis annulauris*

Sources: Moyle 2002; UCD's CalFish Website 2017; Pisces 2017; CDFW 2017; CDFG 2010.

5.4.4 Fish Disease Considerations

Infectious disease can influence fish survival directly, or compromise physical performance during migration, which can lower ocean survival and return of spawning adults. The California-Nevada Fish Health Center conducted fish health surveys in the Yuba and Feather Rivers to determine what major fish pathogens are present and how they are distributed geographically among different fish species (True 2004). NMFS has recently contracted with Anchor QEA, LLC, to conduct a fish health assessment in the North Yuba River in the near future. In general, fish health in the Yuba River system appears to be relatively good, and major disease outbreaks in natural adult or juvenile fish populations have not been reported (True 2004).

5.5 Wildlife

The affected environment for wildlife discussed in this EA is the same as the NEP area except for Southern Resident killer whales where the affected environment includes the Pacific Ocean off the California coast where this species forages on Chinook salmon. The affected environment for all other wildlife is limited to the NEP area because potential effects of the alternatives on wildlife would likely apply to species present in the upper Yuba River. This area represents an area where wildlife species could reasonably be expected to modify their behavior in response to changes in the availability of food resources in the NEP area under the alternatives. The analysis area for Southern Resident killer whales extends to the Pacific Ocean due to the dependence of Southern Resident killer whales on Chinook salmon as a food resource.

The NEP area (Figure 2) is home to a variety of wildlife species, many of which rely to varying extents on fish, including salmonids. Of the approximately 311 wildlife species (amphibians, reptiles, birds, and mammals) that may occur in the NEP area (CDFW 2017), 30 (10 percent) have a strong-consistent or recurrent relationship with salmon as a food resource according to parameters identified by Cederholm et al. (2000). A number of native species prey on salmon or their carcasses directly (Table 6) (Cederholm et al. 2000; Hilderbrand et al. 2004).

The association of some highly aquatic species, particularly native frogs (Table 7) to salmon, including those with a special listing status within the NEP area, is not well documented. While portions of their habitat requirements are often similar (i.e., water), whether these species have a strong and consistent, or recurrent relationship with salmon as defined by Cederholm et al. (2000) is unknown.

5.5.1 Federal and California Listed or Special Status Species

Federal and California listed wildlife species that have a strong-consistent or recurrent relationship with salmonids (Cederholm et al. 2000) are listed in Table 6. Highly aquatic special status species with an unknown relationship to salmon as defined by Cederholm et al. (2000) are listed in Table 7. Additional detail on listed frog species are provided in Appendix B.

Southern Resident killer whales occur outside the NEP in the Pacific Ocean and are included in the analysis (Table 8) because of their reliance on salmon - particularly large Chinook salmon (Hanson et al. 2005). Many Chinook salmon runs consumed by Southern Residents are listed under the ESA, and efforts to recover salmon will benefit the whales. In July 2018, NMFS and the Washington Department of Fish and Wildlife developed a prioritized list of West Coast Chinook salmon stocks, including all runs of CV Chinook salmon, that are important to the whales' recovery to help inform Chinook salmon recovery and habitat restoration efforts (NMFS and WDFW 2018).

Table 6. Native and special-status species in the NEP area - with a strong-consistent (S-C), or recurrent (R) relationship with salmon as defined by Cederholm et al. (2000). BL = BLM, Sensitive, CDF = CDF Sensitive, CE = California Endangered, CF = Ca. Fully Protected, FS = USFS Sensitive, SSC = Ca. Species of Special Concern.

Birds - Classification / Species / Scientific Name	Federal Status	California Status
(R) Common loon (*Gavia immer*)	-	SSC
(R) Pied-billed grebe (*Podilymbus podiceps*)	-	-
(R) Western grebe (*Aechmophorus occidentalis*)	-	-
(R) Clark's grebe (*A. clarkii*)	-	-
(R) American white pelican (*Pelecanus erythrorhynchos*)	-	SSC
(R) Double-crested cormorant (*Phalacrocorax auritus*)	-	-
(R) Great blue heron (*Ardea herodias*)	-	CDF
(S-C) Harlequin duck (*Histrionicus histrionicus*)	-	SSC
(R) Common goldeneye (*Bucephala clangula*)	-	-
(S-C) Hooded merganser (*Lophodytes cucullatus*)	-	-
(S-C) Common merganser (*Mergus merganser*)	-	-
(R) Red-breasted merganser (*M. serrator*)	-	-
(R) Turkey vulture (*Cathartes aura*)	-	-
(S-C) Osprey (*Pandion haliaetus*)	-	CDF
(S-C) Bald eagle (*Haliaeetus leucocephalus*)	BL; FS	CE; CF; CDF
(R) Golden eagle (*Aquila chrysaetos*)	BL	CF; CDF
(R) Ring-billed gull (*Larus delawarensis*)	-	-
(R) Belted kingfisher (*Megaceryle alcyon*)	-	-
(R) Steller's jay (*Cyanocitta stelleri*)	-	-
(R) American crow (*Corvus brachyrhynchos*)	-	-
(R) Common raven (*C. corax*)	-	-
(R) American dipper (*Cinclus mexicanus*)	-	-

Mammals - Classification / Species / Scientific Name	Federal Status	California Status
(R) Virginia opossum (*Didelphis virginiana*)	-	-
(R) Water shrew (*Sorex palustris*)	-	-
(R) Coyote (*Canis latrans*)	-	-
(S-C) Black bear (*Ursus americanus*)	-	-
(R) American mink (*Mustela vison*)	-	-
(S-C) Northern river otter (*Lutra canadensis*)	-	SSC
(R) Bobcat (*Lynx rufus*)	-	-

Sources: CDFW 2017; Cederholm et al. 2000.

Table 7. Highly aquatic species, most with special status, in the NEP area with unknown relationships with salmon.
BL = BLM Sensitive, CF = Ca. Fully Protected, CT = Ca. Threatened, FS = USFS Sensitive, FE = USFWS Endangered, FT = USFWS Threatened, SSC = Ca. Species of Special Concern.

Amphibians: Classification / Species / Scientific Name	Federal Status	California Status
California red-legged frog (*Rana draytonii*)	FT	SSC
Foothill yellow-legged frog (*R. boylii*)	FS; BL	CT
Sierra Nevada yellow-legged frog (*R. sierrae*)	FE	CT
Sierra newt (*Taricha sierrae*)	-	-
Western pond turtle (*Emys marmorata marmorata*)	FS	SSC

Sources: CDFW 2017; Thomson et al., 2016; Cederholm et al. 2000, California Fish and Game Commission 2020.

Table 8. Special-status species outside the NEP area with direct and routine, recurrent relationships with salmon.

Mammals	Federal Status
Killer whale (*Orcinus orca*)	Endangered (Southern Resident DPS)

5.6 Land Use and Ownership

The entire NEP area is considered as the affected environment for land use and ownership because uses of lands in the upper Yuba River sub-basins may be affected by the alternatives. The potential for lands outside the NEP area to be affected by the alternatives is negligible because restrictions on land use in response to ESA take prohibitions are typically applied within the basins that support ESA-listed fish species. The NEP area encompasses: (1) the NYR and tributaries above NBB Dam to the ridgeline near the eastern boundary of the TNF at Yuba Pass along California State Route 49; (2) the MYR and tributaries, which originate in Moscove Meadow, flow north to Jackson Meadows Reservoir, and descend into a gorge, generally defining the boundary of Sierra County in the north and Nevada County in the south, (3) the SYR and tributaries originating in the northern Sierra Nevada at Lake Angela near Donner Pass; (4) the NYR downstream of NBB Dam; and (5) the Yuba River from the confluence of the North and Middle Yuba Rivers downstream to Englebright Reservoir (Figure 2).

Land in the upper Yuba River is predominantly in private and federal ownership. Land uses include timber harvest, recreation, grazing, and minor residential development. At elevations above 3,000 feet, the USFS manages a majority of the land. Other land managers and owners above 3,000 feet include private corporations such as timber companies, NID, PG&E, and other private entities. Below 3,000 feet, land in the sub-basins is predominantly privately owned, with small Federally-owned portions managed by the USFS, BLM (as part of the Sierra Resource Management Area), and Reclamation (FERC 2013).

Table 9. Land ownership in acres by all counties within the NEP area.

Ownership	Butte County	Nevada County	Placer County	Plumas County	Sierra County	Yuba County	Acres[10] Total
Private	259.1	164,327.7	7,204.1	3,435.0	71,753.9	51,162.6	295,052.4
State – Not Specified	-	157.0	66.6	-	3.2	860.4	1,087.2
State – Fish & Wildlife	-	29.0	-	-	-	-	29.0
State – Parks & Rec	2,595.8	-	-	-	0.1	45.9	2,641.7
Federal – ACOE	969.0	-	-	-	-	610.7	1,579.7
Federal – BLM	11,085.6	-	-	-	-	676.0	11,761.6
Federal – Military	0.1	-	-	-	-	-	0.1
Federal – USFS	2.3	101,130.7	4,276.9	8,555.8	237,718.1	42,519.7	394,203.4
Total (acres)	**261.4**	**280,294.8**	**11,547.6**	**11,990.8**	**309,475.2**	**95,875.3**	**709,445.1**

Source: BLM, California State Office, Mapping Sciences, 5/15/2009;

Table 10. Land cover by county within the NEP area in acres.

Land Cover	Butte County	Nevada County	Placer County	Plumas County	Sierra County	Yuba County	Total (Acres)
Barren land	-	1,926.6	82.5	15.6	461.0	38.5	2,524.2
Deciduous forest	-	6.300.2	-	18.7	2,123.2	4,054.3	12,496.3
Developed, high intensity	-	20.5	13.3	-	2.4	0.4	36.7
Developed, low intensity	-	424.3	199.7	23.8	293.3	24.2	965.4
Developed, medium intensity	-	241.1	162.6	3.6	30.9	5.3	443.5
Develop, open space	3.1	2,409.6	171.7	262.9	3,166.2	1,286.8	7,300.3
Emergent herbaceous wetland	-	263.1	96.3	-	257.1	-	616.5
Evergreen forest	256.0	184,165.8	6,619.1	10,375.8	236,919.1	69,535.9	507,871.6
Grassland/herbaceous	-	10,460.8	358.1	12.5	2,151.9	6,398.7	19,381.9
Mixed forest	-	7,404.0	-	47.4	2,661,2	2,382.3	12,494.8
Open water	-	4,540.9	233.3	-	773.5	4,107.8	9,655.5
Pasture/hay	-	-	-	-	-	7.1	7.1
Shrub/scrub	2.2	62,110.3	3,605.7	1,240.7	60,604.5	8,048.0	135,611.5
Woody wetlands	-	2.9	-	-	3.8	-	6.7
Total (acres)	**261.3**	**280,270.0**	**11,542.3**	**12,000.9**	**309,448.2**	**95,889.4**	**709,412.0**

Source: U.S. Geological Survey, 2014, NLCD 2011 Land Cover (2011 Edition, amended 2014), National Geospatial Data Asset (NGDA) Land Use Land Cover.

[10] Differences in Total Acres in Table 9 and Table 10 is due to differences in data formats. Data used for Table 9 was in a vector format (smooth lines and curves) and data used for Table 10 was in a raster format (square cells).

Predominant land uses in Yuba County are agriculture, forested lands, extractive/industrial, commercial/research and development, park, public lands, military installation and urban/communities. The County in accordance with the 2030 Yuba County General Plan and County zoning ordinances manages private land use. In the NEP area, the three significant zoned land uses are Timberland Preserve, Agricultural/Rural Residential and Recreational (Yuba County 2016).

Predominant land uses in Nevada County are forested lands, agriculture, and urban/communities (Nevada County 2020). The County in accordance with the 1996 Nevada County General Plan and County zoning ordinances manages private land use. Major land use in the Nevada County portion of the NEP area is designated as Agricultural, Open Space, Forest, and Timber Production Zones.

Predominant land uses in Sierra County are forested lands, agriculture, and urban/communities (Sierra County 2012). The County in accordance with the 2012 Sierra County General Plan and County zoning ordinances manages private land use. Per the Sierra County Public Land Use map, the NEP area is designated as Rural/Residential and Rural (Sierra County 2012).

A large proportion of the NEP area is also in timber production by private owners as reflected in Figure 7 where the majority (approximately 75 percent) of the NEP area is composed of deciduous/evergreen/ mixed forestlands (Table 10). Subsection 5.7, Tourism and Recreation, and Subsection 5.8, Socioeconomics, describe some of these land uses in more detail.

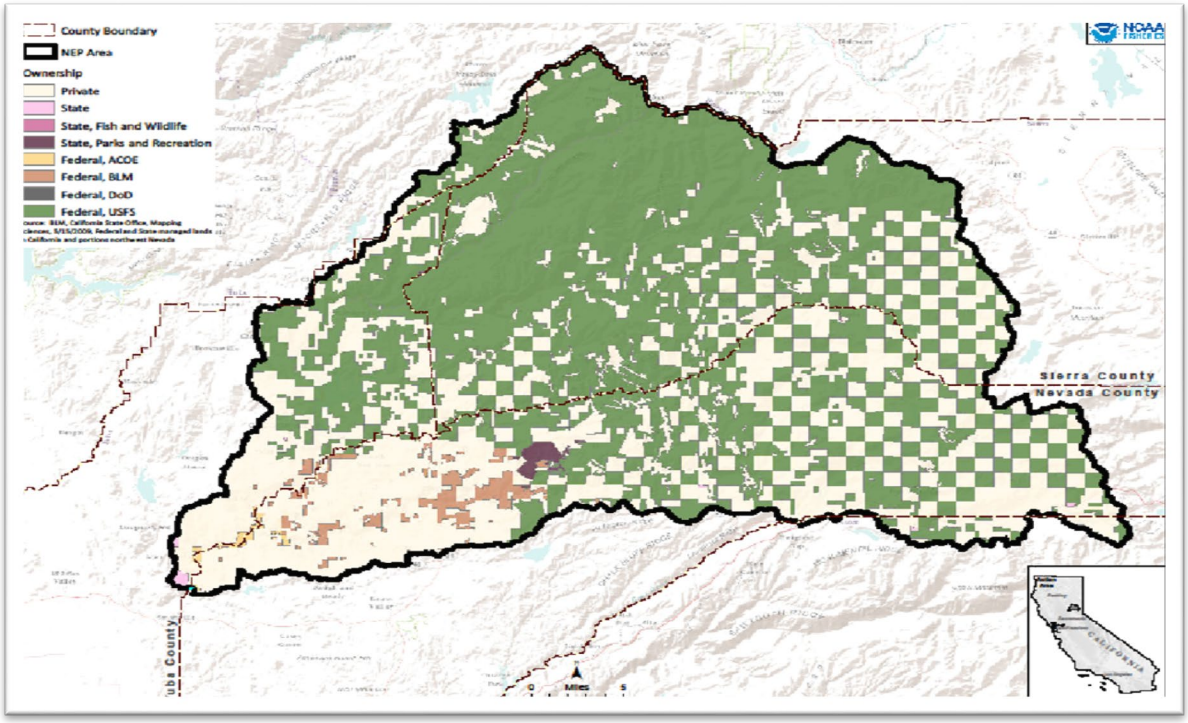

Figure 7. Land ownership patterns in the NEP area. As described above, a large proportion is under Federal or state management.

5.7 Tourism and Recreation

The affected environment for tourism and recreation includes Yuba, Nevada, and Sierra Counties. Placer, Plumas, and Butte Counties were not included in the analysis area because only a relatively small portion of sparsely inhabited areas in those counties are located within the NEP area (261.4 acres for Butte County, 11,542.3 acres for Placer County, 12,000.9 acres for Plumas County). Local residents within Yuba, Nevada, and Sierra Counties would most likely be affected by the alternatives because they live close to, or within, the NEP area.

Tourism and recreation are important components of Sierra and Nevada Counties' economies, and lesser component of the Yuba County economy (Sierra Nevada Conservancy 2011). Travel spending includes categories such as: (a) food and beverage services; (b) accommodations; (c) retail sales; (d) arts; entertainment and recreation; (e) ground transportation; (f) food stores; and (g) air transportation. On a per capita basis, travel spending per county resident ranged from approximately $1,100 in Yuba County, $2,900 in Nevada County, and $5,800 in Sierra County (Sierra Nevada Conservancy 2011). The relatively high proportion of travel spending per resident in Sierra County is likely due to the relatively low number of total residents in the county.

Many of the lakes (e.g., French Lake, Bowman Lake), reservoirs (Jackson Meadows, Englebright) and impoundments (Milton Diversion Impoundment) in the NEP area are stocked with trout by CDFW, and are popular fishing locations (NID 2008). On-stream fishing opportunities, particularly for rainbow and brown trout, also exist throughout the NEP area. CDFW fishing regulations specify fishing in the NYR and MYR may occur from the last Saturday in April through November 15 (CDFW 2020). Special fishing regulations exist on the MYR along the Jackson Meadows Dam Reach and Milton Diversion Impoundment, which include a 12-inch maximum size limit, a daily bag limit of 2 trout, and only artificial lures with barbless hooks. On the NYR, the twelve-mile reach between Sierra City and Downieville is designated by CDFW as special regulation water where only artificial lures (flies) with barbless hooks and a two fish limit are allowed from the last Saturday in April through November 15th. From Ladies Canyon Creek downstream to NBB Reservoir, only artificial lures with barbless hooks may be used from November 16 through the Friday preceding the last Saturday in April.

Other recreation opportunities in the three counties include sightseeing, gold panning, mountain biking, camping, waterfowl hunting, upland hunting (e.g., deer, pigeon, quail)[11], hiking, swimming, horseback riding, off-road vehicle trails[12], climbing, and rafting.

5.8 Socioeconomics

The affected environment for socioeconomic impacts comprises all of Yuba, Sierra, and Nevada Counties because local residents within these areas would likely be affected by the alternatives. The northern portion of the NEP area is within Sierra County the southern portion is within Nevada County and the western portion is within Yuba County. A portion of the NEP area also includes Plumas County (12,001 acres or 1.7 percent of the NEP), Placer County (11,542 acres or 1.6 percent of the NEP) and Butte County (261 acres or 0.04 percent of the NEP). The relative proportion of these Counties to the NEP area is small and alternatives are not anticipated to have direct or indirect effects on the socioeconomics of those three counties, which will not be discussed further.

Current conditions described in this section are combined with current conditions described in Subsection 5.7 (Tourism and Recreation), to provide background information for a comprehensive framework for the socioeconomic effects.

Nevada and Yuba Counties are moderately populated compared to the rest of California and Sierra County is sparsely populated (Table 11). The unincorporated portion of Nevada County contains

[11] http://www.sierracountygold.com/Recreation/
[12] https://sierracountychamber.com/page-18152

approximately 67 percent of the county's population (Nevada County 2016). The unincorporated portion of Yuba County contains approximately 79 percent of the county's population (Yuba County 2011). The unincorporated portion of Sierra County contains approximately 76 percent of the county's population (United States Census Bureau 2019). The alternatives are not anticipated to have direct or indirect effects on human population trends, and population trends will not be discussed further.

Table 11. Population levels in Nevada, Yuba, and Sierra Counties, communities, and the State of California (United States Census Bureau 2019).

County/Community	1990	2000	2010	2016 (est.)
Nevada County	78,510	92,033	98,748	99,107
Truckee	3,484	13,864	16,180	16,391
Grass Valley	9,048	10,922	12,861	12,934
Alta Sierra*	5,709	6,522	7,011	6,902
Lake Wildwood*	4,377	4,868	5,415	5,293
Lake of the Pines*	3,716	3,716	3,704	3,790
Nevada City	2,855	3,001	3,068	3,145
Penn Valley	1,242	1,387	1,162	1,599
Yuba County	58,228	60,219	72,148	75,275
Linda*	13,033	13,474	17,773	18,364
Olivehurst*	9,738	11,061	13,298	13,928
Marysville	12,324	12,268	12,072	12,249
Plumas Lake	312	270	5,161	6,380
Wheatland	1,631	2,275	3,456	3,783
Loma Rica*	1,320	1,533	1,761	1,881
Sierra County	3,318	3,555	3,240	2,947
Loyalton	931	862	769	695
Sierra Brooks*	402	464	478	418
Downieville	280	296	246	207
Sierra City*	295	328	258	285
Verdi*	146	194	185	92
State of California	29,760,021	33,871,648	37,332,685	39,250,017

* https://www.bestplaces.net/people/city/california/

A substantial portion of Nevada and Sierra Counties are under the management of Federal or state resource management agencies. The economy of Nevada County is based on retail trade, manufacturing, health care, professional services, and construction (Nevada County 2016). Employment sectors of Sierra County include government, service sectors, goods production, agriculture (including forestry, fishing and hunting) and construction (Data USA 2018). Recreational users and recreational opportunities also form key components of the Sierra County economy (Sierra County 2012).

In contrast to Nevada and Sierra Counties, a larger portion (approximately 77 percent) of Yuba County is privately owned (Yuba County 2011). Important employment sectors in Yuba County are agriculture (including forestry, fishing and hunting), service sector, government (including Beale Air Force Base) retail, transportation, public utilities and construction (Yuba County 2011; Data USA 2018). Timber production and harvesting are major components of the local economy in Yuba County, and the County has an interest in maintaining timber harvesting as a viable industry, along with the other open space co-benefits of the County's forestlands (Yuba County 2011).

Average monthly employment during 2016 was 41,473 in Nevada County, 25,499 in Yuba County, and 1,110 in Sierra County (Table 11). As of November, 2020, the poverty rate in Nevada County was 10.3 percent, 13.3 percent in Sierra County, and 17.3 percent in Yuba County (US Census Bureau 2020). Unemployment rate as of August 2018, in Nevada County was 3.4 percent, 6.0 percent in Yuba County and 5.1 percent in Sierra County (United States Department of Labor 2018). Trends in economic bases, wages, employment, and unemployment in the three counties would be expected to continue as under existing conditions under all alternatives, and will not be discussed further.

Table 12. Average monthly employment, median household income, land area, and population of Nevada, Yuba, and Sierra Counties, and the State of California.

Parameter	Nevada County	Yuba County	Sierra County	State of California
Average Monthly Employment (2016)[1]	41,473	25,499	1,110	16,295,763
Median Household Income (2015) ($)[1]	56,521	46,892	42,833	64,500
Land Area (square miles)[2]	974	644	962	155,779
Persons per Square Mile (2020)[2]	103.1	114.2	3.4	253.7

[1] http://datausa.io/profile/geo/
[2] U.S. Census Quick Facts for Nevada, Yuba, and Sierra Counties 2020

As discussed above, forestry is an important industry within the NEP area. To alleviate potential concerns regarding economic implications associated with future anadromous salmonid reintroductions

above barrier dams in California, NMFS worked with CDFW and California's Board of Forestry and Fire Protection to amend/clarify the California Forest Practice Rules. The California Forest Practice Rules for Anadromous Salmonid Protection (ASP) regulations previously applied to watersheds where listed anadromous salmonids are "currently present or can be restored" and are more protective than the standard California Forest Practice Rules. Watersheds covered by the ASP regulations excluded watersheds above permanent dams, including Englebright Dam.

In July 2015, NMFS submitted a letter to California's Board of Forestry and Fire Protection requesting a revision to language in the ASP regulations. NMFS requested inclusion of a provision that specifically excluded listed populations of salmonids, when designated as experimental pursuant to ESA section 10(j), and for which an ESA section 4(d) rule has been promulgated. The Board of Forestry voted to accept the new language, and the new regulation went into effect in January 2017. Consequently, the 2017 California Forest Practice Rules (Title 14, California Code of Regulations, Chapters 4, 4.5 and 10) were amended to include the following language under section 898.2 (Special Conditions Requiring Disapproval of Plans).

> *"(d) Implementation of the plan as proposed would result in either a "taking" or finding of jeopardy of wildlife species listed as rare, threatened or endangered by the Fish and Game Commission, the National Marine Fisheries Service, or Fish and Wildlife Service, or would cause significant, long-term damage to listed species. The Director is not required to disapprove a plan under either of the following circumstances:*
>
> > *(1) Which would result in a "taking" if the "taking" is incidental and is authorized by a wildlife agency acting within its authority under state or federal endangered species acts.*
> >
> > *(2) Where anadromous salmonid populations are designated as an experimental population under Section 10(j) of the federal Endangered Species Act, and corresponding regulations under Section 4(d) of the federal Endangered Species Act for those populations provide an exception from take prohibitions under the federal Endangered Species Act for activities subject to the California Forest Practice Rules, and federal and state agencies determine no further take authorizations are necessary, under the federal Endangered Species Act or the California Endangered Species Act*."

5.9 Cultural Resources

Cultural resources include prehistoric and historical archaeological sites, historic structures, and traditional cultural properties (places that may or may not have human alterations, but are important to the cultural identity of a community or Native American tribe). The extent of potential effects of the alternatives on these resources includes the NEP area, the lower Yuba River, the lower Feather River and the lower Sacramento River watershed to the confluence with the San Joaquin River. Areas outside

of the NEP area were included in the effects analysis due to the potential historical importance of CV spring-run Chinook salmon to Native American tribes as the salmon migrated up the lower Sacramento, lower Feather, and lower Yuba Rivers to their spawning grounds in the upper Yuba River. Much of the information on prehistoric context, ethnohistoric context and historic-era context was obtained from the Horizon Water and Environment, LLC (2016) Cultural Resources Assessment Report for the Hallwood Side Channel and Floodplain Restoration Project EA/IS.

5.9.1 Prehistoric Context

Three cultural horizons have been delineated in the Sacramento Valley; the Early, the Middle and the Late horizons, with respective initial dates of 2,500 B.C., 1,500 B.C. and 500 A.D. (Elsasser 1978 *in* Horizon Water and Environment, LLC (2016)). The pattern concept allows for a fluid evolution of culture through time that acknowledges the influence of local environments and economic systems, including trade networks (Fredrickson 1973; Moratto 2004 *both in* Horizon Water and Environment, LLC (2016)). These patterns could last for different lengths of time in localized areas. The revised cultural chronology is currently identified by the Windmiller Pattern, the Berkeley Pattern, and the Augustine Pattern.

The Windmiller Pattern dominated the region from approximately 2,000 B.C. to 500 B.C. Relative to subsequent periods, Windmiller subsistence appears to have focused largely on hunting, as evidenced by large quantities of faunal remains and projectile points in the archaeological record. However, fishing and seed procurement tools are also evident in the archaeological record. With regard to tool technology, both flaked stone and ground stone were used. The Windmiller Pattern is also characterized by distinctive burial patterns, with bodies typically buried fully extended, face down, with the head oriented toward the west, and the inclusion of funerary objects (Moratto 2004; Wallace 1978 *both in* Horizon Water and Environment, LLC (2016)).

The Berkeley Pattern was present from approximately 500 B.C. to 500 A.D. This pattern is represented by an apparent increase in the use of pestles and mortars, indicative of an intensified reliance on acorns as a principal dietary staple. In addition, the Berkeley Pattern exemplifies a well-developed bone industry, distinctive diagonal flaking of large concave-base points, and marked forms of shell beads and ornaments. In contrast to the Windmiller Pattern, Berkeley burials are found in a flexed position with variable orientation and fewer funerary artifacts (Moratto 2004 *in* Horizon Water and Environment, LLC (2016)).

The Augustine Pattern occurred from approximately 500 A.D. to contact in the 1800s. This pattern is thought to reflect the southern expansion of Wintuan peoples through the Sacramento Valley. The pattern is distinguished by large populations with complex social systems heavily dependent on fishing, hunting, and the gathering of seeds, nuts, tubers, and other plant-based foods. Tool technology is represented by shaped pestles and mortars, bone awls, the bow and arrow, and, in some cases, pottery. There was considerable variation in mortuary practices including flexed burials, cremation, and funerary object differentiation (Moratto 2004 *in* Horizon Water and Environment, LLC (2016)).

5.9.2 Ethnohistoric Context

The proposed project area lies within the ancestral territory of the Nisenan, or Southern Maidu. The Nisenan ancestral territory includes the drainages of the Yuba, Bear, and American Rivers, and the lower drainages of the Feather River, and extends from the crest of the Sierra Nevada to the banks of the Sacramento River. The northern boundary was near Honcut Creek, while the southern limits of the territory was just south of the American River. Although Kroeber (1925:393 *in* Horizon Water and Environment, LLC (2016)) identified three dialects among the Nisenan (Valley Nisenan, Northern Hill Nisenan, and Southern Hill Nisenan), Beals's (1933:338-339 *in* Horizon Water and Environment, LLC (2016)) study suggests that there were three dialects among the Hill Nisenan, which were defined by the major river drainages within the territory. From north to south, the dialect divisions were from the Bear River and north, between the Bear River and the Middle Fork American River, and from the American River and south. The NEP area is in the territory occupied by the northernmost Hill Nisenan group who spoke the Bear River dialect of the Nisenan language.

The Nisenan territory was divided into several political divisions or "tribelets," each with its own headman who resided in the larger villages. According to Kroeber (1925:831 *in* Horizon Water and Environment, LLC (2016)), the larger villages could have had populations in excess of 500 individuals, although small settlements consisting of 15 to 25 people and extended families were common.

Nisenan people followed a seasonal round of food gathering that relied heavily on acorns. Acorn harvests in the early fall provided the region's native inhabitants with a reliable, large-scale food source that could sustain populations through the winter months. Various roots, nuts, wild onion, wild sweet potato, and many varieties of grasses, berries, and fruits were also gathered at various times. Many items were processed and stored for winter use, although fresh fruits, such as various berries, wild plums, grapes, and other native fruits, were likely consumed fresh (Wilson and Towne 1978 *in* Horizon Water and Environment, LLC (2016)).

Hunting was accomplished using various techniques and weapons, including the bow and arrow, drives, and decoys. Nets, traps, rodent hooks, and fire were used in hunting small game. Fish could be caught with nets, gorges, hooks, and harpoons within the larger perennial drainages of the foothill regions. Salmon and sturgeon were caught with the aid of weirs. Freshwater clams and mussels were also gathered in the larger waterways, such as the Sacramento River.

Euro-American contact with the indigenous cultures began with infrequent excursions by explorers and trappers traveling through the Sacramento and San Joaquin valleys in the early 1800s. In general, indigenous lifeways remained stable for centuries until the early to middle decades of the nineteenth century. With the influx of Europeans during the Gold Rush era, the population was further reduced because of disease, starvation and violent relations with the miners. Ultimately, Euro-American practices during the Gold Rush era caused the destruction and near elimination of native cultures throughout the analysis area.

5.9.3 Historical-Era Context

Present-day Yuba County was on the far northeastern frontier of Spanish, and then Mexican, California, and most of the explorers of that era largely remained in the plains west of the Feather River. Gabriel Moraga during his 1808 expedition, applied the name “Rio de las Plumas” to the Feather River. It is also possible that he gave the Yuba River its name, “the Rio de las Uvas” (Kyle et al. 2002:572 *in* Horizon Water and Environment, LLC (2016)).

The Yuba River quickly became a focus for gold mining after the initial discovery of gold at Sutter’s Mill on the American River in January 1848. By June of that year, mining camps had sprung up near Timbuctoo, Parks Bar, and Rose Bar (Thompson and West 1879:61 *in* Horizon Water and Environment, LLC (2016)) along the Yuba River. Intensive mining occurred along the Yuba River initially in the form of gold panning, progressing to hydraulic mining, hard rock mining and dredging. Numerous closed and abandoned historical mines are present throughout the NEP area as well as extant Gold Rush era towns such as Downieville, Sierra City, Allegheny, Bloomfield and Washington.

5.9.4 Native American Consultation

Native American tribes on the Bureau of Indian Affairs (BIA) list of federally recognized tribes in the cultural resources analysis area include:

- Berry Creek Rancheria of Maidu Indians
- Mooretown Rancheria of Maidu Indians of California
- Estom Yumeka Maidu Tribe of the Enterprise Rancheria
- United Auburn Indian Community of the Auburn Rancheria of California
- Shingle Springs Band of Miwok Indians
- Washoe Tribe of Nevada and California
- Cachil Dehe Band of Wintun Indians (Colusa Indian Community)
- Ione Band of Miwok Indians
- Kletsel Dehe Wintun Nation
- Mechoopda Indian Tribe of Chico Rancheria
- Paskenta Band of Nomlaki Indians

No tribes, including Nisenan (or Southern Maidu), retain ancestral lands in the NEP area, but tribes were consulted because of their cultural connection to the Yuba River watershed. Tribes not currently on the Bureau of Indian Affair's (BIA) list of federally recognized tribes but with presence and interest in the cultural resources analysis area include:

- Tsi Akium Maidu
- KonKow Valley Band of Maidu
- Pakan'yani Maidu of Strawberry Valley Rancheria
- Greenville Rancheria
- Colfax-Todds Valley Consolidated Tribe
- Nashville Enterprise Miwok-Maidu-Nishinam Tribe

Both BIA recognized and non-BIA recognized tribes were contacted by NMFS via letter in May, 2017 and again in May 2020. These letters described the Proposed Action and invited the tribes to request a meeting to provide their input on this project. The United Auburn Indian Community of the Auburn Rancheria of California requested further information on the project which was provided via

conference call on June 15, 2017. In response to the May 2020 letter the tribe, via email, had no questions or concerns over the project. The Washoe Tribe of Nevada and California, via email, expressed support for the project. No other responses were received. On July 7, 2020, NMFS initiated consultation with the California State Historic Preservation Officer pursuant to the National Historic Preservation Act on the proposed action on the Proposed Action. Pursuant to 36 CFR 800.5(c)(1) the California State Historic Preservation Officer, in a letter to NMFS dated August 26, 2020, stated she did not object to NMFS' determination that the Proposed Action will result in no adverse effect to historic properties.

5.10 Environmental Justice

The analysis area for environmental justice comprises Yuba, Sierra, and Nevada Counties. This subsection was prepared in compliance with Presidential Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations (EO 12898), dated February 11, 1994, and Title VI of the Civil Rights Act of 1964. Both EO 12898 and Title VI address persons belonging to the following target populations:

- Minority – all people of the following origins: Black, Asian, American Indian and Alaskan Native, Native Hawaiian or Other Pacific Islander, and Hispanic.
- Low income – persons whose household income is at or below the U.S. Department of Health and Human Services poverty guidelines.

Through the NEPA process, NMFS will ensure that the requirements of Executive Order 12898 regarding environmental justice are implemented, including all appropriate tribal consultation activities.

Environmental justice impacts refer to disproportionately high and adverse human health or environmental effects of a Proposed Action on low-income populations, minority populations, or Indian tribes (Table 13). The current Health and Human Services poverty guidelines set the poverty line for a family of four at $26,200 for 2020 ($25,750 for 2019, and $254,701 for 2018). In Sierra County, about 13.3 percent of residents live in poverty, about 10.3 percent of residents in Nevada County live in poverty, and about 17.2 percent of residents in Yuba County live in poverty (U.S. Census Bureau 2020).

Table 13. Minority and Hispanic populations in Sierra, Yuba, and Nevada Counties from the 2010 U.S. Census and ACS 5-year estimate (2015 and 2016).

Minority/Hispanic Populations	Sierra County	Yuba County	Nevada County	California
Total[13]	**3,021**	**75,275**	**98,764**	**39,250,017**
White	2,658	41,676	84,497	14,879,258
Black or African-American	6	2,377	462	2,160,795
American Indian or Alaska native	44	740	924	142,191
Asian	12	5,214	1,408	5,192,548
Native Hawaiian and Other Pacific Islander	2	214	71	139,009
Two or more races	79	3,246	2,199	1,072,500
Hispanic	245	19,611	8,902	14,750,686
Other	0	359	107	84,477
Percent minority (%)[14]	12.7	43.2	14.3	61.3

Source: https://factfinder.census.gov/

General directive in Executive Order 12898 requires that each Federal agency identify and address, as appropriate, "disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations…." There are also several provisions of the Executive Order and a number of supporting documents agencies should refer to when identifying and addressing environmental justice concerns in the NEPA process (CEQ 1997). Executive Order 12898 provides for agencies to collect, maintain, and analyze information on patterns of subsistence consumption of fish, vegetation, or wildlife. Where an agency action may affect fish, vegetation, or wildlife, that agency action may also affect subsistence patterns of consumption and indicate the potential for disproportionately high and adverse human health or environmental effects on low-income populations, minority populations, and Indian tribes (CEQ 1997). The following two issues related to consumption patterns were considered.

- ***Subsistence consumption of fish and wildlife*** - Dependence by a minority population, low-income population, Indian tribe or subgroup of such populations on indigenous fish, vegetation and/or wildlife, as the principal portion of their diet.

[13] County population totals differ in individual race estimates due to different available data sets from the US Census Bureau. Estimates based on race were from a 2015 data set while County population totals were based on a 2016 data set.
[14] Estimates based on totals from US Census Bureau's 2015 data set.

- ***Differential patterns of subsistence consumption*** - Differences in rates and/or patterns of subsistence consumption by minority populations, low-income populations, and Indian tribes as compared to rates and patterns of consumption of the general population.

6.0 ENVIRONMENTAL CONSEQUENCES

6.1 Analysis Approach and Alternative Description Summaries

This section evaluates the potential effects of the alternatives on the biological, physical, and human environments described in Section 5, Affected Environment. The affected environment resource information establishes baseline conditions used in the analysis under each alternative in Section 6, Environmental Consequences. For this analysis, baseline conditions reflect expected conditions under the No-action Alternative (Subsection 4.1, Alternative 1 (No-action)). Subsequently, each resource under each action alternative is compared to the No-action Alternative to assess changes in conditions relative to the affected environment. A summary of resource effects under each alternative is provided at the end of this section.

The NEP area is comprised of *all* tributaries that originate from the crest of the Sierra Nevada Mountains and drain into Englebright Reservoir (Subsection 3.1). The potentially affected environment is broader in scope than the NEP area for some of the resources analyzed. Therefore, the analysis area encompasses the geographic area in which the effects of the action alternatives would be experienced and areas outside of the NEP area.

Under the No-action Alternative (Subsection 4.1), NMFS would: (1) not designate all CV spring-run Chinook salmon in the NEP area as a NEP under ESA section 10(j); (2) not authorize the release of a NEP of CV spring-run Chinook salmon in the NEP area; and (3) not establish take prohibitions for the NEP of CV spring-run Chinook salmon in the NEP area and exceptions for particular activities under ESA section 4(d). Assuming no major changes to present circumstances, recovery of the CV spring-run Chinook salmon ESU would largely depend upon the extant population and recovery actions below dams in the CV.

Under Alternative 2 (Subsection 4.2), NMFS would: (1) designate all CV spring-run Chinook salmon in the NEP area as an NEP under ESA section 10(j); (2) authorize the release of a NEP of CV spring-run Chinook salmon in the NEP area; and (3) establish take prohibitions for the NEP of CV spring-run Chinook salmon in the NEP area and exceptions for particular activities under ESA section 4(d). Under Alternative 2, proposed ESA section 4(d) protective regulations would provide exceptions for take of NEP fish in the NEP area appropriate to the circumstances, including take that is incidental to an otherwise lawful activity and unintentional, not due to negligent conduct. Downstream of the NEP area (downstream of Englebright Dam) the current ESA take prohibitions and exceptions that apply to CV spring-run Chinook salmon would remain in effect (see 50 CFR 223.203). Under Alternative 2, if the

reintroduced population became established, the upper Yuba River experimental population would contribute to the recovery of the ESU.

Under Alternative 3 (Subsection 4.3), NMFS would: (1) designate all CV spring-run Chinook salmon in the NEP area as a NEP under ESA section 10(j); (2) authorize the release of a NEP of CV spring-run Chinook salmon in the NEP area; and (3) establish take prohibitions for the NEP of CV spring-run Chinook salmon in the NEP area and exceptions that are the same as the current ESA section 4(d) rule protective regulations (50 CFR 223.203). NMFS would apply the current ESA section 4(d) rule protective regulations (50 CFR 223.203) for the reintroduced fish when they are in the NEP area, rather than establishing a separate ESA section 4(d) rule for the NEP area. Within the NEP area (Figure 1), take would be prohibited unless authorized under section 10 of the ESA or a take limit (exception) specified in 50 CFR 223.203 applies. Under Alternative 3, if the reintroduced population became established, the upper Yuba River experimental population would contribute to recovery of the ESU.

Comparing the level of protection afforded to the NEP experimental population under Alternative 2 and Alternative 3 to the No-action Alternative is not possible because designation and authorization for release of a NEP in the NEP area would not occur under the No-action Alternative.

6.1.1 Determination of Whether Effects of an Alternative are Significant

NEPA requires Federal agencies to examine the impacts of major federal actions significantly affecting the quality of the human environment (NMFS 2009). According to the CEQ regulations (40 CFR 1508.27), the determination of a significant impact is a function of both context[15] and intensity[16]. The following factors should be considered in evaluating intensity (40 CFR 1508.27):

- Impacts may be both beneficial and adverse – a significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.
- Degree to which public health or safety is affected.
- Unique characteristics of the geographic area.
- Degree to which effects on the human environment are likely to be highly controversial.

[15] The significance of an action is analyzed in several contexts such as society as a whole, the affected region, the affected interests, and the locality.
[16] Refers to the severity of an impact.

- Degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.
- Degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.
- Whether the action is related to other actions with individually insignificant but cumulatively significant impacts.
- Degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places, or may cause loss or destruction of significant scientific, cultural, or historic resources.
- Degree to which the action may adversely affect an endangered or threatened species or its critical habitat as defined under the ESA.
- Whether the action threatens a violation of Federal, state, or local law or requirements imposed for environmental protection.

Significance is a function of the short-term, long-term, and cumulative impacts, both positive and negative, of the action on that environment. To determine significance, impact severity must be examined in terms of: (1) the type, quality, and sensitivity of the resource involved; (2) the location of the proposed project; (3) the duration of the effect (short- or long-term); and (4) other considerations of context (NMFS 2009).

6.2 Effects on Aquatic Habitat

For aquatic habitat, the analysis area is the same as the NEP area described in Subsection 3.1. The following discussion focuses on different effects to aquatic habitat in the NEP area, including water quality, fish passage, and habitat availability and quality, that could occur as a result of implementing the alternatives.

The alternatives vary in extent to which authorization for reintroduction of CV spring-run Chinook salmon would have potential to impact aquatic habitat in the NEP area. Under all alternatives, the NEP area would continue to have variable flows and water temperatures as described in Subsection 5.3.1 and 5.3.4. Under all alternatives, environmental laws would continue to regulate, and habitat restoration actions would continue to mitigate, human impacts from agriculture, timber harvesting, mining, and

commercial and residential development. These human induced impacts can directly influence water quality parameters limiting salmon productivity, such as sediment levels (fine and coarse), chemical contamination (e.g., pesticide and herbicide use in agriculture), and municipal waste (e.g., high nitrogen levels).

6.2.1 Effects on Fish Passage

6.2.1.1 Alternative 1 (No-action) –No Designation of a Nonessential Experimental Population, No Authorization for Reintroduction, and No Adoption of Protective Regulations

Under the No-action Alternative, NMFS would not designate a NEP of CV spring-run Chinook salmon in the NEP area, authorize the release of a NEP of CV spring-run Chinook salmon in the NEP area, or adopt protective regulations. Therefore, the No-action Alternative would not facilitate, nor would it preclude, a future reintroduction program. Under the No-action Alternative, efforts to reintroduce CV spring-run Chinook salmon would meet increased resistance from landowners and other user groups in the upper Yuba River watershed.

6.2.1.2 Alternative 2 (Proposed Action/Preferred Alternative) – Designation of a Nonessential Experimental Population, Authorization for Reintroduction, and Adoption of Limited Protective Regulations

In contrast to the No-action Alternative, under Alternative 2, NMFS would designate a NEP of CV spring-run Chinook salmon in the NEP area and authorize release of a NEP of CV spring-run Chinook salmon in the NEP area under ESA section 10(j), and adopt limited protective regulations under ESA section 4(d), all of which would be expected to facilitate a future reintroduction program. Under Alternative 2, efforts to reintroduce CV spring-run Chinook salmon would meet reduced resistance from landowners and other user groups in the upper Yuba River.

6.2.1.3 Alternative 3 – Designation of a Nonessential Experimental Population, Authorization for Reintroduction, and Adoption of Current Protective Regulations

Similar to Alternative 2, under Alternative 3, NMFS would designate a NEP of CV spring-run Chinook salmon in the NEP area and authorize release of a NEP of CV spring-run Chinook salmon in the NEP area under ESA section 10(j), and adopt protective regulations under ESA section 4(d), all of which would be expected to facilitate a future reintroduction program. Unlike Alternative 2, under Alternative 3, NMFS would adopt the more restrictive current ESA section 4(d) rule protective regulations that apply to CV spring-run Chinook salmon downstream of Englebright Dam for the NEP area. Adoption of more restrictive regulations would likely result in increased resistance from landowners and other user groups to a future CV spring-run Chinook salmon reintroduction program.

6.2.2 Effects on Water Quality

The analyses below focus on how water quality, particularly water temperature, could be affected by the action alternatives, relative to the No-action Alternative.

6.2.2.1 Alternative 1 (No-action) –No Designation of a Nonessential Experimental Population, No Authorization for Reintroduction, and No Adoption of Protective Regulations

Under the No-action Alternative, NMFS would not designate a NEP of CV spring-run Chinook salmon in the NEP area, authorize the release of a NEP of CV spring-run Chinook salmon in the NEP area, or adopt protective regulations; thus, the No-action alternative would not facilitate a future reintroduction program. The absence of marine-derived nutrient transport into the NEP area would continue under the No-action Alternative. Availability of additional food for rearing fishes, growth of riparian forests, and salmonid productivity would continue to be the same as it is now. In addition, because no decomposing salmon carcasses would be available as a result of the No-action Alternative, biological oxygen demand would not increase, and there would be no change to dissolved oxygen levels in the upper Yuba River.

As discussed in Subsection 5.3.3, California law requires the SWRCB regulate discharges (including those from septic systems) to ensure long-term water quality protection (SWRCB 2020). Every new or replacement septic system in the NEP area requires a permit, either through local jurisdiction (city or county), or the Lahontan RWQCB. Under the No-action Alternative, it is anticipated that new and replacement septic systems and leach fields in the upper Yuba River portions of Yuba, Sierra and Nevada Counties would continue to adhere to existing health department requirements, setback requirements, building permits, inspections, and state and county approvals.

Under the No-action Alternative, existing dams and water diversion projects located in the upper Yuba River would continue to operate, and would continue to affect stream flow in the NEP area. Existing dams would continue to regulate downstream flows in the NEP area with the exception of the NYR upstream of NBB Reservoir, which is largely unregulated. Overall, stream flows in the NEP area would continue to be at their lowest and relatively stable during the summer and fall, and exhibit more flow variability and peak flows in response to precipitation events and snowmelt runoff from the winter through the spring (Subsection 3.3.2).

Under the No-action Alternative, water quality conditions in the NYR upstream of NBB Reservoir would be the same as under existing conditions (Subsection 5.3.3). The NYR (NBB Reservoir Dam to Englebright Reservoir reach), MYR and the SYR would continue to be listed as impaired waterbodies

due to mercury concentrations pursuant to CWA section 303(d). Under the No-action Alternative, Yuba River tributaries, Deer, Humbug, Kanaka, Little Deer Creeks, and Englebright and Scotts Flat Reservoirs would continue to be listed for water quality impairments to beneficial uses, as defined pursuant to CWA section 303(d) (CVRWQCB 2018).

Overall, there would be no changes in water quality under the No-action Alternative.

6.2.2.2 Alternative 2 (Proposed Action/Preferred Alternative) – Designation of a Nonessential Experimental Population, Authorization for Reintroduction, and Adoption of Limited Protective Regulations

Although the administrative actions associated with Alternative 2 would have no direct effect on water quality, Alternative 2 does have the potential to indirectly affect water quality in the future - primarily as a result of facilitating reintroduction of adult salmon (and consequently their carcasses) into the NEP area as part of a future reintroduction program, which would increase the amount of available marine-derived nutrients in the upper Yuba River. An increase in decomposing salmon carcasses resulting from a future reintroduction program could lead to an increase in biological oxygen demand and reduce dissolved oxygen levels that negatively affect water quality. However, it is unlikely that a large enough concentration of carcasses would be present in any given location to cause measurable adverse effects on water quality. Unlike the No-action Alternative, an increase in future returning adult CV spring-run Chinook salmon carcasses under Alternative 2 would likely have a beneficial effect on availability of food for rearing fishes, growth of riparian forests, and salmonid productivity through the addition of marine-derived nutrients from the carcasses. The increased transport of marine-derived nutrients and trace elements from returning Chinook salmon adults associated with reintroduction is expected to enhance stream productivity (Scheuerell et al. 2005). Bilby et al. (2002) found a positive linear relationship between the biomass of juvenile anadromous salmonids and the abundance of carcass material at sites in the Salmon (Idaho) and John Day (Oregon) rivers, suggesting that spawning salmon may influence aquatic productivity and the availability of food for rearing fishes.

Salmon carcasses also appear to promote the growth of riparian forests, a source of large woody material and stream shading (Bilby et al. 1998; Cederholm et al. 2000; Gresh et al. 2000). Helfield and Naiman (2001) hypothesized several pathways for the transfer of marine-derived nutrients from streams to riparian vegetation, including transfer of dissolved nutrients and trace elements from decomposing carcasses into shallow subsurface flow paths, and the dissemination in feces, urine, and partially eaten carcasses by bears and other salmon-eating fauna (Gende et al. 2002). Studies suggest that the biomass of carcasses beneficially affects productivity of salmonids and salmonid rearing

habitat, but functional and quantitative relationships are poorly understood and difficult to generalize from the specific conditions studied (Bilby et al. 1998; Cederholm et al. 2000; Gresh et al. 2000).

Instream flow conditions in the NEP area under Alternative 2 are anticipated to be the same as those described for the No-action Alternative. Designation of an experimental population and authorization for reintroduction in the NEP area would have no effect on CWA section 303(d) listings of tributaries and reservoirs listed for water quality impairments (CVRWQCB 2018). Additionally, designation of an experimental population and authorization for reintroduction in the NEP area would not cause any effects on other baseline aquatic habitat water quality components such as sedimentation levels. There would be no streambed disturbance greater than baseline levels, other than spawning by reintroduced adult spring-run Chinook salmon. Increased disturbance of streambeds by spawning salmon under Alternative 2 would be expected to result in local improvements in spawning gravel quality because the redd construction process loosens and winnows the gravel and decreases the amount of fine sediments (Kondolf et al. 1993). Under Alternative 2, water temperatures are expected to remain the same as under the No-action Alternative (Subsection 5.3, Subsection 6.2.3).

Under Alternative 2, it is anticipated that new and replacement septic systems and leach fields in Yuba, Sierra and Nevada counties would continue to be required to adhere to existing health department requirements, setback requirements, building permits, inspections, and state and county approvals.

In summary, relative to No-action Alternative, Alternative 2 would not result in adverse effects to water quantity in the NEP area and may result in beneficial effects to the aquatic ecosystem.

6.2.2.3 Alternative 3 – Designation of a Nonessential Experimental Population, Authorization for Reintroduction, and Adoption of Current Protective Regulations

Although the administrative actions associated with Alternative 3 would have no direct effect on water quality or water resource management, Alternative 3 does have the potential to indirectly affect these components in the future - primarily due facilitating a future reintroduction program with increased regulatory restrictions. Under Alternative 3, in contrast to Alternative 2, ESA section 9 restrictions and ESA section 4(d) rule protective regulation limits that apply to CV spring-run Chinook salmon in the lower Yuba River downstream of Englebright Dam would be applied to the NEP area when fish are reintroduced as part of a future action. Application of these regulatory restrictions on "take"[17] of the

[17] Under the ESA, the term "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct (ESA § 3(19)). Harm is defined to include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102).

NEP fish in the NEP area would result in additional restrictions on existing lawful activities in the NEP area.

For purposes of ESA section 7, the NEP would be treated as a species proposed for ESA listing, and only two provisions of ESA section 7 would apply: (1) section 7(a)(1) (requiring Federal agencies to use their authorities in furtherance of the purposes of the ESA by carrying out programs for the conservation of listed species); and (2) section 7(a)(4) (triggered by Federal actions that are likely to jeopardize the continued existence of a species proposed to be listed). Under Alternative 3, there would be no ESA section 7(a)(2) consultation requirement for Federal actions that may affect the NEP in the NEP area.

For non-Federal activities that occur in the NEP that may result in incidental take of CV spring-run Chinook salmon (e.g., replacing a culvert on a county road), unless one of the limits or exceptions under the current ESA section 4(d) rule protective regulations apply (50 CFR 223.203), an ESA section 10(a)(1)(b) incidental take permit would be required. An ESA section 10(a)(1)(b) permit is required for any "take" of endangered or threatened species incidental to, and not the purpose of, an otherwise lawful activity. A habitat conservation plan (HCP) must accompany an application for an incidental take permit (ITP). The HCP associated with the ITP ensures the effects of authorized incidental take are adequately minimized and mitigated. HCPs can cover a variety of residential, commercial, agricultural, and industrial development and any associated activities that may result in incidental take. HCPs can also cover resource extraction (e.g., mining), sustainable use (e.g., timber harvest, wind energy production, fisheries harvest), recurring activities (e.g., irrigation ditch clearing, water diversions, hydroelectric power, recreation), or ongoing operations and maintenance of existing or new projects (USFWS and NMFS 2016). Many activities covered by HCPs are projects with permanent effects, such as loss of habitat from a development of a residential sub-division. HCPs can also cover short-term activities that result in temporary effects, such as one-time take of a specific number of individuals from a bridge replacement. Some longer-term activities may result in temporary rather than permanent effects, such as rotational timber harvest (USFWS and NMFS 2016).

As discussed in Subsection 5.3.3, California law requires the SWRCB regulate discharges (including those from septic systems) to ensure long-term water quality protection (SWRCB 2020). Under Alternative 3, it is anticipated that new and replacement septic systems and leach fields in Yuba, Sierra and Nevada Counties would continue to be required to adhere to health department requirements, setback requirements, building permits, inspections, and state and county approvals. At present, it is uncertain whether initial and replacement setback requirements for on-site sewage disposal (i.e., septic

systems) in proximity to streams and riparian areas in the NEP area would become more stringent under Alternative 3. A potential exists for additional regulatory protections (e.g., city, county, RWQCB), inspections, and/or annual septic system maintenance (e.g., frequency of pumping) requirements to increase under Alternative 3. Increased protections, inspections, and maintenance would minimize the potential for improperly functioning septic systems to cause excessive ammonium/ammonia or nitrate discharges. Minimizing excessive discharges would protect surface waters and local water quality, thereby reducing harm to ESA-protected Chinook salmon in the NEP area.

Under Alternative 3, it is likely additional instream flow would be required to support and protect CV spring-run Chinook salmon in the NEP area. The increased regulatory requirements under Alternative 3 could have construction-related, operational and financial effects on local stakeholders in the upper Yuba River. A discussion of the other types of potential effects resulting from the regulatory requirements proposed under Alternative 3 is provided in Subsection 6.7.

Unlike the No-action Alternative, but similar to Alternative 2, Alternative 3 would have a small indirect effect on water quality resulting from an increase in adult Chinook salmon carcasses to the upper Yuba River to the extent it facilitates a future reintroduction program.

Alternative 3, in contrast to Alternative 2, could have a beneficial effect to water quantity and quality in the NEP area due to increased regulatory oversight. These other types of potential effects resulting from the regulatory requirements proposed under Alternative 3, as they pertain to increased water quality regulations and water resource management, are discussed in Section 6.7 (Socioeconomics).

6.2.3 Effects on Anadromous Salmonid Habitat Availability and Quality

6.2.3.1 Alternative 1 (No-action) –No Designation of a Nonessential Experimental Population, No Authorization for Reintroduction, and No Adoption of Protective Regulations

Under the No-action Alternative, NMFS would not designate a NEP of CV spring-run Chinook salmon in the NEP area, authorize the release of a NEP of CV spring-run Chinook salmon in the NEP area, or adopt protective regulations. Baseline conditions discussed in Subsection 5.3, Aquatic Habitat, generally reflect expected conditions under the No-action Alternative.

6.2.3.2 Alternative 2 (Proposed Action/Preferred Alternative) – Designation of a Nonessential Experimental Population, Authorization for Reintroduction, and Adoption of Limited Protective Regulations

The administrative actions associated with Alternative 2 would have no direct effect on anadromous salmonid habitat availability. Any effect of Alternative 2 on habitat availability would be indirect, resulting from facilitating a future reintroduction effort—namely, an increased incentive to create additional habitat or to improve existing habitat in the NEP area in the future. As under the No-action Alternative, suitable habitat for CV spring-run Chinook salmon spawning and rearing in the NEP area would continue to exist, and no substantial adverse effects are anticipated.

6.2.3.3 Alternative 3 – Designation of a Nonessential Experimental Population, Authorization for Reintroduction, and Adoption of Current Protective Regulations

In contrast to the No-action Alternative and Alternative 2, some long-term benefits to habitat would likely accrue over time under Alternative 3. Facilitation of a future reintroduction program with increased regulatory requirements as a result of Alternative 3 could lead to additional efforts by land and water managers to minimize the adverse effects of their actions through avoidance, minimization and/or mitigation measures focused on improving habitat availability and quality for listed CV spring-run Chinook salmon. Non-federal entities pursuing land and water-related actions that may result in incidental take of CV spring-run Chinook salmon within the NEP area would be required to complete an HCP and apply for an incidental take permit, unless one of the limits or exceptions under the current ESA section 4(d) rule protective regulations apply (50 CFR 223.203), which may involve restoration of degraded habitat, creation of new habitat, or habitat enhancement. The extent of these benefits are unknown, but no adverse effects to anadromous salmonid habitat availability and quality are anticipated.

6.2.4 Effects on Essential Fish Habitat

When assessing fishery management actions, NMFS's (2009) guidance on significance determinations states, an action could be significant if it causes substantial damage to the ocean and coastal habitats and/or EFH as defined under the MSA and identified in FMPs. An adverse effect is defined as any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if modifications reduce quality or quantity of EFH (NMFS 2017). Consequently, potential effects on EFH are evaluated as part of this EA.

The alternatives, if implemented, would occur in an area where EFH is designated but is currently unoccupied by Pacific salmon. Because federal agencies are required to determine whether a federal action they authorize, fund, or undertake may adversely affect EFH (MSA, 16 U.S.C. 1855(b)), this EA considers the potential for adverse effects to occur to EFH within the NEP area. The EA also considers the potential for new EFH management implications, if any, in the NEP area resulting from implementation of one of the action alternatives being considered in this EA.

6.2.4.1 Alternative 1 (No-action) –No Designation of a Nonessential Experimental Population, No Authorization for Reintroduction, and No Adoption of Protective Regulations

Under the No-action Alternative, NMFS would not designate a NEP of CV spring-run Chinook salmon in the NEP area, authorize the release of a NEP of CV spring-run Chinook salmon in the NEP area, or adopt protective regulations.

EFH in the NEP Area

Under the No-action Alternative, activities affecting EFH in the upper Yuba River above Englebright Dam are generally expected to be the same as those occurring under existing conditions. The quality of EFH in the NEP area would remain the same under the No-action Alternative. The NEP area would continue to remain unoccupied by CV spring-run Chinook salmon under the No-action Alternative. Consequently, there would be no effects on EFH in the NEP area under the No-action Alternative, relative to existing conditions.

6.2.4.2 Alternative 2 (Proposed Action/Preferred Alternative) – Designation of a Nonessential Experimental Population, Authorization for Reintroduction, and Adoption of Limited Protective Regulations

EFH in the NEP area

Under Alternative 2, no activities adversely affecting EFH in the NEP area would occur, relative to the No-action Alternative. To the extent that Alternative 2 facilitates a future reintroduction program, benefits to EFH would include the addition of marine derived nutrients from salmon carcasses in the upper Yuba River (Subsection 6.2.2.2). Additionally, NMFS anticipates additional monitoring will occur in the NEP area when a reintroduction program is implemented in the future. Monitoring will likely include juvenile salmonid collection efficiency, spawning success, adult and smolt injury and mortality rates, competition with resident species, disease transmission and other monitoring programs. Additional monitoring would increase knowledge on the overall condition of EFH in the upper Yuba River.

Alternative 2 would only modify the ESA status of CV spring-run Chinook salmon in the NEP area. Other ongoing lawful activities in the NEP area would continue to be unaffected, and activities (e.g., monitoring and implementation of recovery plans) related to the conservation of CV spring-run Chinook salmon would continue to occur under Alternative 2. These activities would not have the potential to directly or indirectly adversely affect EFH.

6.2.4.3 Alternative 3 – Designation of a Nonessential Experimental Population, Authorization for Reintroduction, and Adoption of Current Protective Regulations

EFH in the NEP Area

Under Alternative 3, no activities adversely affecting EFH in the NEP area would occur, relative to the No-action Alternative. Similar to Alternative 2, to the extent that Alternative 3 facilitates a future reintroduction program, benefits to EFH would include the addition of marine derived nutrients from salmon carcasses in the upper Yuba River (Subsection 6.2.2.2). Additionally, NMFS anticipates additional monitoring will occur in the NEP area. Monitoring will likely include juvenile salmonid collection efficiency, spawning success, adult and smolt injury and mortality rates, competition with resident species, disease transmission and other monitoring programs. Similar to Alternative 2, additional monitoring would increase knowledge on the overall condition of EFH in the upper Yuba River.

Alternative 3 would only modify the ESA status of CV spring-run Chinook salmon in the NEP area. Under Alternative 3, NMFS expects that any restrictions placed on water resource management in the NEP area would be similar to those that are currently in place outside of the NEP area. Increased regulatory requirements under Alternative 3 could lead to additional efforts by federal land and water managers, and other non-federal entities pursuing land and water-related actions within the NEP area to minimize the adverse effects of their actions and conserve EFH. The extent of these benefits are unknown, but no direct or indirect adverse effects to EFH availability and quality are anticipated under Alternative 3.

6.3 Effects on Fisheries Resources

Direct and indirect effects to fisheries resources outside the NEP area from a future reintroduction program may occur. However, the specifics of a future reintroduction effort, including when, where, source population, duration, numbers of fish released, transport and capture techniques are unknown. Assessing effects to fisheries resources outside the NEP area is considered speculative and will be

addressed in a future permitting process under ESA section 10(a)(1)(A) when more specific information on a future reintroduction plan is available.

6.3.1 Effects on ESA-listed Fish Species

For ESA-listed fish species, the analysis area is the same at the NEP area. Alternatives analyses presented in this subsection evaluate potential effects of the varying degree and extent the Proposed Action and alternatives would affect ESA-listed fish species.

Macklin Creek and East Fork Creek, which contain Lahontan cutthroat trout, are above the historical extent of anadromy in the Middle Yuba River. Consequently, there is minimal likelihood reintroduced CV spring-run Chinook salmon and transplanted Lahontan cutthroat trout would co-occur and interact. No significant impacts from any of the alternatives are anticipated and, therefore, this species will not be discussed further.

There are no other ESA-listed fish species currently in the NEP area. Absence of other ESA-listed fish species in the NEP area precludes any effects on other ESA-listed fish species in the NEP area.

6.3.1.1 Alternative 1 (No-action) –No Designation of a Nonessential Experimental Population, No Authorization for Reintroduction, and No Adoption of Protective Regulations

Under the No-action Alternative, NMFS would not designate a NEP of CV spring-run Chinook salmon in the NEP area, authorize the release of a NEP of CV spring-run Chinook salmon in the NEP area, or adopt protective regulations. Because these actions would not occur, there would be no effect on ESA-listed fish species or their habitat. Under the No-action Alternative, there would be no changes from existing conditions and, therefore, no adverse effects on ESA-listed fish species.

6.3.1.2 Alternative 2 (Proposed Action/Preferred Alternative) – Designation of a Nonessential Experimental Population, Authorization for Reintroduction, and Adoption of Limited Protective Regulations

In contrast to the No-action Alternative, under Alternative 2, NMFS would designate a NEP of CV spring-run Chinook salmon in the NEP area and authorize the release of a NEP of CV spring-run Chinook in the NEP area under ESA section 10(j), and adopt limited protective regulations under ESA section 4(d). The proposed action associated with Alternative 2 would have no direct or indirect effect on other ESA-listed fish species in the proposed NEP area. Alternative 2 does have the potential to indirectly, beneficially affect CV spring-run Chinook salmon in the future - primarily from facilitating a future reintroduction effort that would increase the amount of habitat available to the ESU. Under

Alternative 2, the quantity of habitat available for CV spring-run Chinook salmon in the Northern Sierra Nevada Diversity Group would increase over current conditions (Figure 5) (see Subsection 5.3.4. for information on habitat availability and suitability).

As part of a future reintroduction program[18], it is anticipated juvenile Chinook salmon would be collected and transported downstream to the lower Yuba River below Englebright Dam. Once released, those juvenile fish would migrate downstream to the ocean. Under Alternative 2, the status and associated regulatory protections provided to those juvenile spring-run Chinook salmon would change from being considered part of the non-essential experimental population of CV spring-run Chinook salmon in the upper Yuba River to being considered part of the threatened CV spring-run Chinook salmon ESU under the ESA. Upon removal from the NEP area and release into the lower Yuba River, those juvenile spring-run Chinook salmon would be afforded the same ESA regulatory protections as the existing population of CV spring-run Chinook salmon in the lower Yuba River. Consequently, Alternative 2 would not result in adverse effects to ESA-listed species, relative to the No-action Alternative.

6.3.1.3 Alternative 3 – Designation of a Nonessential Experimental Population, Authorization for Reintroduction, and Adoption of Current Protective Regulations

Regulatory protections for a non-essential experimental population in the NEP area would be more stringent under Alternative 3 compared to Alternative 2. However, the anticipated physical and biological effects of Alternative 3 on ESA-listed fish species would be the same as Alternative 2. The proposed action associated with Alternative 3 would have no direct or indirect effect on other ESA-listed fish species in the proposed NEP area. As discussed under Alternative 2, the quantity of habitat available for CV spring-run Chinook salmon in the Northern Sierra Nevada Diversity Group under Alternative 3 would increase over current conditions (Figure 5).

6.3.2 Effects on Other Non-listed Native Fish Species

For other non-listed native species, the analysis area is the same as the NEP area. Alternative analyses presented in this subsection depend on the varying degree and extent designation of a NEP of CV spring-run Chinook salmon in the NEP area and authorization for reintroduction of CV spring-run Chinook salmon in the NEP area would facilitate a future reintroduction program and result in potential

[18] Subject to separate NEPA and ESA compliance requirements.

effects to native fish species in the NEP area (Subsection 3.1; Subsection 5.4.2). Limiting factors and threats for native fish species include inter- and intra-specific competition, water quality and quantity, and climatic conditions[19].

6.3.2.1 Alternative 1 (No-action) –No Designation of a Nonessential Experimental Population, No Authorization for Reintroduction, and No Adoption of Protective Regulations

Under the No-action Alternative, NMFS would not designate a NEP of CV spring-run Chinook salmon in the NEP area, authorize the release of a NEP of CV spring-run Chinook salmon in the NEP area, or adopt protective regulations. Because these actions would not occur, there would be no effect on other non-listed native fish species. Because there would be no designation and authorization for release of a NEP of CV spring-run Chinook salmon in the NEP area, the No-Action Alternative would not facilitate a future reintroduction program in the NEP area, and there would be no potential for interaction between native fish and the experimental population in that area as a result of the No-Action Alternative. Baseline conditions generally would reflect the expected conditions under the No-action Alternative. Limiting factors and threats for native fish species would not change (e.g., inter- and intra-specific competition) or would be expected to improve (e.g., water quality and quantity[20]), relative to existing conditions.

6.3.2.2 Alternative 2 (Proposed Action/Preferred Alternative) – Designation of a Nonessential Experimental Population, Authorization for Reintroduction, and Adoption of Limited Protective Regulations

In contrast to the No-action Alternative, under Alternative 2, NMFS would designate a NEP of CV spring-run Chinook salmon in the NEP area and authorize release of a NEP of CV spring-run Chinook salmon in the NEP area under ESA section 10(j), and adopt limited protective regulations under ESA section 4(d), all of which would be expected to facilitate a future reintroduction program. Competition among or between species (interspecific competition) occurs when resources are limiting (such as food availability and/or when the area needed to accommodate spawning or rearing lifestages exceed supply). In general, interspecific interactions with pre-existing native fauna in reintroduction areas are unlikely to suppress the establishment of a population (NMFS 2018). Species that naturally occur in sympatry are more likely to have evolved niche separation in resource usage (Fausch 1988). This sympatry tends to minimize ecological interactions such as competition and predation. Additional information on inter- and intra-specific completion can be found in Young (2001), Reeves et al. (1993),

[19] Climate change considerations are addressed in Section 7 (Cumulative Effects).
[20] See previous discussions about water quality and quantity in Subsection 6.2.2.1 and Subsection 6.2.3.1 of this EA.

Fausch and White (1986), Allee (1982), NMFS (2018), Beamesderfer and Rieman (1991), Rieman et al. (1991), Harvey and Nakamoto (1996) and Ostberg et al. (2004).

Anadromous salmonids supply marine nutrients to terrestrial and aquatic ecosystems (Cederholm et al. 1999). Marine-derived nutrients are released to freshwater systems by anadromous fish through excretion, gametes, and after dying. Although differences can occur from locality to locality, the pathways for use of nutrients by stream biota occur through uptake by: (1) primary producers; (2) transfer of nutrients up the food chain; (3) uptake of dissolved organic matter from decomposing carcasses by microfauna in the streambed substrate; and (4) direct consumption of salmon eggs, fry, and carcasses. Collins et al. (2016) found the addition of salmon carcasses in nine tributaries of the North Fork Boise River, Idaho, increased annual trout production (growth) by 2 to 3 fold. Alternative 2 would benefit the ecosystem with the return of marine-derived nutrients, long absent from the NEP area. Over the long term, this would improve ecosystem function and diversity by increasing primary productivity, increased aquatic insect production and, thereby increasing prey availability for fish species in the NEP area. As a result of Alternative 2, facilitation of reintroduction of Chinook salmon also may lead to an increase in annual trout production over time. Adverse effects to productivity are not expected from inputs of marine derived nutrients.

Reintroduction of CV spring-run Chinook salmon could result in introduction of pathogens and diseases into the NEP area. However, native fish species co-evolved with Chinook salmon and the diseases and pathogens carried by CV spring-run Chinook salmon were likely endemic to the NEP area prior to the construction of Englebright dams. Transmission of a novel disease is more likely to carry risk than transmission of an endemic disease (Ewen et al. 2012). Changes to the status, trends, and life history strategies of native fish species in the NEP area are not expected under Alternative 2 and, therefore, no adverse effects are expected to occur. Additional information on disease transmission can be found in Walker et al. (2008), Naish et al. (2008), McMichael and Pearsons (1998), and NMFS (2008).

6.3.2.3 Alternative 3 – Designation of a Nonessential Experimental Population, Authorization for Reintroduction, and Adoption of Current Protective Regulations

Although the protections for a non-essential experimental population in the NEP area would be more stringent under Alternative 3, the anticipated potential physical and biological effects of this alternative to native fish species are the same as Alternative 2.

6.3.3 Effects on Non-native Fish Species

For non-native fish species the analysis area is the same as the NEP area. Limiting factors and threats for non-native fish species include inter- and intra-specific competition, predation, water quality and quantity, and climatic conditions[21]. There are approximately 16 introduced fish species in the NEP area (Table 6), and many of these species are present in reservoirs in the watershed where conditions are more favorable for warm water non-native fish species. Consideration for the evaluation of non-native fish species in the NEP area was primarily focused on species known to inhabit the NYR, MYR, SYR, NBB Reservoir, and Englebright Reservoir. Although other reservoirs in the watershed (on the MYR and SYR) also provide habitat to non-native fish species, these reservoirs are located upstream of the historical extent of anadromy in areas where reintroduction activities would not occur.

6.3.3.1 Alternative 1 (No-action) –No Designation of a Nonessential Experimental Population, No Authorization for Reintroduction, and No Adoption of Protective Regulations

Under the No-action Alternative, NMFS would not designate a NEP of CV spring-run Chinook salmon in the NEP area, authorize the release of a NEP of CV spring-run Chinook salmon in the NEP area, or adopt protective regulations. Because there would be no authorization for release of Chinook salmon in the NEP area and the No-Action Alternative would not facilitate a future reintroduction program in the NEP area, there would be no potential for interaction between non-native fish species and an experimental population in that area as a result of the No-action Alternative. Under the No-action Alternative, there would be no change to limiting factors and threats currently affecting non-native fish species in the NEP area.

6.3.3.2 Alternative 2 (Proposed Action/Preferred Alternative) – Designation of a Nonessential Experimental Population, Authorization for Reintroduction, and Adoption of Limited Protective Regulations

Non-native species can be a significant threat to the viability of salmon populations, both through predation and competition (Sanderson et al. 2009). According to NMFS (2018), it is conceivable, and in some cases even likely, predation by non-native fish could reduce the likelihood of population establishment. Depensatory processes could magnify predation effects at the low densities typical of recolonization (Liermann and Hilborn 2001). Similar to native species, effects of non-native species will be most significant in highly modified habitats (NMFS 2018). Non-native fish (e.g., channel catfish and smallmouth bass) have thrived in the warm, clear, lentic reservoirs created by dams

[21] Climate change considerations are addressed in Section 7 (Cumulative Effects).

(Sanderson et al. 2009). Collect-and-transport reintroduction programs may offset high rates of juvenile mortality that would likely occur during migration through a reservoir (such as NBB Reservoir or Englebright Reservoir) with abundant non-native populations.

Under Alternative 2, as under the No-action Alternative, potential effects to non-native fish species would likely remain the same as current conditions. Although the administrative actions associated with Alternative 2 would have no direct effect on non-native fish species, Alternative 2 may potentially, indirectly affect non-native fish through positive and negative ecological effects on non-native fish species and their habitats. For example, brown and brook trout are present in the NEP area, and there could be an increase in competition between these fish and juvenile Chinook salmon.

The potential for interspecific competition between Chinook salmon and brown and brook trout (Glova and Field-Dodgson (1995); Krueger et al. (2011)) exist in the NEP area. Compared to the No-action Alternative, facilitation of reintroduction of an experimental population of spring-run Chinook salmon into the NEP area, and the resultant production of juvenile salmon would likely result in beneficial effects through increased food resources available to non-native fish species. Brook trout could potentially prey on young Chinook salmon, as larger brook trout would tend to occupy similar habitats. However, brook trout abundance is likely low in the NEP area; thus, neither competition nor predation is likely to be a factor in juvenile Chinook salmon survival. Therefore, brook trout are not likely to measurably benefit from reintroduction of Chinook salmon as an increased prey base.

Various bass species occur in NBB Reservoir (Subsection 5.4.3). Increased foraging opportunities for bass would depend, in part, on the outmigration timing of juvenile CV spring-run Chinook salmon from the NEP area, and location of juvenile collection facilities. NMFS expects the location and design of juvenile collector facilities would account for predation to minimize interactions between bass and juvenile Chinook salmon. Alternative 2, despite measures to minimize potential effects from predation, would likely have a beneficial effect on bass by providing increased foraging opportunities compared to the No-action Alternative. Pilot studies and other monitoring and evaluation efforts are expected to provide more information on these interactions.

Under Alternative 2, facilitation of reintroduction of CV spring-run Chinook salmon could result in the introduction of pathogens and diseases into the NEP area. The resistance of non-native fish species in the NEP area is unknown, and potential effects to the status, trends, and life history strategies of non-native fish species is unknown. However, below Englebright Dam, anadromous salmonids (including CV spring-run Chinook salmon), co-occur with most if not all of the non-native species present in the

NEP area, and it is expected that conditions allowing co-occurrence below the dam will also occur in the NEP area. Changes to the status, trends, and life history strategies of brown and brook trout and other non-native fish species in the NEP area are not expected to occur under Alternative 2 and, therefore, no adverse effects are expected to occur.

6.3.3.3 Alternative 3 – Designation of a Nonessential Experimental Population, Authorization for Reintroduction, and Adoption of Current Protective Regulations

Similar to Alternative 2, under Alternative 3, NMFS would designate a NEP of CV spring-run Chinook salmon in the NEP area and authorize release of a NEP of CV spring-run Chinook salmon in the NEP area under ESA section 10(j), and adopt protective regulations under ESA section 4(d), all of which would be expected to facilitate a future reintroduction program. Unlike Alternative 2, under Alternative 3, NMFS would adopt the more restrictive current ESA section 4(d) rule protective regulations that apply to CV spring-run Chinook salmon downstream of Englebright Dam for the NEP area. The anticipated potential physical and biological effects to non-native fish species under Alternative 3 could result in slightly less suitable conditions for some of these species. Application of the current ESA section 4(d) rule could create additional opportunities to ensure the protection of water quality. Enhanced protection of water quality could result in marginally cooler water temperatures which are less suitable for some non-natives fish species, particularly those that prefer warmer water temperatures.

6.4 Effects on ESA-listed and Non-listed Wildlife

The analysis area for wildlife resources, except for Southern Resident killer whale, is the same as the NEP area described in Subsection 5.5. Alternative analyses address potential effects of the varying degree and extent the Proposed Action and alternatives would affect wildlife as a food resource in the NEP area. Species addressed in this subsection are those for which salmon provide direct or indirect foraging opportunities, including wildlife species with federal and/or state listing status, indicating a heightened level of concern (Table 6, Table 7, and Table 8). This area represents an area where wildlife species could reasonably be expected to modify their behavior in response to changes in the availability of food resources in the NEP area under the alternatives. The analysis area for Southern Resident killer whales extends to the Pacific Ocean due to the dependence of Southern Resident killer whales on Chinook salmon as a food resource.

6.4.1 Alternative 1 (No-action) –No Designation of a Nonessential Experimental Population, No Authorization for Reintroduction, and No Adoption of Protective Regulations

Under the No-action Alternative, NMFS would not designate a NEP of CV spring-run Chinook salmon in the NEP area, authorize the release of a NEP of CV spring-run Chinook salmon in the NEP area, or adopt protective regulations. Therefore, the No-action Alternative would not facilitate a future reintroduction program. There would be no changes from current conditions and, therefore, no adverse effects to ESA-listed and non-ESA-listed wildlife would occur.

Under the No-action Alternative, species (including the special-status species identified in Table 6 and Table 8 for which salmonids provide direct or indirect foraging opportunities, would continue to forage on fish and other food resources in the NEP area. This includes the 30 species occurring in the NEP area with a strong-consistent, or recurrent relationship with salmon as a food resource (as identified based on parameters described in Cederholm et al. 2000), and the five highly aquatic species with an unknown relationship with salmon (see Table 7). The No-action Alternative would not alter feeding patterns of native or special status species such as bald eagles, golden eagles, raccoons, or black bears (Table 6). For Southern Resident killer whales which occur outside the NEP area, the No-action alternative would not facilitate a future reintroduction program in the NEP area that is expected to provide a potential small increase in CV spring-run Chinook salmon in the Pacific Ocean off the California coast where Southern Resident killer whales forage on Chinook salmon. Finally, the No-action Alternative would not affect presence or absence of any wildlife species in the NEP area.

6.4.2 Alternative 2 (Proposed Action/Preferred Alternative) – Designation of a Nonessential Experimental Population, Authorization for Reintroduction, and Adoption of Limited Protective Regulations

Compared to the No-action Alternative, Alternative 2 would designate and authorize the release of a NEP of CV spring-run Chinook salmon in the NEP area and facilitate a future reintroduction program. Reintroduction is anticipated to result in re-establishment of this species into historical habitats of the upper Yuba River that have been inaccessible since 1941 when fish passage was blocked during construction of Englebright Dam. Unlike the No-action Alternative, Alternative 2 would have a beneficial effect on wildlife species that consume salmon and salmon carcasses, and species that feed on aquatic insects and other taxa beneficially affected by nutrients derived from salmon carcasses.

Of the approximately 311 wildlife species (amphibians, reptiles, birds, and mammals) that may occur in the NEP area (CDFW 2017), 30 species (about 10%) have a strong-consistent or recurrent relationship with salmon as a food resource according to parameters identified by Cederholm et al.

(2000). Alternative 2 could result in: (1) additional food resources for wildlife species that consume salmon (including the adult, egg, embryo or juvenile lifestages); and (2) the addition of marine-derived nutrients entering the food chain from salmon carcasses. Salmon provide direct or indirect foraging opportunities for local wildlife species (e.g., black bear, bald eagle, American dipper, American mink, Northern river otter, etc.) that have a strong-consistent or recurrent relationship with salmon. Some of these relationships are so strong that they influence the distribution or population status of a particular species (Cederholm et al. 2000; Hilderbrand et al. 2004; Ward et al. 2013).

A number of native species prey on salmon or their carcasses directly (Table 6) (Cederholm et al. 2000; Hilderbrand et al. 2004), and these species vary in their response to changes in the availability of salmonids as a food source. Because the availability of salmon varies seasonally, most species that directly consume salmon likely have flexible foraging strategies, eating salmon when they are available and alternate food sources at other times (Cederholm et al. 2000). For example, common mergansers (*Mergus merganser*) may congregate to feed on salmon fry when they are available (Cederholm et al. 2000). By contrast, turkey vultures (*Cathartes aura*) opportunistically feed on salmon carcasses (as well as many other items), and are unlikely to respond to changes in the availability of salmonids as a food source (Cederholm et al. 2000). Black bear (*Ursus americanus*) are generalists and consume salmon and their carcasses when available (Jameson and Peeters 1988). An example of a species with an indirect link to salmonids is the American dipper (*Cinclus mexicanus*), which feeds on aquatic insects that are beneficially affected by nutrients derived from salmon carcasses (Cederholm et al. 2000). Salmon carcasses may also provide benefits to highly aquatic species in the NEP with an unknown relationship to salmon due to an increase in aquatic insects as a food source (e.g., California red-legged frog, foothill yellow-legged frog, and Western pond turtle).

Potential effects of Alternative 2, as a result of facilitating future reintroduction, on California red-legged frogs in the NEP area would be unlikely to occur. Effects are unlikely because known locations with frog presence are at two locations in the NEP area, both of which are pond habitats that are not hydrologically connected with the mainstem channels of the NYR (Yuba County site) or the SYR (Nevada County site).

As described in Section 5, the Sierra Nevada yellow-legged frog is present in areas where CV spring-run Chinook salmon may be reintroduced. Given the behavioral and life history similarities between introduced trout and anadromous salmonids (e.g., CV spring-run Chinook salmon), it is anticipated that similar types of effects (e.g., predation, competition) could occur on Sierra Nevada yellow-legged frog under Alternative 2. Specifically, a potential exists for larger juvenile Chinook salmon to incidentally

encounter and consume tadpoles and post-metamorphic lifestages of Sierra Nevada yellow-legged frog in the watershed. However, the degree of potential adverse effects is expected to be relatively small because it is anticipated that the large majority of juvenile CV Chinook salmons will outmigrate in their first spring and not take a stream-run life history. Juveniles that outmigrate during the first spring would likely be too small to forage on tadpoles and post-metamorphic lifestage.

There are no reports of native salmonids preying on adult foothill yellow-legged frogs, although a variety of introduced trout and warm water fishes eat both the eggs and tadpoles (Amphibiaweb 2018). Similar to potential impacts described above for Sierra-Nevada yellow-legged frog, a potential exists for larger juvenile Chinook salmon to incidentally encounter and consume tadpoles and post-metamorphic lifestages. As with Sierra-Nevada yellow-legged frogs, impacts will likely be relatively small because it is anticipated that the large majority of juvenile CV Chinook salmons will outmigrate in their first spring and not take a stream-run life history. Juveniles that outmigrate during the first spring would likely be too small to forage on tadpoles and post-metamorphic lifestage.

Alternative 2 has the potential to indirectly affect Southern Resident killer whales if a reintroduction program is implemented. Alternative 2 could provide long-term benefits to the CV spring-run Chinook salmon ESU by increasing (to a small extent) the total number of adult salmon in the Pacific Ocean, if a future reintroduction is successful. Increased numbers of adult salmon in the Pacific Ocean would likely have a small, but beneficial effect, on ESA-listed Southern Resident killer whales that feed on adult salmon off the California coast.

Initially, the number of CV spring-run Chinook salmon reintroduced into the NEP area as a result of Alternative 2 would likely be low. Beneficial effects to wildlife with a direct, routine, and recurrent relationship with salmon would probably be negligible in the short-term. Over time, the number of returning adults originating from the NEP area is anticipated to increase, which could provide more foraging opportunities for wildlife in the NEP area and for Southern Resident killer whales in the Pacific Ocean. As a result of Alternative 2, more salmon would be available to these species as a food source, which may result in greater abundance of some of these wildlife species over time.

Alternative 2 is anticipated to have a relatively minor adverse effect to Sierra Nevada yellow-legged frogs. For all other wildlife species, the potential effects are expected to be neutral or beneficial compared to the No-action Alternative.

6.4.3 Alternative 3 – Designation of a Nonessential Experimental Population, Authorization for Reintroduction, and Adoption of Current Protective Regulations

Compared to the No-action Alternative and similar to Alternative 2, Alternative 3 would designate and authorize the release of a NEP of CV spring-run Chinook salmon in the NEP area and facilitate a future reintroduction program, which is anticipated to facilitate reintroduction of this species into historical habitats of the upper Yuba River.

Although protections for a non-essential experimental population in the NEP area would be more stringent under Alternative 3, the anticipated potential physical and biological effects of this alternative on wildlife species generally would be the same as Alternative 2. As a result of Alternative 3, the addition of salmon to the NEP area as part of a future reintroduction program would benefit wildlife species that consume live salmon or salmon carcasses, as well as wildlife species that feed on aquatic insects and other taxa that could benefit from marine-derived nutrients. As a result of Alternative 3, salmon carcasses may also provide benefits to highly aquatic species (e.g., California red-legged frog, foothill yellow-legged frog, Western pond turtle, etc.) in the NEP with an unknown relationship to salmon due to an increase in aquatic insects as a food source. Potential predation and competition-related effects on the California red-legged frog, Sierra Nevada yellow-legged frog and the foothill yellow-legged frog would be expected to be the same as those described under Alternative 2.

Similar to Alternative 2, Alternative 3 has the potential to indirectly affect Southern Resident killer whales if a reintroduction program is implemented. Alternative 3 could provide long-term benefits to the CV spring-run Chinook salmon ESU by increasing (to a small extent) the total number of adult salmon in the Pacific Ocean, if a future reintroduction is successful. Increased numbers of adult salmon in the Pacific Ocean from a future upper Yuba River reintroduction program would likely have a small, but beneficial effect, on ESA-listed Southern Resident killer whales that feed on adult salmon off the California coast.

Similar to Alternative 2, Alternative 3 may have a potential adverse effect on Sierra Nevada yellow-legged frogs under a future reintroduction program. The degree of potential adverse effects, however, is expected to be relatively small. For other wildlife species with the availability of salmon as a food source, the overall abundance of some species could increase temporarily.

Initially, as under Alternative 2, the number of CV spring-run Chinook salmon reintroduced into the NEP area as a result of Alternative 3 would likely be low. At low numbers, beneficial effects to wildlife species with a direct, routine, and recurrent relationship with salmon would probably be negligible.

Over time, however, the number of returning adults originating from the NEP area is anticipated to increase and wildlife species that use salmonids as a food source would benefit from increased availability of foraging opportunities in the NEP area and in the Pacific Ocean. As under Alternative 2, more salmon would be available to these species as a food source as a result of Alternative 3, which may result in greater abundance of some of these wildlife species over time.

Alternative 2 is anticipated to have a relatively minor adverse effect to Sierra Nevada yellow-legged frogs. For all other wildlife species, the potential effects are expected to be neutral or beneficial compared to the No-action Alternative.

6.5 Effects on Land Use and Ownership

The analysis area for land use and ownership is the same as the NEP area. None of the alternatives entails changes in land ownership or land use designations for the NEP area described in Subsection 5.6. The alternatives would not result in different proportions of public, private, and tribal land ownership in the NEP area. A large proportion of lands within the NEP area would continue to be under Federal or state management, or in private timber production. Analyses in this section address the potential for the varying degrees of take prohibition under the alternatives to affect otherwise lawful land use activities.

6.5.1 Alternative 1 (No-action) –No Designation of a Nonessential Experimental Population, No Authorization for Reintroduction, and No Adoption of Protective Regulations

Under the No-action Alternative, NMFS would not designate a NEP of CV spring-run Chinook salmon in the NEP area, authorize the release of a NEP of CV spring-run Chinook salmon in the NEP area, or adopt protective regulations. Therefore, the No-action Alternative would not facilitate a future reintroduction program. There would be no changes from current conditions and, therefore, no adverse effects to land use and ownership would occur under the No-action Alternative. More specifically, there would be no effects to land ownership categories, including private entities, nongovernmental organizations, Federal, tribal, and state or local government ownerships (Subsection 5.6). Existing trends in land use would continue to be addressed by Federal, state, county, and municipal planning efforts. Similarly, land uses would not change under the No-action Alternative. Resource-based industries such as forest management would be expected to continue to occur within the analysis area under the No-action Alternative, along with other current land uses (Subsection 5.6, Land Use and Ownerships).

6.5.2 Alternative 2 (Proposed Action/Preferred Alternative) – Designation of a Nonessential Experimental Population, Authorization for Reintroduction, and Adoption of Limited Protective Regulations

In contrast to the No-action Alternative, under Alternative 2, NMFS would designate a NEP of CV spring-run Chinook salmon in the NEP area and authorize release of a NEP of CV spring-run Chinook salmon in the NEP area under ESA section 10(j), and adopt limited protective regulations under ESA section 4(d), all of which would be expected to facilitate a future reintroduction program. The current salmon ESA section 4(d) rule protective regulations prohibit take of CV spring-run Chinook salmon with specific limits or exceptions outside of the NEP area downstream of Englebright Dam (Subsection 1.2.4). Under Alternative 2, a separate ESA section 4(d) rule would be adopted to apply to the experimental population in the NEP area. Within the NEP area, NMFS's proposed ESA section 4(d) rule would provide exceptions to the take prohibitions as appropriate to the circumstances, including an exception for take that occurs incidental to otherwise lawful activities and is unintentional, not due to negligent conduct. Because of this take exception, as well as the limited applicability of ESA section 7 to a NEP of CV spring-run Chinook salmon in the NEP area, reintroduction of CV spring-run Chinook salmon would have little to no adverse effect on land uses such as agriculture, forestry, extractive/industrial activities, commercial/research and development, parks, public lands, military installations or urban/local communities. Because of the substantial regulatory relief provided by the NEP designation and the exception to the ESA section 4(d) rule protective regulations, NMFS also does not expect Alternative 2 to have any substantial adverse effect on recreational, agricultural, or development activities within the NEP area.

The proposed ESA section 4(d) rule under Alternative 2 is anticipated to: (1) minimize regulatory requirements on landowners in the NEP area; and (2) minimize increased ESA liability for land use activities. Additionally, there would be no new or additional actions required on the landowner/local stakeholder's behalf prior to conducting normal land use activities. Therefore, as under the No-action Alternative, Alternative 2 is not expected to result in any changes in the uses or ownership of land in the NEP area described in Subsection 5.6. As under the No-action Alternative, existing trends in land use would continue under Alternative 2. Existing trends in land use would continue to be addressed by Federal, state, county, and municipal planning efforts.

Under Alternative 2, agencies that fund, carry out, or permit actions that may affect the NEP of CV spring-run Chinook salmon in the NEP area would not face substantially increased regulatory requirements compared to the No-action Alternative. Alternative 2 would be protective of Federal, state, local and private land use and land ownership interests in the NEP area. Alternative 2 would

minimize the potential for new permitting and regulatory compliance responsibilities associated with future Federal, state, county, municipal and private actions in the watershed, while facilitating the ability to reintroduce CV spring-run Chinook salmon into the NEP area.

6.5.3 Alternative 3 – Designation of a Nonessential Experimental Population, Authorization for Reintroduction, and Adoption of Current Protective Regulations

Similar to Alternative 2, under Alternative 3, NMFS would designate and authorize the release of a NEP of CV spring-run Chinook salmon in the NEP area, which would facilitate a future reintroduction program. However, adoption of the current ESA section 4(d) rule protective regulations for the NEP area would result in more restrictive ESA take prohibitions in the NEP area compared to Alternative 2.

Unlike Alternative 2, the current ESA section 4(d) rule protective regulations for threatened species of salmon and steelhead would be adopted to apply to the CV spring-run Chinook salmon in the NEP area under Alternative 3 (Subsection 1.2.4). Thus, facilitation of reintroduction of ESA-listed fish to the NEP area could result in increased restrictions on otherwise lawful land use activities as a result of Alternative 3. Alternative 3 would not change the proportion of public, private, and tribal land ownership in the NEP area. However, for agencies with management authority for public lands and private landowners, Alternative 3 may restrict the types or extent of actions that those management agencies and private landowners would implement on their lands due to increased regulatory obligations necessary to comply with the more restrictive ESA section 4(d) rule protective regulations under Alternative 3.

Unlike the No-action Alternative and Alternative 2, Alternative 3 could affect existing land use and recreational activities in the action area because of increased regulatory constraints and potential ESA liability. Changes in land use could include additional restrictions on special-use permits on Federal lands and timber harvest on private lands to avoid or minimize the potential for take of CV spring-run Chinook salmon in the NEP area. Changes in private ownership are speculative but are more likely under Alternative 3 because of new regulatory requirements for landowners engaged in activities that may result in take, including harm, of CV spring-run Chinook salmon in the NEP area.

Based on the more stringent protective regulations that would apply under Alternative 3, unlike the No-action Alternative and Alternative 2, land management agencies and private landowners throughout the NEP area would likely be required to modify their operations to avoid or minimize the potential for take of CV spring-run Chinook salmon in the NEP area. Examples of modification to operations include: (1) implementing erosion control structures near rivers and tributary streams, and (2)

implementing road drainage system improvements to minimize or avoid sediment inputs into local waterways, among others. Under Alternative 3, Federal, non-Federal public, private landowners, and local entities would have various regulatory options under the ESA to seek limits on their potential liabilities from otherwise lawful activities, subject to applicable conditions. These options could include an ESA section 4(d) limit or an ESA section 10(a) permit as applicable, but any applicable options would be limited to certain types of activities and subject to conditions.

6.6 Effects on Tourism and Recreation

The analysis area for Tourism and Recreation is broader than the NEP area and includes all of Sierra, Nevada, and Yuba Counties. Tourism and recreation make a substantial contribution to the quality of life for local residents (particularly residents in Sierra and Nevada Counties) in terms of employment and income (Subsection 6.7), as well as the outdoor recreational activities available to them. The three alternatives vary in their potential to result in restrictions on otherwise lawful activities in the action area, including recreational fishing. Under all three alternatives, outdoor recreation, including fishing, would continue to attract visitors to Sierra, Nevada and Yuba Counties. NMFS anticipates current restrictions in California's Freshwater Sport Fishing Regulations would remain in effect.

Analyses in this subsection address the potential effects of the alternatives on the availability of recreation opportunities in the analysis area.

6.6.1 Alternative 1 (No-action) –No Designation of a Nonessential Experimental Population, No Authorization for Reintroduction, and No Adoption of Protective Regulations

Under the No-action Alternative, NMFS would not designate a NEP of CV spring-run Chinook salmon in the NEP area, authorize the release of a NEP of CV spring-run Chinook salmon in the NEP area, or adopt protective regulations. Therefore, the No-action Alternative would not facilitate a future reintroduction program. Recreational opportunities (e.g., sightseeing, gold panning, mountain biking, camping, waterfowl and upland hunting, hiking, swimming, horseback riding, use of off-road vehicle trails, back country skiing, climbing, and rafting) in the three counties would continue to occur. There would be no changes that directly or indirectly affect visitor facilities, viewpoints, scenic overlooks, walking trails, picnic shelters, or other designated recreation amenities (Subsection 5.7). Consequently, because there would be no changes from the current conditions, the No-action Alternative would have no adverse effects on recreational opportunities in the NEP area.

6.6.2 Alternative 2 (Proposed Action/Preferred Alternative) – Designation of a Nonessential Experimental Population, Authorization for Reintroduction, and Adoption of Limited Protective Regulations

In contrast to the No-action Alternative, under Alternative 2, NMFS would designate a NEP of CV spring-run Chinook salmon in the NEP area and authorize the release of a NEP of CV spring-run Chinook salmon in the NEP area under ESA section 10(j), and adopt limited protective regulations under ESA section 4(d), all of which would facilitate a future reintroduction program. Within the NEP area, NMFS's proposed 4(d) rule protective regulations would provide an exception for take that occurs incidental to otherwise lawful activities and is unintentional, not due to negligent conduct. Because of the substantial regulatory relief provided by the NEP designation and this take exception, Alternative 2 would facilitate the reintroduction of CV spring-run Chinook salmon with little to no adverse effect on tourism and recreational activities within the NEP area.

Alternative 2 could result in an increase in the number of fish available for recreational viewing in the upper Yuba River, compared to the No-action Alternative. Increased viewing opportunities could expand recreational opportunities in the analysis area with an opportunity to view CV spring-run Chinook salmon in areas where they have been long extirpated. Alternative 2 is expected to result in opportunities to view adult CV spring-run Chinook salmon returning to historical holding and spawning areas. If reintroduced into the NYR, the likelihood of recreational viewing is facilitated by the proximity of Highway 49 and USFS campgrounds to the river. Highway 49 in Sierra County runs parallel to the NYR, including segments of the river with high quality holding and spawning habitat where CV spring-run Chinook salmon could be reintroduced in the future. Locations that could provide fish viewing opportunities for adult CV spring-run Chinook salmon include Indian Valley and Rocky Rest Bridge campgrounds, the North Yuba trail, and a large holding pool and bridge crossing of the NYR near the courthouse in Downieville. Recreational viewing is more unlikely to occur if CV spring-run Chinook salmon are reintroduced into the MYR or SYR due to the difficulty of accessing these river reaches. A potential does exist for harassment of CV spring-run Chinook salmon in the NYR due to the presence of suitable viewing locations. Harassment is anticipated to be more unlikely in the MYR and SYR due to more limited viewing locations.

Although the number of fish available for recreational viewing is difficult to predict, the unique opportunity to see CV spring-run Chinook salmon in the Sierra Nevada region is anticipated to generate some interest among members of the public. In response to the increased public interest, a concomitant increase in tourism may occur as people are drawn to the NEP area. People visiting Sierra

County in particular would be anticipated to support local community businesses by partaking in food and beverage services, accommodations, retail sales, arts, entertainment and recreation, etc.

Opportunities to engage in recreational fishing would not be reduced under Alterative 2. As under the No-action Alternative, locations of fishing opportunities would not change under Alternative 2.

The current salmon and steelhead ESA section 4(d) rule protective regulations prohibit take of CV spring-run Chinook salmon downstream of Englebright Dam (Subsection 1.2.4), subject to specific limits or exceptions, which do not specifically include an exception for take that occurs incidental to otherwise lawful activities. Under Alternative 2, a separate ESA section 4(d) rule would be adopted for the experimental population in the NEP area. This proposed rule would generally prohibit take of CV spring-run Chinook salmon in the NEP area, but would provide an exception for take that is incidental to an otherwise lawful activity and is unintentional, not due to negligent conduct. This exception would include recreational fishing for non-listed salmonids, and other game and non-game fish. Opportunities to engage in recreational fishing would not be reduced with implementation of Alternative 2.

Effects from increased viewing opportunities on visitor facilities, viewpoints, scenic overlooks, walking trails, picnic shelters, or other designated recreation amenities in the analysis area are anticipated to be minor. Additionally, no changes to other recreational opportunities (i.e., boating, water-skiing, swimming, wildlife viewing, hunting, camping, picnicking, hiking, gold panning, mountain biking, off-road vehicle trails, sightseeing, climbing, back country skiing, and horseback riding) within the analysis area would be expected to occur under Alternative 2. In response to increased public interest, an increase in tourism also may occur as people are drawn to the NEP area. Visitors to Sierra County would be anticipated to support the local economy by partaking in food and beverage services, accommodations, retail sales, arts, entertainment and recreation, etc.

Under Alternative 2, Federal, state, and local agencies that fund, carry out, or permit actions that may affect the experimental population of CV spring-run Chinook salmon in the NEP area would not face substantially increased regulatory requirements compared to the No-action Alternative. Overall, Alternative 2 would be protective of Federal, state, local and private land use and land ownership interests, while facilitating the reintroduction of salmon into the NEP area and concurrently protecting tourism and recreational activities.

6.6.3 Alternative 3 – Designation of a Nonessential Experimental Population, Authorization for Reintroduction, and Adoption of Current Protective Regulations

Alternative 3 is expected to result in opportunities to view adult Chinook salmon returning to historical holding and spawning areas. As under Alternative 2, Alternative 3 would designate and authorize the release of a NEP of CV spring-run Chinook salmon in the NEP area, which would facilitate a future reintroduction program and would likely increase the number of fish available for recreational viewing in the NEP area, compared to the No-action Alternative. As such, Alternative 3 would add incrementally to recreational viewing opportunities in the NEP area (Subsection 5.7) due to the unique opportunity to view this species.

In response to the increased public interest, an increase in tourism also may occur as people are drawn to the NEP area. Visitors to Sierra County, in particular, would be anticipated to support the local economy by partaking in food and beverage services, accommodations, retail sales, arts, entertainment and recreation, etc. As with Alternative 2, a potential does exist for harassment of CV spring-run Chinook salmon in the NYR due to the presence of suitable viewing locations. Harassment is anticipated to be more unlikely in the MYR and SYR due to more limited viewing locations.

Unlike Alternative 2, the current ESA section 4(d) protective regulations that apply to the CV spring-run Chinook salmon ESU downstream of Englebright Dam would also be adopted to apply to reintroduced CV spring-run Chinook salmon in the NEP area. NMFS' experience under the current ESA section 4(d) rule protective regulations (50 CFR 223.203) shows that NMFS does authorize take associated with some otherwise lawful activities, but some activities may not meet one of the 10 categories of activities and some activities may be modified during the authorization process to meet the applicable criteria under the current protective regulations. NMFS expects any such modifications or restrictions placed on tourism or recreational activities in the NEP area under Alternative 3 would be similar to those that are in place outside the NEP area downstream of Englebright Dam. Application of these restrictions could result in additional restrictions on existing lawful tourist-oriented and recreational activities, including recreational fishing and some upland activities. Upland activities, particularly those that cause erosion, such as mountain biking and motorized off-road vehicle activities, could be subject to seasonal restrictions to minimize sediment input into fish-bearing streams.

Federal agencies that fund, carry out, or permit actions that may affect CV spring-run Chinook salmon in the NEP area would not face substantially increased regulatory requirements associated with tourism and recreation compared to the No-action Alternative due to the limited ESA section 7 obligations with an ESA section 10(j) designation (see Subsection 4.2.2.3). However, such Federal agencies could face

increased regulatory restrictions in order to avoid or minimize the take of reintroduced CV spring-run Chinook salmon to comply with the more restrictive ESA section 4(d) rule protective regulations under Alternative 3. In addition, state regulated recreational fishing would be subject to the more restrictive ESA section 4(d) rule protective regulations under Alternative 3.

Under Alternative 3, Federal, non-Federal public, and private entities would have various regulatory options under the ESA in which to seek limits on their potential liabilities from otherwise lawful activities, subject to applicable conditions. These could include an ESA section 4(d) limit or a section 10(a) permit as applicable, but any available options would be limited to certain types of activities and subject to conditions. Overall, because of the potential for additional restrictions on the recreational fishery and some upland activities, there is the potential for some minor adverse effects to tourism or recreation under Alternative 3.

6.7 Effects on Socioeconomics

The analysis area for socioeconomics is broader than the NEP area, and comprises Sierra, Nevada and Yuba Counties because local residents within these areas would have the greatest potential to be affected by the alternatives.

Commercial fishing of salmon occurs off the United States West Coast in accordance with fishery management plans that identify annual goals for the number of spawners of the major salmon stocks (i.e., "spawner escapement goals"), and allocation provisions of the harvest among different groups (e.g., commercial, tribal, etc.) (PFMC 2019). CV spring-run Chinook salmon are not actively managed in the commercial fishery and the alternatives would have no adverse effect on commercial fisheries, because none of the alternatives would change the status of CV spring-run Chinook salmon or applicable restrictions outside the NEP area.

The three alternatives vary in their potential to result in restrictions on otherwise lawful activities in the analysis area. Under all three alternatives, the population trends in the largest cities, as well as local communities, in Sierra, Nevada and Yuba Counties would likely continue as described in Subsection 5.8. NMFS's Proposed Action and the alternatives would have no direct or indirect effect on population trends in the analysis area. Similarly, the economic bases in Sierra County, Nevada and Yuba Counties would continue to be influenced by local, state, and national trends unrelated to the designation and authorization for release of a NEP of CV spring-run Chinook salmon in the NEP area. Trends in wages, employment, and unemployment would be expected to continue as described in Subsection 5.8.

Analyses in this subsection address the potential socioeconomic effects of the alternatives related to the availability of opportunities for recreational fishing, tourism, and other recreational opportunities in the analysis area, as well as the potential for substantial changes in regulatory costs.

6.7.1 Alternative 1 (No-action) –No Designation of a Nonessential Experimental Population, No Authorization for Reintroduction, and No Adoption of Protective Regulations

Under the No-action Alternative, NMFS would not designate a NEP of CV spring-run Chinook salmon in the NEP area, authorize the release of a NEP of CV spring-run Chinook salmon in the NEP area, or adopt protective regulations. Therefore, the No-action Alternative would not facilitate a future reintroduction program. There would be no changes from current conditions and, therefore, no adverse effects to recreational opportunities in the NEP area would occur. Because these actions would not take place, there would be no potential for socioeconomic effects. Tourism would be expected to continue as described in Subsection 5.7, and would also continue to contribute to employment and wages in the analysis area as under current conditions. The No-action Alternative would not result in any new regulatory costs for county residents, persons visiting the affected Counties for recreational fishing opportunities, and persons or organizations engaged in water management, timber harvest, grazing, or other similar activities.

6.7.2 Alternative 2 (Proposed Action/Preferred Alternative) – Designation of a Nonessential Experimental Population, Authorization for Reintroduction, and Adoption of Limited Protective Regulations

In contrast to the No-action Alternative, under Alternative 2, NMFS would designate and authorize the release of a NEP of CV spring-run Chinook salmon under ESA section 10(j), and adopt limited protective regulations under ESA section 4(d), all of which would facilitate a future reintroduction program. Within the NEP area, NMFS's proposed 4(d) rule protective regulations would provide an exception for take that occurs incidental to otherwise lawful activities and is unintentional, not due to negligent conduct. Because of the substantial regulatory relief provided by the NEP designation and this take exception, Alternative 2 would facilitate the reintroduction of CV spring-run Chinook salmon with no substantial adverse effect on tourism and recreational activities within the NEP area.

Over time, when a reintroduction program is implemented, Alternative 2 would be expected to increase the recreational viewing opportunities of salmon in the action area, with a possible concomitant increase in tourism and associated socioeconomic benefits compared to the No-action Alternative. As described in the analysis of effects on tourism and recreation (Subsection 6.6), opportunities to engage

in recreational fishing would not be reduced, nor would locations of fishing opportunities change by implementation of Alternative 2.

Because the time required to build facilities that would be necessary for a future reintroduction program is preliminarily projected to extend over about 2 ½ years, it is anticipated that such a program would provide increased opportunities for employment related to construction of the requisite facilities (e.g., juvenile salmon collection facilities). Increased economic benefits for local communities within the NEP area could be realized by hiring local workers, providing housing and other accommodations for temporary workers with specialized expertise, as well as the day-to-day contribution of workers to the local economy (such as from purchasing automobile fuel, food, etc.). In the long-term, it is anticipated a reintroduction program would contribute to the local economy by increasing employment opportunities over the duration of the program. Opportunities would increase because new employees would be necessary for operation and maintenance of physical facilities, and to oversee the day-to-day operation of the program.

Similar to existing conditions under the No-action Alternative, Agencies such as USFS and CalFire, as well as local agencies that fund, carry out, or permit actions that may affect the experimental population in the NEP area would not face substantially increased regulatory requirements under Alternative 2. Similarly, Alternative 2 would not result in new regulatory costs for residents of Sierra, Nevada and Yuba Counties, recreational fishers, and persons or organizations engaged in water management, timber harvest, grazing, or other similar types of activities. The ESA section 4(d) rule protective regulations under Alternative 2 would generally prohibit take of CV spring-run Chinook salmon in the NEP area, but would provide an exception for take that is incidental to an otherwise lawful activity and is unintentional, not due to negligent conduct. As described in the analysis of potential effects on Tourism and Recreation, opportunities to engage in recreational fishing would not be reduced by implementation of Alternative 2.

Under Alternative 2, it is anticipated that new and replacement septic systems and leach fields in Sierra, Nevada and Yuba Counties would continue to be required to adhere to health department requirements, setback requirements, building permits, inspections, and state and county approvals. Water quality compliance regulations for on-site sewage disposal (i.e., septic systems) in proximity to streams and riparian areas in the NEP area would not be expected to change, relative to the No-action Alternative.

Overall, Alternative 2 would be protective of Federal, state, local and private land use and land ownership interests in the NEP area. Alternative 2 would minimize the potential for new or exacerbated

expenses from increased regulatory compliance responsibilities associated with future Federal, state, county, municipal, and private actions in the watershed, while at the same time facilitating the ability to reintroduce CV spring-run Chinook salmon into the NEP area. Although the actions associated with Alternative 2 would not be expected to have a substantial adverse effect on socioeconomics, Alternative 2 does have the potential to result in both near-term and long-term positive economic benefits to the NEP area, when a reintroduction program is implemented.

6.7.3 Alternative 3 – Designation of a Nonessential Experimental Population, Authorization for Reintroduction, and Adoption of Current Protective Regulations

As under Alternative 2, under Alternative 3, NMFS would designate and authorize the release of a NEP of CV spring-run Chinook salmon in NEP area, which would facilitate a future reintroduction program and would likely increase the number of adult fish available for recreational viewing in the action area compared to the No-action Alternative with a possible concomitant increase in tourism and associated socioeconomic benefits.

Similar to Alternative 2, a future reintroduction program would provide: (1) increased opportunities for employment related to construction of the requisite facilities; and (2) increased economic benefits for local communities due to hiring local workers, providing housing and other accommodations for temporary workers with specialized expertise, and the day-to-day contribution of workers to the local economy as a result of purchasing necessities such as automobile fuel, food, etc. Over the long-term, it is also anticipated that a reintroduction program would contribute to the local economy by increasing employment opportunities over the duration of the program because new employees would be required in order to operate and maintain the physical facilities, and to oversee the day-to-day operation of the program.

Unlike Alternative 2, the current ESA section 4(d) protective regulations that apply to the CV spring-run Chinook salmon ESU downstream of Englebright Dam would also be adopted to apply to reintroduced CV spring-run Chinook salmon in the NEP area. NMFS' experience under the current ESA section 4(d) rule protective regulations (50 CFR 223.203) shows that NMFS does authorize take associated with some otherwise lawful activities, but some activities may not meet one of the 10 categories of activities and some activities may be modified during the authorization process to meet the applicable criteria under the current protective regulations. NMFS expects any such modifications or restrictions placed on lawful land use, water use, and recreational activities in the NEP area under Alternative 3 would be similar to those that are in place outside the NEP area downstream of

Englebright Dam. Application of these restrictions could result in additional restrictions on existing lawful land use, water use, and recreational activities in the NEP area.

Additional restrictions on lawful land use, water use, and recreational activities as a result of Alternative 3 would likely result in negative socioeconomic effects compared to the No-action Alternative or Alternative 2. These negative socioeconomic effects could affect persons visiting the NEP area for recreational fishing opportunities (and ancillary businesses associated with recreational fishing), residents of Sierra, Nevada and Yuba Counties, and persons or organizations engaged in water management, timber harvest, grazing, or other similar types of activities.

As previously discussed, fish passage conditions in the NEP area upstream of Englebright Dam could improve as a result of Alternative 3 if existing barriers to adult and juvenile passage (e.g., dams, poorly designed or poorly functioning fishways, and road crossings) are required to come up to modern standards as a consequence of the new regulatory requirements and increased regulatory oversight. Although improved fish passage conditions as a result of Alternative 3 would provide benefits to fisheries resources, regulatory restrictions would likely impose additional operational constraints, construction-related/permitting responsibilities and financial obligations on local stakeholders in the upper Yuba River. Consequently, although the extent of benefit associated with improved fish passage in the NEP area as a result of Alternative 3 is unknown, this alternative would have the potential to result in negative financial and socioeconomic effects to Federal, state, county and local management agencies, private stakeholders, and local communities in the NEP area, relative to the No-action Alternative and Alternative 2. For agricultural properties adjacent to streams in the NEP area, water storage and withdrawals for irrigation may be reduced to help preserve water in streams. Timber harvest near streams may also be limited to ensure appropriate streamside shading, Large Woody Material (LWM) recruitment, and storm water retention, particularly in watersheds with degraded aquatic habitat.

Under Alternative 3, it is anticipated that existing health department requirements, setback requirements, building permits, inspections, and state and county approvals would remain in place.

Under Alternative 3, Federal, non-Federal public, and private entities would have various regulatory options under the ESA in which to seek limits on their potential liabilities from otherwise lawful activities, subject to applicable conditions. These could include an ESA section 4(d) limit or a section 10(a) permit as applicable, but any available options would be limited to certain types of activities and subject to conditions.

Overall, Alternative 3 has the potential to result in both near-term and long-term positive economic benefits to the NEP area (when a future reintroduction program is implemented), and the potential for adverse socioeconomic effects due to the additional regulatory requirements adopted under Alternative 3.

6.8 Effects on Cultural and Historical Resources

Cultural resources include prehistoric and historical archaeological sites, historic structures, and traditional cultural properties (places that may or may not have human alterations, but are important to the cultural identity of a community or Native American tribe). The analysis area for cultural resources is broader than the NEP area and includes the lower Yuba River, the lower Feather River, and the lower Sacramento River watershed to the confluence with the San Joaquin River.

6.8.1 Alternative 1 (No-action) –No Designation of a Nonessential Experimental Population, No Authorization for Reintroduction, and No Adoption of Protective Regulations

Under the No-action Alternative, NMFS would not designate a NEP of CV spring-run Chinook salmon in the NEP area, authorize the release of a NEP of CV spring-run Chinook salmon in the NEP area, or adopt protective regulations. Therefore, the No-action Alternative would not facilitate a future reintroduction program. There would be no changes from current conditions and, therefore, no adverse effects to cultural and historical resources would occur. The presence of salmon runs, which are of significant cultural importance to Native American tribes, would remain absent from the NEP area as they have been for more than 75 years.

6.8.2 Alternative 2 (Proposed Action/Preferred Alternative) – Designation of a Nonessential Experimental Population, Authorization for Reintroduction, and Adoption of Limited Protective Regulations

In contrast to the No-action Alternative, under Alternative 2, NMFS would designate a NEP of CV spring-run Chinook salmon in the NEP area and authorize the release of a NEP of CV spring-run Chinook salmon in the NEP area under ESA section 10(j), and adopt limited protective regulations under ESA section 4(d).

Compared to the No-action Alternative, Alternative 2 would facilitate reintroduction of these fish to the NEP area where they have been absent for more than 75 years. A significant cultural resource (salmon runs) would be returned to the upper Yuba River. No prehistoric or historical archaeological sites, historical structures, or traditional cultural properties in the analysis area would be affected by the

designation and authorization for release of an experimental population and associated protective regulations.

6.8.3 Alternative 3 – Designation of a Nonessential Experimental Population, Authorization for Reintroduction, and Adoption of Current Protective Regulations

Under Alternative 3, NMFS would designate and authorize the release of a NEP of CV spring-run Chinook salmon in the NEP area and apply the current 4(d) rule protective regulations to the NEP area, which would facilitate a future reintroduction program similar to Alternative 2. Under Alternative 3, a significant cultural resource (salmon runs) would be returned to the NEP area. No prehistoric or historical archaeological sites, historical structures, or traditional cultural properties in the analysis area would be affected by designation and authorization for release of an experimental population and associated protective regulations in the NEP area.

6.9 Environmental Justice

NEPA requires Federal agencies to determine whether minority populations, low-income populations, or Indian tribes are present in the area affected by a Proposed Action, and if present, whether there may be disproportionately high and adverse human health or environmental effects on minority populations, low-income populations, or Indian tribes (CEQ 1997). The analysis area for environmental justice encompasses Sierra, Nevada, and Yuba Counties.

This subsection focuses on whether any potential additional restrictions on otherwise lawful activities (e.g., subsistence fishing), and any expected disproportionately high and adverse human health or environmental effects to low income and minority communities would occur in the action area.

6.9.1 Alternative 1 (No-action) –No Designation of a Nonessential Experimental Population, No Authorization for Reintroduction, and No Adoption of Protective Regulations

Under the No-action Alternative, NMFS would not designate a NEP of CV spring-run Chinook salmon in the NEP area, authorize the release of a NEP of CV spring-run Chinook salmon in the NEP area, or adopt protective regulations. Therefore, the No-action Alternative would not facilitate a future reintroduction program.

The extent to which dietary habits of low-income or minority families and their economic condition dictate subsistence living (e.g., subsistence fishing, hunting, gathering or farming) in the NEP area is unknown. Under the No-action Alternative, there would be no changes from current conditions in terms of locations and opportunities to engage in legal fishing and, therefore, no adverse effects to

subsistence living in the NEP area would occur. Under the No-action Alternative, agencies that fund, carry out, or permit actions that may affect the NEP area would not face increased regulatory requirements, and there would be no change to regulatory requirements affecting minority or low-income populations.

6.9.2 Alternative 2 (Proposed Action/Preferred Alternative) – Designation of a Nonessential Experimental Population, Authorization for Reintroduction, and Adoption of Limited Protective Regulations

In contrast to the No-action Alternative, under Alternative 2, NMFS would designate a NEP of CV spring-run Chinook salmon in the NEP area, authorize the release of a NEP of CV spring-run Chinook salmon in the NEP area, and adopt limited protective regulations under ESA section 4(d), all of which would facilitate a future reintroduction program.

The current salmon and steelhead ESA section 4(d) rule protective regulations prohibit take of CV spring-run Chinook salmon downstream of Englebright Dam (Subsection 1.2.4), subject to specific limits or exceptions, which do not specifically include an exception for take that occurs incidental to otherwise lawful activities. Under Alternative 2, a separate ESA section 4(d) rule would be adopted for the experimental population in the NEP area. This proposed rule would generally prohibit take of CV spring-run Chinook salmon in the NEP area, but would provide an exception for take that is incidental to an otherwise lawful activity and is unintentional, not due to negligent conduct. The proposed ESA section 4(d) rule will minimize regulatory requirements in the NEP area associated with reintroduction of CV spring-run Chinook salmon. As previously discussed in Subsection 6.6, locations and opportunities to engage in legal fishing would not be reduced under Alterative 2. NMFS anticipates current restrictions in California's Freshwater Sport Fishing Regulations would remain in effect.

Although the extent to which subsistence living (e.g., subsistence fishing, hunting, gathering or farming) occurs within the NEP area is unknown, Alternative 2 would not diminish the amount of fish, vegetation and/or wildlife available in the watershed that are consumed by minority populations, low-income populations, or Indian tribes in the area. It is also unlikely that Alternative 2 would change the rate and/or pattern of subsistence consumption by minority populations, low-income populations, and Indian tribes as compared to rates and patterns of consumption of the general population.

The time required to build and test facilities for a future reintroduction program may extend two years or longer. NMFS anticipates the program would provide increased opportunities for employment related to construction, installation and testing of the requisite facilities (e.g., juvenile salmonid

collection facilities and acclimation ponds). Increased economic benefits for local communities within the NEP area could be realized by hiring local workers, providing housing and other accommodations for temporary workers with specialized expertise, as well as the day-to-day contribution of workers to the local economy from purchasing necessities (e.g., automobile fuel and food). In the long-term, a future reintroduction program is anticipated to contribute to the local economy by increasing employment opportunities over the duration of the program (employees would be needed to operate and maintain facilities and oversee day-to-day operations). Although the administrative actions associated with Alternative 2 would have no direct effect on environmental justice, Alternative 2 does have the potential to provide both near-term and long-term positive economic benefits to Sierra, Yuba and Nevada Counties when a future reintroduction program is implemented.

Under Alternative 2, agencies that fund, carry out, or permit actions in the NEP area would not face substantially increased regulatory requirements compared to the No-action Alternative. Therefore, there would not be increased regulatory requirements disproportionately affecting minority or low income populations. Overall, Alternative 2 would be protective of Federal, state, local and private land use and land ownership interests in the NEP area, and would minimize the potential for disproportionate effects to minority or low-income populations, while at the same time facilitating the ability to reintroduce CV spring-run Chinook salmon into the NEP area.

6.9.3 Alternative 3 – Designation of a Nonessential Experimental Population, Authorization for Reintroduction, and Adoption of Current Protective Regulations

Under Alternative 3, NMFS would designate and authorize the release of a NEP of CV spring-run Chinook salmon in NEP area, which would facilitate a future reintroduction program similar to Alternative 2. Unlike Alternative 2, under Alternative 3, NMFS would adopt the current ESA section 4(d) protective regulations that apply to the CV spring-run Chinook salmon ESU downstream of Englebright Dam to apply to reintroduced CV spring-run Chinook salmon in the NEP area. NMFS' experience under the current ESA section 4(d) rule protective regulations (50 CFR 223.203) shows that NMFS does authorize take associated with some otherwise lawful activities, but some activities may not meet one of the 10 categories of activities and some activities may be modified during the authorization process to meet the applicable criteria under the current protective regulations. NMFS expects any such modifications or restrictions placed on lawful land use, water use, and recreational activities in the NEP area under Alternative 3 would be similar to those that are in place outside the NEP area downstream of Englebright Dam. Application of these restrictions could result in additional restrictions on existing lawful land use, water use, and recreational activities in the NEP area.

Potential effects for Alternative 3 associated with locations and opportunities to engage in legal fishing, as well as daily bag limits, would be the same as those described above for Alternative 2. Although the extent to which subsistence living (e.g., subsistence fishing, hunting, gathering or farming) occurs within the NEP area is unknown, Alternative 3 would not diminish the amount of fish, vegetation and/or wildlife available in the watershed that are depended upon and consumed by minority populations, low-income populations, or Indian tribes that may be present in the area. It is also unlikely that Alternative 3 would change the rate and/or pattern of subsistence consumption by minority populations, low-income populations, and Indian tribes as compared to rates and patterns of consumption of the general population.

Anticipated positive local economic benefits associated with near-term construction activities and long-term operation and maintenance of a future reintroduction program under Alternative 3 would be the same as those previously described for Alternative 2.

Compared to the No-action Alternative and Alternative 2, Alternative 3 has the potential for an increase in restrictions on lawful land use, water use, and recreational activities in the NEP area. These additional restrictions could affect persons visiting the action area, residents of Sierra, Nevada and Yuba Counties, and persons or organizations engaged in water management, timber harvest, grazing, or other similar activities.

Under Alternative 3, Federal, non-Federal public, and private entities would have various regulatory options under the ESA in which to seek limits on their potential liabilities from otherwise lawful activities. These could include an ESA section 4(d) limit or an ESA section 10(a) permit as applicable, but any available options would be limited to certain types of activities and subject to conditions. Additional restrictions under Alternative 3 could disproportionately affect minority or low income populations relative to others. The disproportionate effects would be due to the relative effect on these populations of additional financial costs necessary to comply with additional regulatory requirements.

7.0 CUMULATIVE EFFECTS

According to the Council on Environmental Quality's regulations for implementing NEPA (40 CFR 1508.7), a cumulative impact or effect is the impact on the environment that results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

This section considers the cumulative effects of the two action alternatives when added to the aggregate effects of past actions, existing conditions, and reasonably foreseeable future actions and conditions. Only resources potentially affected by the action alternatives are analyzed for cumulative effects. Past, ongoing, and reasonably foreseeable future actions likely contribute to adverse effects on aquatic habitat and other environmental conditions for fish and wildlife species in the analysis area. Some of these reasonably foreseeable future actions/occurrences include, but are not limited to, dam operations, water diversions, recreation, forestry, livestock grazing, and climate change. Adverse cumulative effects of NMFS's Proposed Action/Preferred Alternative would be minor, if even measurable, on all resources.

7.1 Affected Resources

In Section 6, the resources affected by the Proposed Action are identified and are carried forward for the cumulative effects analysis. Those resources are as follows:

- Aquatic Habitat.
    - Fish passage.
    - Water quality.
    - Anadromous salmonid habitat availability and quality.
    - Essential Fish Habitat.
- Fisheries Resources.
    - ESA-listed fish species.
    - Non-listed native fish species.
    - Non-native fish species.
- Wildlife Species.
    - ESA-listed and special status wildlife species.
    - Non-ESA-listed wildlife species.
- Land Use and Ownership.

- Tourism and Recreation.
- Socioeconomics.
- Cultural and Historical Resources.
- Environmental Justice.

7.2 Geographic Boundaries

The analysis areas for cumulative effects vary by resource, depending on the geographic area of the direct and indirect effects analyzed. For physical and biological resources (except for Southern Resident killer whales), as well as for land use and ownership, the cumulative effects analysis area consists of the NEP area. For cultural resources, the cumulative effects analysis area consists of the NEP area and the Sacramento River watershed below Englebright Dam (i.e., lower Yuba River, lower Feather River, lower Sacramento River, and the Delta) within the range of Chinook salmon. For social resources (i.e., socioeconomics, tourism and recreation and environmental justice), the cumulative effects analysis area consists of Sierra, Nevada, and Yuba Counties.

7.3 Temporal Boundaries

Designation and authorization for release of a NEP of CV spring-run Chinook salmon in the NEP area and applicability of protective regulations under ESA section 4(d) in the NEP area (Alternatives 2 and 3) are anticipated to remain in effect until the listed ESU is delisted. The anticipated time period for recovery and delisting are unknown, but will likely take at least 25 years or longer.

7.4 Effects of Past, Present, and Reasonably Foreseeable Future Actions other than the Proposed Action

Past, present and reasonably foreseeable future actions that might contribute to cumulative effects in the analysis area are discussed below. Historical and ongoing factors in the NEP area include: (1) blockage of upstream anadromous fish passage at Englebright Dam and (2) upstream water diversions and storage, which reduce upstream aquatic habitat due to decreased flow, warmer water temperatures, capture and retention of sediment and LWM. Reasonably foreseeable future actions include (1) FERC's issuance of new licenses to upstream hydroelectric projects, including YWA's YRDP, SFWPA's South Feather Power Project, NID's Yuba-Bear Hydroelectric Project, and PG&E's Drum-Spaulding Project, and (2) increased consumptive water diversions.

7.4.1 Hydropower Relicensing

Five hydroelectric projects[22] are located within the Yuba River watershed that fall under FERC's regulatory jurisdiction. The three largest projects under FERC jurisdiction (NID, PG&E and YWA) are currently in the process of relicensing. NID's Yuba-Bear Hydroelectric Project and PG&E's Drum-Spaulding Project primarily occur in the MYR and SYR, as well as the Bear River. YWA's YRDP occurs primarily in the NYR and MYR. These projects impound water behind various dams in the watershed, and alter streamflows throughout the Yuba River. FERC typically issues licenses for a 30-50 year duration and is required to consider environmental impacts under NEPA and consider protection, mitigation, and enhancement measures under the Federal Power Act when issuing licenses.

Hydroelectric project operation and diversions for consumptive uses have historically affected flows in the Yuba River. The Yuba River watershed includes approximately 46 dams and reservoirs with a combined storage capacity of about 1,350,000 acre-feet (FERC 2019). Thirty-eight of these dams are located on the NYR, MYR, and SYR. Estimated average monthly unregulated flows indicate that, on an annual average basis, the NYR, MYR, and SYR upstream of Englebright Reservoir would contribute 1,087,000 acre-feet, 401,000 acre-feet, and 726,000 acre-feet, respectively, to unregulated flows in the lower Yuba river (FERC 2019). Inter-basin water transfers from the upper Yuba River to the Bear and American Rivers reduce the volume of water that enters NBB Reservoir (FERC 2019). The largest inter-basin water diversions occur on the SYR, followed by the NYR, and then the MYR (FERC 2019).

Water diversions and withdrawals affect aquatic habitat and other environmental conditions for fish and wildlife species in the analysis area. NID and Placer County Water Agency (PCWA) are the two largest water providers, with both agencies diverting water from the Yuba River watershed. Water demands for water years 2001-2009 were about 139,000 acre-feet for NID and 105,000 acre-feet for PCWA (FERC 2014). Annual water demand is projected to increase to 171,000-acre-feet by 2032 and 201,000-acre-feet by 2062 for NID, and 114,000-acre-feet by 2032 and 118,000 acre-feet by 2062 for PCWA (FERC 2014). NID's and PG&E's water rights for water delivery are senior to, and hold priority over, hydroelectric power generation. Consumptive water deliveries are made by PG&E to PCWA on a contractual basis. FERC does not have jurisdiction over water rights or how an entity exercises their water right. However, the protection, mitigation, and enhancement measures developed through FERC's Federal Power Act processes for the YRDP and for the Yuba-Bear/Drum-Spaulding

[22] Nevada Irrigation District (NID) (FERC #2266), Pacific Gas and Electric Co. (PG&E) (FERC #2310), YWA (FERC #2246), SFWPA (FERC #2088), and Deadwood Creek (FERC #6780.

relicensings are expected to minimize the cumulative effects of hydroelectric generation and consumptive water demand. Although environmental flow measures and power operations are likely to remain similar over the duration of the FERC project licenses in most years, non-project consumptive water demand (agriculture, municipal, and industrial) is projected to increase during this same period (FERC 2019).

7.4.1.1 Fish Passage

Upstream of NBB Reservoir, the NYR is not affected by FERC-related activities. Fish passage surveys in the upper Yuba River have identified several natural barriers to salmon and steelhead upstream passage, including a few due to low flow conditions. To protect and enhance aquatic resources, PG&E, USFS, BLM, and CDFW have agreed on minimum instream flow requirements for all Yuba-Bear/Drum-Spaulding project-affected reaches (FERC 2014). The new flows will generally be the same or higher than flows under the existing FERC license (see Subsection 7.4.1.3 for more detail) and, in some cases, higher than estimated unregulated flows during the dry summer period. Under the existing FERC license, many of the Yuba-Bear/Drum-Spaulding project-affected stream reaches have no minimum instream flow requirement. In the MYR and SYR, the new flow requirements resulting from the FERC relicensing process are expected to potentially result in benefits to fish passage in areas where increased flow could provide improved passage opportunities for resident fish.

7.4.1.2 Water Quality

Under future conditions, water quality conditions in the NYR upstream of NBB Reservoir are anticipated to be the same as under existing conditions (Subsection 5.3.3). The NYR below NBB Dam, MYR and the SYR would continue to be listed as impaired waterbodies due to mercury concentrations under CWA section 303(d). The SYR upstream of Englebright Reservoir is listed under CWA section 303(d) as impaired for temperature with completion of a total maximum daily load scheduled for 2021 (FERC 2014). To address water temperature concerns, several stakeholders in the Yuba-Bear/Drum-Spaulding relicensing processes filed proposals to augment flow in selected stream reaches during summer, which would further reduce water temperatures to benefit aquatic resources (FERC 2014). Under future conditions, Yuba River tributaries, Deer, Humbug, Kanaka, Little Deer Creeks, and Englebright and Scotts Flat Reservoirs, would continue to be listed for water quality impairments to beneficial uses, as defined under CWA section 303(d) (CVRWQCB 2018).

7.4.1.3 Anadromous Salmonid Habitat Availability and Quality

Baseline conditions discussed in Subsection 5.3 generally reflect expected conditions in the future. However, minimum instream flow conditions in the SYR and MYR will be different from existing conditions, as discussed in Appendix A. In general, modified flow regimes would enhance available habitat for rainbow trout, and resultant water temperature changes occurring in the SYR would be beneficial to aquatic habitat. However, implementation of the new minimum instream flows identified through the Yuba-Bear/Drum-Spaulding FERC relicensing process would not substantially increase the amount of thermally suitable habitat for Chinook salmon in the SYR (Stillwater 2013; YSF 2013).

In addition to new minimum instream flow requirements, the FERC Final EIS (2014) for relicensing the Yuba-Bear/Drum-Spaulding projects includes references to NMFS's recommended minimum flows associated with planning for the future reintroduction of CV spring-run Chinook salmon and CCV steelhead to the upper Yuba River. NMFS's flow recommendations include those for the MYR (between Our House Diversion Dam (non-project) and Milton Diversion Dam and the SYR (downstream of Lake Spaulding Dam). FERC (2014) stated "…*NMFS has recommended future increases in minimum streamflows in the Middle Yuba and South Yuba rivers during late spring and summer to support the potential reintroduction of spring-run Chinook salmon and Central Valley steelhead in the upper Yuba River Basin above Englebright dam.* FERC (2014) further stated that *"….If and when reintroduction of either of these species occurs, the operations model results indicate that the proposed flow increases are likely to further stress the water delivery system, reduce power generation, and could lead to non-compliance with minimum streamflows in other project-affected stream reaches, particularly in downstream project areas (e.g., Auburn Ravine and Mormon Ravine) and during drier years."* Regarding NMFS's recommendations, FERC (2014) stated "*Given the uncertain schedule and progress toward reintroduction of anadromous salmonids in this watershed and ongoing studies associated with this reintroduction, it is premature to determine appropriate flows to support reintroduction of anadromous salmonids for future implementation as recommended by NMFS*".

Regarding the potential for future reintroduction of anadromous salmonids (i.e., CV spring-run Chinook salmon and CCV steelhead) into the upper Yuba River, FERC (2014) recognized its reserved authority, as well as the potential for the USFS and BLM to modify FPA section 4(e) conditions. According to FERC (2014) "*In the event that anadromous fish reintroduction becomes reasonably foreseeable in the future, the Commission has sufficient reserved authority under standard article 15 to reopen the license and require, as appropriate, measures to facilitate reintroduction of anadromous*

fish, ensure that project-related impacts are addressed, and complete consultation with NMFS under the ESA. The Forest Service (condition 46) and BLM (condition 8) provide for modifications of the section 4(e) conditions in the event of anadromous fish reintroduction."

Large Woody Material

LWM contributes to productive aquatic ecosystems and is an important component in the formation of complex aquatic habitat units and channel maintenance. At larger dams (e.g., NBB Dam, Lake Spaulding Dam), LWM is periodically collected and stockpiled for burning or disposal (FERC 2014; YWA 2018). Under future conditions, YWA (2018) has developed a plan as part of its YRDP FERC relicensing process to provide guidance, including coordination with the USFS, for YWA's passage of woody material at Our House Diversion Dam on the MYR and at Log Cabin Diversion Dam on Oregon Creek, and for YWA's annual collection, storage and disposal of LWM on NBB Reservoir on the NYR. Management of LWM is expected to provide downstream habitat benefits for aquatic and riparian species, while ensuring public safety (YWA 2018).

In the MYR and the SYR, LWM currently passes over small high elevation dams and diversion dams during periods of high flow. For the SYR, PG&E has agreed to develop and implement a LWM Management Plan. Under the plan, PG&E will facilitate the passage of LWM at Drum-Spaulding project dams and diversions for protection and enhancement of downstream aquatic habitat (FERC 2014). On the MYR, NID has agreed to ensure that mobile LWM passes downstream of Yuba-Bear project dams (e.g., Jackson Meadows Dam, Milton Diversion Dam). NID will survey and identify project dams where LWM is blocked from passing downstream, and will identify opportunities and locations for reintroduction of LWM to downstream reaches (FERC 2014). These actions will provide some future benefits for aquatic species and habitats downstream of existing dams.

7.4.1.4 Essential Fish Habitat

FERC (2014) concluded the Yuba-Bear/Drum-Spaulding relicensing projects "*do not affect Pacific salmon EFH upstream of Englebright Reservoir but could affect EFH downstream of Englebright dam*". Consequently, FERC (2014) stated it would initiate EFH consultation with NMFS after FERC's evaluation of recommended measures, including flow releases, associated with the YRDP relicensing. FERC's 2019 Final EIS for the YRDP concluded the YRDP would have only minor and, in most cases, beneficial effects on Chinook salmon EFH. FERC (2019) determined that "*EFH consultation is required for Chinook salmon, because the geographic extent of Chinook salmon EFH in the Yuba*

River Basin includes project-affected areas"[23], and stated it would request that NMFS provide EFH conservation recommendations along with its biological opinion (BO) for the YRDP. Under future conditions, the provision of EFH conservation recommendations through consultation with FERC is expected to be beneficial to EFH.

7.4.2 U. S. Army Corps of Engineers Yuba River Ecosystem Restoration Feasibility Study

The Corps initiated the Yuba River Ecosystem Restoration Feasibility Study (YRERFS) to investigate the feasibility of ecosystem restoration opportunities in the Yuba River. As the non-Federal sponsor for the YRERFS, YWA has been working constructively with the Corps to develop a long-term plan to restore ecosystem conditions in the lower Yuba River. The Corps completed the Final Feasibility Report in January 2019, and is currently in the process of finalizing the Chief of Engineers Report signifying approval of the project recommendation. If the project is authorized by Congress, construction funds must be appropriated for the project by Congress before a Project Partnership Agreement can be signed by Corps and the non-Federal sponsor (i.e., YWA), and before detailed project design and construction could begin (Corps 2019).

The Corps consulted with NMFS and United States Fish and Wildlife Service (USFWS) on its Recommended Plan through ESA section 7 formal and informal consultation, the Magnuson-Stevens Act, and the Fish and Wildlife Coordination Act. In October 2018, NMFS issued a BO and concluded that the project: (1) would not jeopardize CV spring-run Chinook salmon, CCV steelhead, or green sturgeon; and (2) would not destroy or adversely modify their critical habitat (Corps 2019). NMFS also issued conservation recommendations for the Corps' project under the Magnuson-Stevens Act. Although there may be some short-term construction-related effects (e.g., increases in sedimentation, turbidity, and physical disturbance) from conducting in-channel work, these effects would be minor, and the Corps' Recommended Plan is anticipated to result in long-term improvements to the quality and quantity of critical habitat and EFH in the lower Yuba River.

7.4.3 Wild and Scenic Rivers

The Wild and Scenic Rivers Act (16 U.S.C. 1271 *et seq*.) establishes a National Wild and Scenic Rivers System. The Act also prescribes methods and standards through which additional rivers may be identified and added to the system.

[23] Chinook salmon EFH in the Yuba River watershed includes the upper Yuba River upstream of Englebright Dam as previously described.

During the 1990s, twenty-two rivers in the western portion of the TNF were considered for their suitability for inclusion in the National Wild and Scenic Rivers System. The Record of Decision for the Twenty-two Westside Rivers Wild and Scenic Study Report and Final EIS (USFS 1999) recommended that the NYR (from the headwaters just below Yuba Pass to NBB Reservoir) be designated as a *recreation* and *scenic* river pursuant to the Wild and Scenic Rivers Act. The NYR was found to have "outstandingly remarkable" cultural values in the form of extensive gold mining sites, historical gold mining communities, and existing and potential high-quality interpretive opportunities. These historical values were considered of high regional significance, with probable national significance. The fishery values were considered of statewide significance due to the fish diversity, quality of habitat, and trophy fishery (USFS 1999). The recreational values were considered regionally significant due to the diversity of river-associated recreation activities (e.g., whitewater rafting, kayaking, hiking and day use, overnight camping). The USFS also determined a Wild and Scenic designation of the NYR would not interfere with operation of NBB Reservoir (USFS 1999). The USFS (1999) determined that, upon Congressional designation, the NYR could be added to the National Wild and Scenic River System.

The TNF also addressed the MYR and SYR to determine if a recommendation should be made to include them as rivers to receive study for designation as components of the Wild and Scenic Rivers system. The TNF determined that Scenic and Recreation values were present and the MYR and SYR (USFS 1988) and are eligible for inclusion in the Wild and Scenic River system.

If the proposed areas become designated by Congress, forest management practices would not change because the TNF already applies the same protections to these reaches as if they were designated.

7.4.4 Hatchery and Genetic Management Plans

NEP designation could potentially initiate planning for a new conservation hatchery facility, or expansion/modification of current facilities to accommodate a conservation hatchery, for CV spring-run Chinook salmon for future reintroduction efforts. Additional conservation hatchery production would require authorization under the ESA and completion of a HGMP. A HGMP provides detailed descriptions of hatchery programs that are submitted to NMFS for authorization under the ESA and are the basis for NMFS' biological evaluations under ESA sections 7 and 10, or Limit 5 of the current ESA section 4(d) rule protective regulations (50 CFR 223.203) (Subsection 1.2.4).

Although donor stocks associated with a potential reintroduction are uncertain at this time, fish produced from the FRH may be the initial source of individuals to establish an experimental

population of CV spring-run Chinook salmon in the NEP area (potentially using donor stock from the Yuba and/or Feather River). Subsequent to the initial potential reintroduction, NMFS in coordination with CDFW may consider diversifying the donor stock with fish from the natural spawning population in other streams, if those populations could sustain the removal of fish without adverse population level effects. Any collection of CV spring-run Chinook salmon would be subject to NMFS's approval of a permit under ESA section 10(a)(l)(A), which includes an HGMP and an analysis under NEPA and ESA section 7. Thus, NMFS anticipates that there will be a need for future authorization for the collection of CV spring-run Chinook salmon, an HGMP, subsequent issuance of a 10(a)(1)(A) permit, and a future analysis under the ESA and NEPA when NMFS receives a permit application. Reintroduction of an experimental population of CV spring-run Chinook salmon in the NEP area along with an HGMP and a future ESA section 10(a)(1)(A) permit would work in concert with other ongoing recovery and reintroduction efforts for CV spring-run Chinook salmon, and would enhance NMFS' flexibility and discretion in managing listed Central Valley salmon.

7.4.5 Federal, State, and Local Laws and Regulations

Many of the potential adverse effects from other actions in the analysis area (some identified above) would be avoided or offset through the implementation of Federal, state, and local laws and regulations. Projects with the greatest potential to affect fish and fish-dependent resources—that is, projects occurring in or near the water—are subject to oversight through several regulatory processes. Examples of reviews and permits that would limit the potential for adverse effects on physical and biological resources include the following:

- NEPA and California Environmental Quality Act reviews of agency actions with the potential to significantly affect the quality of the environment.
- CWA section 404 permits for excavating, clearing land, or discharging dredged or fill material into waters of the United States, including wetlands.
- Implementation of HGMPs for hatcheries determined to be necessary for reintroduction efforts.
- FERC relicensing every 30 to 50 years.
- Approvals for projects that use, divert, obstruct, or change the natural flow or bed of waters of the State.

- Local land use permits for activities in or near locally designated critical areas (e.g., wetlands, fish and wildlife habitat conservation areas, and frequently flooded areas) or in protective buffer zones.

7.4.6 Climate Change

Climate is a major driver of geographic distribution and abundance of salmon and steelhead (NMFS 2016a). Over 60% of California's anadromous salmonids are vulnerable to climate change, and future climate change will affect NMFS's ability to influence their recovery in most or all of their watersheds (Moyle et al. 2008; Moyle et al. 2013). California's anadromous salmonids are particularly vulnerable to the adverse impacts of climate change (Crozier et al., 2019).

7.4.6.1 Recent Trends

Impacts from a changing climate are evident in California (Barnett et al. 2008; Bonfils et al. 2008), and these impacts have the potential to significantly alter aquatic habitats over the upcoming decades. For example, the San Francisco Bay Area's average annual maximum temperature has increased by 1.7°F from 1950-2005, and sea level in the Bay Area has risen about 8 inches in the last 100 years (Ackerly et al. 2019). Temperatures over the Sierra Nevada have increased during the last 100 years, resulting in less snowfall (and more rainfall) and an earlier snowmelt (Moser et al. 2009). Nighttime temperatures are rising across California and at a higher rate than daytime temperatures (DWR and Reclamation 2016).

7.4.6.2 Projections to 2100

Since 2006, the State of California has undertaken four comprehensive assessments designed to assess the impacts and risks from climate change. California's Fourth Climate Change Assessment (Sievanen et al. 2018) included over 44 technical peer-reviewed reports examining specific aspects of climate change in California, including projections of impacts, analysis of vulnerabilities and adaptation for various sectors (Table 14). Trends in California will likely include increases in average air temperatures, rising sea levels, changes in precipitation patterns (including storm intensity and timing of runoff), changes in freshwater supply and management of those supplies, and changes in the frequency and severity of extreme events such as heat waves, droughts, and catastrophic fires (Hanak et al. 2011; Mastrandrea and Luers 2012).

Table 14. Current Understanding of Historical and Expected Climate Impacts in California (modified from Sievanen et al. 2018).

Climate Impact	Historical Trends	Future Direction of Change	Confidence for Future Change
Temperature	Warming (last 100+ years)	Warming	Very High
Sea Levels	Rising (last 100+ years)	Rising	Very High
Snowpack	Declining (last 60+ years)	Declining	Very High
Annual Precipitation	No significant trends (last 100+ years)	Unknown	Low
Intensity of Heavy Precipitation Events	No significant trends (last 100 years)	Increasing	Medium-High
Frequency of Drought	No significant trends (last 100 years)	Increasing	Medium-High

Anadromous Salmonid Considerations

Because salmon and steelhead depend upon freshwater streams, estuaries and oceans during different stages of their life history, NMFS (2014) Recovery Plan reports that these species are likely to be adversely affected by the climate related-impacts listed below.

- More frequent intense winter storms, high stream flow events, and floods.
- Earlier snowmelt, with higher peak flows in winter, less spring runoff, and much lower summer flows.
- Considerably warmer stream, river and ocean water temperatures during the summer.
- Greater inter-annual precipitation variability, more frequent wet and drought years, and extended droughts.
- Years with weaker fall storms, and delays in the onset of high stream flows.
- More frequent wildfires leading to increased erosion and sedimentation.

NMFS anticipates the above changes will affect freshwater streams and estuaries in California used by Chinook salmon. These climate-related effects occur across different life history stages, and are typically cumulative, which could result in reduced populations (Williams et al. 2016). Information provided below is intended to characterize the potential extent of future climate-related conditions that may be experienced by anadromous salmonids in the Yuba River.

Freshwater Streams

Freshwater streams may experience increased frequencies of floods, droughts, lower summer flows and higher water temperatures (Luers et al. 2006; Lindley et al. 2007; Schneider 2007; Osgood 2008), as described below.

Precipitation - At higher elevations in California, precipitation is likely to fall as rain rather than snow (Safeeq et al. 2015), reducing overall snowpack and the critical snowmelt that provides cold water year-round to California's salmonid species (Moyle et al. 2017). As precipitation patterns change and warmer stream temperatures become more common, it will be more difficult to maintain cold-water releases from dams during the summer and fall months to sustain Central Valley Chinook salmon and steelhead populations on the valley floor. Central Valley watersheds are fed predominantly by snowmelt runoff from the southern Cascade and Sierra Nevada Mountains, which has been historically highest during the late spring and early summer. High flows allow CV spring-run Chinook salmon to reach their summer holding areas, while the lower flow extending from the summer into early fall is cool enough for spawning (NMFS 2014). However, recent trends toward an earlier seasonal runoff and lower flow in spring and summer have reduced the potential for survival in these watersheds, and will make the migration of adults to their spawning streams more difficult. Atmospheric rivers influence flooding events, and studies (Guan et al. 2016; Crozier 2016) suggest that intense atmospheric rivers will occur more frequently as mean temperatures rise, with maximum change affecting northern California (Gao et al. 2015; Payne and Magnusdottir 2015; Radic et al. 2015; Warner et al. 2015). Finally, increases in rainfall during the winter have the potential to increase the loss of salmonid redds via streambed scour from more frequent, high instream flows.

Droughts – Natural climate variations such as droughts can dramatically affect salmon habitat. Based on future climate projections, an increased occurrence of drought may dramatically reduce total quantity and quality of freshwater habitat. Prolonged drought due to lower precipitation shifts in snowmelt runoff, and greater climate extremes could render most existing CV spring-run Chinook salmon habitat unusable, either through temperature increases or lack of adequate flows (NMFS 2014).

Climate-related Effects in the Cumulative Effects

Climate change is likely to reduce the quantity, and impair the quality and accessibility, of suitable habitat for many species, exacerbating the adverse effects of other reasonably foreseeable future actions. As described above, anticipated impacts of climate change include increased water temperatures, changes in hydrological processes, and accelerated loss of forest habitat because of forest fires and insect outbreaks, all with concomitant changes in habitat-forming processes (Mantua et al. 2009; Littell et al. 2016). With reductions in snowmelt runoff and increased contributions by rainfall, peak flows may come earlier, which could affect species such as CV spring-run Chinook salmon that have evolved their life history based on predictable runoff patterns (Williams 2006).

Reduction in snowpack owing to climate change will increase water temperatures. Increased water temperatures will reduce reproductive success, particularly at elevations lower than those found in the NEP area. A recent analysis modeling changes to average water temperatures in August under two climate change scenarios predicts an increase of approximately 1° C by 2080 (USFS 2017) in the NYR. This change could reduce the overall quantity of habitat for CV spring-run Chinook salmon by approximately four mainstem miles in the NYR. YSF (2013) evaluated available habitat in the NYR and determined that, depending on water year, between 7.6 and 33.7 miles of the NYR could maintain suitable holding and summer rearing habitat. If reintroduction occurs in the NYR, a loss of 4 miles, while significant, would still allow, depending on water year, between 3.6 and 29.7 additional miles of habitat than is currently available downstream of Englebright Dam. Furthermore, the fish would be spatially distributed across a greater area making the ESU more resilient to stochastic events.

As part of a future reintroduction program, the potential greenhouse gas emission would be minimal. Sources of greenhouse gas emissions associated with implementation of the reintroduction are anticipated to occur if the reintroduction program uses trap and haul methods. Trap and haul methods would be limited to vehicle trips for transporting fish and installing collector equipment. Impacts would be extremely small in the local or global context.

7.5 Incremental Impacts When Added to Other Past, Present, and Reasonably Foreseeable Future Actions

For this analysis, the focus is on the contribution of the No-action Alternative or an action alternative to cumulative effects considering other past, present, and future actions that occurred, are occurring, or are expected to occur in the analysis area. Section 5, Affected Environment, describes existing conditions and reflects environmental effects from past and existing conditions for eight resource areas. Section 6, Environmental Consequences, evaluates the direct and indirect effects of the No-action Alternative, the Proposed Action/Preferred Alternative (i.e., Alternative 2) and Alternative 3 on these resources. This section considers the cumulative effects of the alternatives in the context of past actions, present conditions, and reasonably foreseeable future actions and conditions.

7.5.1 Aquatic Habitat

7.5.1.1 Fish Passage

The NYR upstream of NBB Dam is not subject to regulatory-imposed instream flow conditions and there would be no changes from existing conditions and, therefore, no adverse effects on fish passage or access to available fish habitat under the Cumulative Effects. In the MYR and SYR, the new Yuba-

Bear/Drum-Spaulding flow requirements resulting from the FERC relicensing process are expected to potentially result in benefits to fish passage in the FERC-affected stream reaches where increased flow could provide improved passage opportunities for resident fish. Similar to the No-action Alternative, Alternative 2 would not have an adverse effect on fish passage or access to available fish habitat in the NEP area. The extent of benefit associated with improved fish passage under Alternative 3 is unknown, but no biologically adverse effects to fish passage or habitat access are anticipated under this alternative. Therefore, adverse cumulative effects to fish passage are expected to be negligible under the action alternatives in consideration of all past, present and reasonably foreseeable future actions.

7.5.1.2 Water Quality

As a result of ongoing and future FERC relicensing efforts, NMFS anticipates future effects to water quality and availability will either remain substantially the same as current conditions in some tributaries (e.g., NYR), or would improve as a result of implementing new flow regimes as a result of FERC relicensing (e.g., in the MYR and the SYR). Instream flow conditions in the NEP area under Alternative 2 and Alternative 3 would not change, and would have no effect on CWA 303(d) listings of tributaries and reservoirs for water quality impairments. Compared to the No-action Alternative, Alternative 2 would not result in adverse effects to water quantity in the NEP area and may result in beneficial effects to the aquatic ecosystem due to the addition of marine derived nutrients. The increased regulatory requirements associated with Alternative 3 could beneficially affect water quality and water resource management in the future. Adverse cumulative effects to water quality are expected to be negligible under the action alternatives in consideration of all past, present and reasonably foreseeable future actions.

7.5.1.3 Anadromous Salmonid Habitat Availability and Quality

As discussed in Subsection 5.3.4, current conditions in the NYR are suitable for CV spring-run Chinook salmon, due in large part to the lack of water impoundments and water diversions. Current conditions in the MYR are moderately favorable (depending on water year) and generally unfavorable in the SYR due to water impoundments and diversions. Under the No-action Alternative, NMFS would not designate and authorize the release of an experimental population in the NEP area. Therefore, the No-action Alternative would not facilitate a future reintroduction program, and no effects on habitat availability are expected in the NEP area. Alternative 2 would have no direct effect on anadromous salmonid habitat availability but would have an indirect effect by facilitating a future

reintroduction program. Along with facilitating a future reintroduction program, increased regulatory requirements under Alternative 3 could lead to additional efforts by land and water managers to minimize the adverse effects of their actions through avoidance, minimization and/or mitigation measures focused on improving habitat availability and quality for listed CV spring-run Chinook salmon. The extent of these benefits are unknown, but no adverse cumulative effects to anadromous salmonid habitat availability and quality are anticipated under Alternative 3. Therefore, in consideration of all past, present and reasonably foreseeable future actions, no adverse cumulative effects to anadromous salmonid habitat availability and quality are expected to occur under the action alternatives.

7.5.1.4 Essential Fish Habitat

As described above, FERC has indicated it will initiate EFH consultation with NMFS on the YRDP, as well as the Yuba-Bear/Drum-Spaulding relicensing projects, and requested NMFS provide EFH conservation recommendations along with its BO(s) for the three FERC projects. Compared to the No-action Alternative, no activities adversely affecting EFH and Habitat Areas of Particular Concern in the NEP area would occur as a result of Alternative 2 or Alternative 3. Under Alternative 3, increased regulatory requirements could lead to additional efforts by federal land and water managers, and other non-federal entities pursuing land and water-related actions within the NEP area to minimize the adverse effects of their actions and to conserve EFH. The extent of these benefits are unknown, but no adverse effects to EFH availability and quality are anticipated under Alternative 3. No activities affecting ocean or coast habitats, and inland EFH would occur under Alternative 2 or Alternative 3. Therefore, no adverse cumulative effects to EFH are expected under the action alternatives in consideration of all past, present and reasonably foreseeable future actions.

7.5.2 Fisheries Resources

In contrast to the No-action Alternative, facilitation of reintroduction of CV spring-run Chinook salmon into the NEP area as a result of both Alternative 2 and Alternative 3 is anticipated to improve the overall viability of the CV spring-run Chinook salmon ESU. Alternative 2 and Alternative 3 would be consistent with NMFS's (2014) final recovery plan for CV spring-run Chinook salmon. Reintroduction would aid in recovery of the ESU by increasing abundance and productivity, improving spatial structure and diversity, and reducing the risk of extinction to the ESU as a whole. Designation and authorization for release of a NEP in the NEP area under ESA section 10(j) as part of

Alternative 2 and Alternative 3 would enhance NMFS's flexibility and discretion in conserving CV spring-run Chinook salmon.

The potentially adverse cumulative effects to CV spring-run Chinook salmon and other fisheries resources from ongoing actions in the area, such as some water and land management practices, are anticipated to continue under Alternative 2. Additionally, climate change projections indicate continued pressures on fish habitat from warming trends would exist into the future. Under Alternative 2, overall habitat conditions for CV spring-run Chinook salmon and other fisheries resources in the NEP area are anticipated to remain suitable, even in consideration of all past, present, and reasonably foreseeable future actions. Overall, adverse cumulative effects to fishery resources are expected to be negligible under Alternative 2 in consideration of all past, present and reasonably foreseeable future actions.

Under Alternative 3, facilitation of reintroduction of ESA-listed species to an area where they do not currently occur would add to the regulatory requirements compared to Alternative 2. Increased regulatory oversight for ongoing actions in the area, such as dam operations and some land management practices, could lead to improvements to instream conditions for successful holding, spawning, and rearing over time. Climate change projections under Alternative 3 would be similar to those under Alternative 2, and indicate continued pressures on fish habitat from warming trends would exist into the future. Overall, no adverse cumulative effects to fisheries resources are expected under the action alternatives in consideration of all past, present and reasonably foreseeable future actions.

7.5.3 Wildlife Resources

Potentially adverse cumulative effects on wildlife species or their habitat within the analysis area resulting from implementation of Alternative 2 or Alternative 3 are unlikely for any of the wildlife species addressed in Subsection 6.4, except the action alternatives are anticipated to have a relatively minor adverse effect to Sierra Nevada yellow-legged frogs. Under both Alternative 2 and Alternative 3, climate change projections indicate continued pressures on terrestrial and aquatic habitats from warming trends that would likely exist into the future, which could increase stressors to certain wildlife species in the analysis area. Overall, no adverse cumulative effects to wildlife resources are expected under the action alternatives, except for relatively minor cumulative adverse effects to Sierra Nevada yellow-legged frogs, in consideration of all past, present and reasonably foreseeable future actions.

7.5.4 Land Use and Ownership

Substantial adverse effects on land use and ownership (Subsection 6.5) are not anticipated under Alternative 2. Within the NEP area, NMFS's proposed ESA section 4(d) rule protective regulations would include an exception to take prohibitions for take that is incidental to otherwise lawful activities and unintentional, not due to negligent conduct. This take exception, as well as the limited applicability of ESA section 7 to a NEP of CV spring-run Chinook salmon in the NEP area, would facilitate the reintroduction of CV spring-run Chinook salmon with little to no effect on land uses such as agriculture, forestry, extractive/industrial activities, commercial/research and development, parks, public lands, military installations or urban/local communities. Because of the regulatory relief provided by NEP designation and the exception to the proposed ESA section 4(d) protective regulations, NMFS also does not expect Alternative 2 to have any substantial adverse cumulative effect on recreational, agricultural, or development activities within the NEP area in consideration of all past, present and reasonably foreseeable future actions.

Under Alternative 3, potentially adverse cumulative effects may occur to land use and ownership (Subsection 6.5) in consideration of all past, present and reasonably foreseeable future actions as a result of adoption of the more restrictive current ESA section 4(d) rule protective regulations for the NEP area under Alternative 3. For agencies with management authority for public lands and private landowners, Alternative 3 may restrict the types or extent of actions those management agencies and private landowners would implement on their lands because of increased regulatory obligations necessary to comply with the more restrictive ESA section 4(d) rule protective regulations under Alternative 3.

7.5.5 Tourism and Recreation

No substantial adverse effects on tourism and recreation (Subsection 6.6) are anticipated under Alternative 2. Within the NEP area, NMFS's proposed ESA section 4(d) rule protective regulations would provide an exception to take prohibitions for take that is incidental to otherwise lawful activities and unintentional, not due to negligent conduct. Because of the regulatory relief provided by the NEP designation and this take exception, Alternative 2 would facilitate reintroduction of CV spring-run Chinook salmon to the NEP area with little to no effect on tourism and recreational activities within the NEP area or outside the NEP area portions of Sierra, Nevada, and Yuba Counties. Alternative 2 is expected to result in opportunities for future recreational viewing of salmon. Under Alternative 2, people visiting Sierra Nevada, and Yuba Counties would be anticipated to support local community

businesses by partaking in food and beverage services, accommodations, retail sales, arts, entertainment and recreation, etc. Opportunities to engage in recreational fishing would not be reduced under Alternative 2. Overall, no adverse cumulative effects to tourism and recreation resources are expected under Alternative 2 in consideration of all past, present and reasonably foreseeable future actions.

Alternative 3, as with Alternative 2, would be expected to result in opportunities to view adult Chinook salmon returning to historical holding and spawning areas over the long-term. However, potential adverse effects on tourism and recreation (Subsection 6.6) may occur. Potential incidental take of CV spring-run Chinook salmon would be subject to greater regulatory restrictions than under Alternative 2. NMFS' experience under the current ESA section 4(d) rule protective regulations (50 CFR 223.203) shows that NMFS does authorize take associated with some otherwise lawful activities, but some activities may not meet one of the 10 categories of activities and some activities may be modified during the authorization process to meet the applicable criteria under the current protective regulations. NMFS expects that any such modifications or restrictions placed on tourism or recreational activities in the NEP area under Alternative 3 would be similar to those that are in place outside the NEP area downstream of Englebright Dam. One possible exception is the potential to "harass" adult CV spring-run Chinook salmon by excessive proximity of tourist viewing of holding adults. Overall, minor adverse cumulative effects to tourism and recreational activities are expected under Alternative 3 in consideration of all past, present and reasonably foreseeable future actions.

7.5.6 Socioeconomics

Alternative 2 has the potential to bring positive socioeconomic benefits to the NEP area, and adverse cumulative effects to socioeconomics are not expected to occur under Alternative 2 in consideration of all past, present and reasonably foreseeable future actions. When a reintroduction program is implemented, the program would provide increased opportunities for employment related to construction of the requisite facilities (e.g., roads and a juvenile collection facility) for several years. Increased economic benefits for local communities within the NEP area could be realized by hiring local workers, providing housing and other accommodations for temporary workers with specialized expertise, as well as the day-to-day contribution of workers to the local economy. In the long-term, when a reintroduction program is implemented, it is anticipated the program would contribute to the local economy by increasing employment opportunities. Overall, Alternative 2 would be protective of Federal, state, local and private land use and land ownership interests in the NEP area. Alternative 2 would minimize potential for new or higher expenses from increased regulatory compliance

responsibilities associated with future Federal, state, county, and municipal actions in the watershed, and while at the same time facilitate the ability to reintroduce CV spring-run Chinook salmon into the NEP area.

When a future reintroduction program is implemented, Alternative 3 has the potential to bring similar economic benefits to the NEP area as those that are described in the paragraph above for Alternative 2. By contrast, however, potentially adverse socioeconomic effects also may occur under Alternative 3. Relative to Alternative 2, Alternative 3 has the potential for an increase in restrictions to lawful land use, water use, and recreational activities in the analysis area. Overall, compliance with new regulatory requirements associated with Alternative 3 would likely result in negative cumulative effects to socioeconomics compared to effects that would occur with the No-action Alternative or Alternative 2 in consideration of all past, present and reasonably foreseeable future actions. Negative socioeconomic effects would result from regulatory requirements that could affect persons visiting the action area for recreational fishing opportunities (and ancillary businesses associated with recreational fishing), residents of Sierra, Nevada and Yuba Counties, and persons or organizations engaged in water management, timber harvest, grazing, or other similar types of activities.

7.5.7 Cultural and Historical Resources

No prehistoric or historical archaeological sites, historical structures, or traditional cultural properties in the analysis area would be affected by designation and authorization for release of an experimental population and associated protective regulations in the NEP area under the action alternatives. Overall, no adverse cumulative effects on cultural and historical resources are expected under Alternative 2 and Alternative 3 in consideration of all past, present, and reasonably foreseeable future actions.

7.5.8 Environmental Justice

Potentially adverse effects on environmental justice (Subsection 6.9) are not anticipated under Alternative 2. Alternative 2 would be protective of Federal, state, local and private land use and land ownership interests in the NEP area, and would minimize the potential for disproportionate effects to minority or low-income populations, while at the same time facilitating the ability to reintroduce CV spring-run Chinook salmon into the NEP area. Under Alternative 3, additional restrictions could disproportionately affect minority or low income populations relative to others. The disproportionate effects would be due to the relative effect on these populations of additional financial costs necessary to comply with additional regulatory requirements. Overall, potentially adverse cumulative effects to

environmental justice are not expected to occur under Alternative 2 but could occur under Alternative 3 in consideration of all past, present and reasonably foreseeable future actions.

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9.0 GLOSSARY OF KEY TERMS

Action area: For this Environmental Assessment, this term is used synonymously with the proposed Nonessential Experimental Population (NEP) area for the NEP designation under Endangered Species Act section 10(j).

Anadromous: A life-history pattern for fish that features early juvenile development in fresh water, migration to seawater, and a return to fresh water for spawning.

Biological Opinion: the document in Endangered Species Act section 7 consultation that states the opinion of the National Marine Fisheries Service or Fish and Wildlife Service as to whether or not the Federal action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat (see 50 CFR 402.02).

Centrarchid: A member of the sunfish family (Centrarchidae) of freshwater ray-finned fish, including largemouth bass, bluegill, pumpkinseed, and crappies.

Distinct population segment: Under the Endangered Species Act (ESA), the term species includes any subspecies of fish or wildlife or plants, and any "distinct population segment" of any species of vertebrate fish or wildlife which interbreeds when mature (16 U.S.C. 1532(16)). The ESA thus considers a distinct population segment of vertebrates to be a "species." The ESA does not, however, establish how distinctness should be determined. Under National Marine Fisheries Service's (NMFS) Policy on Applying the Definition of Species Under the Endangered Species Act to Pacific Salmon (56 Fed. Reg. 58612, November 20, 1991), a salmon stock will be considered a distinct population segment and hence a "species" if it represents an evolutionarily significant unit (ESU) of the biological species. In contrast to Pacific salmon, NMFS listed steelhead runs under the joint NMFS-U.S. Fish and Wildlife Service Policy Regarding the Recognition of Distinct Vertebrate Population Segments Under the Endangered Species Act (Distinct Population Segment Policy; 61 Fed. Reg. 4722, February 7, 1996). This policy adopts criteria similar to those in the ESU policy, but applies to a broader range of animals to include all vertebrates.

Endangered Species Act (ESA): A United States law that provides for the conservation of endangered and threatened species of fish, wildlife, and plants (16 U.S.C. 1531 *et seq.*).

Essential Fish Habitat (EFH): EFH was defined in the 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity" (16 U.S.C. 1802(10)). Implementing regulations

clarified that, for the purpose of interpreting the definition of essential fish habitat, “waters” include all aquatic areas and their physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; “substrate” includes sediment, hard bottom, structures underlying the waters, and associated biological communities; “necessary” means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and “spawning, breeding, feeding, or growth to maturity” covers a species' full life cycle (50 CFR 600.10). EFH includes types of aquatic habitat such as wetlands, coral reefs, sand, seagrasses, and rivers.

The National Marine Fisheries Service works with the regional fishery management councils to designate EFH using the best available scientific information. EFH has been described for more than a 1,000 managed species to date. The main purpose of EFH regulations is to minimize the adverse effects of fishing and non-fishing impacts on EFH to the maximum extent practicable.

Evolutionarily significant unit (ESU): The ESA defines ‘species’ to include any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature (16 U.S.C. 1532(16)). Under National Marine Fisheries Service’s (NMFS) Policy on Applying the Definition of Species Under the Endangered Species Act to Pacific Salmon (56 Fed. Reg. 58612, November 20, 1991), a salmon stock will be considered a distinct population segment and hence a “species” if it represents an evolutionarily significant unit (ESU) of the biological species. A stock of Pacific salmon must satisfy two criteria to be considered an ESU: (1) It must be substantially reproductively isolated from other nonspecific population units; and (2) it must represent an important component of the evolutionary legacy of the species.

Hatchery-origin: A fish that originated from a hatchery facility. Also known as a hatchery fish.

Hatchery program: A program that artificially propagates fish. Most hatchery programs for salmon and steelhead spawn adults in captivity, raise the resulting progeny for a few months or longer, and then release the fish into the natural environment where they will mature.

Incidental take: “Take” is defined in the ESA as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct (16 U.S.C. 1532(19)). “Incidental take” is defined in implementing regulations as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02).

Natural-origin: Natural-origin fish are the offspring of parents that spawned in the natural environment rather than the hatchery environment. Synonymous with native or wild fish.

Parr: A young salmon over one year old.

Redd: A shallow depression created by a spawning female where she will lay her eggs. More than one redd can be made by a female when spawning.

Resident fish: Fish that reside in fresh water throughout their life cycle.

Rim dams: The large dams at the base of most major river systems in the Central Valley of California. No rim dam in the Central Valley has a fish passage program or fish passage facilities. Depending on species, these dams block between 80 to 100 percent of historical spawning, holding, and rearing habitat.

Salmonid: Of, belonging to, or characteristic of the family Salmonidae, which includes salmon, trout, char, grayling, and freshwater whitefish.

Smolt: A young salmon that begins the migration from fresh water to marine waters. A smolt is characterized by its physiological changes needed for life in the sea.

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Cooperating agencies in the review of this document were CDFW, YWA, and USFS (Tahoe National Forest).

APPENDIX A Summary of FERC-related Flow Changes in the Upper Yuba River watershed

Five hydroelectric projects (operated by Nevada Irrigation District (NID) (FERC #2266), Pacific Gas and Electric Co. (PG&E) (FERC #2310), YCWA (FERC #2246), South Feather Water and Power Agency (FERC #2088), and Deadwood Creek (FERC #6780) are located within the Yuba River watershed under the regulatory jurisdiction of FERC, and the three largest projects (NID, PG&E, and YCWA) are currently in the process of relicensing.

Flows in the MYR and SYR are largely regulated by dams and associated water conveyance facilities, whereas the NYR is largely unregulated upstream of NBB Dam. Information provided below provides an overview of the changes to minimum instream flow requirements in the MYR and SYR that have been agreed upon as part of the FERC relicensing processes for NID's Yuba-Bear Hydroelectric Project and PG&E's Upper Drum-Spaulding Project.

Under existing conditions in the upper Yuba River, minimum flows in the MYR and SYR provide flow variability typical of regulated streams with limited aquatic habitat and fish production (FERC 2014). The Upper Drum-Spaulding Project provides existing minimum instream flows in 16 reaches, although 7 project-affected stream reaches have no required minimum flow. Consequently, these 7 reaches have the potential of providing no aquatic habitat during dry conditions.

In reaches controlled by the Upper Drum-Spaulding Project, existing minimum flows do not vary by water year type, and operation to these minimum flow requirements create restricted seasonal and inter-annual flow variability. In relicensing, increased flow regimes will provide greater inter-annual flow variation, and minimum instream flow requirements will be dependent on six different water year types. In relicensing, the Upper Drum-Spaulding Project will provide: (1) the same or higher minimum flows, depending on water year type, in 15 project-affected reaches; and (2) new minimum instream flows in 10 project-affected reaches with no minimum instream flow requirements in the existing license; and (3) no minimum instream flow at 1 previous compliance point (FERC 2014).

Under existing conditions, the Yuba-Bear Hydroelectric Project provides existing minimum flows in seven stream reaches, although no minimum flows are required in 10 project-affected stream reaches, thereby providing no aquatic habitat (FERC 2014). Significant changes in future operation, however, are related to new and increased minimum flow releases and modified ramping rates (FERC 2014). In relicensing, the Yuba-Bear Hydroelectric Project will provide: (1) the same or higher minimum instream flows in six project-affected reaches; (2) new minimum instream flows in nine project-affected reaches that do not have existing minimum instream flow requirements; and (3) two stream reaches would have no specific minimum instream flow requirements (FERC 2014).

Overall, implementation of the new minimum instream flow requirements will result in higher flows in project-affected stream reaches, and new minimum flows in several additional project-affected stream reaches that had no minimum instream flow requirement under the existing FERC license. In project reaches with higher flows, seasonal flow variability more typical of unregulated flow conditions would be introduced with implementation of the minimum instream flow requirements (FERC 2014).

The higher minimum instream flows and increased flow variability will protect and enhance aquatic habitat for resident species by increasing habitat, maintaining stream channel geometry, vegetative structure, and gravel or woody debris movement, initiating spawning or upstream and downstream fish migration, and providing rearing habitat in off-channel, floodplain, or side channel areas (FERC 2014).

Mutual operations of the Upper Drum-Spaulding, Deer Creek, Lower Drum, and Yuba-Bear Projects will affect flows and the ability to provide specified minimum instream flows in some project-affected reaches. Development and implementation of a Coordinated Operations Plan will ensure that both PG&E and NID are able to comply with minimum instream flow requirements downstream of their respective project facilities (FERC 2014).

Middle Yuba River

To enhance aquatic habitat and protect resident aquatic species, the Yuba-Bear Hydroelectric Project will provide the same or increased minimum instream flows to seven project-affected reaches, and provide new minimum instream flows to 10 project-affected reaches, including two reaches of the Middle Yuba River (downstream of Jackson Meadows Dam, and downstream of Milton Diversion Dam) (FERC 2014).

Middle Yuba River Downstream of Jackson Meadows Dam

Under the existing FERC license, the minimum instream flow released from Jackson Meadows Dam is 5 cfs year-round (FERC 2014). A thorough description and characterization of the hydrologic regime in this reach of the MYR is presented in FERC (2014). The proposed minimum instream flows would be higher than estimated unregulated median flows during late summer and fall (August to November), but lower during winter and spring (FERC 2014). The proposed minimum instream flow requirements would shift seasonal flow variability to better mimic the natural seasonal hydrograph (FERC 2014).

Overall, the minimum instream flows proposed by NID and the Yuba-Bear/Drum-Spaulding relicensing stakeholders for the MYR downstream of Jackson Meadows Reservoir Dam would enhance existing habitat conditions for resident rainbow trout. The minimum instream flows would provide

greater than 80 to 100% of maximum habitat for adult rainbow trout during all years, and 75 to 100% of maximum available habitat for juvenile rainbow trout during all months and all years (FERC 2014). In general, weighted usable area (WUA) habitat duration for adult rainbow trout under the proposed minimum instream flows also would be similar or higher in relicensing than historical flows under the existing FERC license flows (FERC 2014).

Middle Yuba River Downstream of Milton Diversion Dam

Under the existing FERC license, the minimum instream flow in the 32-mile-long reach downstream of Milton Diversion Dam is 3 cfs year-round. A thorough description and characterization of the hydrologic regime of the MYR downstream of Milton Diversion Dam is presented in FERC (2014). Under existing FERC license conditions, monitoring data indicate that reaches of the Middle Yuba River had mean daily water temperatures that exceeded 68° F (generally considered to be near the upper limit of the preferred temperature range for trout) or instantaneous maximum temperatures exceeding 77° F (the approximate lethal thermal threshold of rainbow trout for a limited exposure time) (FERC 2014).

The proposed minimum instream flows would ensure higher minimum instream flows than under existing FERC license conditions during all years. The proposed minimum instream flows would also introduce seasonal flow variability in all years, which does not occur under the existing FERC license. NID's proposal to reduce minimum instream flows during winters leading into potentially dry years would still be considerably higher than the 3 cfs minimum instream flow under the existing FERC license during winter in MYR downstream of Milton Diversion Dam (FERC 2014).

Habitat-flow simulations for resident rainbow trout in this reach of the MYR indicate that maximum available habitat occurs at about 45 cfs for juveniles, and at about 65 cfs for adults (FERC 2014). Minimum instream flows would provide greater than 40 to 100% of maximum habitat for adults, depending on month and water year type. Maximum rainbow trout spawning habitat is relatively constant from about 50 to 1,100 cfs with a slight decrease between 300 and 600 cfs. Maximum available habitat for rainbow trout fry occurs at about 15 cfs, decreasing sharply to about 50% of maximum at about 100 cfs, and then increasing steadily to about 80% at about 600 cfs. During extreme critically dry, critically dry, and dry years, available habitat would be less than 50% of maximum habitat year-round. During below normal to wet years, habitat for adult rainbow trout would exceed 80% of maximum in spring and early summer (March to July). Flows would provide the highest amount of spawning habitat in May during all years (27 to 76%, depending on water year type).

Spawning habitat in April and June would range from 27 to 74% of maximum, depending upon water year type (FERC 2014). Juvenile rearing habitat availability under proposed flows would range from 56 to 100% of maximum, with the highest availability during spring (April to June) - ranging from 65% in extreme critically dry years to 100% in wet years (FERC 2014). During below normal to wet years, rainbow trout juvenile rearing habitat would be 77 to 100% of maximum year-round.

Overall, the minimum instream flows proposed by NID and the Yuba-Bear/Drum-Spaulding relicensing stakeholders for the MYR downstream of Milton Diversion Dam would enhance existing habitat conditions for resident rainbow trout that frequently do not achieve the target of 80% of maximum available habitat (FERC 2014). Adult rainbow trout habitat would meet or exceed this target during the spring and early summer, and juvenile rearing habitat also would achieve this target year-round during below normal or wetter years (FERC 2014).

In general, the flow regimes in relicensing would enhance available habitat for rainbow trout, and resultant water temperature changes occurring in the MYR would be beneficial to aquatic habitat. However, as previously discussed in Subsection 5.3.1.2, implementation of the new minimum instream flow requirements identified through the Yuba-Bear/Drum-Spaulding FPA relicensing process would not substantially increase the amount of thermally suitable habitat for CV spring-run Chinook salmon and CCV steelhead in the MYR (YSF 2013).

South Yuba River

To enhance aquatic habitat and protect resident aquatic species, the Drum-Spaulding Hydroelectric Project will provide the same or increased minimum instream flows to six project-affected reaches, and provide new minimum instream flows to three project-affected reaches, including two reaches of the SYR (downstream of Kidd Lake and Lower Peak Lake Dam, and downstream of Lake Spaulding Dam) (FERC 2014).

South Yuba River Downstream of the Confluence of Unnamed Tributary below Kidd Lake and Cascade Creek

The SYR downstream of Kidd Lake Dam and Lower Peak Lake Dam is downstream of the confluence of Cascade Creek with the South Yuba River, and continues 12.2 miles to Lake Spaulding (FERC 2014). Under the existing FERC license, the minimum flow in this reach is 5 cfs year-round. A thorough description and characterization of the hydrologic regime of this reach of the SYR is presented in FERC (2014).

Historical and estimated unregulated flows are very similar through this reach, although the lowest median historical monthly flows are slightly higher than unregulated conditions (FERC 2014). The Yuba-Bear/Drum-Spaulding relicensing flows would ensure minimum instream flows of at least 5 cfs throughout the year during all years, which is higher than estimated for unregulated conditions in late summer and early fall. The new minimum instream flows would ensure the availability of aquatic habitat in this stream reach throughout the summer. The range of flows in this stream reach is likely to remain similar to existing conditions (FERC 2014).

South Yuba River Downstream of Lake Spaulding Dam

Under the existing license, there are two minimum instream flow requirements in this reach of the SYR, including: (1) 1 cfs below Lake Spaulding Dam; and (2) 5 cfs at Lang's Crossing downstream of the confluence of Jordan Creek. A thorough description and characterization of the hydrologic regime of this reach of the SYR is presented in FERC (2014). PG&E's new minimum instream flows (10 to 90 cfs) in relicensing would be 2 to 18 times higher than those under the existing FERC license (FERC 2014). The new minimum instream flow requirement of 20 cfs during the summer would provide an improvement in available aquatic habitat, particularly during exceptionally dry periods compared to the existing license (FERC 2014).

Minimum instream flows are predicted to provide 40 to 55% of maximum habitat for adult trout from mid-September through January, and adult habitat is close to or exceeds 80% of maximum from April to June of below normal and wetter years (FERC 2014). Available habitat for trout spawning is 77% of maximum or greater during May and June of below normal to wet years, 53% during April to June of extreme critically dry years, and 64 to 81% during critically dry to dry years (FERC 2014). Available juvenile rainbow trout habitat (as percent of maximum available weighted usable area) is 90% or greater throughout the year. According to FERC (2014), the available habitat for these lifestages of rainbow trout would be consistently higher than that provided by minimum flows under the existing FERC license, and generally enhances conditions compared to flows under the existing FERC license.

In summary, the minimum instream flows proposed by PG&E and the Yuba-Bear/Drum-Spaulding relicensing stakeholders for SYR downstream of Lake Spaulding Dam would enhance existing habitat conditions for resident rainbow trout, relative to the existing FERC license flow requirement conditions.

PG&E, NID, and the Yuba-Bear/Drum-Spaulding relicensing stakeholders have generally agreed on minimum flows that are significantly higher in most project-affected stream reaches, to enhance aquatic

habitat and provide cooler water temperatures compared to conditions under the existing FERC license (FERC 2014). However, although aquatic habitat conditions in the MYR and SYR would improve with implementation of new FERC-required flow regimes, model results indicate that summer water temperatures in some key Yuba-Bear/Drum-Spaulding project-affected stream reaches could still approach stressful levels for coldwater aquatic species (e.g., resident rainbow trout), particularly during warmer years (FERC 2014).

Moreover, implementation of the new minimum instream flows identified through the Yuba-Bear/Drum-Spaulding FERC relicensing process would not substantially increase the amount of thermally suitable habitat for CV spring-run Chinook salmon and CCV steelhead in the SYR (YSF 2013).

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APPENDIX B Listed Amphibians in the Nonessential Experimental Population Area

California red-legged frog

The California red-legged frog is present at two locations in the nonessential experimental population (NEP) area, both of which are pond habitats that are not hydrologically connected with the mainstem channels of the NYR (Yuba County site) or the SYR (Nevada County site). In Yuba County, the first site is located in ponds adjacent to Little Oregon Creek, which flows into Moran Cove at NBB Reservoir. The second site is located in Nevada County, and occurs in ponds associated with the Sailor Flat area of Nevada County. Both sites occur within designated critical habitat for the California red-legged frog (75 Fed. Reg. 12816, March 17, 2010). The Yuba County critical habitat unit consists of approximately 6,322 acres of land in northeastern Yuba County, north of Marysville Road and south of La Porte Road. USFS biologists on the Plumas National Forest intermittently monitored locations within the Yuba critical habitat unit for two years, during which time there have been no CRLF sightings (M. Cisneros, pers. comm. 2013). The Sailor Flat critical habitat unit is comprised of approximately 8,285 acres in central Nevada County, approximately 3 miles northeast of Nevada City. Both units are considered essential for the conservation of the species because they contain aquatic habitat for breeding and non-breeding activities, contain upland habitat for foraging and dispersal activities, and are currently occupied by the species. In the Sierra Nevada region, where the species was once widespread, there are only six known extant populations of California red-legged frog, most of which contain few adults (Shaffer et al. 2004; Tatarian and Tatarian 2010; 75 Fed. Reg. 12816). No additional populations are known to occur within the NEP area.

California red-legged frog habitat requirements are fairly distinct, combining both specific water (aquatic) and upland (terrestrial) components. Non-breeding aquatic habitat includes pools of slow-moving streams, perennial or ephemeral ponds, and upland sheltering habitat such as rocks, small mammal burrows, logs, and densely vegetated areas. Breeding sites are generally found in deep, still or slow-moving water (greater than 2.5 feet) and can have a wide range of edge and emergent cover amounts. California red-legged frogs breed from November through April and complete metamorphosis by the end of summer (Jennings and Hayes 1994; USFWS 2005). Their diet is variable and ranges from algae in their larval stage to insects and small vertebrates as adults. Additional information on their life history requirements can be found in Hayes and Jennings (1988) and Thomson et al. (2016).

A number of species prey on California red-legged frogs including raccoons, garter snakes, bass, sunfish, mosquito fish, herons, egrets, cats, foxes, coyotes, and the introduced American bullfrog. The most secure aggregations of California red-legged frogs are found in aquatic sites with substantial

riparian and aquatic vegetation for cover and lacking exotic predators (e.g., bullfrogs, bass, and sunfish). California red-legged frogs have experienced drastic and ongoing declines throughout parts of their range (Thomson et al., 2016). They are threatened by loss of habitat from urbanization, mining, overgrazing, invasion of nonnative plants, impoundments, water diversions, degraded water quality, and introduced predators. Fragmentation of existing habitat and ongoing colonization of existing habitat by non-native species may represent the most significant threat to the California red-legged frog.

Sierra Nevada yellow-legged frog

The Sierra Nevada yellow-legged frog is present in the NEP area in small numbers at isolated locations. Two designated critical habitat areas occur in the NEP area - Gold Lakes in Sierra County and Black Buttes in Nevada County. Extant populations occur in Sierra County in the headwaters of the NYR and within several ponds and lakes near Gold Lake. The Black Buttes critical habitat unit contains several populations, including Rattlesnake Creek, which flows into the SYR. Typical habitat includes lakes, ponds, marshes, meadows, and slow moving streams at high elevations - ranging from about 4,500 to 12,000 feet (USFWS 2016), but the frogs can occur as low as about 3,500 feet in northern portions of their range (USFWS 2017). Sierra Nevada yellow-legged frogs are highly aquatic and adults remain in close proximity to water; rarely found more than 3.3 feet away (USFWS 2017). They spend the winter at the bottom of frozen lakes and emerge shortly after snow melts (USFWS 2016). In years of heavy snow, they may only be active for about 3 months.

According to Kupferberg et al. (2012), the Sierra Nevada yellow-legged frog's life cycle includes adult migration from tributaries and refugia to mate and oviposit on the margins of sunlit rivers during the transition between wet and dry seasons. During this transition, flood probability declines and algal food for tadpoles begins to bloom. Tadpoles metamorphose by late summer and juveniles move out of the river channel during autumn rains (Kupferberg et al. 2012). Egg-laying sites must be connected to permanent lakes or ponds that do not freeze to the bottom in winter, because the tadpoles live in open water through the winter (USFWS 2016).

A range-wide reduction in abundance and geographic extent of surviving populations has occurred for the Sierra Nevada yellow-legged frog. The decline is due to decades of fish stocking, habitat fragmentation, and most recently a disease epidemic from the chytrid fungus. The primary reason for their decline is CDFW's introduction of trout (rainbow trout, brook trout, and brown trout) to alpine lakes (CDFW 2018). Introduced trout prey on tadpole and post-metamorphic lifestages and complete

for resources, leading to their decline (Vredenburg 2002; Needham and Vestal 1938; Grinnell and Storer 1924; Bradford 1989; Bradford et al. 1993; Jennings 1994; Knapp 1996; Center for Biological Diversity 2018; Drost and Fellers 1996; Knapp and Matthews 2000, as cited in AmphibiaWeb 2018a). Field experiments have shown when non-native trout are removed, frog populations rebound (Vredenburg 2004; Knapp et al. 2007).

Foothill yellow-legged frog

The foothill yellow-legged frog is present in suitable lower elevation habitats of the NEP area, including the North, South, and Middle Yuba Rivers and numerous tributaries. Typical habitats include water with rocky substrate, as found in riffles, and on open sunny banks (Stebbins 1985). Adult breeding migrations appear to be limited to modest movements along stream corridors (Ashton et al. 1998), but the magnitude of such movements, any seasonal component, and differences between sexes remains largely unknown (Amphibiaweb 2018). Foothill yellow-legged frogs mate and lays eggs exclusively in streams and rivers (Lannoo 2005 as cited in Amphibiaweb 2018). Oviposition sites are generally shallow, slow-moving water with a cobble or pebble substrate used to anchor each egg mass. On occasion, egg masses may be attached to aquatic vegetation, woody debris, and gravel (Amphibiaweb 2018). Masses are usually attached to the downstream side of rocks, at the stream margin, and at depths of < 0.5 meters (1.6 ft.) (Stebbins 1985; Fuller and Lind 1992; Ashton et al. 1998, as cited in Amphibiaweb 2018). Nussbaum et al. (1983) reports that the diet includes flies, moths, hornets, ants, beetles, grasshoppers, water striders, and snails. Terrestrial arthropods were the primary prey items of recently metamorphosed foothill yellow-legged frogs at a single site studied by Van Wagner (1996). Additional information on their life history requirements can be found in Hayes et al. (2016) and Thomson et al. (2016).

Foothill yellow-legged frogs are susceptible to a wide range of environmental impacts including loss of habitat, pesticides, competition/predation from nonnative species (e.g., warm water fish, bullfrogs, and crayfish), disease, water impoundments, logging, mining, and grazing in riparian zones. In the Sierra Nevada foothills of California, air-borne pesticides (that move east on the prevailing winds blowing across the agriculturalized CV) are likely to be the primary threat to foothill yellow-legged frogs (LeNoir et al., 1999; Sparling et al., 2001; Hayes et al., 2002). The populations of foothill yellow-legged frogs in greatest decline are all downwind of highly impacted (mostly agriculturalized) areas (https://amphibiaweb.org/species/4993).

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