Draft Environmental Assessment for the Designation and Release of a Nonessential Experimental Population of Upper Columbia Spring-run Chinook Salmon in the Okanogan River Subbasin under Endangered Species Act Section 10(j)

Photo by Michael Humling

National Marine Fisheries Service

Northwest Region

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COVER SHEET

TITLE OF ENVIRONMENTAL REVIEW	Draft Environmental Assessment for the Designation and Release of a Nonessential Experimental Population of Upper Columbia Spring-run Chinook Salmon in the Okanogan River Subbasin under Endangered Species Act Section 10(j)
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LOCATION OF PROPOSED ACTIVITIES	The entire United States portion of the Okanogan River subbasin to its confluence with the Columbia River, Washington.
PROPOSED ACTION	NMFS proposes to designate and authorize the release of a nonessential experimental population (NEP) of Upper Columbia River (UCR) spring-run Chinook salmon (*Onchorhynchus tshawytscha)* under section 10(j) of the Endangered Species Act in the Okanogan River subbasin, and to establish a limited set of take prohibitions for the NEP.
ABSTRACT	The proposed action supports the reintroduction and reestablishment of a self-sustaining population of UCR spring-run Chinook salmon in the Okanogan River subbasin, and will contribute to the recovery of UCR spring-run Chinook salmon and to the overall recovery goals provided in Upper Columbia Salmon Recovery Board's 2007 recovery plan for UCR spring-run Chinook salmon.

List of Acronyms and Abbreviations

Bonneville Power Administration	BPA
Code of Federal Regulations	CFR
Confederated Tribes of the Colville Reservation	CTCR
Endangered Species Act	ESA
Environmental Assessment	EA
Environmental Impact Statement	EIS
Evolutionarily Significant Unit	ESU
Federal Columbia River Power System	FCRPS
Fishery Management and Evaluation Plans	FMEPs
Hatchery Scientific Review Group	HSRG
Hatchery and Genetic Management Plans	HGMP
Interior Columbia Technical Recovery Team	ICTRT
National Environmental Policy Act	NEPA
National Marine Fisheries Service	NMFS
Northwest Power and Conservation Council	NPCC
Primary Constituent Elements	PCEs
Record of Decision	ROD
River Mile	RM
Secretaries of Interior and Commerce	Secretaries
Tribal Resource Management Plans	TRMPs
United States Fish and Wildlife Service	USFWS
Upper Columbia River	UCR
Washington Department of Ecology	Ecology
Washington Department of Fish and Wildlife	WDFW

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1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

At the request of the Confederated Tribes of the Colville Reservation (CTCR), the National Marine Fisheries Service (NMFS) (herein referred to as "we" or "our") propose to authorize the release of Upper Columbia River (UCR) spring-run Chinook salmon in the Okanogan River subbasin under section 10(j) of the Endangered Species Act (ESA). The authorization would allow the CTCR to use appropriate excess hatchery salmon from the neighboring Methow River and would designate the population as a non-essential experimental population. We also propose to adopt limited protective regulations that would prohibit take of fish from the experimental population except in certain circumstances. This environmental assessment (EA) examines the impact on the human environment of the Proposed Action and alternatives.

1.1 Background

1.1.1 The Endangered Species Act of 1973

The ESA (16 United States Code of Federal Regulations [USC] 1531 *et seq.*), authorizes the Secretaries of Interior and Commerce (Secretaries) to list species[1] 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 implements the agency's responsibilities under the ESA for marine and anadromous species (http://www.nmfs.noaa.gov/pr/laws/esa/)[2]. In the Pacific Northwest, conservation management of listed species occurs at many levels including federal oversight of marine and anadromous species by NMFS, as well as state, local, and Native American tribal level development and implementation of on-the-ground measures to further our conservation objectives. Under the ESA section 10(j), we may choose to designate a population as experimental if it furthers the conservation of the species, and the experimental population is geographically separate from the rest of the listed species.

1.1.2 Upper Columbia River Spring-run Chinook Salmon ESA Listing

We listed the UCR spring-run Chinook salmon (*Oncorhynchus tshawytscha*) evolutionarily significant unit (ESU)[3] as endangered under the ESA on March 24, 1999 (64 Fed. Reg. 14308,

[1] Examples of Department of Commerce management responsibilities for listed species conservation can be found through the ESA, including the critical habitat program definition ("…those physical or biological features (II) which may require special management considerations or protection…") (16 USC 1532 (5)(A)(i)), the basis for listing determinations ("the Secretary shall implement a system to monitor effectively the status of all species…") (16 USC 1533 (b)(3)(C)(A)(iii)), and recovery planning (The Secretary shall develop and implement plans…for the conservation and survival of endangered species and threatened species…") (16 USC 1533 (f)(1)).

[2] The mission statement for the NMFS Northwest Region is to conserve, protect, and manage Pacific salmon, groundfish, halibut, and marine mammals and their habitats under the Endangered Species Act (ESA) and other federal laws (http://www.nwr.noaa.gov/).

[3] The ESA defines 'species' to include subspecies and 'distinct population segments' of vertebrates (16 USC §1532(16); 50 CFR 424.02 (k)). For Pacific salmon, we determined that an ESU constitutes a distinct population segment (56 Fed. Reg. 58612, November 20, 1991). A group of Pacific salmon is an ESU if it is (1) substantially reproductively isolated from other salmon of the same species and (2) represents an important component of the evolutionary legacy of the species.

March 24, 1999), and reaffirmed this status on June 28, 2005 (70 Fed. Reg. 37160, June 28, 2005). Section 9 of the ESA prohibits "take" of UCR spring-run Chinook salmon.

The listed ESU includes all naturally spawned populations of spring-run Chinook salmon in accessible reaches of Columbia River tributaries between Rock Island and Chief Joseph Dams, excluding the Okanogan[4] River. Listed spring-run Chinook salmon from this ESU currently spawn in three river basins in north-central Washington: the Wenatchee, Entiat, and Methow (Figure 1-1). A fourth population historically inhabited the Okanogan River, but was extirpated in the 1930s as a result of over-fishing, hydropower development, and habitat degradation (UCSRB 2007). A number of populations were present upstream of Chief Joseph Dam, but all were extirpated when this dam and other dams on the upper Columbia River were completed in the mid-20th century.

The designated critical habitat of UCR spring-run Chinook salmon similarly includes all accessible reaches of Columbia River tributaries between Rock Island and Chief Joseph Dams, but excludes the Okanogan River (70 Fed. Reg. 52630, September 2, 2005). We did not include the Okanogan subbasin in any critical habitat designation because the Okanogan population of spring-run Chinook salmon no longer exists and designation of the Okanogan River habitat was not essential to the conservation of the species.

The listed UCR spring-run Chinook salmon ESU also includes fish from six artificial propagation programs: the Twisp River, Chewuch River, Methow Composite, Winthrop National Fish Hatchery, Chiwawa River, and White River spring-run Chinook salmon hatchery programs (70 Fed. Reg. 37160, June 28, 2005).

In 2011, we completed a periodic review as required by ESA section 4(c)(2), and announced that the UCR spring-run Chinook salmon ESU would remain listed as endangered (76 Fed. Reg. 50448, August 15, 2011). An analysis conducted by our Northwest Fisheries Science Center indicated that all three extant populations of the UCR spring-run Chinook salmon ESU remained at high risk of extinction (Ford 2011). The analysis noted that short-term abundance trends have been positive for all three populations (Wenatchee, Entiat, and Methow) but that returns are still below replacement and abundance of all populations is well below levels in the 1960s. The analysis identified high proportions of hatchery-origin spawners as a risk to diversity of the ESU. Previous reviews have identified habitat loss and mainstem passage as key threats. We noted that improvements had been made in operations and fish passage at tributary dams and at the federal Columbia River power system dams, and that numerous habitat restoration projects had been completed in many upper Columbia River tributaries. However, habitat problems were still common throughout the upper Columbia region, and many more habitat improvements were likely needed to achieve ESU viability (NMFS 2011).

The Okanogan subbasin is home to two additional anadromous species of salmonids. UCR steelhead are listed as threatened and their range and designated critical habitat includes the Okanogan subbasin (70 Fed. Reg. 52630, September 2, 2005). Columbia River summer/fall-run

[4] We use the United States spelling, "Okanogan," throughout this document. The Canadian spelling is "Okanagan."

Chinook salmon also occur in the Okanogan subbasin and the mainstem Columbia River from the confluence of the Columbia and Okanogan Rivers upstream to the base of Chief Joseph Dam. We reviewed the status of this distinct population segment in 1999 and found it did not warrant listing under the ESA (64 Fed. Reg. 14308, March 24, 1999).

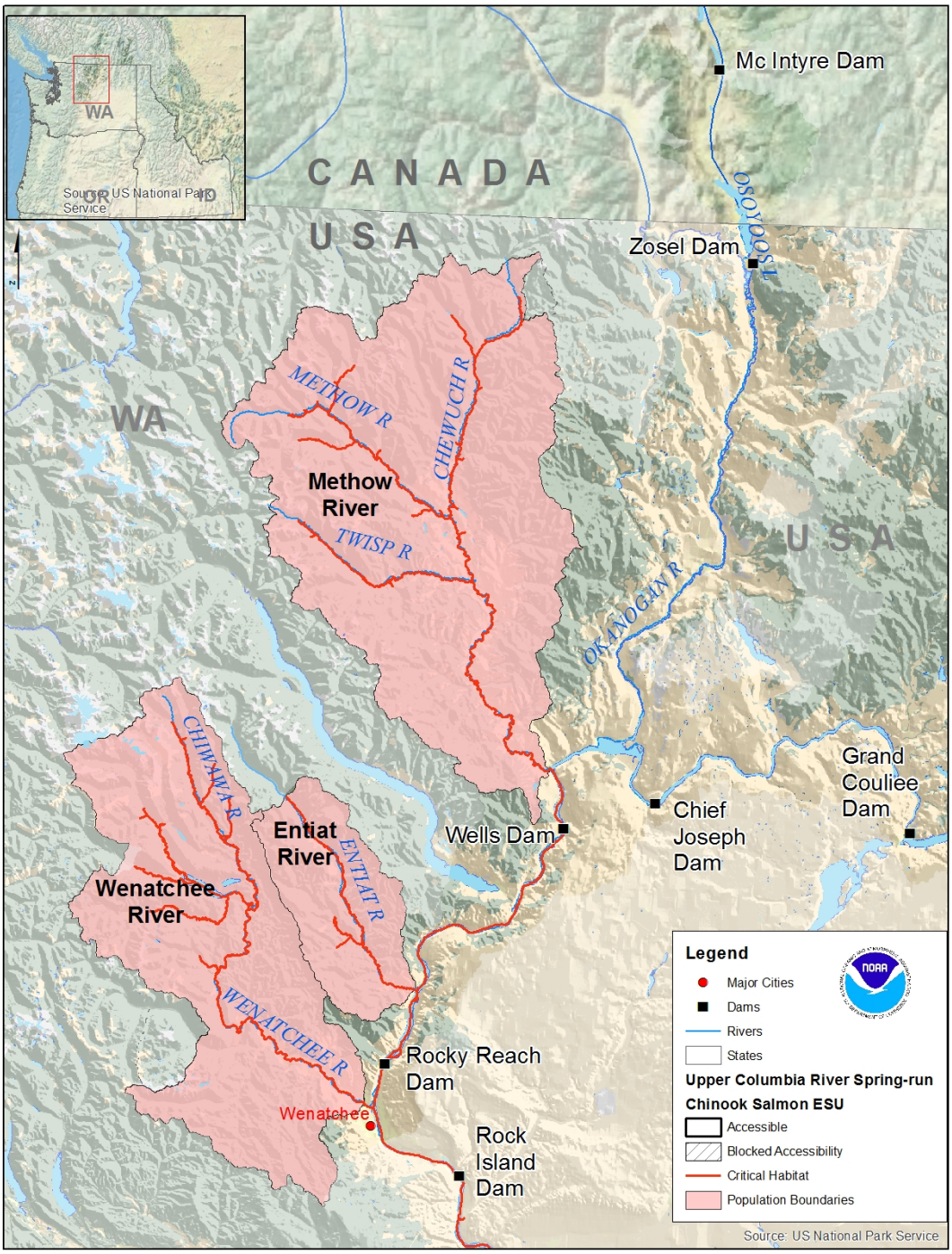


Figure 1-1. Current range of the UCR spring-run Chinook salmon ESU.

1.1.3 Upper Columbia River Recovery Plan

On October 9, 2007, we adopted a final recovery plan for the UCR spring-run Chinook salmon ESU (72 Fed. Reg. 57303, October 9, 2007) (UCSRB 2007). The recovery plan identifies three extant populations in this ESU (the Wenatchee, Entiat, and Methow populations) and an historic extirpated population in the Okanogan subbasin. The recovery plan identifies re-establishment of a population in the Okanogan subbasin as a recovery action. Re-establishment of a spring-run Chinook salmon population in the Okanogan subbasin could aid in the recovery of this 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.

1.2 The Confederated Tribes of the Colville Reservation's Request

On November 22, 2010, we received a letter from the CTCR requesting that we authorize the release of an experimental population of UCR spring-run Chinook salmon in the Okanogan subbasin under ESA section 10(j) (CTCR, letter sent to NMFS, November 22, 2010, regarding rulemaking petition pursuant to section 10(j) of the ESA). Under this section, the Secretary of Commerce may authorize the release of listed species outside their current range as an "experimental population," with limited protections, if doing so would further the species' conservation. The CTCR proposed to use excess hatchery UCR spring-run Chinook salmon from the neighboring Methow River. The CTCR also requested that we exercise our discretion under sections 10(j) and 4(d) to apply limited take prohibitions to this experimental population.

The CTCR requested that we generally prohibit take of members of the population, but allow (1) take that is incidental to an otherwise lawful activity, (2) incidental take that occurs as a result of lawful tribal and recreational fishing for non-listed fish, (3) intentional[5] harvest of adult salmon in the case that such harvest is required to reduce the proportion of hatchery-origin fish (as compared to naturally-produced fish) returning to spawning grounds, and (4) intentional or unintentional take that occurs as a result of scientific research or monitoring and evaluation (Subsection 2.2.2, Regulatory Process).

1.3 Description of the Proposed Action

We propose to authorize establishment of an experimental population of UCR spring-run Chinook salmon in the Okanogan subbasin using excess Methow Composite hatchery-origin UCR spring-run Chinook salmon from the Winthrop National Fish Hatchery in the adjacent Methow River subbasin. These fish are part of the UCR spring-run Chinook salmon ESU and are presumed to be a close genetic match to the extirpated Okanogan population. We also propose to designate fish released in the Okanogan as a non-essential experimental population under ESA section 10(j) and adopt limited protective regulations under ESA section 4(d) to allow management of the experimental population in furtherance of conservation.

[5] The CTCR's application refers to this type of take as "direct." The term "direct" has a specific and different meaning than was meant in the context of the Tribe's request. We, therefore, use the term "intentional" throughout the environmental assessment.

The Okanogan subbasin is outside the current range of the ESU, but within the historical range of UCR spring-run Chinook salmon. The non-essential experimental population designation would apply only when the fish are in the United States portion of the Okanogan subbasin (Subsection 1.6, Description of the Action Area) (Figure 1-2) and would include the hatchery-origin Methow Composite smolts released into the Okanogan River from the acclimation ponds and returning adults and their naturally produced offspring. We would manage these fish as a non-essential experimental population in a manner to reduce the risk of ESA liability to the local community. All other growth stages of the Methow Composite UCR spring-run Chinook salmon prior to release from the acclimation ponds in the Okanogan subbasin, including acclimating pre-smolts, would be considered endangered and would receive the same protection under ESA section 9 as the other UCR spring-run Chinook salmon population members of the ESU.

1.4 Experimental Populations under Section 10(j) of the ESA

1.4.1 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 USC 1531(5)(c)(2); (16 USC 1535(a)). When Congress amended the ESA in 1982, it added section 10(j) to reduce opposition to release of listed species outside their current range, and to give the Secretaries flexibility and discretion in ESA management for purposes of species conservation. Section 10(j) provides for the designation of specific reintroduced populations of listed species to be released as "experimental populations."

Previously, the Secretaries had authority to reintroduce populations into unoccupied portions of a listed species' historical range when doing so would foster the conservation and recovery of the species. However, public and private entities were concerned that once ESA-listed species were present in their vicinity, federal agencies would place restrictions on development projects (see *Forest Guardians v. United States Fish and Wildlife Service*, 611 F.3d 692 (10th Cir. 2010); *Wyoming Farm Bureau Federation v. Babbitt*, 199 F.3d (10th Cir. 2000)). Local opposition to reintroduction efforts from parties concerned about potential restrictions and liability, and prohibitions on federal and private activities contained in sections 7 and 9 of the ESA, reduced the Services'[6] use of such reintroduction actions. In response to these concerns, Congress added section 10(j) to provide federal agencies with more flexibility and discretion in managing reintroduced populations.

Congress intended to encourage the recovery of species through population reestablishment with the cooperation of state and local entities[7] (H.R. Rep. No. 97-567 at 34 [1982] and S. Rep. No. 97-418, *supra* note 2 at 9 [1982] *in* Wolok 2002). In enacting section 10(j) of the ESA, Congress stated that a rule issued for a designated experimental population "should be viewed as an

[6] Both the Secretary of Commerce (NMFS) and the Secretary of Interior (USFWS) are responsible for administering the ESA.

[7] We consider tribes, and in the case of this Proposed Action, the CTCR, to be a "local entity" consistent with Congressional intent when adding section 10(j) to the ESA.

agreement among the federal agencies, the state fish and wildlife agencies, and any landowners involved" (H.R. Rep. No. 97-567, *supra* note 2 at 34 [1982], *in* Wolok 2002). Further, the House Report on the section 10(j) amendment anticipated that incidental take of individuals of experimental populations may occur during the designation period while landowners are engaging in otherwise lawful activities (e.g., tribal fishing) (*Forest Guardians v. United States Fish and Wildlife Service*, 611 F.3d 692 (10th Cir. 2010)).

1.4.2 Statutory and Regulatory Framework

Section 10(j) of the ESA allows us to authorize the release of populations of listed species outside their current range if the release would "further conservation" of the listed species. The statute refers to such a population as "experimental." We may only authorize an experimental population by regulation, and the regulation must identify the population and determine, on the basis of the best information, whether the population is "essential to the continued existence of the species" (section 10(j)(2)(B)). Section 10(j) provides that an experimental population be treated as a "threatened species," except that populations authorized as "non-essential" experimental populations do not receive the benefits of certain protections normally applicable to threatened species. Below we discuss the consequences of treating experimental populations as threatened species, and of exceptions that apply to non-essential experimental populations.

1.4.3 Section 10(j) Regulations

We have not promulgated regulations implementing section 10(j), and have authorized only one experimental population to date (NMFS 2012). The United States Fish and Wildlife Service (USFWS) has authorized many experimental populations and developed regulations to implement section 10(j) at 50 CFR 17.80 through 17.84. While USFWS' regulations do not apply to NMFS' section 10(j) authorizations, they can help inform our authorization process. The USFWS' implementing regulations contain the following provisions:

- The USFWS 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 non-essential (50 CFR 17.81). This definition was apparently directly derived from the legislative history to the ESA amendments that created section 10(j).

- In finding whether the experimental population will further the conservation of the species, the USFWS regulations require the agency to consider: (1) any possible adverse effects on extant populations of a species as a result of removal of individuals, eggs, or propagules for introduction elsewhere; (2) the likelihood that any such experimental population will become established and survive in the foreseeable future; (3) the relative effects that establishment of an experimental population will have on the recovery of the species; and (4) the extent to which the introduced population may be affected by existing or anticipated federal or state actions or private activities within or adjacent to the experimental population area (50 CFR 17.81(b)).

USFWS regulations also describe four components that will be provided in any regulations promulgated with regard to an experimental population under section 10(j). The components are: (1) appropriate means to identify the experimental population, including, but not limited to, its actual or proposed location, actual or anticipated migration, number of specimens released or to be released, and other criteria appropriate to identify the experimental population(s); (2) a finding of whether the experimental population is, or is not, essential to the continued existence of the species in the wild; (3) management restrictions, protective measures, or other special management concerns of that population, which may include but are not limited to measures to isolate and/or contain the experimental population designated in the regulation from natural populations; and (4) a process for periodic review and evaluation of the success or failure of the release and the effect of the release on the conservation and recovery of the species (50 CFR 17.81(c)).

In our consideration of the CTCR request, we intend to consider the factors identified in the USFWS regulations in the course of making the statutorily mandated determinations found in section 10(j). To summarize, the statute requires that we determine: (1) whether the release will further the conservation of the species, and (2) whether the population is essential or non-essential. In addition, because section 10(j) provides that the population will only be experimental when and at such times as it is wholly separate geographically from non-experimental populations of the same species, we must establish that there are such times and places when the experimental population is wholly geographically separate. Similarly, the regulations must identify the experimental population; the legislative history indicates that the purpose of this requirement is to provide notice as to which populations of listed species are experimental (House of Representatives Committee of Conference 1982). In this EA, we analyze information relevant to those factors.

1.4.4 Non-essential Experimental Population Designation and Regulatory Restrictions

Regulatory restrictions can be limited under a non-essential experimental population 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. Section 9 of the ESA prohibits the take of endangered species and also prohibits the violation of any protective regulation established for a threatened species under section 4(d) of the ESA. The ESA defines take to mean harass, harm, pursue, hunt, shoot, wound, trap, capture, or collect, or attempt to engage in any such conduct. For threatened species, the ESA does not automatically prohibit take, but instead authorizes the Secretaries to adopt regulations deemed necessary for species conservation (ESA section 4(d)). Such section 4(d) regulations may include the take prohibitions of ESA section 9. ESA section 10(j) treats non-essential experimental populations as threatened, therefore eligible for a section 4(d) rule. A section 4(d) rule that is specific to an experimental population provides the level of protection deemed necessary for that specific population (the USFWS section 10(j) implementing regulations refer to this as a “special rule”).

If we authorize an experimental population of a threatened species, and there is an existing regulation under ESA section 4(d), that existing regulation would apply to the experimental population unless we adopt a separate section 4(d) rule that is applicable only to the experimental

population. If, however, we authorize an experimental population of an endangered species, there are no protective regulations in place until we adopt regulations under section 4(d). This would be the case for an experimental population of UCR spring-run Chinook salmon that are listed as endangered.

If the experimental population is authorized as non-essential, ESA section 10(j)(c) requires that we apply the ESA section 7 consultation provisions 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 that the ESA section 7(a)(2) consultation requirement would not apply to federal agency actions affecting a non-essential experimental population in the Okanogan subbasin. Only two provisions of ESA section 7 would apply: section 7(a)(1) (requiring federal agencies to use their authorities to further conservation of listed species) and section 7(a)(4) (requiring federal agencies to confer before taking actions that are likely to jeopardize the listed species).

1.4.5 ESA Section 10(a)(1)(A) and Experimental Populations

Section 10 of the ESA allows the Secretaries to grant exceptions to the prohibitions of section 9 for scientific research and enhancements to the propagation and survival of listed species. This includes acts necessary for the establishment and maintenance of experimental populations as specifically noted in section 10(a)(1)(A). Section 10(d) requires that the Secretaries grant exemptions under 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 will not operate to the disadvantage of such endangered species, and (3) will be consistent with the purposes and policies set forth in section 2 of the ESA.

In authorizing the release of an experimental population of UCR spring-run Chinook salmon in the Okanogan subbasin under ESA section 10(j), we would issue a permit under ESA section 10(a)(1)(A) for the collection of adult Methow Composite UCR spring-run Chinook salmon stock for broodstock for the Okanogan reintroduction. A section 10(a)(1)(A) permit is required because the Methow Composite stock for UCR spring-run Chinook salmon is listed as part of the endangered UCR spring-run Chinook salmon ESU. The permit would include outplanting of juvenile UCR spring-run Chinook salmon as part of the Okanogan reintroduction, as well as the monitoring and evaluation associated with these activities as described in the Chief Joseph Hatchery Program: Final Environmental Impact Statement (EIS) (BPA 2009).

The permit would not authorize collection of broodstock from adults returning to the Okanogan subbasin while the 2012 Chief Joseph Hatchery Program Okanogan Basin Spring Chinook Hatchery and Genetic Management Plan is implemented (CTCR 2012a). The CTCR anticipate that at a minimum, it would take two generations (8 to10 years) of reintroduction efforts to establish a spawning population that includes some natural-origin spawners (Subsection 1.7.2, Chief Joseph Hatchery; Subsection 1.7.8, Hatchery and Genetic Management Plans).

1.5 Purpose and Need for the Proposed Action

1.5.1 Purpose of the Action

The purpose of the Proposed Action is to support the reintroduction and reestablishment of a self-sustaining population of spring-run Chinook salmon in the Okanogan subbasin under ESA section 10(j) using excess UCR spring-run Chinook salmon Methow Composite hatchery stock. This action will contribute to the recovery of UCR spring-run Chinook salmon, and to the overall recovery goals provided in the recovery plan for UCR spring-run Chinook salmon (UCSRB 2007).

1.5.2 Need for the Action

The need for the Proposed Action is to further the conservation of UCR spring-run Chinook salmon by increasing the abundance, productivity, spatial structure, and diversity of the species, as the reintroduced Okanogan population becomes self-sustaining and contributes to the recovery of the ESU. Establishing a population of spring-run Chinook salmon in the Okanogan subbasin would aid recovery of the UCR spring-run Chinook salmon ESU because the Okanogan subbasin is within the historic range of the ESU but currently unoccupied by the ESU. Using the UCR spring-run Chinook salmon Methow Composite stock would support recovery because it is locally derived and genetically similar to the spring-run Chinook salmon originally occupying the Okanogan subbasin and is already part of the listed ESU. As a result, the UCR spring-run Chinook salmon Methow Composite stock is best suited for survival in the Okanogan subbasin and poses the least risk to the extant populations in the ESU.

The purpose and need for the Proposed Action can be further defined from the perspectives of both NMFS as the federal agency responsible for the conservation of the listed UCR spring-run Chinook salmon and the CTCR as a local entity requesting the designation.

From the federal perspective, the non-essential experimental population designation would meet the purpose and need to further conservation of the species by supporting reintroduction (UCSRB 2007). Applying section 10(j) to establish the designation would provide NMFS with flexibility and discretion to manage the reintroduction and to tailor our management to the circumstances of the UCR spring-run Chinook salmon ESU (*Forest Guardians v. United States Fish and Wildlife Service*, 611 F.3d 692 (10th Cir. 2010)). NMFS is also interested in further developing a cooperative relationship with local entities such as the CTCR regarding the management of listed species for conservation and recovery (Subsection 1.4.1, Congressional History and Intent). The designation would assist us in meeting this objective because less regulatory burden compared to current conditions may encourage cooperative efforts for recovery of the species.

From the CTCR's perspective, the non-essential experimental population designation would meet their purpose and need by restoring the culturally important spring-run Chinook salmon population in the Okanogan subbasin. Further, limited ESA regulatory restrictions associated with the designation would allow the CTCR and local entities to engage in otherwise lawful activities that incidentally take UCR spring-run Chinook salmon without further ESA process. Activities that incidentally take UCR spring-run Chinook salmon could include agricultural,

water management, construction, recreation, navigation, or forestry practices. Consequently, as the ESU begins to recover, local entities may be inclined to contribute to habitat improvements because there would be no perceived penalty for encouraging the presence of ESA-listed fish.

1.6 Description of the Action Area

The action area for the proposed experimental population designation would be the United States portion of the Okanogan subbasin, particularly the river and stream reaches accessible to spring-run Chinook salmon (Figure 1-2). The action area differs from the analysis area, which is described in Subsection 4.1, Analysis Approach and Alternative Description Summaries. The Okanogan River is a major tributary of the upper Columbia River, entering the Columbia River between Wells and Chief Joseph Dams (Figures 1-1 and 1-2). The majority of the Okanogan subbasin (Figure 3-1) is in Canada (74 percent) with the remainder in Washington State (26 percent) (NPCC 2004a). There are three major watersheds in the Okanogan subbasin: the Similkameen River and Omak and Salmon Creeks (UCSRB 2007). Spring-run Chinook salmon from the proposed experimental population may eventually migrate over the United States–Canada border, but United States' jurisdiction over these fish would end when they cross the border into Canada.

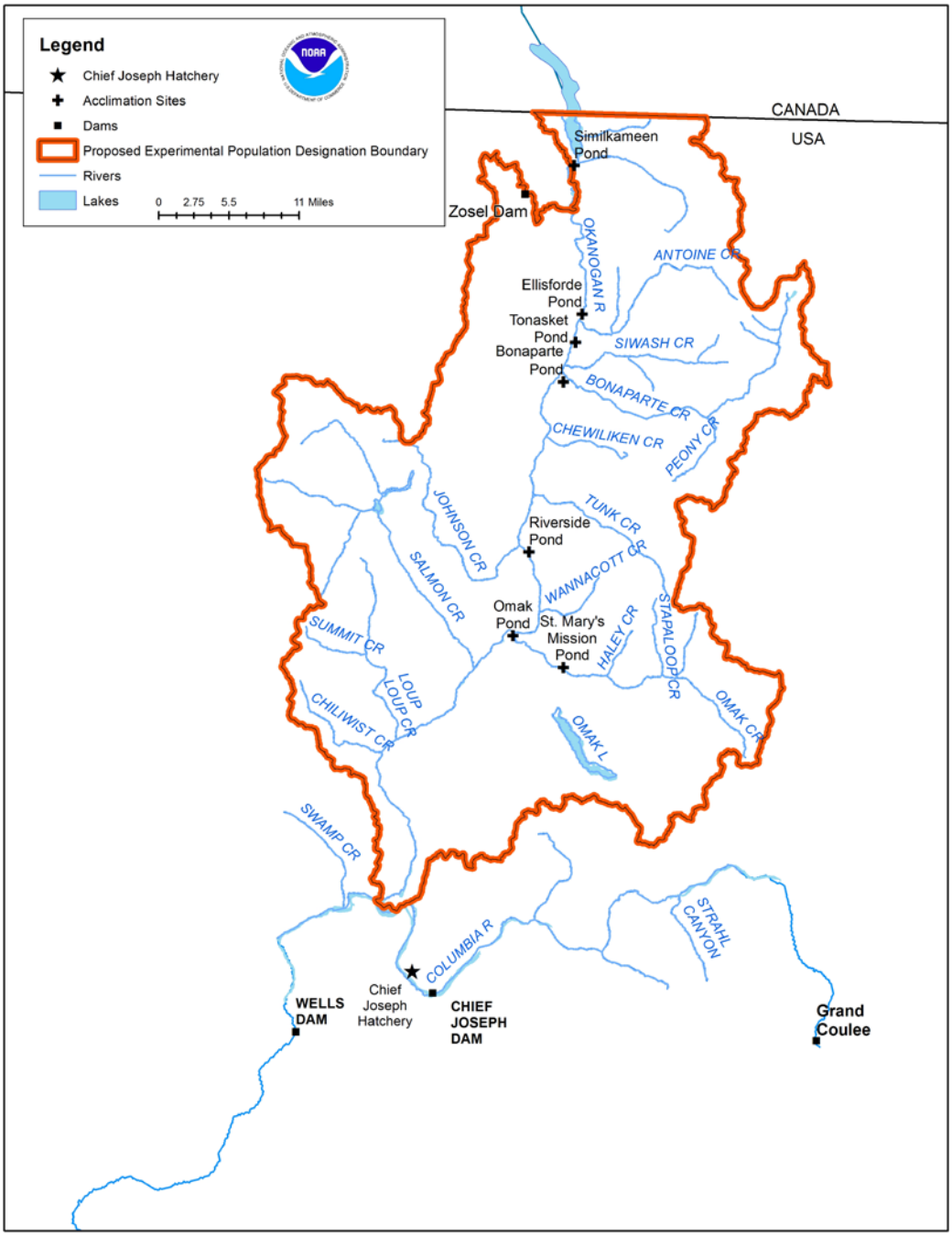


Figure 1-2. United States portion of the Okanogan subbasin including the proposed experimental population designation boundary and acclimation sites.

1.7 Relationship to other Plans and Policies

Many federal, state, and local regulations and policies affect UCR spring-run Chinook salmon in general. Some of these regulations and policies also aid in meeting the goals of the Upper

Columbia Spring-run Chinook Salmon and Steelhead Recovery Plan (UCSRB 2007). Below we summarize major policies and plans to provide context for the proposed non-essential experimental population designation.

1.7.1 Chief Joseph Hatchery

The Bonneville Power Administration (BPA) is funding the Chief Joseph Hatchery, which would be operated by the CTCR. The hatchery is intended to mitigate for the adverse effects caused to anadromous fish by the federal Columbia River power system. The Chief Joseph Hatchery was completed in June 2013. The primary facility is located on U.S. Army Corps of Engineers property on the north shore of the Columbia River immediately below Chief Joseph Dam. The Chief Joseph Hatchery is operated under the Chief Joseph Hatchery Production Program (CTCR 2004), which includes seven acclimation ponds located in the Okanogan subbasin: Omak Pond, St. Mary's Mission Pond, Riverside Pond, Bonaparte Pond, Tonasket Pond, Ellisforde Pond, and Similkameen Pond. The BPA constructed this project to assist in the protection of, and mitigation for, the hydropower system impacts to spring-run Chinook salmon and summer/fall-run Chinook salmon populations in the Okanogan River and mainstem Columbia River (BPA 2009).

In 2009, BPA published a final EIS analyzing the impact of funding and operation of the proposed hatchery, and a Record of Decision (ROD) in March 2010. The EIS analyzed the effects of construction, operation, and maintenance of the Chief Joseph Hatchery and its associated satellite facilities in the Okanogan subbasin on a number of resources including fish and aquatic habitats, wildlife, land use, socioeconomics and environmental justice, and cultural resources. The EIS also addressed monitoring and evaluation of the production program in Subsection 2.1.3, Monitoring and Evaluation (BPA 2009). The hatchery production program would produce 900,000 spring-run Chinook salmon yearlings (700,000 Leavenworth stock and 200,000 Methow Composite stock) and 2,000,000 summer/fall-run Chinook salmon yearlings and sub-yearlings for release into the Columbia and Okanogan Rivers using four distinct components (NMFS 2008a):

- Spring-run Chinook salmon segregated program (Leavenworth stock)
- Spring-run Chinook salmon integrated conservation program (Methow Composite stock)
- Summer/fall-run Chinook salmon segregated program (Wells stock)
- Summer/fall-run Chinook salmon integrated program (Okanogan subbasin stock)

On July 28, 2008, we issued a biological opinion (Public Consultation Tracking System Number F/NWR/2006/07534) on the construction and operation of the Chief Joseph Hatchery (NMFS 2008a). In our biological opinion, we evaluated the operation of the Chief Joseph Hatchery and determined that its operation would not jeopardize listed upper Columbia River salmon and steelhead (NMFS 2008a).

The Chief Joseph Hatchery biological opinion contemplated two spring-run Chinook salmon propagation programs (described below) that might occur at this facility. The biological opinion concluded that construction and operation of the hatchery as well as implementation of both

spring-run Chinook salmon propagation programs, including monitoring and evaluation, are not likely to jeopardize the continued existence of the UCR spring-run Chinook salmon ESU or the UCR steelhead distinct population segment (NMFS 2008a).

1.7.1.1 Spring-run Chinook Salmon Segregated Program (Leavenworth Stock)

The purpose of the Chief Joseph Hatchery spring-run Chinook salmon segregated program is to establish a CTCR fishery in the mainstem Columbia River below Chief Joseph Dam. Seven hundred thousand non-listed Leavenworth spring-run Chinook salmon eggs would be transferred from Leavenworth National Fish Hatchery to the Chief Joseph Hatchery for rearing and release at the facility. Eventually, the Leavenworth National Fish Hatchery program would phase out and Leavenworth broodstock would originate from adults returning to the Chief Joseph Hatchery.

1.7.1.2 Spring-run Chinook Salmon Integrated Conservation Program (Methow Composite Stock)

The purpose of the Chief Joseph Hatchery spring-run Chinook salmon integrated conservation program is to restore natural spawning UCR spring-run Chinook salmon in historical habitats of the Okanogan subbasin, thereby contributing to the conservation of the UCR spring-run Chinook salmon ESU, using the nearest available within-ESU donor stock, Methow Composite (CTCR 2012a). Surplus UCR spring-run Chinook salmon Methow Composite stock from the Winthrop National Fish Hatchery would be used for the reintroduction (USFWS 2012). The UCR spring-run Chinook salmon Methow Composite stock is presently a mix of indigenous and non-local origin stocks, but is sufficiently similar to the natural origin population in the Methow River to be included with the UCR spring-run Chinook salmon ESU. The Hatchery and Genetic Management Plan (HGMP) for the Winthrop National Fish Hatchery provides the history of the Methow Composite stock, as well as current and future information regarding the UCR spring-run Chinook salmon program (USFWS 2012) (Subsection 1.7.8, Hatchery and Genetic Management Plans). The hatchery currently produces 200,000 eggs that are excess to the hatchery's broodstock collection needs.

For at least 8 to 10 years, the Winthrop National Fish Hatchery would annually transfer 200,000 UCR spring-run Chinook salmon Methow Composite stock eyed-eggs to the Chief Joseph Hatchery for initial rearing. The CTCR would subsequently release the pre-smolts to the Tonasket Pond acclimation site (Figure 1-2) in late October or early November for acclimation and volitional release directly into the Okanogan River as smolts in April/May the following year. The tag and mark plan for the smolts is to be unclipped (adipose present) with a coded wire tag in the snout and with 5,000 having a PIT tag (CTCR 2012a).

The use of acclimation ponds as rearing vessels for up to 6 months, combined with the volitional release program, allows the fish to be physiologically adapted to their natal streams and ready to migrate downstream to the Columbia River and out to sea, as well as improve homing fidelity so that adults would return to the Okanogan subbasin to spawn rather than straying into other areas to spawn (NMFS 2008a). All adults from the hatchery-origin Methow Composite stock returning to the Okanogan River would be allowed to spawn naturally for at least 8 to10 years. The CTCR does not anticipate collecting broodstock from returning adults for the Okanogan reintroduction

program at the Chief Joseph Hatchery or in the Okanogan subbasin during implementation of the 2012 Chief Joseph Hatchery Program Okanogan Basin Spring Chinook Hatchery Genetic Management Plan (CTCR 2012a).

The CTCR expects the UCR spring-run Chinook salmon integrated conservation program to continue into the foreseeable future unless monitoring and evaluation indicates that program components need be adjusted (Subsection 1.7.2, Monitoring Programs in the Okanogan Subbasin). At a minimum, the CTCR anticipate it will take two generations (8 to10 years) of reintroduction efforts using hatchery-origin broodstock from the Methow Composite stock to establish a spawning population that includes some natural-origin spawners. After at least two generations of reintroduction efforts, the CTCR would evaluate the strategy and success of the program to determine if modifications are warranted. At such time as monitoring and evaluations indicate that there are sufficient natural-origin returns, the program will shift to an integrated conservation program that uses some natural-origin broodstock from adults returning to the Okanogan River. The CTCR anticipate that the Okanogan River will always need some level of hatchery supplementation to overcome the many anthropogenic factors limiting survival such as hydropower, harvest, and habitat degradation (CTCR 2012a).

1.7.1.3 Summer/Fall-run Chinook Salmon Segregated Program (Chief Joseph Hatchery)

The purpose of the Chief Joseph Hatchery summer/fall-run Chinook salmon segregated program is primarily for harvest by both tribal and non-tribal fishers in the mainstem Columbia River. Initially, summer/fall-run Chinook salmon raised at the Chief Joseph Hatchery would come from adults collected at Wells Dam. A total of 500,000 yearling and 400,000 sub-yearling fish would be reared and released from Chief Joseph Hatchery. Eventually, adults that return to the Chief Joseph Hatchery or are captured in the mainstem Columbia River upstream of Wells Dam would provide all of the egg-take needs for the segregated program.

1.7.1.4 Summer/Fall-run Chinook Salmon Integrated Program (Okanogan Subbasin)

The purpose of the Chief Joseph Hatchery summer/fall-run Chinook salmon integrated program is to increase abundance, distribution, and diversity of naturally spawning summer/fall-run Chinook salmon within the Okanogan subbasin. Initially, similar to the segregated program, summer/fall-run Chinook salmon adults would be collected at the Wells Dam fish ladder. A total of 800,000 yearlings and 300,000 sub-yearlings would be reared at Chief Joseph Hatchery and transferred to acclimation ponds in the Okanogan subbasin for acclimation and release (Figure 1-2). The specific acclimation sites to be used for the summer/fall-run Chinook salmon integrated program have yet to be determined. Acclimation ponds used for the spring-run Chinook salmon integrated program may also be used for the Okanogan summer/fall-run Chinook salmon integrated program. Immediately after the last spring-run Chinook salmon smolts leave the Okanogan subbasin acclimation ponds in late May, the summer/fall-run Chinook salmon would be transferred into the acclimation ponds for final rearing and release by early July. Eventually, adults captured at an Okanogan subbasin weir are expected to provide all of the egg-take needs for the integrated summer/fall-run Chinook salmon program.

1.7.2 Monitoring Programs in the Okanogan Subbasin

Two programs guide monitoring efforts in Okanogan subbasin: the Okanogan Basin Monitoring and Evaluation Program developed in 2004 by the CTCR (CTCR 2004), and the Chief Joseph Hatchery Monitoring and Evaluation Plan (CTCR 2009).

1.7.2.1 Okanogan Basin Monitoring and Evaluation Program

The Okanogan Basin Monitoring and Evaluation Program (CTCR 2004) is a long-term status and trend monitoring program specifically designed to track key components of the ecosystem including biological, physical habitat, and water quality parameters. The Upper Columbia Monitoring Strategy (Hillman 2006) provides the sampling designs, indicators, and protocols for the Okanogan Basin Monitoring and Evaluation Program (CTCR 2004). Data collected under the monitoring program include habitat conditions, stream discharge, stream temperature, adult dam counts, smolt production, and redd and carcass data. The Okanogan Basin Monitoring and Evaluation Program is an ongoing program that would continue irrespective of the reintroduction of UCR spring-run Chinook salmon to the Okanogan subbasin.

The primary goals of the Okanogan Basin Monitoring and Evaluation Program are to: (1) determine if there is a biological change at the population scale for summer/fall-run Chinook salmon, spring-run Chinook salmon, sockeye salmon, and steelhead in the Okanogan subbasin over time; (2) determine if there is a change in selected physical habitat parameters in the Okanogan subbasin over time; (3) determine if selected water quality parameters change in the Okanogan subbasin mainstem and tributaries over time; (4) determine if there is a change in viability parameters from habitat improvement actions throughout the Okanogan subbasin; and (5) ensure that the monitoring effort continues in a scientifically sound manner that is closely coordinated across the Pacific Northwest. The Okanogan Basin Monitoring and Evaluation Program is available at: http://cctobmep.com/obmep.php.

The Okanogan Basin Monitoring and Evaluation Program calls for collection of ESA-listed Okanogan steelhead at a smolt trap in the action area to estimate natural production and productivity and calculate annual population estimates, egg-to-emigrant survival, and emigrant-to-adult survival rates (Rayton and Wagner 2006). We issued a Scientific Research Permit (#16122) to the CTCR under ESA section 10(a)(1)(A), valid through December 31, 2015, to operate the trap and conduct the research. We concluded that our authorization of research associated with the steelhead smolt trapping is categorically excluded from evaluation under the National Environmental Policy Act (NEPA), as scientific research (Will Stelle, NOAA, letter sent to Darin Hathaway, Anadromous Fish Biologist, CTCR, June 1, 2011, regarding issuance of Scientific Research Permit 16122). We, in coordination with the Washington Department of Fish and Wildlife (WDFW) and BPA, cooperate with the CTCR in this research. We would modify the Scientific Research Permit upon completion of the ESA section 10(j) rule to incorporate monitoring of the experimental population.

1.7.2.2 Chief Joseph Hatchery Monitoring and Evaluation Plan

The CTCR developed the Chief Joseph Hatchery Monitoring and Evaluation Plan (CTCR 2009). The plan outlines a strategy for how and what information would be gathered to evaluate the success of all four components of the Chief Joseph Hatchery Production Program (Subsection 1.7.1, Chief Joseph Hatchery) (CTCR 2004). The CTCR would collect information on fish interactions, productivity rates of hatchery origin and natural origin populations, and harvest effects. This information would be used to refine broodstock collection and adjust fish production numbers and release locations. The Chief Joseph Hatchery Monitoring and Evaluation Plan would be coordinated through existing forums to ensure strategic integration with other programs and projects in this and other river basins of the Columbia Cascade Province. Finally, the Chief Joseph Hatchery Monitoring and Evaluation Plan would be coordinated with broader, Columbia River basin monitoring and evaluation efforts to seek cost efficiencies and opportunities to address prevailing uncertainties at a large scale (BPA 2009).

The CTCR would conduct an annual review of the UCR spring-run Chinook salmon integrated reintroduction conservation program through the Chief Joseph Hatchery Annual Project Review process (CTCR 2009). In addition, the CTCR would conduct a "roll-up" review after Year 6 of the reintroduction program and annually thereafter, to provide a brood-year-specific assessment of: hatchery-origin release number and location; hatchery-origin smolt-to-adult survival rate; hatchery-origin homing fidelity; hatchery and natural-origin spawning distribution; hatchery return rates; natural recruitment rates; and harvest rates within the Okanogan subbasin and Columbia River upstream from the Okanogan River confluence.

The Chief Joseph Hatchery Monitoring and Evaluation Plan is an ongoing program that would continue irrespective of the UCR spring-run Chinook salmon experimental population proposed for reintroduction to the Okanogan subbasin. The Chief Joseph Hatchery Monitoring and Evaluation Plan is discussed further in the BPA 2009 Chief Joseph Hatchery Program: Final Environmental Impact Statement (Subsection 2.1.3, Monitoring and Evaluation; Section 3, Affected Environment and Environmental Consequences). The Chief Joseph Hatchery Monitoring and Evaluation Plan is consistent with best management practices for artificial production as developed by the Hatchery Scientific Review Group (HSRG) and other science groups that have contemplated guidelines for co-managing natural and hatchery populations for harvest and conservation (ISRP 2010).

1.7.3 Federal Columbia River Power System Biological Opinion

ESA section 7(a)(2), requires federal agencies to insure that actions they fund, permit, or carry out are not likely to jeopardize the continued existence of the listed species or result in the destruction or adverse modification of critical habitat. The Federal Columbia River Power System (FCRPS) Biological Opinion (NMFS 2008b) evaluates the 10-year operation and configuration of the FCRPS facilities, including dams, reservoirs, various other dams and reservoirs operated for irrigation purposes by the United States Bureau of Reclamation, and our issuance of a permit for the transportation of juvenile salmonids through or around FCRPS dams. We concluded that the action proposed by the Action Agencies (Bonneville Power

Administration, United States Army Corps of Engineers, and the United States Bureau of Reclamation) was likely to jeopardize species affected by the power system including UCR spring-run Chinook salmon and UCR steelhead. As a result, we developed Reasonable and Prudent Alternatives for the FCRPS operations as mitigation measures to benefit listed species.

Reasonable and Prudent Alternative Number 42 in the FCRPS Biological Opinion directs the Action Agencies to "Fund reintroduction of spring-run Chinook salmon into the Okanogan subbasin consistent with the Upper Columbia Salmon Recovery Plan including capital construction, operation, and monitoring and evaluation costs to implement a transition to local broodstock and a sliding scale for managing the composition of natural spawners comprising hatchery origin fish. Reintroduction would be coordinated with the restoration and improvement of spring-run Chinook salmon habitat in the Okanogan subbasin and would be contingent on the availability of within-ESU broodstock from the Methow subbasin" (NMFS 2008b). We also identified the reintroduction of spring-run Chinook salmon as one of the "Specific Projects to Implement Hatchery RPA Actions that would rebuild genetic resources and assist in promoting recovery" (NMFS 2008b). An essential first step for implementing the Chief Joseph Hatchery Methow Composite stock program required under Reasonable and Prudent Alternative Number 42 is an ESA analysis under section 10(j).

1.7.4 Secretarial Order 3206

Secretarial Order 3206 (American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the ESA), issued by the Secretaries of Interior and Commerce, clarifies the responsibilities of the Departments of Interior and Commerce when actions taken under the ESA and its implementing regulations affect, or may affect, tribal lands, tribal trust resources, or the exercise of tribal rights. Secretarial Order 3206 acknowledges the trust responsibility and treaty obligations of the United States toward recognized tribes and tribal members, as well as its government-to-government relationship with tribes. The order requires us to carry out our ESA responsibilities in a manner that harmonizes the federal trust responsibility to tribes, tribal sovereignty, and statutory missions of the Department of Commerce, and that strives to ensure that tribes do not bear a disproportionate burden for the conservation of listed species to avoid or minimize the potential for conflict and confrontation.

1.7.5 *United States v. Oregon*

In 1968, the United States District Court ruled in *United States v. Oregon* that Columbia River treaty Indian tribes were entitled to an equitable share of the Columbia River fish returns. In 2008, treaty tribes, and state and federal fisheries agencies reached an agreement on the management of mainstem Columbia River fisheries and hatchery production in the Columbia River basin above Bonneville Dam (The *United States v. Oregon* Settlement Agreement for 2008-2017; NMFS 2008b). The 2008 agreement resulted in development of the Columbia River Fish Management Plan.

The purpose of the Columbia River Fish Management Plan is to provide a framework within which the parties may exercise their sovereign powers in a coordinated and systematic manner to

protect, rebuild, and enhance Columbia River fish runs while providing harvests for both treaty Indian and non-Indian fisheries. To achieve the goals of the Columbia River Fish Management Plan, the parties intend to use habitat protection authorities, enhancement efforts, artificial production techniques, and harvest management to ensure that Columbia River fish runs continue to provide a broad range of benefits in perpetuity. The parties manage fisheries in the Columbia River basin according to provisions of the Columbia River Fish Management Plan. Harvest agreements reached in the *United States v. Oregon* process would impact Chief Joseph Hatchery adult returns (Subsection 3.2.1, Upper Columbia River Spring-run Chinook Salmon).

1.7.6 Federal Water Pollution Control Act (Clean Water Act)

The Clean Water Act (33 USC 1251 *et seq*.) is the principal federal legislation directed at protecting water quality. States may implement certain provisions, as well as approve and review National Pollutant Discharge Elimination System applications, and establish total maximum daily loads for rivers, lakes, and streams. The states are responsible for setting the water quality standards needed to support all beneficial uses, including protection of public health, recreational activities, aquatic life, and water supplies.

In Washington, the Washington Department of Ecology (Ecology) is responsible for carrying out its delegated Clean Water Act responsibilities. Ecology manages its responsibilities through its water quality program. The Okanogan River mainstem is listed under the 2008 Clean Water Act section 303(d) list as water quality impaired for failure to meet temperature, dissolved oxygen, and pH standards (Ecology 2008) (Subsection 3.5, Aquatic Habitat).

1.7.7 ESA Section 4(d) Regulations

In July of 2000, we adopted a rule under ESA section 4(d) prohibiting the take of 14 groups of salmon and steelhead listed as threatened under the ESA (65 Fed. Reg. 42422, July 10, 2000). In addition to applying the take prohibitions in section 9(a)(1) of the ESA, the section 4(d) rule sets forth specific circumstances when the prohibitions would not apply, known as section 4(d) limits. The rule included a set of 13 limits on the application of the ESA take prohibitions for specific categories of activities that contribute to the conservation of the listed salmon and steelhead or adequately limit their adverse impacts. The take prohibitions apply to actions carried out by state, tribal, and local governments and private parties that take listed salmon and steelhead, except take that is associated with those activities that come under one of the section 4(d) limits and those already permitted under other sections of the ESA. The section 4(d) limits create several new avenues for local and state governments as well as tribal governments to avoid take of ESA-listed salmon and steelhead.

The 13 limits on the ESA take prohibitions are:

- Limit No. 1. ESA Permits (activities conducted in accordance with ESA section 10 incidental take authorization (50 CFR 223.203(b)(1));
- Limit No. 2. Ongoing Scientific Research (scientific or artificial propagation activities with pending permit applications at the time of rulemaking 50 CFR (§223.203(b)(2));

- Limit No. 3. Rescue and Salvage Actions (emergency actions related to injured, stranded, or dead salmonids (50 CFR §223.203(b)(3));
- Limit No. 4. Fishery Management (fishery management activities (§223.203(b)(4));
- Limit No. 5. Artificial Propagation (hatchery and genetic management programs (50 CFR §223.203(b)(5));
- Limit No. 6. Joint Tribal/State Plans Developed under the *United States v. Washington* or *United States v. Oregon* Settlement Processes (activities in compliance with joint tribal/state plans developed within *United States (U.S.) v. Washington* or *United States v. Oregon* (50 CFR §223.203(b)(6));
- Limit No. 7. Scientific Research (scientific research activities permitted or conducted by the states (50 CFR §223.203(b)(7));
- Limit No. 8. Habitat Restoration Limits on the Take Prohibitions (state, local, and private habitat restoration activities (50 CFR §223.203(b)(8));
- Limit No. 9. Water Diversion Screening (properly screened water diversion devices (50 CFR §223.203(b)(9));
- Limit No. 10. Routine Road Maintenance (routine road maintenance activities (50 CFR §223.203(b)(10));
- Limit No. 11. Portland Parks Integrated Pest Management (certain park pest management activities (50 CFR §223/203(b)(11));
- Limit No. 12. Municipal, Residential, Commercial, and Industrial Development and Redevelopment (certain municipal, residential, commercial, and industrial development and redevelopment activities (50 CFR §223.203(b)(12)); and,
- Limit No. 13. Forest Management in Washington (management activities on state and private lands within the State of Washington (§223.203(b)(13)).

We also adopted a section 4(d) rule for Tribal Resource Management Plans (activities undertaken consistent with an approved tribal resource management plan (50 CFR §223.204), which allows tribes to take ESA-listed fish in cases where the Secretary has determined that implementing the Tribal Plan would not appreciably reduce the likelihood that listed species would survive and recover (65 Fed. Reg. 42481, July 10, 2000).

In February 2006, we applied these ESA section 4(d) protective regulations (as amended in 2005 (70 Fed. Reg. 37160, June 28, 2005)) to UCR steelhead (71 Fed. Reg. 5178, February 1, 2006). (This became necessary when we changed the listing status from endangered to threatened (71 Fed. Reg. 834, January 5, 2006)). The section 4(d) protective regulations prohibit the take of anadromous fish with an intact adipose fin that are part of the UCR steelhead distinct population segment, subject to the limits described above.

We do not require tribes, states, local governments, or private parties to change their practices to conform to any of the take limits described in the section 4(d) rule. The limits provide one way to ensure an activity or program does not risk violating the take prohibitions. Simply because a program is not within a limit does not mean that it automatically violates the ESA or the section 4(d) rule. However, it does mean that any program or jurisdiction would risk ESA penalties if the activity in question takes a listed fish. By receiving a limit, governments and individuals receive

assurance that their activities do not violate the take prohibitions and would not be subject to enforcement.

1.7.8 Hatchery and Genetic Management Plans

Hatchery programs that may affect listed salmon and steelhead require authorization under the ESA. A Hatchery and Genetic Management Plan (HGMP) provides detailed descriptions of hatchery programs that are submitted to us for authorization under the ESA. HGMPs are the basis for our biological evaluations of the hatchery programs under ESA sections 7 and 10, or Limit 5 of the current section 4(d) rule (Subsection 1.7.7, ESA Section 4(d) Regulations). The method of authorization depends on the status of the listed species affected, if there is a federal nexus, and if impacts are incidental to, or cause direct take of, the listed species. HGMPs describe each hatchery's operations and the actions taken to support recovery and minimize ecological or genetic impacts, such as straying and other forms of competition with naturally produced fish. There are two HGMPs directly relevant to analysis of the Proposed Action and alternatives: (1) the USFWS Winthrop National Fish Hatchery Spring Chinook HGMP, and (2) the CTCR Chief Joseph Hatchery HGMP, which are further described below.

1.7.8.1 USFWS Winthrop National Fish Hatchery HGMP

The USFWS 2012 Winthrop National Fish Hatchery HGMP describes the 200,000 Methow Composite UCR spring-run Chinook salmon destined for reintroduction to the Okanogan subbasin. According to the HGMP, spring-run Chinook salmon production at the Winthrop National Fish Hatchery would be marked to distinguish from natural-origin fish and hatchery-origin fish from other Methow River subbasin programs, and, one-third of the Winthrop National Fish Hatchery spring-run Chinook salmon production (200,000 smolts) would be made available for release in the Okanogan drainage as part of the UCR spring-run Chinook salmon integrated conservation program led by the CTCR (USFWS 2012).

1.7.8.2 CTCR Chief Joseph Hatchery Program Okanogan Basin Spring Chinook Hatchery Genetic Management Plan

The 2012 Chief Joseph Hatchery Program Okanogan Basin Spring Chinook HGMP (CTCR 2012a) provides additional information and analyses in support of the Chief Joseph Hatchery HGMP initially submitted to us on July 1, 2008 (CTCR 2008). The current accepted 2008 HGMP includes two spring-run Chinook salmon programs—a segregated harvest program that uses Leavenworth stock, and an integrated conservation program that was also going to use Leavenworth stock (CTCR 2008). The revised 2012 HGMP only addresses changes to the integrated conservation program. The major differences between the approved 2008 HGMP and the revised 2012 HGMP is the source population (specifically marked Methow Composite stock instead of Leavenworth stock) and release location (Okanogan mainstem instead of both the Okanogan mainstem and Omak Creek). The CTCR proposed these changes to reduce risk and potential effects to ESA-listed UCR spring-run Chinook salmon in the Methow River and ESA-listed steelhead in the Okanogan River subbasin, while providing a brood source that is closer to the historical UCR spring-run Chinook salmon that once inhabited the Okanogan subbasin. For

additional information on the Chief Joseph Hatchery spring-run Chinook salmon integrated conservation program using Methow Composite stock, see Subsection 1.7.1, Chief Joseph Hatchery, in this environmental assessment.

1.7.9 Fishery Management and Evaluation Plans

Fishery Management and Evaluation Plans (FMEPs) describe how recreational, commercial, and tribal fisheries would be managed to protect listed salmon and steelhead and allow them to recover. We describe FMEPs in the final ESA section 4(d) rule as a mechanism for addressing the take of certain listed species in fisheries (Subsection 1.7.7, ESA Section 4(d) Regulations). FMEPs are the basis for our biological evaluations of harvest programs under ESA sections 7 and 10, or Limit 4 of the section 4(d) rule. To date, the Washington Department of Fish and Wildlife has not submitted an FMEP to address non-tribal harvest of the experimental population returning to the Okanogan River.

1.7.10 Tribal Resource Management Plans

Tribal Resource Management Plans (TRMPs) may cover a range of activities, including fishery harvest, artificial propagation, research, or water or land management. A TRMP describes a specific resource management activity and its effect on threatened salmonids. If we determine the TRMP would not appreciably reduce the likelihood of survival and recovery of the listed species, any take associated with the TRMP is not a violation of the take prohibition (Subsection 1.7.7, ESA Section 4(d) Regulations). The section 4(d) rule for Tribal Resource Management Plans harmonizes statutory conservation requirements with tribal treaty rights and the federal trust responsibility to tribes.

On March 20, 2012, the CTCR submitted a draft TRMP to us for review. The TRMP provides the basis for our biological evaluations of the CTCR's fishery harvest, artificial propagation, research, and water and land management programs under ESA sections 7 and 10, or the section 4(d) rule for Tribal Resource Management Plans (65 Fed. Reg. 42481, July 10, 2000).

2.0 ALTERNATIVES

This EA describes and evaluates three alternatives. We considered but did not analyze four additional alternatives because they did not meet the purpose and need for the action. These are discussed in Subsection 2.5, Alternatives Considered but not Analyzed in Detail. Table 2-1 summarizes the key components of each alternative.

2.1 Alternative 1 (No-action) - No Reintroduction, No Designation of an Experimental Population, and No Adoption of Protective Regulations

Under the No-action Alternative, we would not (1) authorize the release of UCR spring-run Chinook salmon in the Okanogan subbasin under section 10(j) of the ESA, (2) designate UCR spring-run Chinook salmon released in the Okanogan subbasin as a non-essential experimental population, or (3) adopt protective regulations that would prohibit take of fish from the experimental population except in certain circumstances. The 200,000 Methow Composite spring-run Chinook salmon eggs excess to hatchery needs would continue to be reared at the Winthrop National Fish Hatchery and released in the Methow subbasin if reintroduction to the Okanogan subbasin under ESA section 10(j) is not authorized (W. Gale, pers. comm., United States Fish and Wildlife Service, Deputy Project Director for the Middle Columbia Fisheries Resource Office, May 7, 2013).

Monitoring and evaluation programs described under Subsection 1.7.2, Monitoring Programs in the Okanogan Subbasin, would continue, but because there would be no release of UCR spring-run Chinook salmon smolts, there would be no monitoring of UCR spring-run Chinook salmon smolts or adults.

Under the No-action Alternative, the endangered status of UCR spring-run Chinook salmon would remain in effect throughout the ESU and the ESA section 9 take prohibitions for the species would remain in effect. Section 7 requirements for federal agencies to consult with us to ensure that their actions are not likely to jeopardize the continued existence of UCR spring-run Chinook salmon or to result in destruction or adverse modification of their critical habitat would also apply. Further, our flexibility and discretion in managing UCR spring-run Chinook salmon recovery and conservation under the No-action Alternative would be limited without the designation. Under the No-action Alternative, an important opportunity to work cooperatively with the CTCR regarding management of this listed species for recovery and conservation would not occur because regulatory requirements would not be altered, which may dissuade cooperative efforts for recovery of the species (Subsection 1.5, Purpose and Need for the Proposed Action).

2.2 Alternative 2 (Proposed Action) – Reintroduction and Designation of a Specifically Marked Experimental Population with Adoption of Limited Protective Regulations under ESA Section 4(d)

2.2.1 Introduction

Under Alternative 2, we would (1) authorize the release of specifically marked UCR spring-run Chinook salmon in the Okanogan subbasin under section 10(j) of the ESA, (2) designate the

marked UCR spring-run Chinook salmon released in the Okanogan subbasin as a non-essential experimental population, and (3) adopt limited protective regulations under ESA section 4(d) that would prohibit intentional take of outmigrating smolts and returning adults from the experimental population, unless authorized through a section 4(d) approval process or a section 10 authorization in certain circumstances, as described below.

The monitoring and evaluation programs described under Subsection 1.7.2, Monitoring Programs in the Okanogan Subbasin, would continue, and the existing ESA section 10(a)(1)(A) permits would be modified to include monitoring and evaluation of the experimental population (see Section 10, below).

The ESA section 10(j) designation would give us flexibility and discretion in how we manage the ESU; by treating the experimental population as threatened rather than endangered, we would be able to apply limited protective regulations under ESA section 4(d) appropriate to the circumstances (Subsection 1.5, Purpose and Need for the Proposed Action). Alternative 2 would also assist NMFS in further developing the cooperative relationship with local entities such as the CTCR regarding the management of listed species for conservation and recovery because the section 4(d) rule would prohibit only intentional take of listed species; incidental take from otherwise lawful activities would not be prohibited. Less regulatory burden compared to the No-action Alternative may encourage cooperative efforts for recovery of the species (Subsection1.4, Congressional Intent and History; Subsection 1.5, Purpose and Need for the Proposed Action).

Alternative 2 would meet the purpose and need of the CTCR by restoring the culturally important spring-run Chinook salmon population in the Okanogan subbasin (Subsection 1.5, Purpose and Need for the Proposed Action). Further, limited ESA regulatory restrictions associated with the designation would allow the CTCR and local entities to engage in otherwise lawful activities that incidentally take members of the non-essential population without further ESA process. Activities that incidentally take UCR spring-run Chinook salmon could include agricultural, water management, construction, recreation, navigation, or forestry practices. Consequently, as the ESU begins to recover, local entities may be inclined to contribute to habitat improvements because there would be no perceived penalty for encouraging the presence of ESA-listed fish.

2.2.2 Regulatory Process

Under Alternative 2, the ESA section 4(d) regulations would prohibit intentional take of UCR spring-run Chinook salmon from the non-essential experimental population in the Okanogan subbasin, and would include provisions for approving intentional take as long as appropriate conservation standards are met as provided in section 4(d) regulations. The regulations would not prohibit incidental take of the non-essential population within the experimental population area; thus, such take would be allowed without the need to meet regulatory conservation standards.

2.2.2.1 Section 4(d)

Concurrent with the ESA section 10(j) authorization, we would adopt limited protective regulations under ESA section 4(d) for the experimental population. These limited protective regulations would prohibit take of UCR spring-run Chinook salmon that are part of the

experimental population except in the following circumstances in the geographic range of the experimental population designation (Subsection 1.6, Description of the Action Area) (Figure 1-2):

1. Any activity taken pursuant to a valid permit issued by us under 50 CFR §223.203(b)(1) and §223.203(b)(7) for educational purposes, scientific purposes, the enhancement of propagation or survival of the species, zoological exhibition, and other conservation purposes.
2. Rescue and salvage actions (emergency actions related to injured, stranded, or dead salmonids found in the designated experimental area (§223.203(b)(3)).
3. Activities associated with artificial propagation of the experimental population (but without returning adult broodstock collection activities) under an approved HGMP that complies with the requirements of 50 CFR §223.203(b)(5).
4. Any harvest-related activity undertaken by a tribe, tribal member, tribal permittee, tribal employee, or tribal agent consistent with tribal harvest regulations and an approved TRMP that complies with the requirements of 50 CFR §223.204.
5. Any harvest-related activity consistent with state harvest regulations and an approved FMEP that complies with the requirements of 50 CFR §223.203(b)(4).
6. Any take that is incidental to an otherwise lawful activity. Otherwise lawful activities include, but are not limited to, agricultural, water management, construction, recreation, navigation, or forestry practices, when such activities are in full compliance with all applicable laws and regulations.

Outside the geographic range of the experimental population designation (Figure 1-2), take of the section 10(j) designated experimental UCR spring-run Chinook salmon would be prohibited to the same extent as it would be for take of an endangered species under section 9.

2.2.2.2 Section 7

In accordance with section 10(j) of the ESA, there would be no section 7(a)(2) consultation requirement for federal actions on the basis that they may adversely affect members of the non-essential population (Subsection 1.4.4, Non-essential Experimental Population Designation and Regulatory Restrictions). The non-essential experimental population would be treated as a species proposed for ESA listing, and only two provisions of ESA section 7 would apply: section 7(a)(1) (requiring federal agencies to use their authorities to further conservation of listed species) and section 7(a)(4) (triggered by federal actions that may jeopardize the continued existence of the species). Section 7(a)(2) consultations may be required for actions in the Okanogan Basin that affect other ESA-listed species, and may be required when they affect members of the non-essential population outside the experimental population area where the fish are treated as endangered UCR spring-run Chinook salmon. Additionally, no critical habitat can be designated for a non-essential experimental population.

2.2.2.3 Section 10

Under Alternative 2, we would issue a permit to the CTCR under ESA section 10(a)(1)(A) for the transfer of Methow Composite stock (eggs and/or pre-smolts) to the Chief Joseph Hatchery or to the acclimation ponds in the Okanogan subbasin, and for their release as smolts from the acclimation ponds approximately 6 months later. All activities associated with artificial propagation of the experimental population in the Okanogan subbasin would be approved as part of the permit under ESA section 10(a)(1)(A) (Subsection 1.4.5, ESA Section 10(a)(1)(A) and Experimental Populations), including monitoring and evaluation of out-migrating smolts and returning adults from the experimental population. Artificial propagation activities could also be authorized under the section 4(d) approval process.

Under Alternative 2, the CTCR would continue monitoring and evaluation programs described in Subsection 1.7.2, Monitoring Programs in the Okanogan Subbasin. Monitoring the experimental population of UCR spring-run Chinook salmon would be included in these programs. The CTCR would capture out-migrating smolts, check them for marks, and measure and weigh a subsample before releasing them back into the Okanogan River. They would also monitor returning adults from the experimental population to assess adult returns. The CTCR has not yet identified a method of capture, but it may include screw traps, weirs, seines, and nets fished in the Okanogan River. All such monitoring and evaluation of UCR spring-run Chinook salmon would be approved as part of the permit under ESA section 10(a)(1)(A) (Subsection 1.4.5, ESA Section 10(a)(1)(A) and Experimental Populations). Monitoring and evaluation activities could also be authorized under a section 4(d) approval process. Any activity related to artificial propagation that results in take would likely be modified to ensure section 4(d) regulatory conservation standards are met, and/or section 10 requests would be designed to minimize and mitigate anticipated take from proposed actions (Subsection 1.7.8, Hatchery and Genetic Management Plans).

2.2.3 Summary of ESA Section 4(d) Limited Protective Regulations under Alternative 2

The effect of the ESA section 4(d) limited protective regulations under Alternative 2 is that within the Okanogan subbasin, intentional take of the section 10(j) designated UCR spring-run Chinook salmon would be prohibited unless it is approved through the section 4(d) approval process or a section 10 authorization. Incidental take of the non-essential population inside the experimental population area would not be prohibited under Alternative 2.

We anticipate that an experimental population would require hatchery supplementation for the foreseeable future, and therefore expect activities associated with artificial propagation would continue. Under Alternative 2, the propagation of listed UCR spring-run Chinook salmon at Winthrop National Fish Hatchery for supplementation would be authorized through the section 10(a)(1)(A) permit (Subsection 1.4.5, ESA Section 10(a)(1)(A) and Experimental Populations), but could also be authorized through the section 4(d) approval process.

We also anticipate that at some point there may be sufficient adult returns to support tribal and recreational harvest of the section 10(j) designated spring-run Chinook salmon in the Okanogan subbasin. Under Alternative 2, such harvest could proceed through the section 4(d) approval

process. Activities approved or permitted under section 4(d) or section 10 would likely include appropriate regulatory conservation measures or measures designed to minimize and mitigate take (Subsection 1.7.8, Hatchery and Genetic Management Plans).

2.3 Alternative 3 - Reintroduction and Designation of a Specifically Marked Experimental Population with Adoption of the Current Salmon and Steelhead Section 4(d) Rule

2.3.1 Introduction

Under Alternative 3, we would (1) authorize the release of specifically marked UCR spring-run Chinook salmon in the Okanogan subbasin under section 10(j) of the ESA, (2) designate the marked UCR spring-run Chinook salmon released in the Okanogan subbasin as a non-essential experimental population, and (3) adopt a section 4(d) rule for the marked experimental population that is the same as the current salmon and steelhead section 4(d) rule (Subsection 1.7.7, ESA Section 4(d) Regulations).

As under Alternative 2, the monitoring and evaluation programs described under Subsection 1.7.2, Monitoring Programs in the Okanogan Subbasin, would continue, and the existing ESA section 10(a)(1)(A) permits would be modified to include monitoring and evaluation of the experimental population.

The ESA section 10(j) designation would give us flexibility and discretion in how we manage the ESU; by treating the experimental population as threatened rather than endangered, we would be able to apply protective regulations under ESA section 4(d) appropriate to the circumstances (Subsection 1.5, Purpose and Need for the Proposed Action).

Alternative 3 would meet the purpose and need of the CTCR by restoring the culturally important spring-run Chinook salmon population in the Okanogan subbasin (Subsection 1.5, Purpose and Need for the Proposed Action). However, under Alternative 3, ESA regulatory restrictions on both intentional and incidental take of the section 10(j) designated UCR spring-run Chinook salmon would not allow the CTCR and local entities to engage in otherwise lawful activities, such as agriculture, water management, construction, recreation, navigation, or forestry practices that may take UCR spring-run Chinook salmon without risk of ESA violations. Consequently, local entities may not be inclined to contribute to habitat improvements because the regulatory restrictions may create the perception among local entities that there is a penalty for encouraging the presence of ESA-listed fish. Therefore, under Alternative 3, the ultimate success of the recovery could be hindered or slowed through a lack of cooperation from local entities.

2.3.2 Regulatory Process

Under Alternative 3, the ESA section 4(d) regulations would prohibit both intentional and incidental take of UCR spring-run Chinook salmon from the non-experimental population in the Okanogan, but would include provisions for approving such take as long as appropriate conservation standards are met as provided in section 4(d) regulations. The difference between Alternative 2 and Alternative 3 is that under Alternative 2, incidental take would not require approval and, therefore, would not be required to meet regulatory conservation standards,

whereas under Alternative 3, incidental take would require approval. Incidental take approval would only be issued if regulatory conservation standards are met under Alternative 3.

2.3.2.1 Section 4(d)

Unlike Alternative 2, the section 4(d) rule adopted for the experimental population under Alternative 3 would prohibit both intentional and incidental unauthorized take of fish from the section 10(j) designated experimental population in the Okanogan subbasin in the same manner as the current salmon and steelhead section 4(d) rule (Subsection 1.7.7, ESA Section 4(d) Regulations). Outside the geographic range of the experimental population designation (Figure 1-2), take of the section 10(j) designated experimental UCR spring-run Chinook salmon would be prohibited to the same extent as it would be for take of an endangered species under section 9.

2.3.2.2 Section 7

In accordance with section 10(j) of the ESA, there would be no section 7(a)(2) consultation requirement for federal actions which affect the non-essential population in the experimental population area (Subsection 1.4.4, Non-essential Experimental Population Designation and Regulatory Restrictions). The non-essential experimental population would be treated as a species proposed for ESA listing, and only two provisions of ESA section 7 would apply to actions affecting the non-essential population inside the experimental population area: section 7(a)(1) (requiring federal agencies to use their authorities to further conservation of listed species) and section 7(a)(4) (triggered by federal actions that may jeopardize the continued existence of the species). Formal ESA consultation under section 7(a)(2) may be required for federal actions in the experimental population area if they affect other ESA-listed species. Additionally, no critical habitat can be designated for a non-essential experimental population.

2.3.2.3 Section 10

As under Alternative 2, we would issue a permit to the CTCR under ESA section 10(a)(1)(A) for the transfer of Methow Composite stock (eggs and/or pre-smolts) to the Chief Joseph Hatchery or to the acclimation ponds in the Okanogan subbasin, and for their release as smolts from the acclimation ponds approximately 6 months later. All activities associated with artificial propagation of the experimental population in the Okanogan subbasin would be approved as part of the permit under ESA section 10(a)(1)(A) (Subsection 1.4.5, ESA Section 10(a)(1)(A) and Experimental Populations), including monitoring and evaluation of out-migrating smolts and returning adults from the experimental population. All artificial propagation-related activities could also be authorized under the section 4(d) approval process.

Similar to Alternative 2, the intentional and incidental take of fish from the section 10(j) designated experimental population could be authorized through the issuance of section 10(a)(1)(A) permits or through section 4(d) approval. Activities resulting in take would likely be modified to ensure section 4(d) regulatory conservation standards are met, and/or section 10 requests would be designed to minimize and mitigate anticipated take from proposed actions (Subsection 1.7.8, Hatchery and Genetic Management Plans).

2.3.3 Summary of ESA Section 4(d) Protective Regulations under Alternative 3

The effect of using our current salmon and steelhead section 4(d) rule under Alternative 3 is that within the Okanogan subbasin, intentional and incidental take of UCR spring-run Chinook salmon from the section 10(j) designated experimental population would be prohibited unless it is approved through the section 4(d) approval process or a section 10 authorization.

As under Alternative 2, we anticipate that an experimental population would require hatchery supplementation for the foreseeable future and, therefore, expect activities associated with artificial propagation would continue. Under Alternative 3, such activities would be authorized through the section 10(a)(1)(A) permit (Subsection 1.4.5, ESA Section 10(a)(1)(A) and Experimental Populations), but could also be authorized through the section 4(d) approval process.

Also as under Alternative 2, we anticipate that at some point there may be sufficient adult returns to support tribal and recreational harvest of section 10(j) designated spring-run Chinook salmon in the Okanogan subbasin. Under Alternative 3, such harvest could proceed through the section 4(d) approval process in exactly the same manner and subject to the same findings and conditions as would be the case under Alternative 2.

Also as under Alternative 2, we anticipate some take would occur associated with otherwise lawful activities such as agricultural, water management, construction, recreation, navigation, or forestry practices. Under Alternative 3, any of these takes would also require authorization under either a section 4(d) approval or a section 10 permit. Our experience under the current section 4(d) rule for other listed salmon and steelhead shows that we do authorize takes associated with lawful activities, but activities are often modified from what was originally proposed to ensure section 4(d) regulatory conservation standards are met. Similarly, section 10 requests are designed to minimize and mitigate anticipated take from proposed actions (Subsection 1.7.8, Hatchery and Genetic Management Plans). We, therefore, expect otherwise lawful land use activities would occur under Alternative 3, but would be modified to meet regulatory conservation standards and/or to include measures to minimize and mitigate take.

2.4 Distinctions and Similarities between Alternative 2 and Alternative 3

2.4.1 Distinctions

The primary distinction between Alternative 2 and Alternative 3 is related to incidental take. Alternative 2 would prohibit intentional take of section 10(j) designated experimental UCR spring-run Chinook salmon unless authorized. Incidental take of the section 10(j) designated population UCR spring-run Chinook salmon population from otherwise lawful activities such as agricultural, water management, construction, recreation, navigation, or forestry practices would not be prohibited. In contrast, the section 4(d) rule adopted under Alternative 3 would prohibit all unauthorized take, whether intentional or incidental, of the section 10(j) designated UCR spring-run Chinook salmon. We, therefore, anticipate that fewer takes would occur under Alternative 3 than under Alternative 2. The likely result would be that more fish from the experimental population would survive under Alternative 3 than under Alternative 2.

Under Alternative 3, incidental take of experimental population fish would be prohibited. Local entities would likely perceive this as a burden that would dissuade them from cooperating in habitat conservation efforts that may encourage the presence of more experimental population fish. In contrast, under Alternative 2, there would be no prohibition of incidental take and, therefore, less perceived burden associated with the presence of experimental population fish. This could result in greater cooperation from local entities in habitat protection and restoration under Alternative 2 than under Alternative 3. Therefore, the ultimate success of recovery could be hindered or slowed through a lack of cooperation between NMFS and local entities under Alternative 3. Moreover, opposition under Alternative 3 could be sufficiently great to cause the CTCR to abandon the reintroduction efforts.

2.4.2 Similarities

The primary similarities between Alternative 2 and Alternative 3 are that a non-essential experimental population of UCR spring-run Chinook salmon would be designated in the same geographical action area under both alternatives—the United States portion of the Okanogan subbasin. The same authorization processes for take would be applicable under both Alternatives (section 4(d) approval and/or a section 10 permit). The regulatory process would also incorporate measures to meet conservation standards and/or to minimize and mitigate for anticipated take.

The 10j designated population would be monitored and evaluated as part of the monitoring and evaluation programs described in Subsection 1.7.2, Monitoring Programs in the Okanogan Subbasin, under both alternatives.

An additional similarity is that both alternatives would give us flexibility and discretion in how we manage the ESU; by treating the experimental population as threatened rather than endangered, we would be able to apply ESA section 4(d) protective regulations appropriate to the circumstances (Subsection 1.5, Purpose and Need for the Proposed Action). Further, both alternatives would meet the purpose and need of the CTCR by restoring the culturally important spring-run Chinook salmon population in the Okanogan subbasin (Subsection 1.5, Purpose and Need for the Proposed Action).

2.5 Alternatives Considered But Not Analyzed in Detail

2.5.1 Designation as an Essential Experimental Population

Under this scenario, the experimental population would be designated as an essential experimental population rather than a non-essential experimental population. Under ESA section 10(j), the Secretary must determine, considering the best information available, whether experimental populations are essential to the continued existence of an endangered or threatened species. The United States Fish and Wildlife regulations define an essential experimental population to be a population whose loss would appreciably reduce the likelihood of the survival of the species in the wild (50 CFR 17.8).

As noted above in Subsection 1.1.3, Upper Columbia River Recovery Plan, the Plan's recovery criteria and proposed management strategies indicate that the UCR spring-run Chinook salmon

ESU could recover to the point where listing under the ESA is no longer necessary solely with contributions from the three extant populations, stating that recovery of spring-run Chinook salmon in the Okanogan subbasin is not a requirement for delisting. Because according to the recovery plan there is no need for a viable Okanogan spring-run Chinook salmon population to recover the UCR spring-run Chinook salmon ESU, there would be no purpose for designation of an "essential" experimental population in the Okanogan. Although we must ultimately make this determination through rulemaking, we did not analyze this alternative in detail because of our preliminary determination that the population would not be essential.

2.5.2 Designate a Non-essential Experimental Population with Expiration Date

Including an expiration date for the experimental population would not meet the purpose and need. If the designation expired, there would be no legal basis for the CTCR to continue releasing Methow Composite stock in the Okanogan subbasin and the program would cease. Any fish present in the Okanogan subbasin after the designation expired would not be considered part of the listed ESU because the Okanogan subbasin is explicitly excluded from the listing (70 Fed. Reg. 37160, June 28, 2005). These fish would thus not receive any ESA protection. In addition, an expiration date is unnecessary because if it were appropriate to terminate the program, the designation included in the Proposed Action alternative could be withdrawn through rulemaking.

The Proposed Action is distinguishable from the other experimental population designation proposed by us for steelhead in the Deschutes River (76 Fed. Reg. 28715, May 18, 2011). There the area for reintroduction is within the range of the original listing, so any fish present after the designation expires would be considered part of the listed ESU and would receive the protection of the ESA.

2.5.3 Authorize the Reintroduction Using a Different Hatchery Stock

Under the Proposed Action, the CTCR would use excess Methow Composite hatchery-origin UCR spring-run Chinook salmon from the Winthrop National Fish Hatchery in the adjacent Methow River subbasin as the donor stock to begin the reintroduction into the Okanogan subbasin. These fish are part of the UCR spring-run Chinook salmon ESU and are a close genetic match to the extirpated Okanogan population.

We considered if there were any other suitable donor hatchery stocks to begin the reintroduction. Although there are six hatchery programs included in the UCR spring-run Chinook salmon ESU, the Winthrop National Hatchery facility, operated by the USFWS, has the most available excess UCR spring-run Chinook salmon. Four of the other hatchery programs considered to be part of this ESU are located in river basins that are farther from the Okanogan subbasin. Chinook salmon from these programs are generally considered to be more genetically dissimilar to the UCR spring-run Chinook salmon extirpated from the Okanogan subbasin. The other UCR spring-run Chinook salmon program in the Methow subbasin is at the WDFW Methow Hatchery. The Methow Hatchery uses stock that is genetically similar to the stock used at the Winthrop National Fish Hatchery. However, the Methow Hatchery does not currently have the capacity to produce the excess broodstock needed for the reintroduction. As a result, we did not select the

Methow Hatchery for the reintroduction program in the Okanogan subbasin because it would not meet the purpose to establish a population of spring-run Chinook salmon in the Okanogan subbasin under ESA section 10(j) using excess UCR spring-run Chinook salmon Methow Composite hatchery stock. Further, it would not meet the need for the action to use the UCR spring-run Chinook salmon Methow Composite stock, which would support recovery because it is a locally derived and genetically similar to the spring-run Chinook salmon originally occupying the Okanogan subbasin.

We also considered Leavenworth stock spring-run Chinook salmon from the Leavenworth Hatchery for reintroduction into the Okanogan subbasin. The CTCR released Leavenworth stock into the Okanogan subbasin from 2002 through 2006 to evaluate the potential for a reintroduction program (C. Fisher, pers. comm., CTCR, Fisheries Biologist, March 1, 2012). However, Leavenworth stock releases were terminated to obtain a more genetically similar Okanogan egg source for the reintroduction program. The use of Leavenworth stock would not meet the purpose and need for the action because the genetically dissimilar Leavenworth stock would not support recovery of the UCR spring-run Chinook salmon ESU (UCSRB 2007). In addition, the Winthrop National Fish Hatchery HGMP (USFWS 2009) identified the Methow Composite stock for release into the Okanogan subbasin. For these reasons, the option of using an alternative hatchery stock to begin the reintroduction was not considered in further detail.

2.5.4 Revise the UCR Spring-run Chinook Salmon Listing to Include Fish Reproducing in the Okanogan Subbasin

Under this scenario, we would authorize the release of UCR spring-run Chinook salmon into the Okanogan subbasin, either through a section 7 incidental take statement or a section 10(a)(1)(A) enhancement permit, and revise the current ESU listing to include the Okanogan subbasin through a rulemaking.

This alternative would provide for the reintroduction of an experimental population of UCR spring-run Chinook salmon to the Okanogan subbasin in support of recovery of the listed ESU. However, this alternative would not meet the purpose and need because the reintroduced fish would be treated as endangered, and we would have no discretion and flexibility to manage the listed ESU for recovery efforts. Finally there would also be diminished local support for the reintroduction (Subsection 1.5, Purpose and Need for the Proposed Action).

Table 2-1. Comparison of key components among alternatives.

Alternative	UCR Spring-run Chinook Salmon Reintroduction	ESA Section 9 Take Prohibitions on UCR Spring-run Chinook Salmon	Experimental Population Designation for UCR Spring-run Chinook Salmon
Alternative 1 – No-action	No reintroduction of UCR spring-run Chinook salmon in the Okanogan subbasin.	Section 9 take prohibitions would remain in effect throughout the current range of UCR spring-run Chinook salmon.	No experimental population designation.
Alternative 2 – Reintroduction of a specifically marked section 10(j) designated experimental population with adoption of limited protective regulations under ESA section 4(d).	Authorization for release of a specifically marked section 10(j) designated experimental population of UCR spring-run Chinook salmon in the Okanogan subbasin using excess Methow Composite hatchery stock with adoption of limited protective regulations under ESA section 4(d).	Adoption of limited protective regulations under ESA section 4(d) that would not prohibit take of UCR spring-run Chinook salmon in the Okanogan subbasin resulting from: 1) Any activity taken pursuant to a valid permit issued by NMFS under 50 CFR §223.203(b)(1) and §223.203(b)(7) for educational purposes, scientific purposes, the enhancement of propagation or survival of the species, zoological exhibition, and other conservation purposes. 2) Rescue and Salvage Actions (emergency actions related	Experimental population designation. The experimental population action area is the United States portion of the Okanogan subbasin.

Alternative	UCR Spring-run Chinook Salmon Reintroduction	ESA Section 9 Take Prohibitions on UCR Spring-run Chinook Salmon	Experimental Population Designation for UCR Spring-run Chinook Salmon
		to injured, stranded, or dead salmonids found in the designated experimental area (50 CFR §223.203(b)(3)). 3) Activities associated with artificial propagation of the experimental population under an approved HGMP that complies with the requirements of 50 CFR §223.203(b)(5). 4) Any harvest-related activity undertaken by a tribe, tribal member, tribal permittee, tribal employee, or tribal agent consistent with tribal harvest regulations and an approved TRMP that complies with the requirements of 50 CFR §223.204. 5) Any harvest-related activity consistent with state harvest regulations and an approved FMEP that complies with the requirements of 50 CFR §223.203(b)(4).	

Alternative	UCR Spring-run Chinook Salmon Reintroduction	ESA Section 9 Take Prohibitions on UCR Spring-run Chinook Salmon	Experimental Population Designation for UCR Spring-run Chinook Salmon
		6) Any take of UCR spring-run Chinook salmon found in the designated experimental area that is incidental to an otherwise lawful activity, such as agricultural, water management, construction, recreation, navigation, or forestry practices, when such activities are in full compliance with all applicable laws and regulations.	
Alternative 3 – Reintroduction of a specifically marked section 10(j) designated experimental population with adoption of current salmon and steelhead ESA section 4(d) rule.	Authorization for release of a specifically marked section 10(j) designated experimental population of UCR spring-run Chinook salmon in the Okanogan subbasin using excess Methow Composite hatchery stock.	Application of the current salmon and steelhead ESA section 4(d) rule take prohibitions.	Same as Alternative 2 – experimental population designation.

3.0 AFFECTED ENVIRONMENT

3.1 Overview and Approach

The Okanogan subbasin (Figure 3-1) is one of the largest geographic subbasins in the Columbia River basin (NPCC 2004a). The Okanogan River system begins in the forested mountains of British Columbia, Canada. Numerous streams from these mountains drain into Okanogan Lake, with the Okanogan River proper beginning at the south end of this large lake. The river continues south through Skaha Lake, over Okanogan Falls, through Vaseux Lake, and eventually into Osoyoos Lake, which spans the United States–Canada border. The Okanogan River exits Osoyoos Lake near the town of Oroville, Washington and flows south to meet the Columbia River at river mile (RM) 533. Major tributaries of the United States portion of the Okanogan River include the Similkameen River, Omak Creek, and Salmon Creek. A complete description of the biology, geology, and demographics of the Okanogan subbasin can be found in the Okanogan Subbasin Plan (NPCC 2004a).

The three alternatives considered in this EA can potentially affect the physical, biological, sociological, and economic resources within the action area (Subsection 1.6, Description of the Action Area). Below is a description of the current baseline condition of the environmental resources that may be affected by these alternatives within the United States portion of the Okanogan subbasin (Subsection 1.6, Description of the Action Area). We conducted an internal scoping process to identify those resources within the action area that could be impacted by the alternatives. During the scoping process, we discussed possible effects to all resources from activities associated with issuing a final rule to designate a reintroduced population of UCR spring-run Chinook salmon in the Okanogan subbasin as a non-essential experimental population. In 2009, the BPA published a final EIS (BPA 2009) analyzing the construction, operation, and maintenance of the Chief Joseph Hatchery and its associated satellite facilities in the Okanogan subbasin. The facilities analyzed in the EIS are needed to carry out our Proposed Action, and the EIS has extensive information on the action area of this EA. NMFS weighed a number of environmental parameters against the Proposed Action and concluded that the following environmental resources did not warrant further analysis beyond the detail of the 2009 BPA EIS on the Chief Joseph Hatchery: (1) geology and soils, (2) air, (3) groundwater and hydrology, (4) wetlands, listed plants, and vegetation, and (5) environmental justice.

Below is a description of the current baseline condition of the biological, sociological, and economic resources identified during our internal scoping process that could be affected by the three alternatives considered in this EA. We identified potential impacts on ESA-listed and non-listed salmonid species, non-native fish species, aquatic habitat, wildlife, socioeconomics, land use and ownerships, tourism and recreation, and cultural resources. The following is a discussion of the current, baseline condition of those resources within the action area (Subsection 1.6, Description of the Action Area) that could be impacted by the alternatives.

3.2 ESA-listed Salmon and Steelhead

There are three ESA-listed species of fish in the analysis area:

- Upper Columbia River spring-run Chinook salmon (endangered)
- Upper Columbia River steelhead (threatened)
- Bull trout (threatened)

Species discussed in this section are organized first by background information (including listing status), followed by current status and trends, life history, and limiting factors and threats.

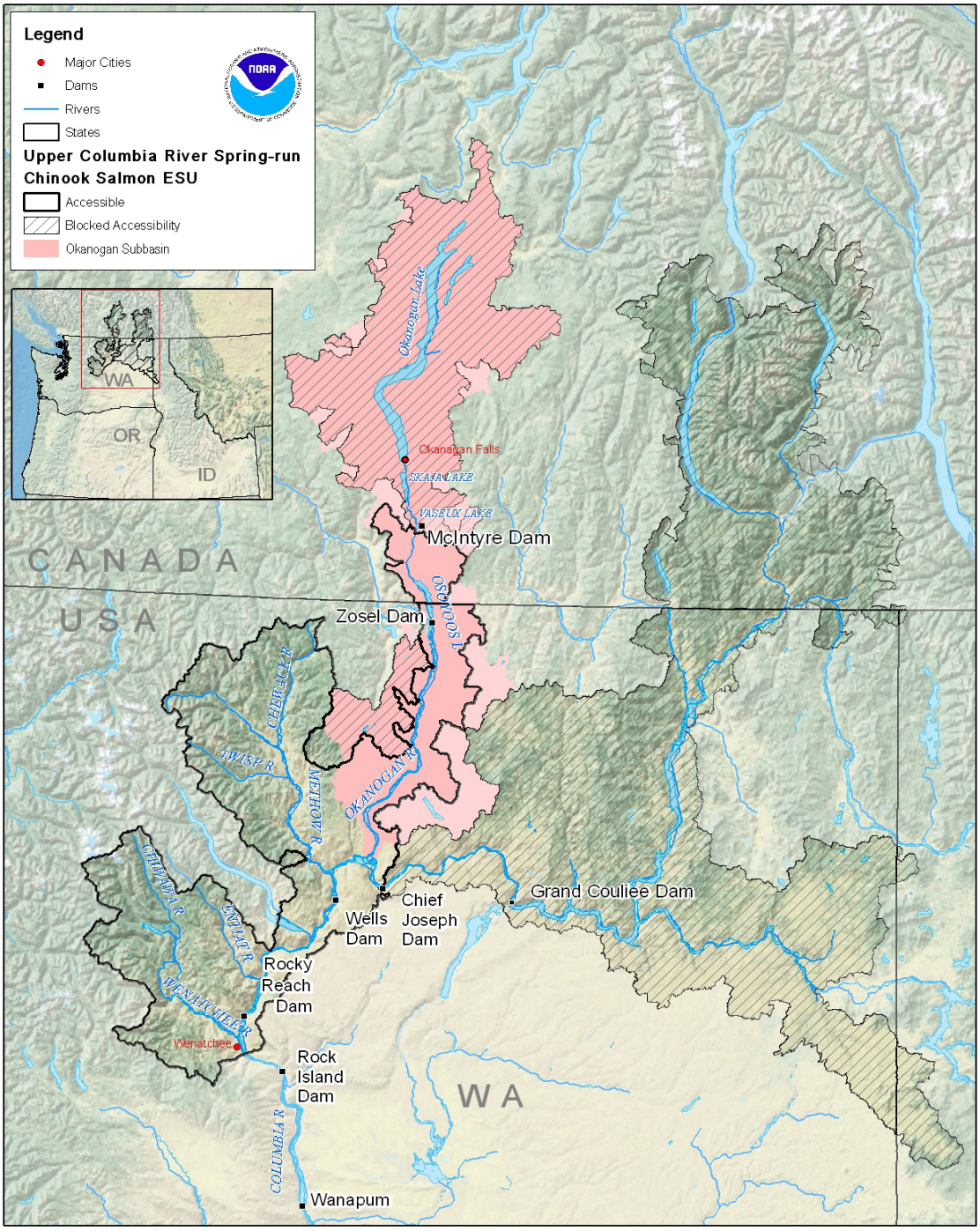


Figure 3-1. The Okanogan subbasin.

3.2.1 Upper Columbia River Spring-run Chinook Salmon

3.2.1.1 Background

The UCR spring-run Chinook salmon (*Oncorhynchus tshawytscha*) ESU consists of one major population group composed of three existing populations and one extinct population. In 1999, we listed the Upper Columbia River spring-run Chinook salmon ESU as endangered (64 Fed. Reg. 14308, March 24, 1999). We reaffirmed this listing in 2005 (70 Fed. Reg. 37160, June 28, 2005). The current UCR spring-run Chinook salmon ESA-listed ESU includes all naturally spawned populations of spring-run Chinook salmon in accessible reaches of Columbia River tributaries upstream of Rock Island Dam and downstream of Chief Joseph Dam in Washington State, excluding the Okanogan River.

Listed spring-run Chinook salmon from this ESU currently spawn in three river basins in north-central Washington State: the Methow, Entiat, and Wenatchee. A fourth population historically inhabited the Okanogan subbasin, but was extirpated in the 1930s because of over-fishing, hydropower development, and habitat degradation (UCSRB 2007). The ESU also includes six artificial propagation programs: the Twisp River, Chewuch River, Methow Composite, Winthrop National Fish Hatchery, Chiwawa River, and White River spring-run Chinook salmon hatchery programs (70 Fed. Reg. 37160, June 28, 2005). In Subsection 2.5.3, Authorize the Reintroduction Using a Different Hatchery Stock, we analyzed the suitability of each of these six hatchery programs for use as donor stock for the Okanogan reintroduction. We dismissed all but the Methow Composite stock from the National Fish Hatchery Program as not suitable for the reintroduction. There will be no further analysis of the remaining five hatchery programs comprising the UCR spring-run Chinook salmon ESU.

We designated critical habitat for UCR spring-run Chinook salmon on September 2, 2005 (70 Fed. Reg. 52630, September 2, 2005). The ESA-designated critical habitat of UCR spring-run Chinook salmon includes all accessible reaches of Columbia River tributaries between Rock Island and Chief Joseph Dams, but excludes the Okanogan subbasin. We did not include the Okanogan subbasin in any critical habitat designation because the Okanogan population of spring-run Chinook salmon no longer exists and available information at the time of designation did not indicate that the Okanogan was “essential for conservation” as unoccupied habitat.

UCR spring-run Chinook salmon historically occurred in at least four systems in the Okanogan subbasin: (1) Salmon Creek (Craig and Suomela 1941), (2) tributaries upstream of Lake Osoyoos (Chapman et al. 1995), (3) Omak Creek (Fulton 1968), and (4) the Similkameen River (Fulton 1968) (Figure 1-1 and Figure 3-1). In addition, spring-run Chinook salmon may have inhabited several other smaller, Okanogan tributaries (e.g., Bonaparte and Loup Loup Creeks) prior to irrigation development in the late 19th century.

UCR spring-run Chinook salmon historically migrated above Lake Osoyoos into Canada and spawned in the upper Okanogan River and other tributaries. As reported in the 2004 Northwest Power and Conservation Council (NPCC) Okanogan Subbasin Plan, “In 1936, spring-run Chinook salmon were observed in the Okanogan River upstream from Lake Osoyoos by

Canadian biologists" (Gartrell 1936). In the late 1950s and early 1960s, spring-run Chinook salmon were in the Okanogan subbasin as far as Okanogan Falls (NPCC 2004a). Figure 3-1 illustrates the current range of the Upper Columbia River spring-run Chinook salmon ESU including the extirpated Okanogan population.

The Osoyoos, Vaseux, Skaha, and Okanogan Lakes located on the mainstem Okanogan River in Canada (Figure 3-1) have a high potential to increase abundance and productivity of spring-run Chinook salmon (CTCR 2010). Recently, biologists captured large, juvenile Chinook salmon in gill nets in upper Osoyoos Lake (NPCC 2004a). The origin of these Chinook salmon is unknown. They could be strays from the Similkameen summer/fall-run Chinook salmon acclimation program or strays from the experimental CTCR spring-run Chinook salmon Omak Creek program conducted from 2002 to 2006 (Subsection 2.5.3, Authorize the Reintroduction Using a Different Hatchery Stock). In addition, there are other examples in the Columbia River basin of spring-run Chinook salmon rearing in lake environments. Spring-run Chinook salmon historically spawned above Redfish Lake in Idaho with their juveniles rearing in the lake along with the sockeye salmon prior to ocean migration (NPCC 2004a).

The UCR spring-run Chinook salmon ESU is currently heavily influenced by hatchery spawners. Ford (2011) reported that the most recent 5-year average of hatchery adults on the spawning grounds in the Methow subbasin was about 71 percent. While hatchery programs may provide short-term demographic benefits, there are significant uncertainties regarding the long-term risks of relying on high levels of hatchery influence to maintain natural production (Ford 2011). Since we listed this ESU in 1998, hatchery managers have worked to reduce the production of out-of-ESU hatchery spring-run Chinook salmon in the upper Columbia River, particularly by limiting the release of Leavenworth stock (spring-run Chinook salmon originating from outside the ESU) at the hatchery, outside the three natural spawning areas of the Methow, Entiat, and Wenatchee River basins. Managers are now developing within-ESU broodstocks for releases in these areas.

The USFWS plans to decrease the releases of Methow Composite stock at the Winthrop National Fish Hatchery. The goal of this reduction is to decrease the numbers of hatchery fish on the Methow River spawning grounds, in an effort to promote natural production (USFWS 2012). The hatchery currently produces 600,000 smolts, 200,000 of which are surplus to recovery needs and will be used to support the Action Alternatives. In the short term under the No-action Alternative, the excess fish would continue to be reared at the Winthrop National Fish Hatchery and released in the Methow subbasin. Over the long term, releases of excess Methow Composite spring-run Chinook salmon could be phased out of the Methow basin and transferred to other appropriate release sites. Under the Action Alternatives, the excess 200,000 eggs would continue to be phased out over the long term, but in the near term, the excess 200,000 eggs would be reared at the Winthrop National Fish Hatchery or at Chief Joseph Hatchery and the resulting pre-smolts would be placed into acclimation ponds and ultimately released in the Okanogan subbasin.

3.2.1.2 Current Status and Trends

On August 15, 2011, we announced completion of 5-year status reviews for Northwest salmon and steelhead including the UCR spring-run Chinook salmon ESU. After analyzing the status of

this ESU since the 2005 review, the Northwest Fisheries Science Center rated all three extant UCR spring-run Chinook salmon populations at a high risk of extinction for all four viability parameters: abundance, productivity, spatial structure, and diversity (Ford 2011). After considering this status information, the ESA section 4(a)(1) listing factors, and efforts being made to protect this ESU, we concluded that the UCR spring-run Chinook salmon should remain listed as endangered (NMFS 2011). The UCR Okanogan spring-run Chinook salmon population remains extirpated and does not contribute to the viability of the ESU. The proportion of hatchery-origin returns in natural spawning areas is extremely high (71 percent for the period 2003 to 2008) in the Methow population. As a result, the 2011 5-year status review raised concern with the Winthrop National Fish Hatchery program because the hatchery poses a genetic risk to natural spawning spring-run Chinook salmon in the Methow subbasin and is contributing to divergence of the ESU.

3.2.1.3 Life History

Juvenile spring-run Chinook salmon generally spend 1 year in fresh water before they migrate downstream (Mullan 1987; Healey 1991). Some juvenile spring-run Chinook salmon migrate out of their natal subbasin and rear in the mainstem Columbia River prior to their migration as smolts (NPCC 2004a). Smolt migration occurs from mid-April through May (University of Washington 2012). Most spend 2 years in the ocean before migrating back to their natal streams (Mullan 1987). Spring-run Chinook salmon adults enter the Columbia River basin from March through early June and enter their natal streams from late April through July. While in their natal streams, they hold in the deeper pools and under cover until the onset of spawning. Spawning occurs from late July through September, usually peaking in late August (Chapman et al. 1995).

3.2.1.4 Limiting Factors and Threats

Factors that limit the recovery of UCR spring-run Chinook salmon include migration barriers (e.g., irrigation diversions in the tributaries), poor riparian conditions, lack of channel structure and form, high sediment loads, low base stream flows, and warm summer water temperatures (UCSRB 2007). Potential threats to UCR spring-run Chinook salmon include residential and agricultural development, livestock grazing, predation, and hydropower development and operation (NPCC 2004b). These limiting factors and threats are habitat-based and are therefore discussed in Subsection 3.5, Aquatic Habitat, and analyzed in Subsection 4.5, Effects on Aquatic Habitat. Subsection 3.5, Aquatic Habitat, provides additional detail on limiting factors and threats for UCR spring-run Chinook salmon in the Okanogan subbasin. Subsection 4.5 addresses the effects of each of the alternatives on these aquatic habitat limiting factors and threats.

UCR spring-run Chinook salmon are generally not caught (less than 2 percent) in ocean fisheries (Pacific Fishery Management Council 2012), but are harvested in treaty and non-treaty fisheries in the mainstem Columbia River. Total harvest rates range from 5.5 percent to 17 percent based on run size, in accordance with harvest agreements under *United States v. Oregon* (*U.S. v. Oregon* Technical Advisory Committee 2008). Non-treaty fisheries use mark-select methods, which require harvesters to release unmarked naturally produced fish. Treaty fisheries are non-selective. In addition, the CTCR manage a hook-and-line snag fishery below Chief Joseph Dam

that targets summer/fall-run Chinook salmon. Few, if any, spring-run Chinook salmon are caught in this fishery. The Colville Natural Resource Committee approves this exclusive tribal fishery annually. In addition, the CTCR has experimented with selective fishing gear since 2007 to test the feasibility and evaluate the costs and effectiveness of 12 different live-capture fishing gears. Each of the methods continue to be evaluated with the purse seine, weir, beach seine, tangle net, hoop net, and dip net having the strongest potential for catching fish and allowing non-target species to be released with the lowest potential for unintended mortality. The two methods with the highest release survival rate were from the purse seine (100 percent) and the beach seine (99 percent) (Rayton et al. 2012).

As a result of straying from within-ESU and out-of-ESU hatchery spring-run Chinook salmon, there is a high rate of hatchery fish on the Methow subbasin spawning grounds. The proportion of hatchery fish on the spawning grounds is over 50 percent in the Methow subbasin and not acceptable for recovery of the UCR spring-run Chinook salmon ESU (Ford 2011). The Winthrop National Fish Hatchery is operated to intentionally allow spawning by Methow Composite stock hatchery fish (HSRG 2008). The extremely high proportion of UCR spring-run Chinook salmon hatchery fish on the spawning grounds represents a near-term threat to the diversity of the ESU and a long-term threat to abundance, productivity, and distribution of the ESU.

3.2.2 Upper Columbia River Steelhead

3.2.2.1 Background

The UCR steelhead (*Oncorhynchus mykiss*) distinct population segment consists of one major population group composed of four existing and one extinct population. Steelhead is the name commonly applied to the anadromous form of the biological species *O. mykiss.* This species also includes the non-anadromous rainbow trout. The UCR steelhead distinct population segment was listed as endangered in 1997 (62 Fed. Reg. 43937, August 18, 1997). This distinct population segment was later reclassified as threatened in 2006 (71 Fed. Reg. 834, January 5, 2006). The threatened classification was affirmed in 2009 (74 Fed. Reg. 42605, August 24, 2009) after a number of legal challenges to this distinct population segment's classification. The UCR steelhead distinct population segment is currently protected under our ESA section 4(d) regulations for steelhead (71 Fed. Reg. 5178, February 1, 2006) (Subsection 1.7.7, ESA Section 4(d) Regulations). The UCR steelhead distinct population segment includes all naturally spawned populations of steelhead in streams in the Columbia River basin upstream from the Yakima River, Washington, to the United States-Canada border (62 Fed. Reg. 43937, August 18, 1997).

UCR steelhead spawn in four river basins in north-central Washington State: Wenatchee, Entiat, Methow, and Okanogan. The distinct population segment also includes six artificial propagation programs: the Wenatchee River, Wells Hatchery in the Methow and Okanogan Rivers, Winthrop National Fish Hatchery, Omak Creek, and the Ringold steelhead hatchery programs.

The action area includes areas designated as critical habitat for the UCR steelhead (70 Fed. Reg. 52630, September 2, 2005). UCR steelhead critical habitat in the Okanogan subbasin includes

the mainstem Okanogan River from the mouth to and including the United States portion of Osoyoos Lake. Portions of several Okanogan tributaries, including Salmon Creek, Omak Creek, Loup Loup Creek, Bonaparte Creek, and Antoine Creek, are designated as critical habitat for Okanogan steelhead. The first 8 miles of the Similkameen River to the base of Enloe Dam and the mainstem Columbia River to the base of Chief Joseph Dam are also designated as critical habitat for UCR steelhead.

In designating critical habitat, we identified primary constituent elements (PCEs) that consist of the physical and biological features identified as essential to the conservation of the listed species. PCEs for salmon and steelhead include sites essential to support one or more life stages of the ESU or distinct population segment (sites for spawning, rearing, migration, and foraging). These sites, in turn, contain physical or biological features essential to the conservation of the ESU or distinct population segment. Those specific types of sites and the features associated with them that are found in the action area include:

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation, and larval development.
2. Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.
3. Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

3.2.2.2 Current Status and Trends

On August 15, 2011, we announced completion of 5-year reviews for Northwest salmon and steelhead including the UCR steelhead distinct population segment. After reviewing the status of this distinct population segment, the Northwest Fisheries Science Center rated all four populations of UCR steelhead at high risk of extinction (Ford 2011). Upper Columbia River steelhead populations have increased in natural abundance in recent years, but productivity levels remain low. The proportion of hatchery-origin returns in natural spawning areas remains extremely high across the distinct population segment, especially in the Methow and Okanogan populations. This, coupled with ESA section 4(a)(1) listing factors and efforts being made to protect this distinct population segment, led us to conclude that the UCR steelhead distinct population segment should remain listed as threatened (NMFS 2011).

3.2.2.3 Life History

O. mykiss exhibit perhaps the most complex suite of life history traits of any species of Pacific salmonid. They can be anadromous or freshwater residents, and, under some circumstances, can

apparently yield offspring of the opposite form. Those that are anadromous can spend up to 7 years in fresh water prior to smoltification, and then spend up to 3 years in salt water prior to first spawning. *O. mykiss* are also iteroparous (meaning individuals may spawn more than once), whereas the Pacific salmon species are principally semelparous (meaning individuals generally spawn once and die).

Steelhead can be divided into two basic reproductive ecotypes, based on the state of sexual maturity at the time of river entry and duration of spawning migration. The ‘‘stream-maturing’’ type (summer steelhead in the Pacific Northwest and Northern California) enters fresh water in a sexually immature condition between May and October and requires several months to mature and spawn. The ‘‘ocean-maturing’’ type (winter steelhead in the Pacific Northwest and Northern California) enters fresh water between November and April and spawns shortly thereafter. Winter steelhead dominate coastal streams, whereas inland steelhead of the Columbia River basin are almost exclusively summer steelhead. UCR steelhead are the “stream-maturing” type (i.e., summer steelhead). Okanogan steelhead that enter the Okanogan subbasin in August and September may experience some reaches of the river where water temperatures reach lethal levels.

UCR steelhead spawn in April and May, and into early June. Steelhead spawn in cool, clear streams with suitable gravel size, depth, and current velocity. Intermittent streams may also be used for spawning (Everest 1973). Steelhead juveniles emerge from the gravel in May through early August depending on time of spawning and water temperature during egg incubation (Chandler and Bjornn 1988; YBFWRB 2009; Zimmerman and Reeves 1999). Smolt migration occurs from mid-April through mid-June (University of Washington 2012).

Because steelhead and spring-run Chinook salmon have similar smolt migration timing and both actively feed during downstream migration, it is likely they compete for food resources (Becker 1973; Muir and Emmet 1988; Sagar and Glova 1988). The degree to which food supply affects downstream survival is unknown (Muir et al. 1994) but the recovery plan for steelhead does not identify food supply as a limiting factor (UCSRB 2007).

Though salmon and steelhead occupy streams flowing through a wide spectrum of upland environments, their freshwater habitat preferences are limited to a comparatively narrow set of hydrological and streambed conditions (Reiser and Bjornn 1979). Studies generally show that for both yearling and stream type Chinook salmon, juvenile densities are typically highest in relatively low gradient, unconfined stream reaches with well-defined pool structure (e.g., Hillman and Miller 2002; Petrosky and Holubetz 1988), while steeper gradient, relatively confined tributary reaches typically support the highest relative densities of juvenile steelhead (Petrosky and Holubetz 1988; Burnett 2001). There may be areas in the Okanogan subbasin where juvenile spring-run Chinook salmon and Okanogan steelhead coexist. However, competition by juvenile salmonids of different species for food, space, and cover tends to be minimal (Hearn 1987).

Steelhead are widely distributed in the Okanogan subbasin and have been recently recorded above Osoyoos Lake (NPCC 2004a). Historically, steelhead had access to Okanagan Lake (Wright and Smith 2003). Few wild steelhead currently spawn successfully in the Okanogan

subbasin because many of the tributaries with spawning habitat are dewatered during the summer months (NPCC 2004a). Omak and Salmon Creeks are the two primary spawning and rearing habitats in the Okanogan subbasin for steelhead.

3.2.2.4 Limiting Factors and Threats

Limiting factors and threats to steelhead in the Okanogan subbasin are similar to those of UCR spring-run Chinook salmon. Limiting factors include habitat quality (e.g., migration barriers such as irrigation diversions), riparian conditions, channel structure and form, high sediment load, and water quality (e.g., low base stream flow and warm summer water temperatures) (UCSRB 2007). Potential threats to steelhead include residential and agricultural development, livestock grazing, interactions with hatchery fish, harvest, predation, and hydropower development and operation (NPCC 2004a). Subsection 3.5, Aquatic Habitat, provides additional detail on limiting factors and threats for steelhead in the Okanogan subbasin.

UCR steelhead are generally not caught in ocean fisheries (Pacific Fishery Management Council 2012) but are harvested in treaty and non-treaty fisheries in the mainstem Columbia River. From 1999 to 2007, total harvest rates on wild steelhead above Bonneville Dam ranged from 4.1 to 7.4 percent for treaty fisheries and 0.1 to 0.4 percent for non-treaty fisheries, in accordance with harvest agreements under *United States v. Oregon* (*U.S. v. Oregon* Technical Advisory Committee 2008). Non-treaty fisheries use mark-select methods, which required harvesters to release unmarked naturally produced fish. The purpose of WDFW sport fisheries in the upper Columbia River including the Okanogan subbasin has been to reduce the number of hatchery-origin steelhead spawners. The CTCR manage a hook-and line-snag fishery below Chief Joseph Dam that targets summer/fall-run Chinook salmon but also impacts steelhead. The incidental take of natural Okanogan subbasin steelhead by the CTCR and sport fisheries is less than 5 percent.

As a result of Wells Dam hatchery releases in the Okanogan subbasin, there is a high rate of hatchery fish on the spawning grounds. The current proportion of hatchery steelhead on the spawning grounds is 91 percent in the Okanogan subbasin and not acceptable for recovery of the UCR steelhead distinct population segment (Ford 2011). The extremely high proportion of hatchery fish on the spawning grounds represents a near-term threat to the diversity of the distinct population segment and a long-term threat to abundance, productivity, and distribution of the distinct population segment.

3.2.3 Bull Trout

3.2.3.1 Background

Bull trout (*Salvelinus confluentus*) belong to the char family along with brook trout (*Salvelinus fontinalis*), lake trout (*Salvelinus namaycush*), and Dolly Varden (*Salvelinus malma*). The USFWS listed bull trout in the conterminous lower 48 states as threatened in 1999 (64 Fed. Reg. 58910, November 1, 1999). The 1999 listing of bull trout included a section 4(d) special rule related to existing state and tribal conservation laws and harvest regulations pertaining to bull trout at the time of publication of the final rule. The USFWS determined that the applicable state

and tribal fishing regulations provided conservation of bull trout at the time of listing. Historically, bull trout were found in about 60 percent of the Columbia River basin. They now occur in less than half their historic range and they have been eliminated from the mainstem of most large rivers. Populations remain in portions of Oregon, Washington, Idaho, Montana, and Nevada (USFWS 1998, 2010).

There are only anecdotal reports of bull trout occurrence in the United States portion of the Okanogan subbasin; however, the USFWS reports "occupancy unknown" in their Bull Trout Recovery Plan (USFWS 2002). Bull trout are known to occur in the Canadian portion of the Okanogan subbasin (McPhail and Carveth 1992).

The USFWS first designated critical habitat for bull trout in 2004 (69 Fed. Reg. 60076, October 6, 2004). The Service revised bull trout critical habitat several times before issuing the final, currently effective designation in 2010 (75 Fed. Reg. 63898, October 18, 2010). There is no critical habitat designated for bull trout in the proposed Okanogan subbasin experimental action area (Subsection 1.6, Description of the Action Area). However, the Service did designate the mainstem Columbia River upriver to the base of Chief Joseph Dam as critical habitat for bull trout.

The USFWS issued a Section 10 scientific research permit (#TE-126985-1) on June 2, 2006 authorizing the CTCR to take bull trout in conjunction with evaluating selective live-capture activities for collection of summer/fall-run Chinook salmon at the mouth of the Okanogan River in the mainstem Columbia River.

The permit includes the Okanogan subbasin, but states that the USFWS is unaware of any reproducing bull trout populations in the Okanogan River or its tributaries. The permit provides guidance on how bull trout should be handled if captured. To date, the CTCR has not caught a single bull trout during live-capture activities to collect summer/fall-run Chinook salmon (Rayton et al. 2012). For these reasons, we do not discuss further, or analyze the effects of, the proposed experimental population of UCR spring-run Chinook salmon on bull trout in this environmental analysis.

3.3 Non-Listed Salmonids

There are three non-listed species of salmonids in the analysis area:

1. Upper Columbia River Summer/Fall-run Chinook Salmon
2. Resident Rainbow Trout
3. Okanogan Sockeye Salmon

The species discussions in this section are organized first by background information, followed by current status and trends, life history, and limiting factors and threats.

3.3.1 Upper Columbia River Summer/Fall-run Chinook Salmon

3.3.1.1 Background

Summer/fall-run Chinook salmon is the name commonly applied to the anadromous form of the biological species *O. tshawytscha* that emigrate to the ocean as sub-yearlings, enter fresh water later in the summer, and mature at an older age than spring-run Chinook salmon. Waknitz et al. (1995) and NMFS (1994) first identified all summer/fall-run Chinook salmon spawning in areas between McNary Dam and Chief Joseph Dam as the Middle Columbia River Summer/fall-run Chinook Salmon ESU (59 Fed. Reg. 48855, September 23, 1994). In 1998, the Biological Review Team concluded that the boundaries of this ESU did not extend downstream from the Snake River, and changed the name to the Upper Columbia River Summer/Fall-run Chinook Salmon ESU (Myers et al. 1998).

In 1998, we determined that UCR summer/fall-run Chinook salmon were not in danger of extinction, nor likely to become endangered in the foreseeable future (63 Fed. Reg. 11482, March 9, 1998). WDFW assessed the Okanogan summer/fall-run Chinook salmon population in 2002 based on redd counts in the Okanogan and Similkameen Rivers and concluded the stock was healthy. The "total spawner abundance for this stock continues to be strong" (WDFW 2002).

There is no critical habitat designated for the UCR summer/fall-run Chinook salmon, because the ESU is not ESA-listed.

3.3.1.2 Current Status and Trends

Recent run size estimates of the UCR summer/fall-run Chinook salmon ESU have been relatively stable. Between 2003 and 2008, adult returns ranged between 114,500 and 373,200 fish (ODFW and WDFW 2009).

3.3.1.3 Life History

Adult summer/fall-run Chinook salmon migrate past Wells Dam mid-July through November to spawn during October and November in the Columbia River and Methow and Okanogan basins. Historical spawning ground surveys indicated the heaviest spawning in the lower Okanogan River, where almost no spawning occurs today, and in the Riverside and Omak areas (Bryant and Parkhurst 1950). In recent years, most UCR summer/fall-run Chinook salmon adults return to the Similkameen River to a 1.2-mile area in the vicinity of the Similkameen Pond. Spawning also occurs in spatially discontinuous areas from the town of Malott upstream to Zosel Dam, approximately RM 64 of the Okanogan River (Murdoch and Miller 1999). A large portion of the Okanogan River is underutilized and the habitat under seeded (NPCC 2004a).

Emergence timing probably occurs from January through April. Juveniles generally emigrate to the ocean as sub-yearling fry, leaving the Okanogan River from 1 to 4 months after emergence. Juveniles use the Okanogan River and Columbia River between Wells and Chief Joseph Dams for rearing before emigrating toward the ocean in their first year of life (CTCR 2004). Smolt migration occurs from mid-May through mid-August (University of Washington 2012).

Most of the UCR summer/fall-run Chinook salmon that return to the Okanogan subbasin are progeny of this WDFW program (BPA 2009). UCR summer/fall-run Chinook salmon raised at the East Bank Hatchery acclimate in the Similkameen Pond prior to release into the Okanogan River. This WDFW program has been on-going for many years but would change to CTCR management for rearing and acclimation upon completion of the Chief Joseph Hatchery. A total of 800,000 yearling and 300,000 sub-yearling UCR summer/fall-run Chinook salmon would be reared at the Chief Joseph Hatchery and transferred to acclimation ponds in the Okanogan subbasin for acclimation and volitional release (Subsection 1.7.1, Chief Joseph Hatchery).

3.3.1.4 Limiting Factors and Threats

Primary limiting factors to summer/fall-run Chinook salmon include habitat quality, channel structure and form, sediment conditions, and water quality. Primary threats to summer/fall-run Chinook salmon include residential development, agricultural development, livestock grazing, and hydropower development and operation (NPCC 2004b).

3.3.2 Okanogan Resident Rainbow Trout

3.3.2.1 Background

Within North America, the historic range of rainbow trout extends from Alaska to Mexico, including the Columbia River basin. The species exhibits an extremely diverse suite of life-history strategies, ranging from completely freshwater to anadromy. The resident form typically is referred to as rainbow trout. Within the inland Columbia River basin, the resident form of rainbow trout is also referred to as redband trout (*Oncorhynchus mykiss gairdneri*). The anadromous form is referred to as steelhead (*Oncorhynchus mykiss*) (NCRS 2000; Thurow et al. 2007).

3.3.2.2 Current Status and Trends

Rainbow trout are not a federally listed or state-listed species. Despite the wide distribution of rainbow trout, local extirpation and declines have occurred. Strong rainbow trout populations were reported in 17 percent of their potential range. Interior Columbia River basin rainbow trout have mostly absent, depressed, or unknown populations (Thurow et al. 2007). There is very limited information on the status of rainbow trout populations in the Okanogan subbasin, but they are believed to be generally healthy with some notable local exceptions where local tributary quality is limited (NPCC 2004a).

3.3.2.3 Life History

Resident rainbow trout are present throughout the Okanogan subbasin, especially in those areas upstream of anadromous fish distribution (ENTRIX and Golder Associates 2004). There are three distinct types of wild rainbow trout stocks in the Okanogan subbasin. Fluvial rainbow trout spend their lives in streams and are abundant although limited in size because headwater streams in the Okanogan tend to be unfertile and cold (NPCC 2004a). Adfluvial rainbow trout spend most of their life in lakes but enter streams to spawn and often rear in lake tributaries for a year or

more. Resident lake-dwelling rainbow trout occur in two forms. The first are those that live in the small headwater lakes of the Okanogan and are insectivorous. The second form lives in the pelagic zone of large lakes of the Okanogan where they become piscivorous and grow to large sizes (NPCC 2004a). Maximum life span for resident rainbow trout is typically 6 years.

Rainbow trout are a cold-water species that spawn in moving water over gravel or cobble substrate. Rainbow trout feed on insects, crayfish, and other crustaceans. Adults feed on salmon eggs, alevin, fry, smolts, and adult salmon carcasses. Introduced rainbow trout also interbreed with native rainbow trout, cutthroat trout, and steelhead (Kozfkay et al. 2007). According to Thurow et al. (2007), native rainbow trout and salmon do not exhibit interspecific competition when in the same location.

3.3.2.4 Limiting Factors and Threats

Limiting factors include habitat loss from dams, habitat degradation, habitat fragmentation, and non-native species introductions. Primary threats include residential development, agricultural development, and livestock grazing (Thurow et al. 2007).

3.3.3 Okanogan River Sockeye Salmon

3.3.3.1 Background

Okanogan River sockeye salmon is the name commonly applied to the anadromous form of the biological species *Oncorhynchus nerka*. Sockeye salmon in the Columbia River basin once comprised at least eight principal stocks (Fulton 1970; Fryer 1995). Today, only three stocks remain in the Columbia River basin: Wenatchee Lake, Okanogan River, and Red Fish Lake. The Okanogan River sockeye salmon population is the healthiest, and makes up over 50 percent of the remaining wild sockeye salmon in the Columbia River basin.

3.3.3.2 Current Status and Trends

Over the last 25 years, the run size has varied from a low of 2,048 in 1998 to a high of 290,000 in 2010 (University of Washington 2012).

3.3.3.3 Life History

Adult Okanogan River sockeye salmon migrate past Wells Dam during July and August and move rapidly through the Okanogan subbasin to Lake Osoyoos prior to spawning in October. However, generally in July or August, water temperatures in the mainstem Okanogan rise to lethal levels for Okanogan River sockeye salmon (Hyatt et al. 2003). As a result, the late arriving portion of the run stops migrating for a month or so and remains in the cooler mainstem Columbia until water temperatures drop to a tolerable level and their migration can continue.

Juvenile Okanogan River sockeye salmon spend 1 year rearing in Lake Osoyoos (a United States and Canadian cross-boundary lake) before migrating to the Pacific Ocean. Their survival is adversely impacted in late summer when surface waters in Lake Osoyoos warm and deep waters become low in oxygen (Wright and Smith 2003). Sockeye salmon smolts emigrate mid-April

through May. Unlike other species of Pacific salmon, sockeye salmon feed on zooplankton during their juvenile and adult stages. Insects are also part of their diet at the juvenile stage.

For many years, McIntyre Dam (Figure 1-1) was the upstream boundary of Okanogan River sockeye salmon. Adult Okanogan River sockeye salmon would spawn to the base of McIntyre Dam and emergent sockeye would drop downstream to rear in Lake Osoyoos. This dam had been a barrier to fish passage under all but the highest flows since its construction in 1954. In 2009, McIntyre Dam was modified to allow sockeye access into Vaseux Lake (Fryer et al. 2010). There is optimism that the increased habitat should improve adult and juvenile survival and greatly improve their abundance and productivity (Wright 2003).

In 2003, the Okanogan Nations Alliance developed a plan to reintroduce sockeye salmon into the high quality rearing habitat of Skaha Lake (Figure 3-1). The outlet dam of Skaha Lake remains impassable to Okanogan River sockeye salmon, but the Okanogan Nations Alliance has moved adult sockeye into Skaha Lake to evaluate the spawning and rearing potential (Wright 2003).

3.3.3.4 Limiting Factors and Threats

Primary limiting factors to Okanogan River sockeye salmon include high water temperatures and low oxygen concentrations, impaired fish passage, hydro system effects, and predation from exotic species, such as largemouth bass, small mouth bass, and *Mysis* shrimp (Wright 2003). Primary threats include residential development, hydropower dams, and agriculture.

3.4 Non-native Fish Species

Species discussed in this section are organized first by background information, followed by current status and trends, life history, and limiting factors and threats.

3.4.1 Background

Five introduced species are present in the Okanogan subbasin: brook trout, grass carp, Lahontan cutthroat trout, smallmouth bass, and largemouth bass (Wydoski and Whitney 2003). Additional exotic fish species found in the mainstem Columbia River may also occur in the lower Okanogan subbasin: black crappie, common carp, pumpkinseed, walleye, and yellow perch.

3.4.2 Current Status and Trends

Except for trout stocked in lakes on the Colville Reservation, little is known about the current status and trends of the non-native fish species in the Okanogan subbasin. No estimates of fish predator abundance have been made in the Okanogan subbasin (C. Fisher, pers. comm., CTCR, Biologist, April 12, 2012).

3.4.3 Life History

The CTCR have stocked several lakes on the Colville Reservation with brook trout and rainbow trout since the 1930s. The CTCR also stock Lahontan cutthroat trout in Omak Lake because it is

the only trout species able to tolerate the lake's high alkalinity. Grass carp are also present in Omak Lake.

Smallmouth bass and largemouth bass occur throughout the Washington portion of the Okanogan subbasin. Both bass species spawn primarily in June (Wydoski and Whitney 2003; Michael et al. 2011). Smallmouth bass and largemouth bass may be the primary fish predators of spring-run Chinook salmon in the Okanogan subbasin (NPCC 2004a). Bass begin feeding when water temperatures reach 50°F (10°C) but become most aggressive when water temperatures are over 59°F (15°C). Although smallmouth bass feed heavily on other fish (Poe et al. 1991; Zimmerman 1999), reports of smallmouth preying on salmonids in lotic environments of the Northwest are mixed. Shrader and Gray (1999) and Summers and Daily (2001) reported no predation on salmonids in the John Day River, Oregon and very low predation on salmonids in the Willamette River, Oregon. Few salmonids rear year round in the lower John Day River. However, salmonids pass through the lower John Day River during the spring when discharge and turbidity are high and water temperatures are still low. As a result, water conditions are not optimal for bass to feed actively during the spring salmonid emigration through the lower John Day River.

Predation data collected in the lower Yakima River indicate that smallmouth bass were capable of consuming a substantial number of age-0 fall-run Chinook salmon, but they did not consume large numbers of yearling spring-run Chinook salmon (McMichael et al. 1999). Age-0 fall-run Chinook salmon are much smaller than yearling spring-run Chinook salmon and migrate in the late spring and early summer when water temperatures warm and bass actively feed. Water temperature trends in the Okanogan subbasin are similar to those in the lower John Day and Yakima Rivers.

3.4.4 Limiting Factors and Threats

There is no information available on limiting factors and threats of non-native species in the Okanogan subbasin.

3.5 Aquatic Habitat

This subsection describes the current quality and quantity of salmonid aquatic habitat in the action area (Subsection 1.6, Description of the Action Area) and Canadian portion of the Okanogan subbasin. Discussions in Subsection 3.5 address the aquatic habitat conditions important for viability of UCR spring-run Chinook salmon, including Okanogan subbasin water quality, water quantity and fish passage, and habitat availability.

3.5.1 Background

The Okanogan subbasin is a naturally harsh environment for fish with high peak flows, low base flows, warm summers, and cold winters. The warmer Okanogan River is distinctly different from the glacial and snowmelt conditions of the neighboring Wenatchee, Entiat, and Methow Rivers. Low base stream flow and warm summer water temperatures have limited salmonid production both currently and historically. Nonetheless, the Okanogan subbasin once supported healthy runs of Chinook salmon, sockeye salmon, and steelhead (NPCC 2004a).

As elsewhere in the Columbia River basin, much of the potential habitat for UCR spring-run Chinook salmon in the Okanogan subbasin has been degraded by human activities, including agriculture, timber harvesting, and commercial and residential development. Over the past century, ecosystem processes have been severely impacted, creating a fragmented mixture of altered or barren fish and wildlife habitats. Disruptions in the hydrologic system have resulted in widespread loss of migratory corridors and access to productive habitat (CTCR 2007).

Primary habitat limiting factors to salmonid production identified in the NPCC 2004 Okanogan Subbasin Plan include stream habitat diversity, habitat quantity (primarily a function of reduced quality pools for rearing and holding, and reduced pool tailouts for spawning), sediment quality, and channel stability, and stream temperature (NPCC 2004a). Although Okanogan subbasin habitat conditions vary widely, factors such as water quality and water quantity (i.e., flow conditions) are key to the viability of most fish species in the action area, and play an important role in the availability of suitable habitat for salmonids. Salmonids and other native fish species depend on clear, cold waters for migration, spawning, rearing, and overall viability (Groot et al. 1995). Water quality problems in the Okanogan subbasin are a result of a number of factors including irrigation withdrawals, discharge of partially treated municipal waste, and current and past land management practices (NPCC 2004a; ENTRIX and Golder Associates 2004). Levels of pesticides in surface water can be high in agricultural areas and areas with high irrigation system return flows (ENTRIX and Golder Associates 2004). Similarly, high levels of nitrogen can be found in areas downstream of municipal sewer treatment plants and agricultural areas. Currently, water temperature is a primary factor affecting salmonid spawning and rearing in the Okanogan subbasin, as are sediments, dissolved oxygen, and availability of nutrients. Stream flow and migration barriers affecting fish passage also limit the amount of habitat available for salmon production (NPCC 2004a; BPA 2009).

3.5.2 Okanogan Subbasin Water Quality

Reaches of the Okanogan mainstem and Similkameen Rivers are listed under the 2008 Clean Water Act section 303(d) list as water quality impaired for failure to meet temperature, dissolved oxygen, and pH standards (Ecology 2008). Okanogan subbasin water temperatures often exceed lethal tolerance levels for salmonids in the mid- to late summer months. As water temperatures increase, the concentration of dissolved oxygen decreases. Dissolved oxygen concentration determines the water's ability to support oxygen-consuming aquatic organisms. The high summer water temperatures are partly a result of natural processes such as solar heating of lakes in the Okanogan River system, and partially the result of poor riparian conditions and flow alterations caused by dams and irrigation withdrawals (ENTRIX and Golder Associates 2004).

Fine sediment levels in stream substrates are high in some areas of the Okanogan subbasin primarily because of high road densities. Rain washes fine sediments from the road surface into streams (Furniss et al. 1991). Streams in watersheds with high road densities are particularly vulnerable to this effect. Roads are considered to be the greatest contributing source of sediment to streams in the Okanogan subbasin (ENTRIX and Golder Associates 2004). Excess fine sediment in streams generally degrades the quality of salmonid habitat (Waters 1995).

Stream bottoms typically contain a mix of substrate types, including coarse types (boulders, cobbles, and gravel) and fine types (sand, organic material, and clay particles) (Waters 1995). Salmonids require stream substrates relatively free of fine sediments to successfully complete spawning and incubation (Bjornn and Reiser 1991; Waters 1995; Spence et al. 1996). Juvenile salmonids also benefit from low fine sediment levels in substrates (Suttle et al. 2004). Invertebrates providing prey for rearing salmonids also require stream substrates with low fine sediment levels (Waters 1995). As fine sediment levels increase, egg survival decreases, and the amount of available invertebrate food sources to rearing salmonids also decreases.

The transport of marine nutrients to freshwater environments by returning anadromous fish has implications for the biology of fish, wildlife, and riparian systems, but is also an aspect of water quality, because decomposing salmon carcasses can increase biological oxygen demand and reduce dissolved oxygen levels, negatively affecting water quality (Goldman and Horne 1983). Returning salmon can provide marine-derived nutrients to freshwater spawning and rearing areas, enhancing stream productivity (Scheuerell et al. 2005). Gresh et al. (2000) estimated that only 6 to 7 percent of the marine-derived nitrogen and phosphorus that was delivered to the rivers of the Pacific Northwest by spawning salmon 140 years ago is currently returning to those streams. Gresh et al. (2000) attributed the habitat destruction to beaver trapping, logging, irrigation, grazing, pollution, dams, urban and industrial development, and commercial and recreational fishing. 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 and John Day 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 debris and stream shading. Helfield and Naiman (2001) hypothesized that there were several pathways for the transfer of marine-derived nutrients from streams to riparian vegetation, including the 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. Studies from the mid-1990s to the early 2000s suggest that the biomass of carcasses affects the 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. 1999; Gresh et al. 2000).

3.5.3 Okanogan Subbasin Water Quantity and Fish Passage

Stream flow and fish passage in the Okanogan subbasin are affected by a series of dams and water diversions. A total of 34 water storage or irrigation diversion dams are located on tributaries in the United States portion of the Okanogan subbasin (NPCC 2004a). Only four of the dams are passable (NPCC 2004a). A majority of the 30 impassable dams are not considered for future passage because they are above natural barriers or would have little or no fish benefits if access were made available (e.g., waters are too warm or fish habitat is not available upstream of the dam). Salmon Creek contains one of the passable dams but the lower 4 miles becomes dewatered during low flow periods, generally from the beginning of July through the following

February. Omak Creek was blocked until 1999, but is now passable as a result of efforts coordinated by the CTCR.

Fish passage is not blocked in the mainstem Okanogan subbasin but can become difficult in mid- to late summer because of high water temperatures (NPCC 2004a; BPA 2009). Zosel Dam, which controls the level of Osoyoos Lake, is passable, allowing salmonids access to productive habitat in Canada.

In 1913, a reported 11 dams had been constructed in the Canadian Okanogan, and by 1998, there were 150. Three of the dams are located on the mainstem Okanogan River: McIntyre Dam, Skaha Lake Dam, and Okanogan Lake Dam. In 2009, a project to achieve fish passage at McIntyre Dam was completed. McIntyre Dam is an irrigation dam located on the mainstem of the Okanogan River 1 mile downstream from Vaseux Lake (Figure 3-1). Passage at McIntyre Dam now provides passage into Vaseux Lake. Additional blockages upstream of Vaseux Lake need to be removed before access is achieved to the highly productive Skaha and Okanogan Lakes. A flood control structure with an inactive fish passage facility at Skaha Lake is under evaluation by the British Columbia Ministry of the Environment. Fish passage into Skaha Lake would open up the 4,966-acre lake to rearing salmonids and additional spawning and rearing habitat in tributaries such as Shingle Creek.

3.5.4 Okanogan Subbasin Habitat Availability

There is currently limited tributary habitat for spring-run Chinook salmon spawning and rearing in the United States and Canadian portions of the Okanogan subbasin. Using the intrinsic habitat potential model developed by the Interior Columbia Technical Recovery Team (ICTRT) (Cooney and Holzer 2006), both the ICTRT and the CTCR analyzed the amount of potential UCR spring-run Chinook salmon habitat available in the United States and Canadian portions of the Okanogan subbasin using 72°F (22.2°C) as the maximum temperature limit for UCR spring-run Chinook salmon. In addition, CTCR adjusted the non-temperature portion of the model based on its knowledge of local tributary functions (e.g., spring locations and hyporheic flow conditions). The results of these analyses indicate that adequate tributary and mainstem habitat for UCR spring-run Chinook salmon currently exists in the Okanogan subbasin overall. A minimum viable population of 500 spring-run Chinook salmon would require 119,599 square yards (100,000 square meters) of habitat, and the analysis showed there is from 208,551 to 261,616 square yards (174,376 to 218,745 square meters) in the entire Okanogan subbasin, with 74,540 to 228,591 square yards (62,325 to 191,132 square meters) in the United States portion alone (T. Cooney, pers. comm., NOAA Science Center, Fisheries Scientist, April 11, 2012; C. Baldwin, pers. comm., CTCR, Fisheries Biologist, April 20, 2012). Canadian historical spawning and rearing habitats offer the greatest potential for natural production, while tributary and mainstem habitat in the United States portion of the Okanogan subbasin is limited and marginal for supporting natural populations of spring-run Chinook salmon.

There is adequate tributary habitat to support UCR spring-run Chinook salmon in the United States portion of the Okanogan subbasin. Of that habitat, Salmon Creek and Omak Creek offer the best spawning and rearing habitat for natural production, and major efforts to restore habitat

for spring-run Chinook salmon are underway in both the United States and Canadian portions of the subbasin (CTCR 2007). Key habitat and restoration programs are described below.

Historically, upper Salmon Creek and its tributaries (Figure 1-2) were major production areas for spring-run Chinook salmon. In the United States portion of the Okanogan subbasin, Salmon Creek offers the greatest potential habitat for supporting UCR spring-run Chinook salmon reintroduction. Over the last 15 years, CTCR has made substantial progress in flow restoration and in improving passage in Salmon Creek. A water lease with the Okanogan Irrigation District allows the CTCR to manage 1,500 acre-feet for UCR steelhead and spring-run Chinook salmon migration.

A diversion dam at RM 4.3 dewaters lower Salmon Creek except during periods of snowmelt (NPCC 2004a). Excellent spawning and rearing habitat is available upstream of the diversion to Conconully Dam at RM 15 (BPA 2009). The CTCR has proposed a project to re-allocate irrigation water back to the stream allowing UCR spring-run Chinook salmon access. In addition, a low flow channel has been constructed downstream of the diversion to maximize migration using a minimum of water. To achieve in-stream flow targets for Salmon Creek, CTCR is pursuing the following options: (1) land acquisition with water rights purchase, (2) long-term water lease through the Okanogan Irrigation District, and (3) construction of a new or improved pumping facility (CTCR 2010).

Omak Creek (Figure 1-2) also contains suitable habitat in the Okanogan subbasin to support UCR spring-run Chinook salmon. Omak Creek is a unique tributary of the Okanogan River because it is unaltered by irrigation withdrawals and is located entirely within the Colville Reservation. In 1995, CTCR identified a number of resource problems in Omak Creek (Arterburn et al. 2007). Several of those resource problems were addressed over the past decade. For example, more than 50 miles of roads were decommissioned to reduce high sediment loads. Several culverts were replaced to improve fish passage conditions. Range management plans are being evaluated as a means to address stream bank erosion and stream canopy issues from livestock impacts (C. Fisher, pers. comm., CTCR, Fisheries Biologist, May 10, 2012). CTCR would continue to decommission roads and fix passage barriers and other land use problems in Omak Creek (CTCR 2007). These efforts are directed at restoring UCR spring-run Chinook salmon and UCR steelhead habitat on the Colville Reservation.

Spring-run Chinook salmon habitat is also available in the Canadian portion of the Okanogan subbasin. Tributaries that can support UCR spring-run Chinook salmon spawning and early rearing include Inkaneep Creek, Vaseux Creek, and Shuttlesworth Creek. Restoration projects have been completed in each of these tributaries to address unscreened diversions and water flow issues. Additional restoration projects are planned by the Okanogan Nations Alliance, the Canadian Okanogan Basin Technical Working Group, and Canadian fisheries authorities (CTCR 2007). These Okanogan tributaries would seed fry and fingerlings to the lake environments of Osoyoos and Vaseux Lakes. UCR spring-run Chinook salmon are known to use lakes for juvenile rearing. Lakes in Canada offer substantial, unique, and relatively stable habitat for growth of juvenile Chinook salmon (CTCR 2010).

The mainstem Okanogan subbasin in Canada has been severely impacted by habitat alterations resulting from flood protection works constructed in the mid-1950s. Because of the installation of flood control dikes and urban and agricultural developments, approximately 84 percent of the river was channelized, and over 90 percent of the riparian habitat removed (CTCR 2007). In 2002, the Okanagan River Restoration Initiative was launched by the British Columbia Ministry of the Environment and Okanagan Nations Alliance. The objective of the initiative was to re-naturalize the Okanogan River in Canada by moving back dikes, restoring river meanders, creating pool/riffle sequences, reconnecting the river to its former floodplain, and replanting riparian vegetation (CTCR 2007).

3.6 Wildlife

The analysis area for wildlife consists of the United States and Canadian portions of the Okanogan subbasin, plus an area extending approximately 10 miles beyond the subbasin boundaries. This area was selected because the potential effects of the alternatives on wildlife (Subsection 4.6, Effects on Wildlife) would likely apply to species present in the entire subbasin, and the additional distance represents an area in which wildlife species could reasonably be expected to modify their behavior in response to changes in the availability of food resources in the action area under the alternatives. The Okanogan subbasin (Figure 3-1) is home to a wide variety of wildlife species, many of which rely to varying extents on fish, including salmonids. Of 328 wildlife species that may occur in the Okanogan subbasin, 71 (22 percent) use salmonids, to varying degrees, as a food source (IBIS 2008). Salmonids provide direct or indirect foraging opportunities for these species, in some cases to the extent of influencing the distribution or population status of a particular species (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). Turkey vultures (*Cathartes aura*), in contrast, routinely feed on salmon carcasses as well as many other items, and are unlikely to respond strongly to changes in the availability of salmonids as a food source (Cederholm et al. 2000). An example of a species with an indirect link to salmonids is the American dipper, which feeds on aquatic insects that are affected by nutrients derived from salmon carcasses (Cederholm et al. 2000).

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). This EA provides information about the status and trends of fish populations in the Okanogan subbasin in Subsection 3.2, ESA-listed Salmon and Steelhead, Subsection 3.3, Non-listed Salmonids, and Subsection 3.4, Non-native Fish Species. Information about the number and distribution of salmon carcasses in the Okanogan subbasin is not available.

Several wildlife species that may forage on salmonids are designated under state or federal law as being at risk (Table 3-1). The following paragraphs summarize these species' diets and presence in the analysis area.

Table 3-1. Special-status species of wildlife in the Okanogan subbasin that consume salmonids.

Species	**Federal Status**	**State Status**
Common loon (*Gavia immer*)	None	Sensitive
Bald eagle (*Haliaeetus leucocephalus*)	Species of Concern	Sensitive
Golden eagle (*Aquila chrysaetos*)	None	Candidate
Gray wolf (*Canis lupus*)	Endangered[1]	Endangered
Grizzly bear (*Ursus arctos horribilis*)	Threatened	Endangered

Sources: IBIS 2008, Cederholm et al. 2000

[1] USFWS removed wolves east of Highway 97 in Okanogan County from ESA protection in 2011, but retained the species' status as endangered west of the highway and proposed delisting remainder of wolves on 6/13/13 http://www.gpo.gov/fdsys/pkg/FR-2013-06-13/pdf/2013-13982.pdf.

WDFW has documented common loon nest sites at several lakes in the Okanogan subbasin (WDFW 2012a). In addition, small concentrations of common loons forage in Lake Pateros and the lower reaches of the Okanogan River during winter (WDFW 2012a). Primary freshwater prey species include trout (*Oncorhynchus* spp.), shad (*Alosa sapidissima*), smelt (*Thaleichthys pacificus*), dace (*Rhinichthys* spp.), chubs (Family Cyprinidae), shiners (*Richardsonius balteatus*), suckers (Family Catostomidae), sticklebacks (*Gasterosteus aculeatus*), bluegills (*Lepomis macrochirus*), crappie (*Pomoxis* spp.), yellow perch (*Perca flavescens*), and walleye (*Stizostedion vitreum*) (WDFW 2012b).

Bald eagles (*Haliaeetus leucocephalus*) are present in the analysis area year-round. They nest along and near the Okanogan River between Lake Osoyoos and the river's confluence with the Columbia River (WDFW 2012a). In the winter, they also use Lake Pateros and the lower portion of the Methow River (WDFW 2012a). Bald eagles are opportunistic feeders. They not only feed on adult fish and carcasses, but also on gulls (*Larus* spp.), terns (Subfamily Sterninae), and waterfowl that eat salmon (Cederholm et al. 2000). They will also seek carrion. Although bald eagles have a strong relationship with fish as prey in many areas (Cederholm et al. 2000), the most important food sources for bald eagles at Columbia River reservoirs are coots (*Fulica americana*), mallards (*Anas platyrhynchos*), and chukars (*Alectoris chukar*) (BPA 2009). During the winter, they forage on fish, waterfowl, and deer carcasses along the lower Okanogan River (WDFW 2012a).

WDFW has documented golden eagle breeding areas within and near the analysis area (WDFW 2012a). Researchers have not studied the migratory status of nesting golden eagles in Washington, but observations of golden eagles along the upper Columbia River suggest they

remain at nest sites throughout the winter (Watson and Whalen 2004). Golden eagles forage in grasslands and shrublands, preying primarily on mammals such as jackrabbits (*Alectoris chukar*), cottontails (*Sylvilagus* spp.), ground squirrels (*Sylvilagus* spp.), and marmots (*Marmota* spp.), and secondarily on birds such as ring-necked pheasants (*Phasianus colchicus*) and chukars (WDFW 2012b). They may also forage on spawning salmon and carcasses (Cederholm et al. 2000). Watson and Whalen (2004) did not identify any fish species as important components of golden eagle diets in Washington State.

Gray wolves' (*Canis lupus*) preferred prey items include deer (*Odocoileus* spp.), elk (*Cervus elaphus*), and moose (*Alces alces*) (Sime et al. 2010), but wolves will take smaller mammals, birds, fish, and carrion. Cederholm et al. (2000) documented wolves foraging on spawning fish and carcasses. One of Washington State's eight confirmed wolf packs is in Okanogan County, but the estimated range of this pack does not overlap the Okanogan subbasin (WDFW 2012c). It is possible, however, that wolves from this or other packs in the region could venture into the analysis area. The availability of an adequate prey base is a key factor in determining the suitability of an area for wolves. In addition, studies have shown that human activities influence the distribution and survival of wolves (Mladenoff et al. 1995).

Grizzly bears (*Ursus arctos horribilis*) are opportunistic omnivores with a diet that varies considerably among individuals, seasons, and years. Grizzly bears will consume almost any food available, including living or dead mammals or fish (salmon in particular), insects, and garbage (Cederholm et al. 2000; WDFW 2012b). While grizzly bears are rare in Washington, their presence has been documented in the Okanogan Highlands and the North Cascades (WDFW 2012d). Their population in the North Cascades Ecosystem, which includes the North Cascades National Park and portions of the Mount Baker-Snoqualmie, Wenatchee, and Okanogan National Forests, is estimated at fewer than 20 bears (WDFW 2012b). Foraging grizzly bears generally avoid areas of human activity (Smith 2002). Based on the presence of human development throughout the river valley, including a highway, railroad, and several towns and cities along the Okanogan River, and the lack of any documented sightings of grizzly bears in or near the Okanogan subbasin, the potential for grizzly bears to occur in the analysis area is low.

3.7 Land Use and Ownerships

The analysis area for land use and ownerships comprises the basins that drain into portions of the Okanogan and Columbia Rivers that make up the action area because uses of lands in these basins may be affected by the alternatives. The potential for lands outside these basins 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 majority of the analysis area is within the Okanogan subbasin, which is described in the Okanogan Subbasin Plan (NPCC 2004a), and south of the Canadian border (Figure 3-1 and Figure 3-2). The portion of mainstem Columbia River between the mouth of the Okanogan River and Chief Joseph Dam is in the northern portion of the upper mid-Columbia subbasin, which is described in the Upper Middle Mainstem Subbasin Plan (NPCC 2004b).

Ownership in the analysis area is a mix of private, tribal, federal, and state lands. In the portion of the analysis area that falls within the Okanogan subbasin, private entities own 34 percent of the land area, tribal lands make up 25 percent of the area, with the remainder divided between federal (24 percent) and state (17 percent) ownership (Figure 3-2). In the portion of the analysis area that falls within the upper mid-Columbia subbasin, private entities and non-governmental organizations own 73 percent of the land area, federal lands make up 8 percent, tribal lands make up 2 percent, and state or local governments own 18 percent.

Okanogan County and Douglas County are responsible for comprehensive land use planning in their respective portions of analysis area (Douglas County 2012; Okanogan County 2012a). In addition, tribal, federal, and state agencies develop management plans for tribal and public lands. Much of the land in the southern portion of the analysis area falls within the Colville Reservation (Figure 3-2) and is managed under the CTCR's Integrated Resource Management Plan (CTCR 2000). The United States Forest Service (Okanogan-Wenatchee National Forest) and the United States Bureau of Land Management manage the federal lands in the Okanogan subbasin, while the Washington Department of Natural Resources and WDFW manage state-owned lands (NPCC 2004a). The portion of the analysis area south of the Columbia River consists of a mix of private, non-governmental, federal, state, and local ownership (NPCC 2004b).

In the United States portion of the analysis area that falls within the Okanogan subbasin, forestry and range are the major land uses (48 percent and 45 percent, respectively), followed by cropland (6 percent). Urban and other land uses make up the remaining 1 percent of the subbasin land area within the United States. Agriculture (primarily fruit crops, with some grain and hay production) is the predominant land use along the valley bottom. Livestock grazing and hay production dominate the bench lands, and livestock grazing and timber harvest are the predominant use of most lower- to mid-upper elevation forests. Public entities own most of the forested land in the subbasin, managing the lands primarily for timber production. Mining activity for the extraction of non-metallic minerals, including sand, gravel, gypsum, and limestone, is more extensive than hard rock mining (NPCC 2004a).

In the portion of the analysis area that falls within the upper mid-Columbia subbasin, Colville Reservation major land uses include agriculture, livestock grazing, and suburban development. Agricultural lands cover large portions of the upper mid-Columbia subbasin. Orchards dominate the Columbia River corridor, and dryland farming and ranching are the dominant agricultural practices on the eastern plateau (NPCC 2004b).

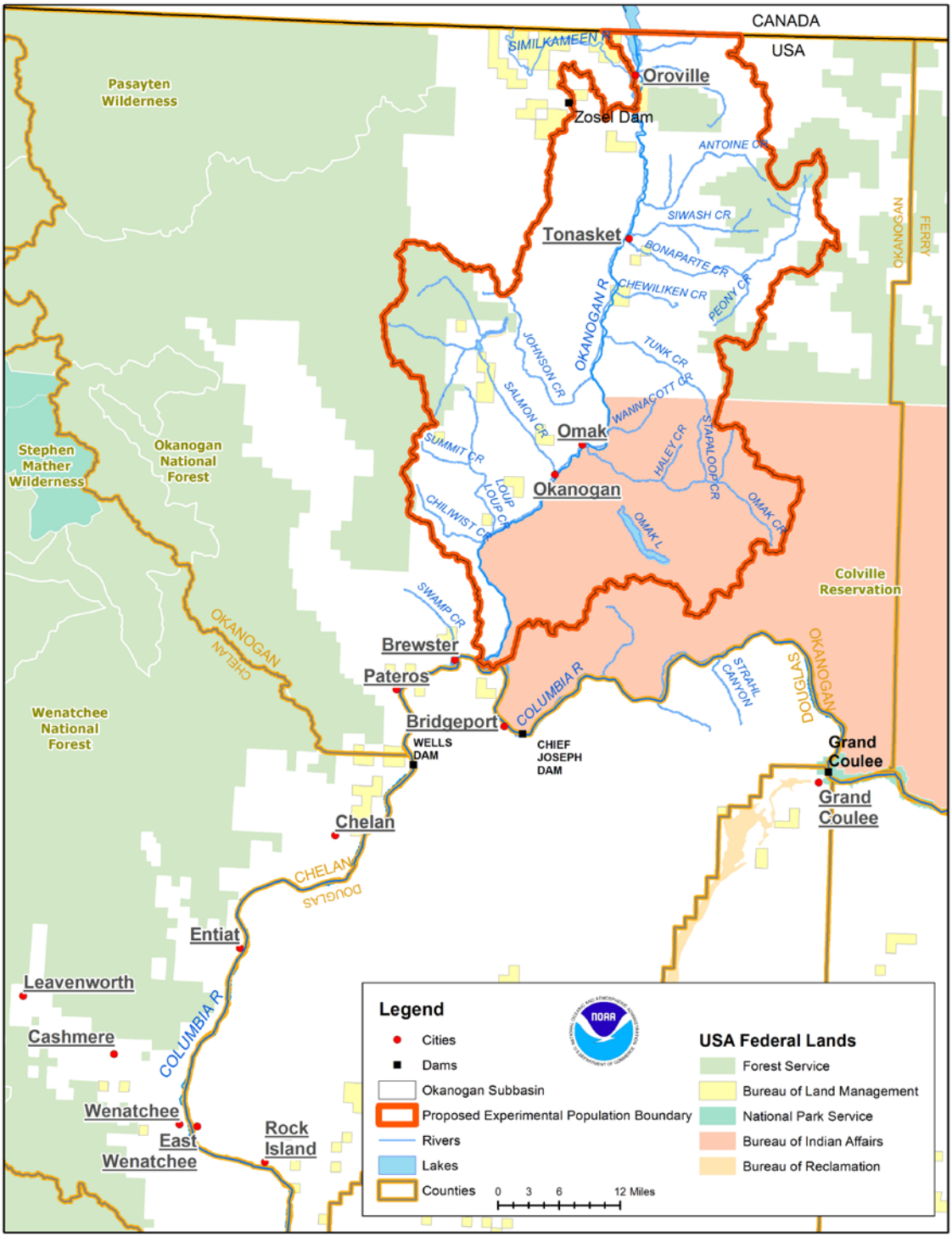


Figure 3-2. Upper Columbia River Basin land ownership and major towns.

With the decline in resource-based industries, the increase in general population, and the demand for vacation homes or property ownership, both counties have experienced conversion of some resource lands into rural residential or recreational residential development. Through comprehensive land use planning, Okanogan and Douglas Counties are addressing the need to balance development with preservation of the resource land base (Douglas County 2012; Okanogan County 2012a).

3.8 Tourism and Recreation

The analysis area for tourism and recreation comprises Okanogan and Douglas Counties because local residents within these two counties would most likely be affected by the alternatives because they live close to the Okanogan subbasin. Differences in the availability of fish resources under the alternatives are not expected to substantially affect recreational opportunities for residents of other counties because such residents are more likely to pursue recreational opportunities near their residence.

In the United States portion of the Okanogan subbasin, tourism and recreation are important to the Douglas and Okanogan County economies. With about 300 days of sunshine per year (ESD 2012a), large amounts of public land, and access to numerous lakes and rivers, the counties offer a wide variety of outdoor tourism and recreation opportunities. Tourism and recreation make a substantial contribution to the quality of life for local residents in terms of employment and income (Subsection 3.9, Socioeconomics), as well as the outdoor recreational activities available to them.

Popular outdoor activities in Okanogan County include sightseeing, picnicking, driving for pleasure, recreational fishing, and hunting (BPA 2009). The area is popular with birdwatchers, as well as individuals interested in wildlife (ESD 2012a). Recreation resources within the project area include developed facilities, use areas, and boat ramps along the Columbia River from Pateros to Chief Joseph Dam and from the mouth of the Okanogan River to the Canadian border (BPA 2009). In a recent online recreational survey, county residents identified a substantial desire for improved and expanded access to water bodies (Okanogan County 2012b).

In Douglas County, recreational activities include boating, racing, camping, hiking, water skiing, and golf (Douglas County 2012). Wineries are also playing an increasing role in the county's tourism (ESD 2012b). Additionally, many people participate in recreational activities that involve fish and wildlife, including hunting, fishing, photography, and bird watching. Douglas County has recently begun to capitalize on these numerous natural resources through promotion of the area as a prime recreational destination (Douglas County 2012).

Recreational fishing in the analysis area occurs from river banks and from boats. WDFW allows fishing for Chinook and sockeye salmon on the Okanogan River during years when the run size is adequate (WDFW 2012d). For the past 5 years, WDFW has published recreational fishing rules that allow fishing for salmon during summer and early autumn along most reaches of the Okanogan River and that require all trout to be released. Steelhead fishing is limited to hatchery-

origin fish in the Okanogan River, and seasonal openings are unpredictable. Fishing for other game and non-native species is permitted, although some restrictions apply (BPA 2009).

Near Chief Joseph Dam, most recreation opportunities focus on the Columbia River in some way, including dam visitor facilities, viewpoints, scenic overlook, a walking trail, picnic shelters, and a children's play area. The Right Bank Fishing Area is located at the base of the dam and provides a fishing site for CTCR members only (BPA 2009). The CTCR subsistence fishery is discussed in Subsection 3.10, Cultural Resources.

3.9 Socioeconomics

The analysis area for socioeconomics comprises Okanogan and Douglas Counties, as well as the Colville Reservation, because local residents within these areas would most likely be affected by the alternatives. Businesses and residents in other counties are unlikely to be affected to a noticeable degree by differences in the availability of fish resources under the alternatives because the socioeconomic benefits associated with recreational fishing is typically realized primarily in the communities closest to fishing opportunities. The current conditions described in this subsection are combined with current conditions described in Subsection 3.8, Tourism and Recreation, to create a comprehensive framework for the socioeconomic effects analyzed in Subsection 4.9, Socioeconomics.

The United States portion of the Okanogan River is located entirely within Okanogan County, while the segment of the mainstem Columbia River between the Okanogan River mouth and Chief Joseph Dam is within Okanogan and Douglas Counties (Figure 3-2). The Colville Reservation is bounded to the west by the Okanogan River and to the south by the Columbia River. Discussions in this subsection include socioeconomic information specific to the Colville Reservation where that information is available.

Douglas and Okanogan Counties and the Colville Reservation are relatively sparsely populated (Table 3-2). Compared to a statewide population density of 102 persons per square mile, there are 21 persons per square mile in Douglas County, 8 persons per square mile in Okanogan County, and 4 persons per square mile in the Colville Reservation (Table 3-3).

Table 3-2. Population levels in Douglas and Okanogan Counties, communities, the Colville Reservation, and the State of Washington, 1990 to 2011.

County/Community	1990	2000	2010	2011
Douglas County	**26,205**	**32,603**	**38,431**	**38,650**
Bridgeport[1]	1,498	2,059	2,409	2,405
East Wenatchee	2,701	5,757	13,190	13,220
Mansfield	311	319	320	320
Rock Island	524	863	788	790
Waterville	995	1,163	1,138	1,140
Okanogan County	**33,350**	**39,564**	**41,120**	**41,200**
Brewster	1,633	2,189	2,370	2,365
Conconully	174	185	210	220
Coulee Dam[2]	1,127	1,044	1,098	1,095
Elmer City	297	267	238	240
Nespelem	187	212	236	235
Okanogan	2,370	2,484	2,552	2,585
Omak	4,117	4,721	4,845	4,845
Oroville	1,505	1,653	1,686	1,690
Pateros	570	643	667	665
Riverside	223	348	280	280
Tonasket	900	1,013	1,032	1,025
Twisp	872	938	919	925
Winthrop	302	349	394	410
Colville Reservation	**6,957**[3]	**7,598**[4]	**7,687**	**N/A**[5]
State of Washington	**4,866,669**	**5,894,143**	**6,724,540**	**6,767,900**

Source: State of Washington Office of Financial Management 2012

[1] Italicized cities and communities are located in the Okanogan subbasin or along the Columbia River between the Okanogan River mouth and Chief Joseph Dam.

[2] This table reports the entire population of Coulee Dam; however, this community spans three counties (Douglas, Grant, and Okanogan). In 2011, there were 185 residents in Douglas County, 0 in Grant County, and 910 in Okanogan County.

[3] State of Washington Office of Financial Management (1990).

[4] State of Washington Office of Financial Management (2000).

[5] Not available.

Table 3-3. Average monthly employment, per capita income, land area, and population Douglas and Okanogan Counties, the Colville Reservation, and the State of Washington.

Parameter	**Douglas County**	**Okanogan County**	**Colville Reservation**	**State of Washington**
Average Monthly Employment (2010)	10,823	17,329	N/A[1]	2,808,445
Per Capita Income (2009) ($)	29,565	32,136	N/A	42,870
Land Area (square miles)	1,819	5,268	2,117	66,456
Persons per Square Mile (2011)	21.24	7.82	3.63[2]	101.84

Source: State of Washington Office of Financial Management 2012

[1] N/A = Not available.

[2] Calculated using the 2010 population reported in Table 3-2.

East Wenatchee is the largest city in the analysis area. This city experienced substantial growth from 1990 to 2011 (2,701 to 13,220 residents) (Table 3-2); however, much of this growth was due to annexations as opposed to a large influx of people (City of East Wenatchee 2010). Population levels in other cities and communities within Douglas and Okanogan Counties are relatively small (fewer than 5,000 residents), and most have experienced relatively modest growth over the last 20 years (Table 3-2). Douglas County has experienced rapid growth over the last 30 years along the Columbia River corridor from Bridgeport downriver to the East Wenatchee area (Douglas County 2012).

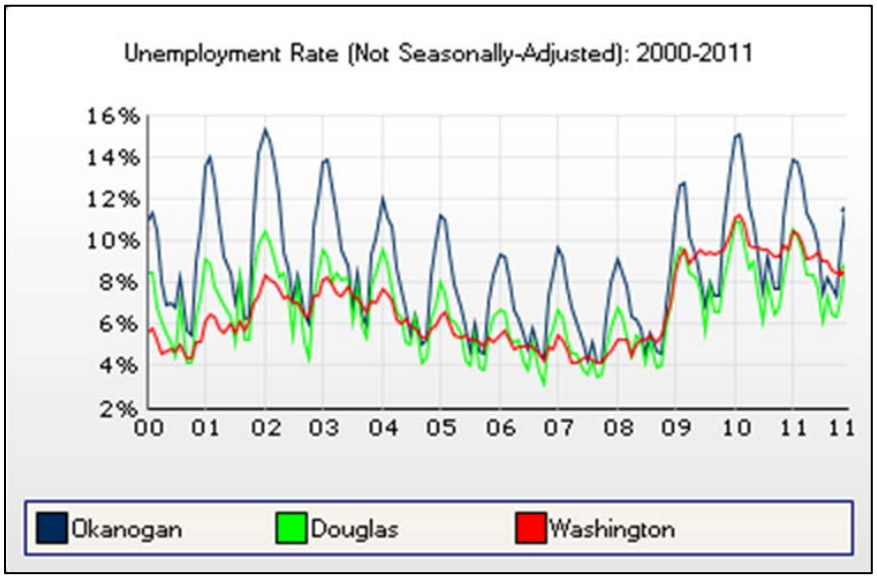
Historically, the economy of Okanogan County was heavily dependent on resource industries, including tree fruit production, cattle ranching, alfalfa production, logging, and wood products manufacturing. Changes in these industries over the past few years have resulted in an increasing dependence on recreational tourism (Subsection 3.8, Tourism and Recreation) and retail sales (Okanogan County 2012b).

Similar to the trend in Okanogan County, the economic base in Douglas County is also in a state of transition. Once closely tied to resource-based activities such as livestock, fruit production, and grain production, Douglas County's economic base faces a major restructuring for a variety of reasons, including economic growth from the tourism and service industry, industrial development, and proximity to the Wenatchee and Seattle market area (Douglas County 2012).

A similar trend is evident on the Colville Reservation. For many years, the CTCR's economic presence was strongly associated with wood products (CTCR 2012b). In response to the recent downturn in the housing market and other industries known for heavy use of wood products, the CTCR has closed both of its lumber and plywood mills (CTCR 2012b). The CTCR is currently planning to build a destination casino, hotel, and resort (CTCR 2012b).

Average monthly employment in 2010 was 10,823 persons (28 percent of total population) in Douglas County and 17,329 persons (42 percent of total population) in Okanogan County. The per capita income for both counties is less than for the entire state (Table 3-3). As shown in Table 3-4, the employment sector with the highest average monthly number of employees for each of the counties is agriculture, forestry, fishing, and hunting, although this sector has the second-highest total amount of wages paid and one of the lowest average wages paid. The distribution of employees and wages paid by sector (Table 3-4), along with unemployment trends (Figure 3-3), indicate that much of the employment in the analysis area is seasonal (summer) and that many residents are not employed year-around, especially in Okanogan County. The four sectors most closely tied to seasonal employment (agriculture, forestry, fishing, and hunting; wholesale/retail trade; arts, entertainment, and recreation; and accommodation and food services) account for more than half of the total number of employees in each county (Table 3-4).

Although comparable data are not readily available for the Colville Reservation, analogous information can be drawn from the Tribe's *Community Economic Development Strategies* planning document (CTCR 2012b). The CTCR employs approximately 1,500 people annually, with employment levels varying by season. The Colville Tribal Government is one of the largest employers in north-central Washington, providing almost 1,000 full-time jobs. The businesses of the Colville Tribal Enterprise Corporation and the Colville Tribal Federal Corporation employ around 500 persons (CTCR 2012b). Based on data from the 2010 United States census, the unemployment rate for the CTCR was higher than the statewide rate and the rate in Okanogan County (CTCR 2012b). Unemployment rates on tribal reservations are commonly higher than in surrounding areas (CTCR 2012b).



Source: Workforce Explorer 2012

Figure 3-3. Monthly unemployment for Douglas and Okanogan Counties and Washington State, 2000 through 2011.

Table 3-4. Average monthly number of employees, total wages paid, and average wages paid by employment sector for Douglas and Okanogan Counties, 2010.

Employment Sector	Douglas County			Okanogan County		
	Employees	Wages ($)	Average Wages ($)[1]	Employees	Wages ($)	Average Wages ($)[1]
Agriculture, Forestry, Fishing, Hunting	3,038	51,712,560	17,022	5,560	82,342,788	14,810
Mining	--[2]	--	--	180	11,987,732	66,599
Utilities	*[3]	*	*	41	1,762,578	42,990
Construction	446	16,509,121	37,016	454	12,616,074	27,789
Manufacturing	356	15,235,299	42,796	348	8,927,984	25,655
Wholesale/Retail Trade	1,708	49,652,243	29,070	1,994	46,791,128	23,466
Transportation and Warehousing	281	9,688,839	34,480	89	3,053,287	34,307
Information	146	7,117,117	48,747	135	4,120,634	30,523
Finance, Insurance, and Real Estate	262	8,075,939	30,824	332	8,388,742	25,267
Professional and Technical Services	214	12,027,259	56,202	196	5,979,652	30,508
Management of Companies and Enterprises	*	*	*	34	1,501,095	44,150
Administrative and Waste Services	199	3,698,004	18,583	170	3,781,945	22,247
Education Services	*	*	*	37	538,836	14,563
Health Care and Social Assistance	629	18,327,885	29,138	1,173	35,536,927	30,296
Arts, Entertainment, and Recreation	342	5,980,378	17,486	106	1,713,767	16,168
Accommodation and Food Services	723	9,052,487	12,521	1,083	15,749,338	14,542
Other Services, Except Public Administration	308	4,220,459	13,703	658	9,015,809	13,702
Total Government	**2,136**	**100,037,982**	**46,834**	**4,738**	**185,693,097**	**39,192**
Not Elsewhere Classified	35	1,575,615	45,018	--	--	--
Total	**10,823**	**312,911,187**	**28,912**	**17,329**	**439,501,413**	**25,362**

Source: State of Washington Office of Financial Management 2012

[1] Total wages paid divided by average monthly number of employees.

[2] No reported employment.

[3] Data suppressed for confidentiality.

3.10 Cultural Resources

Cultural resources include prehistoric and historic 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). Because the extent of potential effects of the alternatives on these resources is expected to be limited to the action area (Subsection 1.6, Description of the Action Area), this area also serves as the analysis area for cultural resources.

The action area is located within the Columbia Plateau, which is characterized by geological features, plant and animal communities, and waterways that are important to traditional Native American uses (BPA 2009). However, effects of the alternatives are expected to be limited to ceremonial and subsistence use by the CTCR of salmon and steelhead harvested from the action area.

The CTCR comprises 12 bands: Lakes, Colville, San Poil, Nespelem, Southern Okanogan, Moses/Columbia, Palus, Chief Joseph band of the Nez Perce, Methow, Chelan, Entiat, and Wenatchee (CTCR 2000). While most of these tribes traditionally lived in the central area of the Columbia Plateau, the current Colville Reservation, which encompasses nearly 1.4 million acres, is located north and east of the plateau, in Okanogan and Ferry Counties (CTCR 2000).

Historically, the Okanogan River provided an important subsistence fishery for the CTCR, with UCR spring-run Chinook salmon being one of the CTCR's culturally significant salmonid species for ceremonial and subsistence purposes (BPA 2009). As previously discussed, over-fishing, hydropower development, and habitat degradation resulted in the extirpation of UCR spring-run Chinook salmon and depressed returns of remaining Chinook salmon and steelhead stocks in the Okanogan subbasin (Subsection 1.1.2, Upper Columbia Spring-run Chinook Salmon ESA Listing). As stated in the EIS for the Chief Joseph Hatchery program, "the remaining Okanogan and Columbia River fishery is inadequate to meet ceremonial and subsistence needs of tribal members" (BPA 2009). Current CTCR fishing regulations identify fisheries in the analysis area for spring and summer/fall-run Chinook salmon immediately below Chief Joseph Dam, as well as Chinook and sockeye salmon in the Okanogan River (CTCR 2011). In 2012, the CTCR's harvest allocation for Okanogan-origin sockeye salmon was projected at more than 100,000 fish (CTCR 2012c).

After an absence of many years, the CTCR observed the First Salmon Ceremony in 2005 as a result of releasing juvenile Leavenworth spring-run Chinook salmon in 2002 (Subsection 2.5.3, Authorize the Reintroduction Using a Different Hatchery Stock). The return was small, but allowed the CTCR the opportunity to participate in an important ceremonial event.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 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 3, Affected Environment. The affected environment resource information establishes baseline conditions that are used in the analysis under each alternative in Section 4, Environmental Consequences. For this analysis, the baseline conditions reflect expected conditions under the No-action Alternative (Subsection 2.1, 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, which is the same as baseline conditions. A summary of resource effects under each alternative is provided at the end of this section (Table 4-1).

The action area is the United States portion of the Okanogan subbasin, particularly river and stream reaches accessible to spring-run Chinook salmon (Subsection 1.6, Description of Action Area). The analysis area is broader in scope than the action area. The analysis area encompasses the geographic area in which the effects of the action alternatives would be experienced and includes areas outside of the action area. The extent of the analysis area varies for the different resources addressed in this analysis, based on the area over which the alternatives may reasonably be expected to affect each resource.

Under the No-action Alternative (Subsection 2.1, Alternative 1 (No-action)), we would not (1) authorize the release of UCR spring-run Chinook salmon in the Okanogan subbasin under section 10(j) of the ESA, (2) designate the UCR spring-run Chinook salmon as a non-essential experimental population, or (3) adopt protective regulations that would prohibit take of fish from the experimental population except in certain circumstances. All progeny of the Methow Composite spring-run Chinook salmon would continue to be reared at the Winthrop National Fish Hatchery for release in the Methow subbasin and considered endangered, thus fully protected by the ESA section 9 prohibition on take throughout their range. Recovery of the endangered UCR spring-run Chinook salmon ESU would depend on contributions from the three extant populations: Methow, Entiat, and Wenatchee.

Under Alternative 2 (Subsection 2.2, Alternative 2 (Proposed Action)), we would (1) authorize the release of UCR spring-run Chinook salmon (excess Methow Composite stock) into the Okanogan subbasin under section 10(j) of the ESA, (2) designate the UCR spring-run Chinook salmon as a non-essential experimental population, and (3) adopt limited protective regulations under ESA section 4(d) that would prohibit take of fish from the experimental population within its range except under certain circumstances. Outside the geographic range of the experimental population designation (Figure 1-2), take would be prohibited to the same extent as it would be for take of an endangered species under section 9. In the near term, excess Methow Composite spring-run Chinook salmon would be reared at the Winthrop National Fish Hatchery or at Chief Joseph Hatchery prior to their transfer as pre-smolts to acclimation ponds in the Okanogan subbasin and release as smolts. Over the long term, the CTCR expect that adults returning from the Okanogan releases would provide sufficient broodstock to produce 200,000 smolts for continuing release into the Okanogan subbasin. Under Alternative 2, if the Okanogan experimental population became self-sustaining, recovery of the endangered UCR spring-run Chinook salmon ESU would depend on contributions from four populations: the extant Methow, Entiat, and Wenatchee, and the experimental population in the Okanogan.

Under Alternative 3 (Subsection 2.3, Alternative 3), we would (1) authorize the release of UCR spring-run Chinook salmon in the Okanogan subbasin under section 10(j) of the ESA, (2) designate the UCR spring-run Chinook salmon as a non-essential experimental population, and (3) adopt an ESA section 4(d) rule for the experimental population that is the same as the current salmon and steelhead section4(d) rule (Subsection 1.7.7, ESA Section 4(d) Regulations). Outside the geographic range of the experimental population designation (Figure 1-2), take would be prohibited to the same extent as it would be for take of an endangered species under section 9. In the near term, excess Methow Composite spring-run Chinook salmon would be reared at the Winthrop National Fish Hatchery or at the Chief Joseph Hatchery prior to their transfer as pre-smolts to acclimation ponds in the Okanogan subbasin and release as smolts. Over the long term, the CTCR expect that adults returning from the Okanogan releases would provide sufficient broodstock to produce 200,000 smolts for continuing release into the Okanogan subbasin. Under Alternative 3, if the Okanogan experimental population became self-sustaining, recovery of the endangered UCR spring-run Chinook salmon ESU would depend on contributions from four populations: the extant Methow, Entiat, and Wenatchee, and the experimental population in the Okanogan.

The primary distinctions and similarities between Alternative 2 and Alternative 3 are summarized under Subsection 2.4. A comparison of Alternative 2 and Alternative 3 to the level of protection that would be afforded the experimental population under the No-action Alternative is not possible because the Okanogan reintroduction would not occur under the No-action Alternative.

4.1.1 Analysis Elements Common to All Alternatives

Various elements of each alternative would be commonly implemented or would have a consistent analysis outcome. As a result, they are not analyzed in detail under each alternative, but are described here.

4.1.1.1 Regulatory Processes

Federal, non-federal public, and private entities have, and will continue to have, various regulatory options under the ESA in which to seek limits on their potential liabilities from otherwise lawful activities. These could include a section 4(d) limit approval or a section 10(a) permit. For analysis purposes, and because the regulatory option federal, non-federal public, and private entities may pursue for a particular proposed action is speculative, these potential regulatory approaches are implied. For example, by authorizing the release of “endangered” Methow Composite spring-run Chinook salmon smolts from acclimation ponds in the Okanogan subbasin under ESA section 10(j), we would treat the released Methow Composite smolts as a non-essential experimental population under the ESA threatened status, and we would adopt protective regulations under ESA section 4(d) that would prohibit take of fish from the experimental population except in certain circumstances. Our concurrence under a section 4(d) limit or our issuance of a section 10(a)(1)(A) permit implies compliance with section 7.

4.1.1.2 Conservation Standards and Mitigation

Our experience under the current section 4(d) rule for other listed salmon and steelhead shows that we do authorize takes associated with otherwise lawful activities, but activities are often modified during consultation to ensure section 4(d) standards are met. Additionally, section 10 requests are designed to minimize and mitigate anticipated take from proposed actions. Such measures have, therefore, been

incorporated into all of the following analyses where it is assumed from agency experience that measures to minimize and mitigate or to meet conservation standards would result in beneficial effects to all resources.

4.1.1.3 Implementation of Existing Plans

It is also assumed for analysis purposes that the federal Upper Columbia Spring-run Chinook Salmon and Steelhead Recovery Plan (UCSRB 2007) would continue to be implemented consistently under all alternatives analyzed (Subsection 1.1.2, Upper Columbia River Spring-run Chinook Salmon ESA Listing; Subsection 1.1.3, Upper Columbia River Recovery Plan). Implementation of the Recovery Plan is assumed to result in beneficial effects to all resources analyzed. However, compared to the No-action Alternative, the management flexibility that we could have under the action alternatives would enable more discretion in managing the reintroduced population consistent with goals of the Recovery Plan.

4.1.1.4 Monitoring and Evaluation

The effects analyses contemplate monitoring and evaluation programs that would occur under all alternatives. Monitoring and evaluation programs described under Subsection 1.7.2, Monitoring Programs in the Okanogan Subbasin, would continue under the No-action Alternative, but because there would be no release of UCR spring-run Chinook salmon smolts, there would be no monitoring of UCR spring-run Chinook salmon smolts or adults. In contrast, the same monitoring and evaluation programs would continue under Alternative 2 or Alternative 3, and the existing ESA section 10(a)(1)(A) permits would be modified to include monitoring and evaluation of the experimental population.

The primary goals of the Okanogan Basin Monitoring and Evaluation Program are to: (1) determine if there is a biological change at the population scale for summer/fall-run Chinook salmon, spring-run Chinook salmon, sockeye salmon, and steelhead in the Okanogan subbasin over time; (2) determine if there is a change in selected physical habitat parameters in the Okanogan subbasin over time; (3) determine if selected water quality parameters change in the Okanogan subbasin mainstem and tributaries over time; (4) determine if there is a change in viability parameters from habitat improvement actions throughout the Okanogan subbasin; and (5) ensure that the monitoring effort continues in a scientifically sound manner that is closely coordinated across the Pacific Northwest (Subsection 1.7.2.1, Okanogan Basin Monitoring and Evaluation Program).

The CTCR developed the Chief Joseph Hatchery Monitoring and Evaluation Plan (CTCR 2009). The plan outlines a strategy for how and what information would be gathered to evaluate the success of all four components of the Chief Joseph Hatchery Production Program (Subsection 1.7.1, Chief Joseph Hatchery) (CTCR 2004). The CTCR would collect information on fish interactions, productivity rates of hatchery-origin and natural-origin populations, and harvest effects. This information would be used to refine broodstock collection and adjust fish production numbers and release locations. The Chief Joseph Hatchery monitoring plan would be coordinated through existing forums to ensure strategic integration with other programs and projects in this and other river basins of the Columbia Cascade Province. Finally, the Chief Joseph Hatchery Monitoring and Evaluation Plan would be coordinated with broader, Columbia River basin monitoring and evaluation efforts to seek cost efficiencies and opportunities to

address prevailing uncertainties at a large scale (BPA 2009) (Subsection 1.7.2.2, Chief Joseph Hatchery Monitoring and Evaluation Plan).

As a result of the monitoring and evaluation program goals and objectives, beneficial effects are anticipated for all resources analyzed below.

4.1.1.5 Short-term and Long-term Timeframes Used for Analyses

The following analyses define impacts or benefits of the alternatives in short-term and long-term timeframes. The short term is considered synonymous with the near term, or some timeframe close to the initiation of the non-essential experimental population designation, or close to the current time period. In contrast, the long term would include the entire non-essential experimental population designation timeframe in perpetuity. Short term may also indicate the duration of the effect. For example, short term could be used to define temporary closures of recreational opportunities to support recovery efforts.

4.1.1.6 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." If we designate UCR spring-run Chinook salmon as a non-essential experimental population, then take would be allowed provided that the taking is associated with an approved fisheries management activity, or not due to negligent conduct, and incidental to, and not the direct purpose of, an otherwise lawful activity. Examples of otherwise lawful activities include recreation, agriculture, forestry, municipal usage, and other, similar activities, which are carried out in accordance with federal, state, and local laws and regulations.

4.1.1.7 Management Flexibility and Discretion, Risk of ESA Violations, and Incentives to Contribute to Habitat Improvements Common to the Analyses under Each Specific Alternative

<u>No-action Alternative</u>

Under the No-action Alternative, our flexibility and discretion in managing UCR spring-run Chinook salmon recovery and conservation under the No-action Alternative would be limited without the designation. Under the No-action Alternative, an important opportunity to work cooperatively with the CTCR regarding management of this listed species for recovery and conservation would not occur because regulatory requirements would not be altered, which may dissuade cooperative efforts for recovery of the species (Subsection 1.5, Purpose and Need for the Proposed Action). Similar outcomes are anticipated for each species potentially affected by the alternatives—management flexibility and discretion and cooperative management with local entities would be limited under the No-action Alternative, thereby limiting potential benefits to other species and to all other resources analyzed below.

<u>Alternative 2</u>

The ESA section 10(j) designation would give us flexibility and discretion in how we manage the ESU; by treating the experimental population as threatened rather than endangered, we would be able to apply limited protective regulations under ESA section 4(d) appropriate to the circumstances (Subsection 1.5,

Purpose and Need for the Proposed Action). Alternative 2 would also assist NMFS in further developing the cooperative relationship with local entities such as the CTCR regarding the management of listed species for conservation and recovery because the section 4(d) rule would prohibit only intentional take of listed species; incidental take from otherwise lawful activities would not be prohibited. Less regulatory burden compared to the No-action Alternative may encourage cooperative efforts for recovery of the species (Subsection 1.4, Congressional Intent and History; Subsection 1.5, Purpose and Need for the Proposed Action; Subsection 2.2, Alternative 2).

Alternative 2 would meet the purpose and need of the CTCR by restoring the culturally important spring-run Chinook salmon population in the Okanogan subbasin (Subsection 1.5, Purpose and Need for the Proposed Action). Further, limited ESA regulatory restrictions associated with the designation would allow the CTCR and local entities to engage in otherwise lawful activities that incidentally take UCR spring-run Chinook salmon without further ESA process. Activities that incidentally take UCR spring-run Chinook salmon could include agricultural, water management, construction, recreation, navigation, or forestry practices. Consequently, as the ESU begins to recover, local entities may be inclined to contribute to habitat improvements because there would be no perceived penalty for encouraging the presence of ESA-listed fish. Such improvements would likely benefit all species and resources analyzed below (i.e., the possibility of increased local entity incentives from a successful reintroduction could result in additional habitat improvements in the action area compared to the No-action Alternative, which would benefit fish and wildlife species and water quality conditions).

Alternative 3

The ESA section 10(j) designation would give us flexibility and discretion in how we manage the ESU; by treating the experimental population as threatened rather than endangered, we would be able to apply limited protective regulations under ESA section 4(d) appropriate to the circumstances (Subsection 1.5, Purpose and Need).

Alternative 3 would meet the purpose and need of the CTCR by restoring the culturally important spring-run Chinook salmon population in the Okanogan subbasin (Subsection 1.5, Purpose and Need for the Proposed Action). However, under Alternative 3, ESA regulatory restrictions on both intentional and incidental take of the section 10(j) designated UCR spring-run Chinook salmon would not allow the CTCR and local entities to engage in otherwise lawful activities, such as agriculture, water management, construction, recreation, navigation, or forestry practices that may take UCR spring-run Chinook salmon without risk of ESA violations. Consequently, local entities may not be inclined to contribute to habitat improvements because the regulatory restrictions may create the perception among local entities that there is a penalty for encouraging the presence of ESA-listed fish. Therefore, the ultimate success of the recovery could be hindered or slowed through a lack of cooperation from local entities. Further, benefits to other species and to resources analyzed below may not occur under Alternative 3 compared to the anticipated outcome under Alternative 2.

4.2 Effects on ESA-listed Salmon and Steelhead

Alternative analyses in this subsection address potential effects of the varying degree and extent to which the reintroduction of a section 10(j) designated population of UCR spring-run Chinook salmon would

impact ESA-listed salmon and steelhead in the Okanogan subbasin action area (Subsection 1.6, Description of the Action Area; Subsection 4.1, Analysis Approach and Alternative Description Summaries). Described below are the potential environmental consequences of each of the alternatives on:

- Upper Columbia River Spring-run Chinook Salmon
- Upper Columbia River Steelhead

4.2.1 Effects on Upper Columbia River Spring-run Chinook Salmon

Under any alternative, the UCR spring-run Chinook salmon ESU would continue to be heavily influenced by hatchery spawners (Subsection 3.2.1, Upper Columbia River Spring-run Chinook Salmon). In addition, the life history strategies for UCR spring-run Chinook salmon would not be affected under any alternative (Subsection 3.2.1, Upper Columbia River Spring-run Chinook Salmon). Finally, management of fisheries affecting UCR spring-run Chinook salmon outside the action area would not be expected to change under any alternative. Ocean fisheries would continue to be managed by the Pacific Fisheries Management Council, mainstem treaty and non-treaty fisheries would continue to be managed in accordance with the *United States v. Oregon* harvest agreements for the mainstem, and the CTCR would continue to evaluate experimental selective fishing gear (Subsection 3.2.1, Upper Columbia River Spring-run Chinook Salmon).

Under the No-action Alternative, there would be no reintroduction and no experimental population designation. Two hundred thousand excess Methow Composite spring-run Chinook salmon from the Winthrop National Fish Hatchery would continue to be reared at the hatchery and released in the Methow subbasin. In contrast, under Alternative 2 and Alternative 3, the excess Methow Composite spring-run Chinook salmon would be reared at the Winthrop National Fish Hatchery or at the Chief Joseph Hatchery and transferred as pre-smolts to acclimation ponds in the Okanogan subbasin where they would be released as ESA section 10(j) designated experimental UCR spring-run Chinook salmon smolts.

Under the No-action Alternative, there would be no change in the current regulatory regime of protection under section 9 of the ESA for the endangered UCR spring-run Chinook salmon ESU. All progeny of the Methow Composite spring-run Chinook salmon would continue to be reared for release in the Methow subbasin and considered endangered, thus fully protected by the ESA section 9 prohibition on take throughout their range. In contrast, under Alternative 2 and Alternative 3 we would designate the reintroduced UCR spring-run Chinook salmon as an experimental population under ESA section 10(j), and adopt protective regulations under ESA section 4(d) to increase the probability of future returns from the experimental population and establishment of a self-sustaining population in the Okanogan subbasin.

The following discussion of the alternatives focuses on the different effects that could result from these differences in the alternatives: (1) recovery of the UCR spring-run Chinook salmon ESU, (2) interactions between hatchery fish and natural fish, and (3) regulatory protections afforded UCR spring-run Chinook salmon in the Okanogan subbasin.

4.2.1.1 Alternative 1 (No-action) – No Reintroduction, No Designation of an Experimental Population, and No Adoption of Protective Regulations

Under the No-action Alternative, we would not authorize the release of UCR spring-run Chinook salmon as an experimental population in the Okanogan subbasin. Absence of the reintroduction and designation of an experimental population would preclude any effects on the current condition of the UCR spring-run Chinook salmon ESU resulting from the reintroduction. Further, there would be no change to habitat conditions in the action area from limiting factors and other threats currently affecting the ESU. Those limiting factors and threats that are habitat-based, such as migration barriers, poor riparian conditions, lack of channel structure, high sediment loads, low base stream flows, warm water temperatures, development, grazing, predation, and hydropower, are discussed in Subsection 3.5, Aquatic Habitat, and analyzed in Subsection 4.5, Effects on Aquatic Habitat. The baseline conditions discussed in Subsection 3.2.1, Upper Columbia River Spring-run Chinook Salmon, would reflect the expected conditions under the No-action Alternative.

Recovery of the UCR Spring-run Chinook Salmon ESU

Recovery of the UCR spring-run Chinook salmon ESU under the No-action Alternative would continue to depend on contributions from the three extant populations: Methow, Entiat, and Wenatchee. All three extant UCR spring-run Chinook salmon populations would remain at high risk of extinction for all four viability parameters (abundance, productivity, spatial structure, and diversity), and the ESU would remain listed as endangered. In the short term, the Winthrop National Fish Hatchery would continue to produce 600,000 Methow Composite spring-run Chinook salmon for release in the Methow subbasin, thereby continuing to contribute to diversity and productivity risks. Attempts to reduce the proportion of hatchery fish on the spawning grounds in the Methow subbasin would be made more difficult, impairing recovery of the UCR spring-run Chinook salmon ESU. The No-action Alternative would continue to represent a near-term threat to the diversity of the ESU, and a long-term threat to the abundance, productivity, and spatial structure of the ESU.

Interactions between Hatchery Fish and Natural Fish

Under the No-action Alternative, in the near term, the 200,000 Methow Composite spring-run Chinook salmon at the Winthrop National Fish Hatchery that would have been released into the Okanogan subbasin would continue to be reared at the Winthrop National Fish Hatchery and released as smolts in the Methow River along with the current production of 400,000 Methow Composite stock. The relative increase in hatchery origin spawners in the Methow subbasin has been disproportionately high reflecting the large increase in releases from the directed supplementation program. As a result, overall abundance and productivity remains rated at high risk, and the estimated population growth rate is below replacement due, in part, to the reduced fitness of hatchery origin spawners (Ford et al. 2011). The hatchery fish would likely continue to interact with naturally produced spring-run Chinook salmon in the upper Columbia River either as smolts or as returning adults and would continue to pose genetic risks to naturally-spawning spring-run Chinook salmon in the Methow subbasin. In addition, under the No-action Alternative, there would be no release of Methow Composite spring-run Chinook salmon into the Okanogan subbasin to establish an experimental population and therefore no potential for straying of

Okanogan-origin fish to interact or interbreed with the extant Wenatchee, Entiat, or Methow populations of UCR spring-run Chinook salmon.

Regulatory Protections Afforded UCR Spring-run Chinook Salmon in the Okanogan Subbasin

Under the No-action Alternative, there would be no adoption of a section 4(d) rule because there would be no experimental population to protect and, therefore, there would be no change in the current regulatory regime. All progeny of the Methow Composite spring-run Chinook salmon would continue to be reared for release in the Methow subbasin and considered endangered, thus fully protected by the ESA section 9 prohibition on take throughout their range.

4.2.1.2 Alternative 2 (Proposed Action) – Reintroduction and Designation of a Specifically Marked Experimental Population with Adoption of Limited Protective Regulations under ESA Section 4(d)

In contrast to the No-action Alternative, under Alternative 2, we would authorize the release of 200,000 UCR spring-run Chinook salmon smolts into the Okanogan subbasin as an experimental population. Initially, those smolts would come from excess Methow Composite eggs collected at the Winthrop National Fish Hatchery, which would be raised to pre-smolts at the Winthrop National Fish Hatchery or at the Chief Joseph Hatchery. Prior to their release as smolts, the fish would be transferred to acclimation ponds in the Okanogan subbasin. The returning experimental Okanogan River-acclimated UCR spring-run Chinook salmon adults would be allowed to spawn naturally for the next generation of the experimental population.

Under Alternative 2, as under the No-action Alternative, effects of the reintroduction on ESU habitat conditions from limiting factors and threats would remain the same as current conditions (Subsection 3.2.1, Upper Columbia River Spring-run Chinook Salmon). Designation of a section 10(j) experimental population would not alter current limiting factors and threats to these fish in the action area such as migration barriers, poor riparian conditions, lack of channel structure, high sediment loads, low base stream flows, warm water temperatures, development, grazing, predation, and hydropower.

Recovery of the UCR Spring-run Chinook Salmon ESU

In contrast to the No-action Alternative, under Alternative 2 it is possible that a population of UCR spring-run Chinook salmon would become established in the Okanogan subbasin. As compared to the No-action Alternative where there would be no reintroduction, under Alternative 2, reintroduction of an experimental population of UCR spring-run Chinook salmon in the Okanogan subbasin could potentially result in a fourth population that would improve the viability of the ESU. Re-establishment of UCR spring-run Chinook salmon in the Okanogan subbasin should increase overall abundance, productivity, spatial structure, and diversity of the ESU (Subsection 3.2.1, Upper Columbia River Spring-run Chinook Salmon). Although the Upper Columbia Recovery Plan (UCSRB 2007) states that recovery of UCR spring-run Chinook salmon in the Okanogan subbasin is not a requirement for delisting, an ESU consisting of four independent populations would face a lower risk of extinction from natural events than would an ESU consisting of three independent populations, as would be the case under the No-action Alternative.

Furthermore, under Alternative 2 and in contrast to the No-action Alternative, by reintroducing 200,000 Methow Composite UCR spring-run Chinook salmon in the Okanogan subbasin, there would be 200,000 less Methow Composite hatchery smolts released in the Methow subbasin, thereby reducing the number of hatchery fish on the Methow subbasin spawning grounds. The proportion of hatchery fish on the Methow subbasin spawning grounds would be reduced relative to what would occur under the No-action Alternative.

Interactions between Hatchery Fish and Natural Fish

Under the No-action Alternative, excess Methow Composite eggs from the Winthrop National Fish Hatchery would continue to be reared at the Winthrop National Fish Hatchery and released in the Methow subbasin. In contrast to the No-action Alternative, under Alternative 2 those excess eggs would be raised to pre-smolts at the Winthrop National Fish Hatchery or at the Chief Joseph Hatchery prior to their transfer to acclimation ponds in the Okanogan subbasin and release as smolts (Section 2, Alternatives). Also in contrast to the No-action Alternative, under Alternative 2, the 200,000 excess Methow Composite smolts would be released into the Okanogan subbasin instead of the Methow subbasin. Initially the fish would be Methow Composite stock originating from the Winthrop National Fish Hatchery. Over time, the CTCR anticipates that there would be sufficient adult spring-run Chinook salmon returning from the experimental releases to produce 200,000 smolts for release in the Okanogan subbasin.

Similar to the straying issue under the No-action Alternative, some of the smolts released into the Okanogan subbasin might not home directly to the Okanogan subbasin as adults but could stray temporarily or permanently into the Wenatchee, Entiat, or Methow subbasins. Strays from the Okanogan subbasin could interact or interbreed with naturally produced adults returning to the Wenatchee, Methow, or Entiat subbasins. The result could be reduced abundance, productivity, spatial structure, and diversity of these naturally producing populations (Subsection 3.2.1, Upper Columbia River Spring-run Chinook Salmon). The intensity of this effect depends on the extent to which such straying occurs. However, the stray rate of Methow Composite fish released into the Okanogan subbasin is likely to be low because the acclimation procedures proposed by the CTCR would imprint the experimental population on Okanogan River waters. Because the warmer Okanogan River is distinctly different from the glacial and snowmelt conditions of the Wenatchee, Entiat, and Methow Rivers (Subsection 3.5, Aquatic Habitat), the number of strays should be small. The homing fidelity anticipated from the Okanogan subbasin acclimation program would create reproductive isolation and adaptation to specialized habitats in the Okanogan subbasin (Subsection 1.7.1, Chief Joseph Hatchery), which would further improve homing fidelity of subsequent generations. Because the stray rate of the section 10(j) designated experimental population anticipated under Alternative 2 is likely to be low, there would be an overall slight increase in abundance, productivity, spatial structure, and diversity of the populations in the Wenatchee, Entiat, or Methow subbasins compared to the No-action Alternative.

Conversely, the experimental population could interact with immigrating adult Wenatchee, Entiat, and Methow UCR spring-run Chinook salmon that inadvertently bypassed their natal streams and strayed upriver to the mouth of the Okanogan River. This scenario is no more likely than it is under the baseline because the warm Okanogan River is distinctly different from the glacial and snowmelt conditions of the Wenatchee, Entiat, and Methow subbasins (Subsection 3.5, Aquatic Habitat). In contrast, under the No-action Alternative, there would be no section 10(j) designated experimental UCR spring-run Chinook

salmon with which spring-run Chinook salmon from the Wenatchee, Entiat, or Methow Rivers could interact or interbreed.

Regulatory Protections Afforded UCR Spring-run Chinook Salmon in the Okanogan Subbasin

Under Alternative 2, we would designate the Methow Composite stock smolts released from acclimation ponds in the Okanogan subbasin as an experimental population under ESA section 10(j). The section 10(j) designation carries with it flexibility in management opportunities for us toward furthering conservation and recovery of the ESU through treating the experimental population as threatened rather than endangered and the application of ESA section 4(d) limited protective regulations (Section 2, Alternatives). Under Alternative 2, because of the experimental population designation and adoption of limited protective regulations under ESA section 4(d), the CTCR and local entities would not have ESA liability for their lawful land management activities. This is in contrast to the No-action Alternative where there would be no experimental population in the Okanogan and no section 4(d) rule to govern its take; all progeny of Methow Composite spring-run Chinook salmon would continue to be reared for release in the Methow subbasin and considered endangered.

4.2.1.3 Alternative 3 – Reintroduction and Designation of a Specifically Marked Experimental Population with Adoption of Current Salmon and Steelhead Section 4(d) Rule

Under Alternative 3, as under Alternative 2, and in contrast to the No-action Alternative, we would authorize the release of 200,000 UCR spring-run Chinook salmon smolts into the Okanogan subbasin as an experimental population. Also under Alternative 3, as under Alternative 2, effects of the reintroduction on ESU habitat conditions from limiting factors and threats would remain the same as current conditions (Subsection 3.2.1, Upper Columbia River Spring-run Chinook Salmon). Designation of a section 10(j) experimental population would not alter current limiting factors and threats to these fish in the action area such as migration barriers, poor riparian conditions, lack of channel structure, high sediment loads, low base stream flows, warm water temperatures, development, grazing, predation, and hydropower. In addition, the potential for recovery of the UCR spring-run Chinook salmon ESU and interactions between hatchery fish and natural fish under Alternative 3 would be the same as under Alternative 2. The primary difference between Alternative 2 and Alternative 3 is the regulatory protection afforded the UCR spring-run Chinook salmon.

Recovery of the UCR Spring-run Chinook Salmon ESU

The potential for recovery of the UCR spring-run Chinook salmon ESU under Alternative 3 would be the same as under Alternative 2.

Interactions between Hatchery Fish and Natural Fish

The potential for interactions between hatchery fish and natural fish under Alternative 3 would be the same as under Alternative 2.

Regulatory Protections Afforded UCR Spring-run Chinook Salmon in the Okanogan Subbasin

In contrast to the No-action Alternative where there would be no adoption of limited protective regulations, under Alternative 3 we would adopt a section 4(d) rule for the experimental population that would prohibit take of fish from the experimental population in the Okanogan subbasin in the same manner as the current salmon and steelhead section 4(d) rule (Subsection 1.7.7, ESA Section 4(d) Regulations). Similar to the current section 4(d) rule for other listed salmon and steelhead, the section 4(d) rule under Alternative 3 would provide us the ability to authorize take through a section 4(d) approval process in addition to authorizing take through section 10 permits (Subsection 2.3, Reintroduction and Designation of an Experimental Population with Adoption of Current Salmon and Steelhead Section 4(d) Rule). Outside the Okanogan subbasin, and, as under the No-action Alternative, the section 4(d) regulation would prohibit take of the Okanogan experimental fish to the same extent as if they were endangered (that is, all take would be prohibited unless otherwise authorized).

The section 4(d) rule under Alternative 3 would be similar to that under Alternative 2 as both would have the same prohibitions and exceptions for intentional takes (such as takes associated with monitoring, hatchery production, and harvest). The two rules differ in how they would treat incidental take. Alternative 2 would not prohibit takes incidental to an otherwise lawful activity, while under Alternative 3 such incidental takes would be prohibited unless specifically authorized.

4.2.2 Effects on Upper Columbia River Steelhead

Under any alternative, the UCR steelhead distinct population segment would continue to be heavily influenced by hatchery steelhead spawners (Subsection 3.2.2, Upper Columbia River Steelhead). In addition, the life history strategies for UCR steelhead would not be affected under any alternative (Subsection 3.2.2, Upper Columbia River Steelhead). Also, management of fisheries affecting UCR steelhead would not be expected to change under any alternative. UCR steelhead, generally not caught in ocean fisheries, would continue to be harvested in treaty and non-treaty fisheries in the mainstem Columbia River (Subsection 3.2.2, Upper Columbia River Steelhead). Finally, take of UCR steelhead is currently prohibited by our existing section 4(d) regulations for steelhead (Subsection 1.7.7, ESA Section 4(d) Regulations), and this would not change under any of the alternatives.

UCR steelhead could be affected by the release of 200,000 UCR spring-run Chinook salmon hatchery smolts in the Okanogan subbasin as a result of interactions between the experimental population and steelhead, or of steelhead being incidentally taken by activities directed at the experimental UCR spring-run Chinook salmon. Interactions could be between juvenile or adult fish, particularly in the Okanogan subbasin. Incidental take of UCR steelhead could occur during smolt outmigration and/or adult return monitoring and evaluation activities. Incidental take could also occur during future harvest of the experimental population. The following analysis therefore considers (1) interactions between the experimental population and UCR steelhead in the Okanogan subbasin, and (2) incidental take of UCR steelhead in the Okanogan subbasin by activities directed at the experimental population of UCR spring-run Chinook salmon.

While this analysis considers the incidental take of UCR steelhead resulting from activities directed at the experimental population of UCR spring-run Chinook salmon, such as monitoring and evaluation, it does

not consider the take of UCR steelhead as a result of other activities, such as land or water management. This is because take of UCR steelhead is currently prohibited by our existing section 4(d) rule, and this would not change under any of the alternatives. Thus, even though the alternatives differ in terms of a separate section 4(d) rule specifically aimed at the experimental population, these differences would have only a very small effect, if any, on UCR steelhead. For example, under Alternative 2 we would adopt a section 4(d) rule that would not prohibit the take of the experimental population incidental to otherwise lawful activities, while under Alternative 3 we would adopt a section 4(d) rule that would prohibit such take. In neither case would there be a change to the rule that prohibits take of UCR steelhead; thus, there would be no difference in impacts to UCR steelhead. For this reason, we do not discuss further the possible effects on UCR steelhead of adopting a section 4(d) rule under Alternative 2 or Alternative 3.

4.2.2.1 Alternative 1 (No-action) – No Reintroduction, No Designation of an Experimental Population, and No Adoption of Protective Regulations

Under the No-action Alternative, we would not authorize the release of UCR spring-run Chinook salmon as an experimental population in the Okanogan subbasin. Absence of the reintroduction and designation of an experimental population would preclude any effects on the current condition of UCR steelhead resulting from the reintroduction. Further, there would be no change to habitat conditions in the action area from limiting factors and other threats currently affecting the ESU (Subsection 3.2.2, Upper Columbia River Steelhead). Those limiting factors and threats that are habitat-based, such as migration barriers, poor riparian conditions, lack of channel structure, high sediment loads, low base stream flows, warm water temperatures, development, grazing, predation, and hydropower, are discussed in Subsection 3.5, Aquatic Habitat, and analyzed in Subsection 4.5, Effects on Aquatic Habitat. The baseline conditions discussed in Subsection 3.2.2, Upper Columbia River Steelhead, would reflect the expected conditions under the No-action Alternative.

Interactions between the Experimental Population and UCR Steelhead in the Okanogan Subbasin

Because there would be no experimental population of UCR spring-run Chinook salmon in the Okanogan subbasin, there would be no interactions between UCR steelhead and the experimental population in that area.

Incidental Take of UCR Steelhead in the Okanogan Subbasin by Activities Directed at the Experimental Population of UCR Spring-run Chinook Salmon

Because there would be no experimental population of UCR spring-run Chinook salmon in the Okanogan subbasin, there would be no activities directed at the experimental population with the potential for incidental take of UCR steelhead.

4.2.2.2 Alternative 2 (Proposed Action) – Reintroduction and Designation of a Specifically Marked Experimental Population with Adoption of Limited Protective Regulations under ESA Section 4(d)

In contrast to the No-action Alternative, under Alternative 2, we would authorize the release of 200,000 UCR spring-run Chinook salmon smolts into the Okanogan subbasin as an experimental population. Initially, those smolts would come from excess Methow Composite eggs collected at the Winthrop

National Fish Hatchery, which would be raised to pre-smolts at the Winthrop National Fish Hatchery or at the Chief Joseph Hatchery. Prior to their release as smolts, the fish would be transferred to acclimation ponds in the Okanogan subbasin. The returning experimental Okanogan River-acclimated UCR spring-run Chinook salmon adults would be allowed to spawn naturally for the next generation of the experimental population.

Under Alternative 2, as under the No-action Alternative, effects of the reintroduction on UCR steelhead habitat conditions from limiting factors and threats would remain the same as current conditions (Subsection 3.2.2, Upper Columbia River Steelhead). Designation of a section 10(j) experimental population would not alter current limiting factors and threats to UCR steelhead in the action area such as migration barriers, poor riparian conditions, lack of channel structure, high sediment loads, low base stream flows, warm water temperatures, development, grazing, predation, and hydropower.

Interactions between the Experimental Population and UCR Steelhead in the Okanogan Subbasin

Unlike the No-action Alternative, under Alternative 2 there is the potential for interaction between Methow Composite stock smolts and the Okanogan steelhead population during the spring outmigration (Subsection 3.2.2, Upper Columbia River Steelhead). Spring-run Chinook salmon and steelhead have similar outmigration timing and have the potential to compete for space and food as smolts as they migrate to the ocean. The amount of interaction during outmigration is likely to be minor because the volitional release of the experimental population smolts allows them to be physiologically ready to migrate and move rapidly downstream to the Columbia River (Subsection 1.7.1, Chief Joseph Hatchery).

Under the No-action Alternative, steelhead would be spawning in Omak Creek and Salmon Creek among other locations in the Okanogan subbasin during April to early June (Subsection 3.2.2, Upper Columbia River Steelhead). Under Alternative 2, UCR adult spring-run Chinook salmon from the experimental population would be expected to return to spawn in some of the same locations (e.g., Omak Creek and Salmon Creek) as steelhead. However, UCR steelhead spawn April to early June, 3 to 5 months prior to spring-run Chinook salmon spawning (September and October), and steelhead progeny would emerge from the gravel before spring-run Chinook salmon spawning is initiated. Therefore, we would not expect any effects from adult experimental population spawners on UCR steelhead on the Omak Creek and Salmon Creek spawning grounds.

Unlike the No-action Alternative, under Alternative 2, returning adults from the experimental population could spawn naturally close to their acclimation sites in Omak and Salmon Creeks—the two primary UCR steelhead spawning and rearing areas—and produce juvenile spring-run Chinook salmon that have the potential of competing with juvenile steelhead for food, space, and cover. However, we expect the effects of competition to be small because juvenile spring-run Chinook salmon and UCR steelhead emerge from the gravel at different times of the year and, even though both species may occupy the same stream at the same time, their rearing locations are generally not the same (Subsection 3.2.2, Upper Columbia River Steelhead). Thus, although some spatial overlap may occur under Alternative 2, we expect the interaction between the experimental population and UCR steelhead to be minimal.

Juvenile steelhead and spring-run Chinook salmon overwinter in tributaries of the Columbia basin and migrate as smolts during the spring. Under Alternative 2, the presence of juvenile spring-run Chinook

salmon could provide an alternative food source for predators of juvenile UCR steelhead. The result would be an increase in survival and productivity of steelhead as compared to the No-action Alternative, in which there would be no experimental UCR spring-run Chinook salmon as an alternate food source for predators.

Incidental Take of UCR Steelhead by Activities Directed at the Experimental Population of UCR Spring-run Chinook Salmon

As under the No-action Alternative, under Alternative 2, the steelhead section 4(d) rule would continue to prohibit take of steelhead but we would have the ability to authorize incidental take that would not jeopardize the species' continued existence. In contrast to the No-action Alternative, under Alternative 2, UCR steelhead smolts could be incidentally captured in the spring while monitoring UCR spring-run Chinook salmon smolts from the experimental population (Subsection 2.2.2, Regulatory Process, Section 10). No information is available to quantify the numbers of steelhead smolts that might be incidentally captured. However, our Scientific Research Permit (#16122) authorizes 2 percent unintentional mortality of natural-origin juvenile steelhead (i.e., 10 of 500 captured) and 2 percent unintentional mortality of hatchery-origin juvenile steelhead (i.e., 24 of 1,200 captured) during the period March to November in the Okanogan subbasin. The juvenile steelhead capture limit applies to both the No-action Alternative and Alternative 2. As a result, no additional mortality is expected under Alternative 2.

Also under Alternative 2, UCR steelhead adults could be incidentally taken during smolt outmigration and/or adult return monitoring and evaluation activities and, possibly in the future, during harvest of the experimental population. Thus, although under Alternative 2 more UCR steelhead smolts and adults might be incidentally taken than under the No-action Alternative, no information exists to quantify the additional number of UCR steelhead smolt mortality during monitoring activities of juvenile spring-run Chinook salmon or returning adults. Because, as noted above, our Scientific Research Permit (#16122) would keep the unintentional monitoring mortality of juvenile steelhead at 2 percent or less, the additional effect of incidental take of UCR steelhead by activities directed at the experimental population is not expected to exceed these amounts.

4.2.2.3 Alternative 3 – Reintroduction and Designation of a Specifically Marked Experimental Population with Adoption of Current Salmon and Steelhead Section 4(d) Rule

Under Alternative 3, as under Alternative 2, and in contrast to the No-action Alternative, we would authorize the release of 200,000 UCR spring-run Chinook salmon smolts into the Okanogan subbasin as an experimental population. However, unlike Alternative 2, the section 4(d) rule we would adopt for the experimental population under Alternative 3 would prohibit take of fish from the experimental population in the Okanogan subbasin in the same manner as the current salmon and steelhead section 4(d) rule (Subsection 1.7.7, ESA Section 4(d) Regulations). Outside the Okanogan subbasin, take of UCR spring-run Chinook salmon from the experimental population would be prohibited unless specifically permitted.

Compared to the limited protective regulations that would be adopted under Alternative 2, the current salmon and steelhead ESA section 4(d) rule adopted under Alternative 3 would include narrower exceptions to the take prohibitions, resulting in a higher level of protection for the experimental population. This difference in the 4(d) rule under Alternative 3 would result in the survival of a few

additional UCR spring-run Chinook salmon (Subsection 4.2.1.3, Alternative 3 – Reintroduction and Designation of a Specifically Marked Experimental Population with Adoption of Current Salmon and Steelhead Section 4(d) Rule).

Also under Alternative 3, as under Alternative 2, effects of the reintroduction on ESU habitat conditions from limiting factors and threats would remain the same as current conditions (Subsection 3.2.2, Upper Columbia River Steelhead). Designation of a section 10(j) experimental population would not alter current limiting factors and threats to UCR steelhead in the action area such as migration barriers, poor riparian conditions, lack of channel structure, high sediment loads, low base stream flows, warm water temperatures, development, grazing, predation, and hydropower.

Interactions between the Experimental Population and UCR Steelhead in the Okanogan Subbasin

In contrast to the No-action Alternative, but as under Alternative 2, there would be the potential for some minor interaction between juveniles and adults from the experimental population and UCR steelhead under Alternative 3. Under Alternative 3 we would expect only a few more spring-run Chinook salmon to survive than under Alternative 2 as a result of adopting the more stringent protective regulations. Because the number of additional experimental Chinook salmon would be so small under Alternative 3, this difference in impacts between Alternative 2 and Alternative 3 would be negligible.

Incidental Take of UCR Steelhead by Activities Directed at the Experimental Population of UCR Spring-run Chinook Salmon

As under both the No-action Alternative and Alternative 2, the steelhead section 4(d) rule would continue to prohibit take of steelhead, and we would have the ability to authorize incidental take that would not jeopardize the species' continued existence. In contrast to the No-action Alternative, the same activities described above under Alternative 2 for the experimental population would also occur under Alternative 3. Because we expect only a few more spring-run Chinook salmon to survive under Alternative 3 than under Alternative 2, this difference in impacts between Alternative 2 and Alternative 3 would be negligible.

4.3 Effects on Non-listed Salmonids

Alternative analyses in this subsection address potential effects of the varying degree and extent to which the reintroduction of a section 10(j) designated population of UCR spring-run Chinook salmon would impact non-listed salmonids in the Okanogan subbasin action area (Subsection 1.6, Description of the Action Area; Subsection 4.1, Analysis Approach and Alternative Description Summaries). Under the No-action Alternative, we would not authorize the release of excess Methow Composite UCR spring-run Chinook salmon in the Okanogan subbasin. Under Alternative 2 and Alternative 3 we would authorize the release of 200,000 Methow Composite UCR spring-run Chinook salmon smolts as an experimental population in the Okanogan subbasin. In addition, under the No-action Alternative, there would be no change in the current regulatory regime. In contrast, under Alternative 2 and Alternative 3, we would adopt protective regulations under ESA section 4(d) for the experimental population in the Okanogan subbasin. The regulatory protections afforded the experimental population under Alternative 2 and Alternative 3 would have no effect on non-listed salmonids. Therefore, the following discussion of

alternatives focuses on the effects that could result from interactions between the experimental population of UCR spring-run Chinook salmon in the Okanogan subbasin and the non-listed salmonids below[8]:

- Upper Columbia River summer/fall-run Chinook salmon
- Okanogan resident rainbow trout
- Okanogan River sockeye salmon

4.3.1 Effects on Upper Columbia River Summer/Fall-run Chinook Salmon

Under all alternatives, a total of 800,000 yearling and 300,000 sub-yearling UCR summer/fall-run Chinook salmon would be reared at the Chief Joseph Hatchery and transferred to acclimation ponds in the Okanogan subbasin for acclimation and release (Subsection 3.3.1, Upper Columbia River Summer/Fall-run Chinook Salmon). In addition, the life history strategies of UCR summer/fall-run Chinook salmon in the Okanogan subbasin would not change under any alternative (Subsection 3.3.1, Upper Columbia River Summer/Fall-run Chinook Salmon).

4.3.1.1 Alternative 1 (No-action) – No Reintroduction, No Designation of an Experimental Population, and No Adoption of Protective Regulations

Under the No-action Alternative, we would not authorize the release of UCR spring-run Chinook salmon as an experimental population in the Okanogan subbasin. Absence of the reintroduction and designation of an experimental population would preclude any effects on the current condition of UCR summer/fall-run Chinook salmon resulting from the reintroduction (Subsection 3.3.1, Upper Columbia River Summer/Fall-run Chinook Salmon). Further, there would be no change to habitat conditions in the action area from limiting factors and other threats currently affecting the ESU. Those limiting factors and threats that are habitat-based, such as migration barriers, poor riparian conditions, lack of channel structure, high sediment loads, low base stream flows, warm water temperatures, development, grazing, predation, and hydropower, are discussed in Subsection 3.5, Aquatic Habitat, and analyzed in Subsection 4.5, Effects on Aquatic Habitat. The baseline conditions discussed in Subsection 3.3.1, Upper Columbia River Summer/Fall-run Chinook Salmon, would reflect the expected conditions under the No-action Alternative.

4.3.1.2 Alternative 2 (Proposed Action) – Reintroduction and Designation of a Specifically Marked Experimental Population with Adoption of Limited Protective Regulations under ESA Section 4(d)

In contrast to the No-action Alternative, under Alternative 2, we would authorize the release of 200,000 UCR spring-run Chinook salmon smolts into the Okanogan subbasin as an experimental population. These experimental fish would be held for up to 6 months in acclimation ponds near Omak Creek and Salmon Creek and released volitionally when ready to smolt. Under Alternative 2, as under the No-action Alternative, effects of the reintroduction on UCR summer/fall-run Chinook salmon habitat conditions from limiting factors and threats would remain the same as current conditions (Subsection 3.3.1, Upper

[8] Monitoring activities such as capture of UCR spring-run Chinook salmon from the 10(j) designated experimental population could result in the incidental capture of non-listed species. However, this effect is anticipated to be minor or may not occur because of seasonal migration timing in relation to monitoring periods.

Columbia River Summer/Fall-run Chinook Salmon). Designation of a section 10(j) experimental population would not alter current limiting factors and threats to UCR summer/fall-run Chinook salmon in the action area such as migration barriers, poor riparian conditions, lack of channel structure, high sediment loads, low base stream flows, warm water temperatures, development, grazing, predation, and hydropower.

However, in contrast to the No-action Alternative, under Alternative 2, there would be the potential for interaction between the experimental population and UCR summer/fall-run Chinook salmon in the form of competition for space and food during the spring outmigration (Subsection 3.2.1, Upper Columbia River Spring-run Chinook Salmon; Subsection 3.3.1, Upper Columbia River Summer/Fall-run Chinook Salmon). Compared to the No-action Alternative, where there would be no potential for interaction because there would be no experimental population, under Alternative 2 the amount of competition would be minimal because fish from the yearling and sub-yearling Okanogan summer/fall-run Chinook salmon hatchery programs migrate up to 2 months later than spring-run Chinook salmon (Subsection 3.3.1, Upper Columbia River Summer/Fall-run Chinook Salmon; Subsection 3.2.1, Upper Columbia River Spring-run Chinook Salmon). In addition, under Alternative 2, the volitional release of the experimental population from the acclimation ponds would allow the experimental population to be physiologically ready to migrate and move rapidly downstream to the Columbia River (Subsection 1.7.1, Chief Joseph Hatchery).

4.3.1.3 Alternative 3 – Reintroduction and Designation of a Specifically Marked Experimental Population with Adoption of Current Salmon and Steelhead Section 4(d) Rule

Under Alternative 3, as under Alternative 2, and in contrast to the No-action Alternative, we would authorize the release of 200,000 UCR spring-run Chinook salmon smolts into the Okanogan subbasin as an experimental population. Also under Alternative 3, as under Alternative 2, effects of the reintroduction on ESU habitat conditions from limiting factors and threats would remain the same as current conditions (Subsection 3.2.1, Upper Columbia River Spring-run Chinook Salmon). Designation of a section 10(j) experimental population would not alter current limiting factors and threats to UCR summer/fall-run Chinook salmon in the action area such as migration barriers, poor riparian conditions, lack of channel structure, high sediment loads, low base stream flows, warm water temperatures, development, grazing, predation, and hydropower.

In contrast to the No-action Alternative, but as under Alternative 2, there would be the potential for interaction between the two species under Alternative 3 in the form of competition for space and food during the spring outmigration (Subsection 3.2.1, Upper Columbia River Spring-run Chinook Salmon; Subsection 3.3.1, Upper Columbia River Summer/Fall-run Chinook Salmon). Compared to the No-action Alternative where there would be no potential for interaction because there would be no experimental population, under both Alternative 2 and Alternative 3, the amount of competition would be minimal because fish from the yearling and sub-yearling Okanogan summer/fall-run Chinook salmon hatchery programs migrate up to 2 months later than spring-run Chinook salmon (Subsection 3.3.1, Upper Columbia River Summer/Fall-run Chinook Salmon; Subsection 3.2.1, Upper Columbia River Spring-run Chinook Salmon). In addition, under Alternative 3, as under Alternative 2, the volitional release of the experimental population from the acclimation ponds would allow the experimental population to be physiologically ready to migrate and move rapidly downstream to the Columbia River (Subsection 1.7.1, Chief Joseph Hatchery).

Under Alternative 3 we would expect only a few more spring-run Chinook salmon to survive than under Alternative 2. Because the number of additional surviving experimental Chinook salmon would be so small under Alternative 3, there would be almost no impact on top of the already negligible effect of interactions between the experimental population and UCR summer/fall-run Chinook salmon in the Okanogan subbasin.

4.3.2 Effects on Okanogan Resident Rainbow Trout

Under any alternative, the presence of generally healthy Okanogan resident rainbow trout populations in the Okanogan subbasin action area, and the diverse life history strategies of these fish would not change (Subsection 3.3.2, Okanogan Resident Rainbow Trout). Fluvial rainbow trout would continue to spend their lives in the cool headwaters of tributaries upstream of anadromous fish distribution, and adfluvial rainbow trout would continue to spend most of their lives in lakes. The current status and trends of Okanogan resident rainbow trout would continue under all alternatives (Subsection 3.3.2, Okanogan Resident Rainbow Trout).

4.3.2.1 Alternative 1 (No-action) – No Reintroduction, No Designation of an Experimental Population, and No Adoption of Protective Regulations

Under the No-action Alternative, we would not authorize the release of UCR spring-run Chinook salmon as an experimental population in the Okanogan subbasin. Because there would be no experimental population of UCR spring-run Chinook salmon in the Okanogan subbasin, there would be no potential for interaction between Okanogan resident rainbow trout and the experimental population in that area. Further, there would be no change to habitat conditions in the action area from limiting factors and other threats currently affecting Okanogan resident rainbow trout. Those limiting factors and threats that are habitat-based, such as habitat loss from dams, habitat degradation and fragmentation, non-native species introductions, residential and agricultural development, and livestock grazing are discussed in Subsection 3.5, Aquatic Habitat, and analyzed in Subsection 4.5, Effects on Aquatic Habitat. The baseline conditions discussed in Subsection 3.3.2, Okanogan Resident Rainbow Trout, would reflect the expected conditions under the No-action Alternative.

4.3.2.2 Alternative 2 (Proposed Action) – Reintroduction and Designation of a Specifically Marked Experimental Population with Adoption of Limited Protective Regulations under ESA Section 4(d)

Under Alternative 2, in contrast to the No-action Alternative, we would authorize the release of 200,000 UCR spring-run Chinook salmon smolts into the Okanogan subbasin as an experimental population. These fish would be held up to 6 months in acclimation ponds near Omak Creek and Salmon Creek and released volitionally when ready to smolt. The potential for interaction between the two species would be negligible not only because Okanogan resident rainbow trout exist primarily in the headwaters of tributaries upstream of anadromous fish distribution, but also because native resident rainbow trout and salmon do not exhibit interspecific competition when in the same location (Subsection 3.3.2, Okanogan Resident Rainbow Trout). Therefore, as under the No-action Alternative, there would be no potential for interaction between Okanogan resident rainbow trout and the experimental population.

Under Alternative 2, as under the No-action Alternative, effects of the reintroduction on Okanogan resident rainbow trout habitat conditions from limiting factors and threats would remain the same as current conditions (Subsection 3.3.2, Okanogan Resident Rainbow Trout). Designation of a section 10(j) experimental population would not alter current limiting factors and threats to Okanogan resident rainbow trout in the action area, such as habitat loss from dams, habitat degradation and fragmentation, non-native species introductions, residential and agricultural development, and livestock grazing.

4.3.2.3 Alternative 3 – Reintroduction and Designation of a Specifically Marked Experimental Population with Adoption of Current Salmon and Steelhead Section 4(d) Rule

Under Alternative 3, as under Alternative 2, and in contrast to the No-action Alternative, we would authorize the release of 200,000 UCR spring-run Chinook salmon smolts into the Okanogan subbasin as an experimental population. Under Alternative 3, as under the No-action Alternative and Alternative 2, effects of the reintroduction on Okanogan resident rainbow trout habitat conditions from limiting factors and threats would remain the same as current conditions (Subsection 3.3.2, Okanogan Resident Rainbow Trout). Designation of a section 10(j) experimental population would not alter current limiting factors and threats to Okanogan resident rainbow trout in the action area such as habitat loss from dams, habitat degradation and fragmentation, non-native species introductions, residential and agricultural development, and livestock grazing.

Finally, in contrast to the No-action Alternative, but similar to Alternative 2, the potential for interaction between the section 10(j) designated experimental population and Okanogan resident rainbow trout under Alternative 3 would be negligible, not only because Okanogan resident rainbow trout exist primarily in the headwaters of tributaries upstream of anadromous fish distribution, but also because native rainbow trout and salmon do not exhibit interspecific competition when in the same location (Subsection 3.3.2, Okanogan Resident Rainbow Trout). Although under Alternative 3, with the adoption of the current salmon and steelhead section 4(d) rule, we would expect a few more experimental UCR spring-run Chinook salmon to survive than under Alternative 2, there would continue to be no potential for interaction between the experimental population and Okanogan resident rainbow trout for reasons described above for the No-action Alternative and Alternative 2.

4.3.3 Effects on Okanogan River Sockeye Salmon

Under all alternatives, the presence of Okanogan River sockeye salmon in the Okanogan subbasin action area would remain robust. Okanogan River sockeye salmon make up over 50 percent of the remaining wild sockeye salmon in the Columbia River basin. In addition, the life history strategies of these fish would not change under any alternative (Subsection 3.3.3, Okanogan River Sockeye Salmon).

4.3.3.1 Alternative 1 (No-action) – No Reintroduction, No Designation of an Experimental Population, and No Adoption of Protective Regulations

Under the No-action Alternative, we would not authorize the release of UCR spring-run Chinook salmon in the Okanogan subbasin. Because there would be no experimental population of UCR spring-run Chinook salmon in the Okanogan subbasin, there would be no potential for interaction between Okanogan River sockeye salmon and the experimental population in that area. Further, there would be no change to habitat conditions in the action area from limiting factors and other threats currently affecting Okanogan

River sockeye salmon. Those limiting factors and threats that are habitat-based, such as high water temperatures and low oxygen concentrations, impaired fish passage, hydroelectric system effects, residential development, agriculture, and predation from exotic species such as largemouth and smallmouth bass, are discussed in Subsection 3.5, Aquatic Habitat, and analyzed in Subsection 4.5, Effects on Aquatic Habitat. The baseline conditions discussed in Subsection 3.3.3, Okanogan River Sockeye Salmon, would reflect the expected conditions under the No-action Alternative.

4.3.3.2 Alternative 2 (Proposed Action) – Reintroduction and Designation of a Specifically Marked Experimental Population with Adoption of Limited Protective Regulations under ESA Section 4(d)

Under Alternative 2, in contrast to the No-action Alternative, we would authorize the release of 200,000 UCR spring-run Chinook salmon smolts into the Okanogan subbasin as an experimental population. These fish would be held up to 6 months in acclimation ponds near Omak Creek and Salmon Creek and released volitionally when ready to smolt. Under Alternative 2, as under the No-action Alternative, effects of the reintroduction on Okanogan River sockeye salmon habitat conditions from limiting factors and threats would remain the same as current conditions (Subsection 3.3.3, Okanogan River Sockeye Salmon). Designation of a section 10(j) experimental population would not alter current limiting factors and threats to Okanogan River sockeye salmon in the action area, such as high water temperatures and low oxygen concentrations, impaired fish passage, hydroelectric system effects, residential development, agriculture, and predation from exotic species such as largemouth and smallmouth bass.

In contrast to the No-action Alternative, under Alternative 2, there would be the potential for interaction between the experimental population and Okanogan River sockeye salmon during the spring outmigration because both species have similar outmigration timing and have the potential to compete for food as smolts as they migrate to the ocean (Subsection 3.3.3, Okanogan River Sockeye Salmon). However, the amount of potential competition during outmigration is likely to be negligible because UCR spring-run Chinook salmon and Okanogan River sockeye salmon actively feed on different prey during emigration (Subsection 3.3.3, Okanogan River Sockeye Salmon).

In addition, unlike the No-action Alternative, under Alternative 2, there would also be some overlap in adult migration timing when both UCR spring-run Chinook salmon and Okanogan River sockeye salmon are in the Okanogan subbasin action area. As Okanogan River water temperature increases in the summer, the number of holding pools decreases with the potential of increased interaction between the experimental population and Okanogan River sockeye salmon (Subsection 3.3.3, Okanogan River Sockeye Salmon). However, no interaction is expected to occur on spawning grounds in the United States portion of the Okanogan subbasin because Okanogan River sockeye salmon spawn in the Okanogan River upstream of Osoyoos Lake and returning adult UCR spring-run Chinook salmon are expected to spawn downstream of the lake (Subsection 3.3.3, Okanogan River Sockeye Salmon). However, under Alternative 2, there is the potential for interaction between the experimental population and Okanogan River sockeye salmon from adult UCR spring-run Chinook salmon that stray into Chinook salmon historical spawning grounds upstream of Osoyoos Lake. Historical spring-run Chinook salmon spawning habitat included the same general area of the mainstem Okanogan River upstream of Osoyoos Lake as spawning Okanogan River sockeye salmon (Subsection 3.2.1, Upper Columbia River Spring-run Chinook Salmon). Although peak spring-run Chinook salmon spawning is in September and peak

Okanogan River sockeye salmon spawning is in October, some overlap could occur under Alternative 2 if spring-run Chinook salmon stray above Osoyoos Lake. However, such interaction is expected to be negligible.

4.3.3.3 Alternative 3 – Reintroduction and Designation of a Specifically Marked Experimental Population with Adoption of Current Salmon and Steelhead Section 4(d) Rule

Under Alternative 3, as under Alternative 2, and in contrast to the No-action Alternative, we would authorize the release of 200,000 UCR spring-run Chinook salmon smolts into the Okanogan subbasin as an experimental population. Under Alternative 3, as under the No-action Alternative and Alternative 2, effects of the reintroduction on Okanogan River sockeye salmon habitat conditions from limiting factors and threats would remain the same as current conditions (Subsection 3.3.3, Okanogan River Sockeye Salmon). Designation of a section 10(j) experimental population would not alter current limiting factors and threats to Okanogan River sockeye salmon in the action area such as high water temperatures and low oxygen concentrations, impaired fish passage, hydroelectric system effects, residential development, agriculture, and predation from exotic species such as largemouth and smallmouth bass.

Finally, in contrast to the No-action Alternative, but similar to Alternative 2, there would be the potential for negligible interactions between the experimental population and Okanogan River sockeye salmon during the spring outmigration, during adult migration in the Okanogan subbasin, and during spawning if the experimental spring-run Chinook salmon stray into historical spawning grounds upstream of Osoyoos Lake (Subsection 3.3.3, Okanogan River Sockeye Salmon). Although, under Alternative 3 with the adoption of the current salmon and steelhead section 4(d) rule, we would expect a few more experimental spring-run Chinook salmon to survive than under Alternative 2, the number of additional experimental spring-run Chinook salmon would be so small under Alternative 3 that there would be almost no additional impact on top of the already negligible potential for interactions between the experimental population and Okanogan River sockeye salmon in the Okanogan subbasin for reasons described above for the No-action Alternative and Alternative 2.

4.4 Effects on Non-native Fish Species

Alternative analyses in this subsection address potential effects of the varying degree and extent to which the reintroduction of a section 10(j) designated population of UCR spring-run Chinook salmon would impact non-native fish species in the Okanogan subbasin action area (Subsection 1.6, Description of the Action Area; Subsection 4.1, Analysis Approach and Alternative Description Summaries).

Under all alternatives, the five introduced species currently present in the Okanogan subbasin action area—brook trout, grass carp, Lahontan cutthroat trout, smallmouth bass, and largemouth bass—would continue to be present in the action area (Subsection 3.4, Non-native Fish Species). Furthermore, the additional exotic fish species found in the mainstem Columbia River would also continue to occur in the lower Okanogan subbasin: black crappie, common carp, pumpkinseed, walleye, and yellow perch (Subsection 3.4, Non-native Fish Species). Finally, the little known status, trends, and life history strategies of these non-native fish species in the Okanogan subbasin would not likely change under any alternative (Subsection 3.4, Non-native Fish Species).

4.4.1 Alternative 1 (No-action) – No Reintroduction, No Designation of an Experimental Population, and No Adoption of Protective Regulations

Under the No-action Alternative, we would not authorize the release of UCR spring-run Chinook salmon as an experimental population in the Okanogan subbasin. Because there would be no experimental population of UCR spring-run Chinook salmon in the Okanogan subbasin, there would be no potential for interaction between non-native fish species and the experimental population in that area. Further, under the No-action Alternative, there would likely be no change to the habitat conditions in the action area limiting factors and threats currently affecting non-native fish species currently found in the Okanogan subbasin. The baseline conditions discussed in Subsection 3.4, Non-native Fish Species, would reflect the expected conditions under the No-action Alternative.

4.4.2 Alternative 2 (Proposed Action) – Reintroduction and Designation of a Specifically Marked Experimental Population with Adoption of Limited Protective Regulations under ESA Section 4(d)

Under Alternative 2, in contrast to the No-action Alternative, we would authorize the release of 200,000 UCR spring-run Chinook salmon smolts into the Okanogan subbasin as an experimental population. These fish would be held up to 6 months in acclimation ponds near Omak Creek and Salmon Creek and released volitionally when ready to smolt. Under Alternative 2, as under the No-action Alternative, effects of the reintroduction on non-native fish species habitat conditions from limiting factors and threats for non-native fish in the Okanogan subbasin action area would likely remain the same as current conditions (Subsection 3.4, Non-native Fish Species). Designation of a section 10(j) experimental population would not likely alter the current limiting factors and threats to non-native fish species in the action area.

Compared to the No-action Alternative, release of the experimental population smolts would likely increase potential food resources available to non-native fish species (e.g., smallmouth bass and largemouth bass) for which salmonids provide direct foraging opportunities (Subsection 3.4, Non-native Fish Species) in the analysis area. However, because bass begin feeding when water temperatures reach 50°F (10°C) and become most aggressive when water temperatures reach 59°F (15°C) (Subsection 3.4, Non-native Fish Species), and spring-run Chinook salmon generally outmigrate before water temperatures reach 50°F (10°C), the reintroduction of UCR spring-run Chinook salmon would likely provide negligible foraging opportunities for smallmouth and largemouth bass in comparison to the No-action Alternative. While there is the potential for interaction between the experimental population and other non-native fish species (i.e., brook trout, grass carp, or Lahontan cutthroat trout), little is known about the population status or life history of these species in the Okanogan subbasin, such that the level of interaction between the experimental spring-run Chinook salmon and non-native fish species cannot be assessed at this time.

4.4.3 Alternative 3 – Reintroduction and Designation of a Specifically Marked Experimental Population with Adoption of Current Salmon and Steelhead Section 4(d) Rule

Under Alternative 3, as under Alternative 2, and in contrast to the No-action Alternative, we would authorize the release of 200,000 UCR spring-run Chinook salmon smolts into the Okanogan subbasin as an experimental population. Under Alternative 3, as under the No-action Alternative and Alternative 2,

effects of the reintroduction on non-native fish species habitat conditions from limiting factors and threats in the action area would likely remain the same as current conditions (Subsection 3.4, Non-native Fish Species). Designation of a section 10(j) experimental population would not likely alter the current limiting factors and threats to non-native fish species in the action area.

In addition, in contrast to the No-action Alternative, but similar to Alternative 2, there would be the potential for some interaction between the experimental population and non-native fish species under Alternative 3. Although, under Alternative 3 with the adoption of the current salmon and steelhead section 4(d) rule protective regulations, we would expect a few more experimental spring-run Chinook salmon to survive than under Alternative 2, the level of interaction between the experimental spring-run Chinook salmon and non-native fish species cannot be assessed at this time because of lack of information on the population status and life history of these non-native fish species in the Okanogan subbasin.

4.5 Effects on Aquatic Habitat

The three alternatives vary in the extent to which the reintroduction of spring-run Chinook salmon would impact aquatic habitat in the Okanogan subbasin action area. The following discussion of alternatives focuses on the different effects that could result from these differences in alternatives on Okanogan subbasin aquatic habitat: (1) water quality, (2) water quantity and fish passage, and (3) habitat availability.

Under all alternatives, the Okanogan subbasin would continue to be a naturally harsh environment for fish, with high peak flows, low base stream flow, warm summer water temperatures, and cold winters as described in Affected Environment (Subsection 3.5, Aquatic Habitat). Under all alternatives, environmental laws would continue to regulate, and habitat restoration actions would continue to mitigate, human impacts such as agriculture, timber harvesting, and commercial and residential development. These human impacts directly influence water quality parameters that limit salmonid productivity such as sediment levels, chemical contamination (e.g., pesticide and herbicide use in agriculture), and municipal waste (e.g., high nitrogen levels). Also, under all alternatives, the CTCR would continue their monitoring of habitat conditions under the Okanogan Basin Monitoring Evaluation Program (Subsection 1.7.2.1, Okanogan Basin Monitoring and Evaluation Program), and would continue their ongoing habitat improvement efforts.

Although continued habitat improvement is anticipated in the long term, disruptions in the hydrologic system from water withdrawal for irrigation and from water storage dams in tributaries and the mainstem would continue in the near term to result in loss of migratory corridors (e.g., low instream flows, and in some cases, nonexistent fish passage conditions, as described in Subsection 3.5, Aquatic Habitat).

Under all alternatives, high summer water temperatures would continue to be partly a result of natural processes such as solar heating of lakes in the Okanogan River system, and partly the result of poor riparian conditions and flow alterations caused by dams and irrigation withdrawals (Subsection 3.5, Aquatic Habitat). Ongoing and proposed habitat improvement efforts would continue, including efforts (1) to achieve in-stream flow targets for Salmon Creek; (2) to reduce sediment loads, fix passage barriers, and address stream bank erosion and stream canopy issues from livestock impacts for Omak Creek; (3) to

address stream habitat diversity, habitat quantity, and channel stability in the United States portion of the Okanogan subbasin; and (4) to address unscreened diversions, water flow issues, and riparian canopy in the Canadian Okanogan (Subsection 3.5, Aquatic Habitat). The accessibility of Osoyoos and Vaseux Lakes and the potential accessibility of Skaha and Okanogan Lakes located on the mainstem Okanogan River in Canada would continue to have a high potential to increase productivity of spring-run Chinook salmon under all alternatives because of the potential for spring-run Chinook salmon to rear in lake habitat (Subsection 3.2.1, Upper Columbia Spring-run Chinook Salmon).

4.5.1 Alternative 1 (No-action) – No Reintroduction, No Designation of an Experimental Population, and No Adoption of Protective Regulations

Under the No-action Alternative there would be no reintroduction, no designation of an experimental population under ESA section 10(j), and no adoption of protective regulations (Subsection 2.1, Alternative 1, No-action).

4.5.1.1 Water Quality

Under the No-action Alternative (Subsection 2.1, Alternative 1 (No-action), reaches of the Okanogan mainstem and Similkameen Rivers would remain on the 2008 Clean Water Act section 303(d) list as water quality impaired for failure to meet temperature, dissolved oxygen, and pH standards. Okanogan subbasin water temperatures, resulting partially from natural processes such as solar heating of lakes in the Okanogan River system and partially from poor riparian conditions and flow alterations caused by dams and irrigation withdrawals, often exceed lethal tolerance levels for salmonids in the mid- to late summer months. These conditions would continue under the No-action Alternative (Subsection 3.5, Aquatic Habitat).

Localized areas of high levels of fine sediment in stream substrates as a result of high road densities (Subsection 3.5, Aquatic Habitat) would be expected to continue under the No-action Alternative. Ongoing sedimentation would continue to impair invertebrate productivity, an important food source for rearing salmonids, until land use changes or habitat actions addressing the sources of sedimentation occur.

Finally, an increased transport of marine nutrients and trace elements from returning adults associated with the reintroduction and concomitant enhancement of stream productivity in the Okanogan subbasin (Subsection 3.5, Aquatic Habitat) would not be expected to occur without the reintroduction. Current levels of marine-derived nutrient transport and, therefore, availability of food for rearing fishes, growth of riparian forests, and salmonid productivity would be expected to continue under the No-action Alternative. In addition, no decomposing salmon carcasses would be available under the No-action Alternative to increase the biological oxygen demand and reduce the amount of dissolved oxygen in tributaries or the mainstem Okanogan River (Subsection 3.5, Aquatic Habitat).

4.5.1.2 Water Quantity and Fish Passage

Under the No-action Alternative, subbasin tributary dams and water diversions would continue to affect stream flow and fish passage in the action area of the Okanogan subbasin (Subsection 1.6, Description of the Action Area; Subsection 3.5.3, Okanogan Subbasin Water Quantity and Fish Passage). A majority of the 30 impassable dams in the subbasin would continue to prevent future passage because they would

remain above natural barriers or would have little or no fish benefits if access were made available (e.g., waters are too warm or fish habitat is not available upstream of the dam) (Subsection 3.5.3, Okanogan Subbasin Water Quantity and Fish Passage). Also under the No-action Alternative, portions of Salmon Creek would continue to be dewatered during low flow periods, and salmon passage would continue to be difficult in mid- to late summer because of elevated water temperatures (Subsection 3.5, Aquatic Habitat).

4.5.1.3 Habitat Availability

Under the No-action Alternative, absence of the reintroduction and designation of an experimental population would preclude any effects on habitat availability in the Okanogan subbasin resulting from the reintroduction. The baseline conditions discussed in Subsection 3.5, Aquatic Habitat, reflect expected conditions under the No-action Alternative. Adequate tributary habitat for spring-run Chinook salmon spawning and rearing in the United States and Canadian portions of the Okanogan subbasin would continue to exist. Salmon Creek and Omak Creek would continue to offer the best spawning and rearing habitat for natural production.

Key habitat and restoration programs described in Subsection 3.5.4, Okanogan Subbasin Habitat Availability, would continue to be implemented under the No-action Alternative providing potentially improved aquatic habitat benefits in the action area and in tributaries located in Canada. Further, lakes in Canada would continue to offer substantial, unique, and relatively stable habitat for growth of juvenile Chinook salmon (CTCR 2010) (Subsection 3.5.4, Okanogan Subbasin Habitat Availability).

4.5.2 Alternative 2 (Proposed Action) – Reintroduction and Designation of a Specifically Marked Experimental Population with Adoption of Limited Protective Regulations under ESA Section 4(d)

In contrast to the No-action Alternative, under Alternative 2 we would designate the reintroduced UCR spring-run Chinook salmon as an experimental population under ESA section 10(j), and adopt limited protective regulations under ESA section 4(d) to increase the probability of future returns from the experimental population and establishment of a self-sustaining population.

4.5.2.1 Water Quality

Unlike the No-action Alternative, under Alternative 2, designation of an experimental population with adoption of limited protective regulations under ESA section 4(d) (Subsection 2.2, Alternative 2 (Proposed Action)) would affect water quality primarily through a minor increase in marine-derived nutrients with the increase in salmon carcasses into the action area. However, as under the No-action Alternative, the reintroduction of an experimental population in the Okanogan subbasin would have no effect on the 2008 Clean Water Act 303(d) listing of reaches of the Okanogan mainstem and Similkameen Rivers, nor would the reintroduction cause any effects on other baseline aquatic habitat water quality components such as sedimentation levels, because, for example, there would be no streambed disturbance, other than spawning, associated with Alternative 2.

Okanogan subbasin water temperatures, resulting partially from natural processes such as solar heating of lakes in the Okanogan River system and partially from poor riparian conditions and flow alterations caused by dams and irrigation withdrawals, often exceed lethal tolerance levels for salmonids in the mid-

to late summer months. As under the No-action Alternative, these conditions would continue under Alternative 2 (Subsection 3.5, Aquatic Habitat).

As under the No-action Alternative, localized areas of high levels of fine sediment in stream substrates as a result of high road densities (Subsection 3.5, Aquatic Habitat) would be expected to continue under Alternative 2. Localized areas of fine sediment would continue to impair invertebrate productivity, an important food source for rearing salmonids, until land use changes or habitat actions addressing the sources of sedimentation occur.

However, unlike the No-action Alternative, Alternative 2 would have an effect on water quality primarily through the increase in adult spring-run Chinook salmon carcasses. Although an increase in decomposing salmon carcasses resulting from reintroduction could lead to an increase in biological oxygen demand and reduce dissolved oxygen levels, negatively affecting water quality (Subsection 3.5, Aquatic Habitat), it is unlikely that a large enough number of carcasses would be present in any given location to cause measurable adverse effects on water quality. Conversely, an increase in carcasses would result in beneficial increases in trace elements and abundance of invertebrate prey items for juvenile salmonids. Unlike the No-action Alternative, Alternative 2 would 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 salmon carcasses.

4.5.2.2 Water Quantity and Fish Passage

As under the No-action Alternative, under Alternative 2, stream flow and fish passage in the Okanogan subbasin would continue to be affected by a series of dams and water diversions, including the 30 impassible dams in the subbasin. Portions of Salmon Creek, for example, would continue to be dewatered during low flow periods, and salmon passage would continue to be difficult in mid- to late summer because of elevated water temperatures (Subsection 3.5, Aquatic Habitat).

4.5.2.3 Habitat Availability

As under the No-action Alternative, designation of an experimental population of UCR spring-run Chinook salmon in the Okanogan subbasin with adoption of limited protective regulations under ESA section 4(d) (Subsection 2.2, Alternative 2 (Proposed Action)) would have no direct effect on habitat availability. Any effect on habitat availability resulting from the reintroduction would be indirect—namely, an increased incentive by the CTCR, and potentially other entities, to create additional habitat in the action area in the future. As under the No-action Alternative, adequate tributary habitat for spring-run Chinook salmon spawning and rearing in the United States and Canadian portions of the Okanogan subbasin would continue to exist and be improved with the CTCR's habitat improvement efforts (Subsection 3.5, Aquatic Habitat).

The habitat improvement level of effort under the key programs described in Subsection 3.5, Aquatic Habitat, would remain the same under Alternative 2 as under the No-action Alternative providing potentially improved aquatic habitat benefits in the action area and in tributaries located in Canada. However, unlike the No-action Alternative, monitoring the results of key programs (Subsection 1.7.2.1, Okanogan Basin Monitoring and Evaluation Program) would provide information on habitats capable of sustaining the experimental population and habitats that require further rehabilitation (Subsection 3.5,

Aquatic Habitat). Such monitoring results could lead to programs that improve habitat availability in the action area over time under Alternative 2, although benefits from future habitat restoration efforts cannot be assessed at this time. Further, lakes in Canada would continue to offer substantial, unique, and relatively stable habitat for growth of juvenile Chinook salmon (CTCR 2010) (Subsection 3.5.4, Okanogan Subbasin Habitat Availability).

4.5.3 Alternative 3 - Reintroduction and Designation of a Specifically Marked Experimental Population with Adoption of Current Salmon and Steelhead Section 4(d) Rule

In contrast to the No-action Alternative, under Alternative 3, as under Alternative 2, we would designate the reintroduced UCR spring-run Chinook salmon as an experimental population under ESA section 10(j). However, unlike Alternative 2, the section 4(d) rule we would adopt for the experimental population under Alternative 3 would prohibit take of fish from the experimental population in the Okanogan subbasin in the same manner as the current salmon and steelhead section 4(d) rule (Subsection 1.7.7, ESA 4(d) Regulations). A comparison to the level of protection that would be afforded the experimental population under the No-action Alternative is not possible because the Okanogan reintroduction would not occur under that alternative.

4.5.3.1 Water Quality

The primary distinction between Alternative 2 and Alternative 3 is the enhanced ESA protection afforded the experimental population through our current salmon and steelhead section 4(d) prohibitions under Alternative 3 (Subsection 2.3, Alternative 3). This distinction would not directly affect on-the-ground water quality conditions as compared to the No-action Alternative. The effects of Alternative 3 on water quality would be the same as under Alternative 2.

4.5.3.2 Water Quantity and Fish Passage

The protective regulatory distinction between Alternative 2 and Alternative 3 would not directly affect on-the-ground water quantity and fish passage conditions when compared to the No-action Alternative. The effects of Alternative 3 on water quantity and fish passage would be the same as under Alternative 2.

4.5.3.3 Habitat Availability

The protective regulatory distinction between Alternative 2 and Alternative 3 would not directly affect on-the-ground habitat availability when compared to the No-action Alternative. Effects of Alternative 3 on habitat availability would be the same as under Alternative 2.

The habitat improvement level of effort of the key programs described in Subsection 3.5, Aquatic Habitat, would be expected to be the same under Alternative 3 as under Alternative 2.

4.6 Effects on Wildlife

The three alternatives vary in the degree to which the management of artificial propagation programs for UCR spring-run Chinook salmon would affect fish populations in the Okanogan subbasin. Analyses in this subsection address the potential effects of the alternatives on the availability of fish as a food resource for wildlife in the analysis area. The analysis area for wildlife is defined in Subsection 3.6, Wildlife. The

primary distinctions between the alternatives are summarized in Subsection 4.1, Analysis Approach and Alternative Description Summaries. Effects on wildlife from operation and maintenance of hatchery facilities are analyzed in the Chief Joseph Hatchery EIS (BPA 2009). Species addressed in this subsection are those for which salmonids provide direct or indirect foraging opportunities, including wildlife species that have federal and/or state listing status indicating a heightened level of concern (Table 3-1).

4.6.1 Alternative 1 (No-action) – No Reintroduction, No Designation of an Experimental Population, and No Adoption of Protective Regulations

Under the No-action Alternative, we would not authorize the release of UCR spring-run Chinook salmon in the Okanogan subbasin as an experimental population so there would be no potential for effects on wildlife. Under the No-action Alternative, species (including the special-status species identified in Table 3-1 and described in Subsection 3.6, Wildlife) for which salmonids provide direct or indirect foraging opportunities would continue to forage on fish and other food resources in the Okanogan subbasin (Subsection 3.6, Wildlife). This would include the 71 species that occur in the Okanogan subbasin and that use salmonids as a food source (Subsection 3.6, Wildlife). The No-action Alternative would neither affect the availability of salmon and salmon carcasses in the analysis area, nor alter the feeding patterns of common loons, bald eagles, golden eagles, gray wolves, or grizzly bears (Subsection 3.6, Wildlife). Finally, the No-action Alternative would not affect the presence or absence of any wildlife species in the analysis area.

4.6.2 Alternative 2 (Proposed Action) - Reintroduction and Designation of a Specifically Marked Experimental Population with Adoption of Limited Protective Regulations under ESA Section 4(d)

Compared to the No-action Alternative, the release of up to 200,000 excess Methow Composite stock smolts under Alternative 2 would likely result in adult Chinook salmon eventually spawning in the Okanogan. At this time it is uncertain how many fish might spawn naturally. Unlike under the No-action Alternative, the released smolts and returning adults would have a beneficial effect on wildlife species that directly consume salmon and salmon carcasses (Subsection 3.6, Wildlife), as well as species that feed on aquatic insects and other taxa that are affected by nutrients derived from salmon carcasses (Subsection 3.5, Aquatic Habitat). This would include the 71 species that occur in the Okanogan subbasin that use salmonids as a food source and special-status species in the action area (Table 3-1) (Subsection 3.6, Wildlife).

Initially the numbers of spawning adults is likely to be low and, therefore, the beneficial effect would likely be negligible compared to the No-action Alternative. Over time, however, wildlife species that use salmonids as a food source would likely benefit from the increased availability of foraging opportunities in the Okanogan subbasin. While Alternative 2 would not alter the feeding patterns of common loons, bald eagles, golden eagles, gray wolves, or grizzly bears (Subsection 3.6, Wildlife), more salmon may be available to these species as a food source. Finally, as under the No-action Alternative, Alternative 2 would not likely affect the presence or absence of any wildlife species in the action area even with the availability of salmon as a food source.

4.6.3 Alternative 3 - Reintroduction and Designation of a Specifically Marked Experimental Population with Adoption of Current Salmon and Steelhead Section 4(d) Rule

As under Alternative 2 and in contrast to the No-action Alternative, the release of up to 200,000 excess Methow Composite stock smolts in the Okanogan subbasin under Alternative 3 would likely result in a beneficial effect on wildlife species that directly consume salmon and salmon carcasses (Subsection 3.6, Wildlife), as well as on species that feed on aquatic insects and other taxa that are affected by nutrients derived from salmon carcasses (Subsection 3.5, Aquatic Habitat). As under Alternative 2, this would include the 71 species that occur in the Okanogan subbasin that use salmonids as a food source and special-status species in the action area (Table 3-1) (Subsection 3.6, Wildlife).

As under Alternative 2, Alternative 3 would likely result in a negligible beneficial effect for wildlife in the short term, and a greater beneficial effect over the long term, compared to the No-action Alternative. If local entities respond to regulatory restrictions on take of UCR spring-run Chinook salmon as described in Subsection 4.1.1.7, Management Flexibility and Discretion, Risk of ESA Violations, and Incentives to Contribute to Habitat Improvements Common to the Analyses under Each Specific Alternative, it is possible that the long-term beneficial effects of Alternative 3 could be less than (or delayed, compared to) those of Alternative 2.

Similar to Alternative 2, Alternative 3 would not alter the feeding patterns of common loons, bald eagles, golden eagles, gray wolves, or grizzly bears (Subsection 3.6, Wildlife), but more salmon may be available to these species as a food source. Finally, as under the No-action Alternative, Alternative 3 would not likely affect the presence or absence of any wildlife species in the action area even with the increased availability of salmon as a food source.

4.7 Effects on Land Use and Ownerships

The three alternatives vary in the degree to which the management of artificial propagation programs for UCR spring-run Chinook salmon would have the potential to affect land use activities in the analysis area. The analysis area for land use and ownerships is defined in Subsection 3.7, Land Use and Ownerships. The primary distinctions between the alternatives are summarized in Subsection 4.1, Analysis Approach and Alternative Description Summaries. None of the alternatives would entail any changes in land ownership or land use designations in the analysis area described in Subsection 3.7, Land Use and Ownerships. The alternatives would not result in different proportions of public, private, and tribal land ownership in the analysis area, nor would they result in differences in the agencies with management authority for public lands (Figure 3-2). Forestry and range would continue to be the predominant land uses within the United States portion of the Okanogan subbasin, with agriculture predominating along the valley bottom (Subsection 3.7, Land Use and Ownerships). Okanogan County and Douglas County would continue to use comprehensive land use planning to address the balance between development and preservation. Analyses in this subsection address the potential for the varying degrees of take prohibition under the alternatives to affect otherwise lawful land use activities.

4.7.1 Alternative 1 (No-action) – No Reintroduction, No Designation of an Experimental Population, and No Adoption of Protective Regulations

Under the No-action Alternative, we would not authorize the release of UCR spring-run Chinook salmon in the Okanogan subbasin as an experimental population. Because this would not take place, there would be no potential for effects on land use or land ownership because of the reintroduction of UCR spring-run Chinook salmon in the Okanogan subbasin under this alternative. There would be no impacts to ownership categories including private entities, nongovernmental organizations, federal, tribal, and state or local government ownerships (Subsection 3.7, Land Use and Ownerships). Similarly, land uses would not change under the No-action Alternative.

Resource-based industries would likely continue to decline within the analysis area under the No-action Alternative, along with an increase in population and demand for vacation property ownership (Subsection 3.7, Land Use and Ownerships). This trend would continue to result in some land ownership conversion in the analysis area. Douglas County and Okanogan County would, however, continue to use comprehensive land use planning to address the balance between development and conservation under the No-action Alternative.

4.7.2 Alternative 2 (Proposed Action) – Reintroduction and Designation of a Specifically Marked Experimental Population with Adoption of Limited Protective Regulations under ESA Section 4(d)

The reintroduction of an experimental population of UCR spring-run Chinook salmon in the Okanogan subbasin under Alternative 2 would increase the number of fish to which take prohibitions would apply in the analysis area, compared to the No-action Alternative. However, the presence of these fish would not result in any restrictions on lawful land use activities beyond the restrictions already in place and, therefore, as under the No-action Alternative would not likely result in any changes in the uses or ownership of land in the analysis area described in Subsection 3.7, Land Use and Ownerships. The current salmon and steelhead ESA section 4(d) rule prohibits take of UCR steelhead in the Okanogan subbasin (Subsection 1.7.7, ESA Section 4(d) Regulations). This rule would continue to operate under Alternative 2 as under the No-action Alternative. A separate section 4(d) rule would apply to the experimental population. This rule would not prohibit take of fish from that population if such take results from an otherwise lawful land use activity, thereby minimizing the potential for increased ESA liability from land use activities, compared to the No-action Alternative.

As under the No-action Alternative, trends in land use conversions in the analysis area would continue under Alternative 2, but would also continue to be addressed by county planning efforts.

4.7.3 Alternative 3 – Reintroduction and Designation of a Specifically Marked Experimental Population with Adoption of Current Salmon and Steelhead Section 4(d) Rule

As under Alternative 2, the reintroduction of an experimental population of UCR spring-run Chinook salmon in the Okanogan subbasin would increase the number of fish to which take prohibitions would apply in the analysis area, compared to the No-action Alternative. Unlike Alternative 2, the section 4(d) rule we would adopt for the experimental population would be the same as the current salmon and steelhead section 4(d) rule, essentially prohibiting take unless authorized under one of the existing section

4(d) limits (Subsection 1.7.7, ESA Section 4(d) Regulations). Although the current section 4(d) rule would continue as described under the No-action Alternative, the presence of additional fish to which the rule would apply could result in the implementation of additional restrictions on otherwise lawful land use activities described in Subsection 3.7, Land Use and Ownerships. Based on our consultation experience in other areas where ESA-listed Chinook salmon and steelhead co-occur, we expect that any restrictions placed on land use activities in the Okanogan subbasin would be similar to those that would continue to be imposed under the No-action Alternative. In addition, based on the current distribution of steelhead and the historical distribution of spring-run Chinook salmon in the Okanogan subbasin, the area over which any such restrictions may be imposed would be similar to the current area affected by restrictions under the No-action Alternative.

Compared to the No-action Alternative, the potential for a substantial increase in ESA liability to local entities employing lawful land use activities under Alternative 3 would be low. In the Federal Register notice for the current salmon and steelhead section 4(d) rule, we stated that we "would not intend to concentrate enforcement efforts on those who operate in conformity with current permits" (65 Fed. Reg. 42422, July 10, 2000) (Subsection 1.7.7, ESA Section 4(d) Regulations). For example, concerning the use of pesticides for commercial crop production on agricultural lands, we stated our intention to work closely with the Environmental Protection Agency and other agencies, using ESA section 7 consultations, to address the potential harm to listed salmonids from pesticides (65 Fed. Reg. 42422, July 10, 2000) (Subsection 1.7.7, ESA Section 4(d) Regulations).

Finally, as under the No-action Alternative, trends in land use conversions in Okanogan and Douglas Counties would continue under Alternative 2, but would also continue to be addressed by county planning efforts.

4.8 Effects on Tourism and Recreation

The three alternatives vary in the degree to which the management of artificial propagation programs for UCR spring-run Chinook salmon would affect fish populations in the Okanogan subbasin. In addition, the three alternatives vary in their potential to result in restrictions on otherwise lawful activities in the analysis area, including recreational fishing. The analysis area for tourism and recreation is defined in Subsection 3.8, Tourism and Recreation. The primary distinctions between the alternatives are summarized in Subsection 4.1, Analysis Approach and Alternative Description Summaries. Under all three alternatives, outdoor recreation, including fishing, would likely continue to attract visitors to Okanogan County and Douglas County. No changes to any activity described in Subsection 3.8, Tourism and Recreation, would occur under any alternative including sightseeing, picnicking, driving for pleasure, hunting, boating, racing, camping, hiking, water skiing, golf, photography, and wildlife viewing because designation or no designation of an experimental population would have no direct or indirect effect on these activities. Similarly, the interest of Okanogan County residents in improved or expanded access to water bodies would likely continue under any alternative. Lastly, none of the alternatives would affect WDFW recreational fishing rules for salmon or other game and non-native species (Subsection 3.8, Tourism and Recreation).

Analyses in this subsection address the potential effects of the alternatives on the availability of opportunities for recreational fishing in the analysis area. We assume for this analysis that increased opportunities for recreational fishing could lead to increased tourism in the analysis area.

4.8.1 Alternative 1 (No-action) – No Reintroduction, No Designation of an Experimental Population, and No Adoption of Protective Regulations

Under the No-action Alternative, we would not authorize the release of UCR spring-run Chinook salmon in the Okanogan subbasin as an experimental population. Because this would not take place, there would be no potential for effects on tourism and recreation because of the reintroduction of UCR spring-run Chinook salmon in the Okanogan subbasin under this alternative. Under the No-action Alternative, recreational fishing opportunities and locations would likely continue as described in Subsection 3.8, Tourism and Recreation. The No-action Alternative would not affect the number of fish available for recreational fishing in the Okanogan subbasin. In addition, the current salmon and steelhead ESA section 4(d) rule would continue to prohibit take of UCR steelhead in the Okanogan subbasin by state, tribal, and local governments, as well as by private parties (Subsection 1.7.7, ESA Section 4(d) Regulations). However, activities carried out under FMEPs, including recreational fishing, would continue to be exempt from take prohibitions.

No changes to recreational opportunities focused on the Columbia River near Chief Joseph Dam would occur under the No-action Alternative because there would be no changes that directly or indirectly affect the dam visitor facilities, viewpoints, scenic overlook, walking trails, picnic shelters, or children's play area in the analysis area. Similarly, there would be no effect on the Right Bank Fishing Area or related CTCR member-only fishing access under the No-action Alternative (Subsection 3.8, Tourism and Recreation).

4.8.2 Alternative 2 (Proposed Action) – Reintroduction and Designation of a Specifically Marked Experimental Population with Adoption of Limited Protective Regulations under ESA Section 4(d)

The release of up to 200,000 excess Methow Composite stock smolts under Alternative 2 could increase the number of fish available for recreational fishing in the Okanogan subbasin compared to the No-action Alternative, resulting in a beneficial effect on recreational opportunities in the analysis area, with a possible concomitant increase in tourism. Opportunities to engage in recreational fishing would not be reduced by the implementation of any new restrictions under Alternative 2. As under the No-action Alternative, locations of fishing opportunities would not change under Alternative 2 (Subsection 3.8, Tourism and Recreation).

The current salmon and steelhead ESA section 4(d) rule prohibits take of UCR steelhead in the Okanogan subbasin (Subsection 1.7.7, ESA Section 4(d) Regulations). Under that rule, activities carried out under FMEPs—including recreational fishing—are exempt from take prohibitions. This rule would continue to operate under Alternative 2 as under the No-action Alternative. A separate section 4(d) rule would apply to the experimental population. This rule would not prohibit take of fish from that population if such take results from an otherwise lawful activity, including recreational fishing. As under the No-action Alternative, no changes to recreational opportunities focused on the Columbia River near Chief Joseph

Dam would occur under Alternative 2 because there would be no changes that directly or indirectly affect the dam visitor facilities, viewpoints, a scenic overlook, walking trails, picnic shelters, or children's play area in the analysis area. Similarly, there would be no effect on the Right Bank Fishing Area or related CTCR member-only fishing access under Alternative 2 (Subsection 3.8, Tourism and Recreation).

4.8.3 Alternative 3 – Reintroduction and Designation of a Specifically Marked Experimental Population with Adoption of Current Salmon and Steelhead Section 4(d) Rule

As under Alternative 2, the release of up to 200,000 excess Methow Composite stock smolts under Alternative 3 would likely increase the number of fish available for recreational fishing in the Okanogan subbasin compared to the No-action Alternative. As such, the designation of UCR spring-run Chinook salmon released in the Okanogan subbasin as a non-essential experimental population with protective regulations under ESA section 4(d) would likely result in a beneficial effect on recreational opportunities in the analysis area. As under the No-action Alternative, locations of fishing opportunities would not change under Alternative 2 (Subsection 3.8, Tourism and Recreation).

Unlike Alternative 2, the section 4(d) rule we would adopt for the experimental population would be the same as the current salmon and steelhead section 4(d) rule, essentially prohibiting take unless authorized under one of the existing section 4(d) limits (Subsection 1.7.7, ESA Section 4(d) Regulations). Although the current section 4(d) rule would continue as described under the No-action Alternative, the presence of additional fish to which the rule would apply could result in the implementation of additional restrictions on otherwise lawful activities, including recreational fishing. As noted in Subsection 4.7.3, Effects on Land Use and Ownerships, Alternative 3, we expect that any restrictions placed on land use activities in the Okanogan subbasin would be similar to those that would continue to be imposed under the No-action Alternative, and that the area over which any such restrictions may be imposed would be similar to the area currently affected by restrictions under the No-action Alternative. If local entities respond to regulatory restrictions on take of UCR spring-run Chinook salmon as described in Subsection 4.1.1.7, Management Flexibility and Discretion, Risk of ESA Violations, and Incentives to Contribute to Habitat Improvements Common to the Analyses under Each Specific Alternative, it is possible that increases in the number of fish available for recreational fishing in the Okanogan subbasin under Alternative 3 could be less than (or could be delayed, compared to) those of Alternative 2.

As under the No-action Alternative, no changes to recreational opportunities focused on the Columbia River near Chief Joseph Dam would occur under Alternative 3 because there would be no changes that directly or indirectly affect the dam visitor facilities, viewpoints, scenic overlook, walking trails, picnic shelters, or children's play area in the analysis area. Similarly, there would be no effect on the Right Bank Fishing Area or related CTCR member-only fishing access under Alternative 3 (Subsection 3.8, Tourism and Recreation).

4.9 Effects on Socioeconomics

The three alternatives vary in the degree to which the management of artificial propagation programs for UCR spring-run Chinook salmon would affect fish populations in the Okanogan subbasin. In addition, the three alternatives vary in their potential to result in restrictions on otherwise lawful activities in the analysis area. The analysis area for socioeconomics is defined in Subsection 3.9, Socioeconomics. The

primary distinctions between the alternatives are summarized in Subsection 4.1, Analysis Approach and Alternative Description Summaries. Under all three alternatives the population trends in the largest cities, on the Colville Reservation, and in local communities in Okanogan County and Douglas County would likely continue as described in Subsection 3.9, Socioeconomics, because designation or no designation of an experimental population would have no direct or indirect effect on population trends in the analysis area. Similarly, the economic bases in Okanogan County and Douglas County would likely continue to change, shifting away from resource industries and toward tourism, particularly recreational tourism (Subsection 3.9, Socioeconomics). Similarly, trends in wages, employment, and unemployment in the two counties and on the Colville Reservation that make up the analysis area would be expected to continue as described in Subsection 3.9, Socioeconomics. Under all alternatives there would be a beneficial effect on socioeconomic conditions for the CTCR if the planned destination casino, hotel, and resort are constructed (Subsection 3.9, Socioeconomics). Lastly, none of the alternatives would affect the costs associated with complying with WDFW's recreational fishing rules.

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

4.9.1 Alternative 1 (No-action) – No Reintroduction, No Designation of an Experimental Population, and No Adoption of Protective Regulations

Under the No-action Alternative, we would not authorize the release of UCR spring-run Chinook salmon in the Okanogan subbasin as an experimental population. Because this would not take place, there would be no change in fishing opportunities in the analysis area and, therefore, no potential for socioeconomic effects because of the reintroduction of UCR spring-run Chinook salmon in the Okanogan subbasin under this alternative. Tourism associated with recreational fishing opportunities would likely continue as described in Subsection 3.8, Tourism and Recreation, and would likely continue to contribute to employment and wages in the analysis area as under current conditions. The No-action Alternative would not affect the availability of fish for recreational fishing in the Okanogan subbasin. In addition, the current salmon and steelhead ESA section 4(d) rule would continue to prohibit take of UCR steelhead in the Okanogan subbasin (Subsection 1.7.7, ESA Section 4(d) Regulations). Consequently, the regulatory burden faced by agencies, such as USFWS and WDFW, that fund, carry out, or permit actions that may affect ESA-listed salmon and steelhead would not change. Similarly, the No-action Alternative would not result in any new regulatory costs affecting county residents, tribal members, or persons visiting the analysis area for recreational fishing opportunities.

4.9.2 Alternative 2 (Proposed Action) – Reintroduction and Designation of a Specifically Marked Experimental Population with Adoption of Limited Protective Regulations under ESA Section 4(d)

The designation of UCR spring-run Chinook salmon released in the Okanogan subbasin as an experimental population with limited protective regulations under ESA section 4(d) under Alternative 2 would likely result in increased recreational fishing opportunities in the analysis area, with a possible concomitant increase in tourism and associated socioeconomic benefits compared to the No-action Alternative (Subsection 4.8, Tourism and Recreation). As described in the analysis of effects on tourism

and recreation (Subsection 4.8), opportunities to engage in recreational fishing would not be reduced by the implementation of any new restrictions under Alternative 2.

Agencies, such as USFWS and WDFW, that fund, carry out, or permit actions that may affect the experimental population would not face a substantially increased regulatory burden under Alternative 2, compared to the No-action Alternative. As under the No-action Alternative, there would be no new regulatory costs affecting county residents, tribal members, or persons visiting the analysis area for recreational fishing opportunities.

4.9.3 Alternative 3 – Reintroduction and Designation of a Specifically Marked Experimental Population with Adoption of Current Salmon and Steelhead Section 4(d) Rule

As under Alternative 2, the release of up to 200,000 excess Methow Composite stock smolts under Alternative 3 would likely increase the number of fish available for recreational fishing in the Okanogan subbasin compared to the No-action Alternative, with a possible concomitant increase in tourism and associated socioeconomic benefits (Subsection 4.8, Tourism and Recreation). Unlike Alternative 2, the section 4(d) rule we would adopt for the experimental population would be the same as the current salmon and steelhead section 4(d) rule, essentially prohibiting take unless authorized under one of the existing section 4(d) limits (Subsection 1.7.7, ESA Section 4(d) Regulations). Although the current section 4(d) rule would continue as described under the No-action Alternative, the presence of additional fish to which the rule would apply could result in the implementation of additional restrictions on otherwise lawful activities, which could negatively impact recreational fishing opportunities and related economic benefits to local communities and the CTCR compared to conditions under the No-action Alternative.

However, based on our consultation experience in other areas where ESA-listed Chinook salmon and steelhead co-occur, we expect that any restrictions placed on land use activities in the Okanogan subbasin would be similar to those that would continue to be imposed under the No-action Alternative. In addition, based on the current distribution of steelhead and the historical distribution of spring-run Chinook salmon in the Okanogan subbasin, the area over which any such restrictions may be imposed would be similar to the current area affected by restrictions. Therefore, it is possible, based on past trends, that there would be no change in associated recreational fishing economic effects under Alternative 3 as compared to the No-action Alternative. If local entities respond to regulatory restrictions on take of UCR spring-run Chinook salmon as described in Subsection 4.1.1.7, Management Flexibility and Discretion, Risk of ESA Violations, and Incentives to Contribute to Habitat Improvements Common to the Analyses under Each Specific Alternative, it is possible that the socioeconomic benefits associated with increases in the number of fish available for recreational fishing in the Okanogan subbasin under Alternative 3 could be less than (or could be delayed, compared to) those of Alternative 2.

As under Alternative 2, agencies that fund, carry out, or permit actions that may affect the non-essential experimental population of UCR spring-run Chinook salmon in the Okanogan subbasin would not face a substantially increased regulatory burden compared to the No-action Alternative. Additionally, there would be no new regulatory costs affecting county residents, tribal members, or persons visiting the analysis area for recreational fishing opportunities.

4.10 Effects on Cultural Resources

The three alternatives vary in the degree to which the management of artificial propagation programs for UCR spring-run Chinook salmon would affect fish populations in the Okanogan subbasin analysis area. The analysis area for cultural resources is defined in Subsection 3.10, Cultural Resources. The primary distinctions between the alternatives are summarized in Subsection 4.1, Analysis Approach and Alternative Description Summaries. No prehistoric or historic archaeological sites, historic structures, or traditional cultural properties would be affected by designation or no designation of an experimental population and associated regulations. Analyses in this subsection address the potential effects of the alternatives on the availability of opportunities for tribal harvest of excess adult salmon returning to the Okanogan subbasin. Under all three alternatives, CTCR tribal members would continue to participate in ceremonial and subsistence fishing for Chinook and sockeye salmon in the analysis area. Under any of the alternatives, CTCR fishing regulations could be modified in response to changes in resource availability and/or the regulatory environment. The nature of any such modifications—including any changes in response to reintroduction of UCR spring-run Chinook salmon under the action alternatives—cannot be assessed at this time.

4.10.1 Alternative 1 (No-action) – No Reintroduction, No Designation of an Experimental Population, and No Adoption of Protective Regulations

Under the No-action Alternative, we would not authorize the release of UCR spring-run Chinook salmon in the Okanogan subbasin as an experimental population. Because this would not take place, there would be no potential for changes in the availability of Chinook salmon because of the reintroduction of UCR spring-run Chinook salmon in the Okanogan subbasin under this alternative. The Okanogan and Columbia River fishery would likely remain inadequate to meet ceremonial and subsistence needs of tribal members (Subsection 3.10, Cultural Resources). The No-action Alternative would not affect current CTCR fishing regulations identifying fisheries in the analysis area for spring and summer/fall-run Chinook salmon immediately below Chief Joseph Dam, as well as Chinook and sockeye salmon in the Okanogan River (Subsection 3.10, Cultural Resources). Additionally, the CTCR's harvest allocation of Okanogan River sockeye salmon would not be altered by the No-action Alternative because fish conditions would not change in the analysis area. Trends in the availability of Chinook and sockeye salmon for ceremonial and subsistence fishing and related ceremonies by CTCR tribal members in the analysis area would likely continue under the No-action Alternative. The availability of these ceremonial and subsistence resources would also be influenced by habitat conditions. Key habitat and restoration programs described in Subsection 3.5.4, Okanogan Subbasin Habitat Availability, would continue to be implemented under the No-action Alternative providing potentially improved aquatic habitat benefits in the United States and Canadian portions of the Okanogan subbasin.

In addition, opportunities for ceremonial and subsistence use of fish in the Okanogan subbasin would be limited by the current salmon and steelhead ESA section 4(d) rule, which would continue to impose prohibitions on take of UCR steelhead by state, tribal, and local governments, as well as by private parties (Subsection 1.7.7, ESA Section 4(d) Regulations). Although activities carried out under the CTCR's Tribal Resource Management Plan may be exempt from take prohibitions (pending our determination whether the plan would appreciably reduce the likelihood of survival and recovery of listed species), the requirement to comply with the section 4(d) rule could constrain management options.

4.10.2 Alternative 2 (Proposed Action) – Reintroduction and Designation of a Specifically Marked Experimental Population with Adoption of Protective Regulations under ESA Section 4(d)

Compared to the No-action Alternative, the release of up to 200,000 excess Methow Composite stock smolts under Alternative 2 would likely increase the number of Chinook salmon available in the Okanogan subbasin, making more fish available for ceremonial and subsistence fishing by CTCR tribal members. Because the magnitude of the increase cannot be predicted, it is not possible at this time to assess whether the Okanogan and Columbia River fishery would continue to remain inadequate to meet ceremonial and subsistence needs of tribal members (Subsection 3.10, Cultural Resources).

4.10.3 Alternative 3 – Reintroduction and Designation of a Specifically Marked Experimental Population with Adoption of Current Salmon and Steelhead Section 4(d) Rule

As under Alternative 2 and in contrast to the No-action Alternative, the release of up to 200,000 excess Methow Composite stock smolts in the Okanogan subbasin under Alternative 3 would likely increase the number of Chinook salmon available in the Okanogan subbasin, making more fish available for ceremonial and subsistence fishing by CTCR tribal members. Because the magnitude of the increase cannot be predicted, it is not possible at this time to assess whether the Okanogan and Columbia River fishery would continue to remain inadequate to meet ceremonial and subsistence needs of tribal members (Subsection 3.10, Cultural Resources).

Based on the higher level of protection it would provide for the experimental population of UCR spring-run Chinook salmon, Alternative 3 would have a greater potential of increasing the availability of this ceremonial and subsistence resource than Alternative 2. As such, Alternative 3 could provide greater long-term increases in the availability of opportunities for tribal harvest of excess adult salmon returning to the Okanogan subbasin, compared to Alternative 2. On the other hand, the difference in rules would also create the potential for local entity liability under Alternative 3 that would not exist under Alternative 2. As a result, there could be less management flexibility and greater opposition by local entities to UCR spring-run Chinook salmon recovery efforts when compared to Alternative 2. Opposition under Alternative 3 could be sufficiently great to cause the CTCR to abandon reintroduction efforts. If this were to occur, Alternative 3 would result in no increase in the availability of opportunities for tribal harvest of excess adult salmon returning to the Okanogan subbasin. A comparison to the level of protection that would be afforded the experimental population under the No-action Alternative is not possible because the Okanogan reintroduction would not occur under that alternative.

1 Table 4-1. Summary of all resource effects by alternative.

Resources		ALTERNATIVE		
		1 (No-action) **No Reintroduction, No Designation, and No Adoption of Protective Regulations**	**2 (Proposed Action)** **Reintroduction and Designation with Adoption of Limited Protective Regulations under ESA Section 4(d)**	**3 (Action Alternative)** **Reintroduction and Designation with Adoption of Current Salmon and Steelhead Section 4(d) Rule**
ESA-Listed Species	**UCR Spring-run Chinook Salmon**	Absence of the reintroduction program and designation of an experimental population would preclude any effects on the UCR spring-run Chinook salmon ESU resulting from the reintroduction. Recovery of the endangered UCR spring-run Chinook salmon ESU under the No-action Alternative would continue to be dependent on contributions from the three extant populations: Methow, Entiat, and Wenatchee. There would be no potential for straying of the experimental population to interact or interbreed with the extant Wenatchee, Entiat, or Methow populations of UCR spring-run Chinook salmon.	Successful reintroduction of an experimental UCR spring-run Chinook salmon population would expand the distribution of the ESU in the Upper Columbia River Basin. Removal of excess eggs from the Methow subbasin would benefit recovery of the Methow population of UCR spring-run Chinook salmon by diminishing the impact of surplus Winthrop National Fish Hatchery returns on the natural-origin Methow subbasin UCR spring-run Chinook salmon population. The number of experimental UCR spring-run Chinook salmon strays would be small and the potential	Compared to the limited protective regulations that would be adopted under Alternative 2, the current salmon and steelhead ESA section 4(d) rule would include narrower limitations on the circumstances under which take prohibitions would apply, resulting in a higher level of protection for the experimental population. Alternative 3 would have a greater potential of increasing the abundance and productivity of the experimental population compared to the No-action Alternative and Alternative 2 because the experimental population would receive greater protection from the section 4(d) rule under Alternative 3 compared to that adopted under

Resources		ALTERNATIVE		
		1 (No-action) **No Reintroduction, No Designation, and No Adoption of Protective Regulations**	**2 (Proposed Action)** **Reintroduction and Designation with Adoption of Limited Protective Regulations under ESA Section 4(d)**	**3 (Action Alternative)** **Reintroduction and Designation with Adoption of Current Salmon and Steelhead Section 4(d) Rule**
		Regulatory protections afforded the three extant populations of the UCR spring-run Chinook salmon ESU would continue to occur under our ESA section 9 take prohibitions.	for interbreeding with the extant populations low, because the warmer Okanogan River is distinctly different from the glacial and snowmelt conditions of the Wenatchee, Entiat, and Methow basins. Limited protective regulations under ESA section 4(d) would prohibit take of the experimental population, except that in the Okanogan subbasin their intentional take would not be prohibited by activities where the take is associated with an approved program that minimizes take such as an approved HGMP, TRMP, or FMEP. Unintentional take in the Okanogan subbasin would not be prohibited if it were incidental to an otherwise lawful activity.	Alternative 2. A few more experimental Okanogan spring-run Chinook salmon hatchery smolts and adults might survive because of more stringent section 4(d) protections, leading to a greater potential for interaction between hatchery fish and natural fish than under Alternative 2. However, we consider the potential for effects on productivity and diversity to be low because of the low likelihood of the experimental Okanogan fish straying under Alternative 3, for the same reasons as under Alternative 2. Alternative 3 provides less management flexibility than Alternative 2 toward furthering conservation and recovery, and

Resources		ALTERNATIVE		
		1 (No-action) **No Reintroduction, No Designation, and No Adoption of Protective Regulations**	**2 (Proposed Action)** **Reintroduction and Designation with Adoption of Limited Protective Regulations under ESA Section 4(d)**	**3 (Action Alternative)** **Reintroduction and Designation with Adoption of Current Salmon and Steelhead Section 4(d) Rule**
			Alternative 2 would provide the most management flexibility toward furthering conservation and recovery because this alternative is likely to encounter the least resistance from local entities and other federal agencies in the experimental action area by allowing the reintroduction but limiting ESA liabilities while carrying out otherwise lawful activities.	local entity opposition to the reintroduction is likely to be greater under Alternative 3 than under Alternative 2 because of increased potential exposure to ESA liability for local entities.
	UCR Steelhead	Absence of the reintroduction program and designation of an experimental population would preclude any effects on UCR steelhead resulting from the reintroduction.	Under Alternative 2, the potential for interaction between the experimental UCR spring-run Chinook salmon and UCR steelhead would be minimal because their individual life history strategies (i.e., run, spawning, and emergence timing) are different.	The potential for interaction between the experimental UCR spring-run Chinook salmon and UCR steelhead would be the same as under Alternative 2 (minimal) for the same reasons as under Alternative 2. Alternatives 2 and 3 differ in terms of a separate section 4(d)

Resources		ALTERNATIVE		
		1 (No-action) **No Reintroduction, No Designation, and No Adoption of Protective Regulations**	**2 (Proposed Action)** **Reintroduction and Designation with Adoption of Limited Protective Regulations under ESA Section 4(d)**	**3 (Action Alternative)** **Reintroduction and Designation with Adoption of Current Salmon and Steelhead Section 4(d) Rule**
			There is the possibility of some incidental take of UCR steelhead by activities directed at the experimental population (e.g., broodstock collection) because the limited protective regulations for the experimental population under Alternative 2 would be less restrictive than those regulatory protections already afforded the threatened UCR steelhead under our current salmon and steelhead section 4(d) rule. The effect of additional take under Alternative 2 would be minor because we would only authorize the take if it did not jeopardize UCR steelhead.	rule specifically aimed at the experimental population. These differences would have no effect on UCR steelhead because take of UCR steelhead is currently prohibited by the existing section 4(d) rule, and this would not change under any of the alternatives. Local entity opposition to the reintroduction is likely to be greater under Alternative 3 than under Alternative 2 because of increased potential exposure to ESA liability. The same activities as described under Alternative 2 for the experimental population would also occur under Alternative 3 and would result in the same levels of incidental take of UCR steelhead

Resources		ALTERNATIVE		
		1 (No-action) **No Reintroduction, No Designation, and No Adoption of Protective Regulations**	**2 (Proposed Action)** **Reintroduction and Designation with Adoption of Limited Protective Regulations under ESA Section 4(d)**	**3 (Action Alternative)** **Reintroduction and Designation with Adoption of Current Salmon and Steelhead Section 4(d) Rule**
				as under Alternative 2.
Non-ESA Listed Species	**UCR Summer/Fall-run Chinook Salmon**	Absence of the reintroduction program and designation of an experimental population would preclude any effects on UCR summer/fall-run Chinook salmon resulting from the reintroduction (i.e., there would be no potential for interspecific competition).	There is the potential for interaction in the form of competition for space and food between experimental population smolts and UCR summer/fall-run Chinook salmon during the spring outmigration. The amount of competition is likely to be negligible because of differences in outmigration timing between the two species. The regulatory protections afforded the experimental population under Alternative 2 would have no effect on the non-listed UCR summer/fall-run Chinook salmon.	The potential for interaction between the experimental UCR spring-run Chinook salmon and UCR summer/fall-run Chinook salmon would be the same as under Alternative 2 and for the same reasons as for Alternative 2. Alternatives 2 and 3 differ in terms of a separate section 4(d) rule specifically aimed at the experimental population. The regulatory protections afforded the experimental population under Alternative 3 would have no effect on the non-listed UCR summer/fall-run Chinook salmon.
	Okanogan Resident Rainbow	Absence of the reintroduction program and designation of an experimental population would preclude any effects on Okanogan	The potential for interaction between the experimental population and Okanogan resident rainbow trout would be non-	The potential for interaction between the experimental UCR spring-run Chinook salmon and Okanogan resident rainbow trout

Resources		ALTERNATIVE		
		1 (No-action) **No Reintroduction, No Designation, and No Adoption of Protective Regulations**	**2 (Proposed Action)** **Reintroduction and Designation with Adoption of Limited Protective Regulations under ESA Section 4(d)**	**3 (Action Alternative)** **Reintroduction and Designation with Adoption of Current Salmon and Steelhead Section 4(d) Rule**
	Trout	resident rainbow trout resulting from the reintroduction.	existent because Okanogan resident rainbow trout exist primarily in the headwaters upstream of anadromous fish distribution, and native rainbow trout and salmon do not exhibit interspecific competition when in the same location. The regulatory protections afforded the experimental population under Alternative 2 would have no effect on the non-listed Okanogan resident rainbow trout.	would be the same as under Alternative 2 and for the same reasons as for Alternative 2. Alternatives 2 and 3 differ in terms of a separate section 4(d) rule specifically aimed at the experimental population. The regulatory protections afforded the experimental population under Alternative 3 would have no effect on the non-listed Okanogan resident rainbow trout.
	Okanogan River Sockeye Salmon	Absence of the reintroduction program and designation of an experimental population would preclude any effects on Okanogan River sockeye salmon resulting from the reintroduction.	There is the potential for interaction between the experimental population and Okanogan River sockeye salmon during the spring outmigration, during the adult return where some overlap might occur in migration timing, and on spawning grounds	The potential for interaction between the experimental UCR spring-run Chinook salmon and Okanogan River sockeye salmon would be the same as under Alternative 2 and for the same reasons as for Alternative 2.

Resources		ALTERNATIVE		
		1 (No-action) **No Reintroduction, No Designation, and No Adoption of Protective Regulations**	**2 (Proposed Action)** **Reintroduction and Designation with Adoption of Limited Protective Regulations under ESA Section 4(d)**	**3 (Action Alternative)** **Reintroduction and Designation with Adoption of Current Salmon and Steelhead Section 4(d) Rule**
			if adults from the experimental population stray into their historical spawning grounds upstream of Osoyoos Lake. However, such interaction between the species is expected to be negligible because of differences in food preferences during outmigration, adult migration timing, and spawning ground preferences. There would be no interaction between the two species on spawning grounds, because Okanogan River sockeye salmon spawn in the Okanogan River upstream of Osoyoos Lake and UCR spring-run Chinook salmon are expected to spawn downstream of the lake. The regulatory protections	Alternatives 2 and 3 differ in terms of a separate section 4(d) rule specifically aimed at the experimental population. The regulatory protections afforded the experimental population under Alternative 3 would have no effect on the non-listed Okanogan River sockeye salmon.

Resources		ALTERNATIVE		
		1 (No-action) **No Reintroduction, No Designation, and No Adoption of Protective Regulations**	**2 (Proposed Action)** **Reintroduction and Designation with Adoption of Limited Protective Regulations under ESA Section 4(d)**	**3 (Action Alternative)** **Reintroduction and Designation with Adoption of Current Salmon and Steelhead Section 4(d) Rule**
			afforded the experimental population under Alternative 2 would have no effect on the non-listed Okanogan River sockeye salmon.	
	Non-native Fish Species	Absence of the reintroduction program and designation of an experimental population would preclude any effects on non-native fish species resulting from the reintroduction.	Release of the experimental population smolts would likely increase potential food resources available to non-native fish species (e.g., smallmouth bass and largemouth bass) for which salmonids provide direct or indirect foraging opportunities. However, the reintroduction of the experimental population would likely provide negligible foraging opportunities for smallmouth and largemouth bass because of lack of spring-run Chinook salmon smolts during primary bass feeding periods. While there is the potential for	The potential for interaction between the experimental UCR spring-run Chinook salmon and non-native fish species would be the same as under Alternative 2 and for the same reasons as for Alternative 2. Alternatives 2 and 3 differ in terms of a separate section 4(d) rule specifically aimed at the experimental population. The regulatory protections afforded the experimental population under Alternative 3 would have no effect on non-listed non-native species.

Resources		ALTERNATIVE		
		1 (No-action) **No Reintroduction, No Designation, and No Adoption of Protective Regulations**	**2 (Proposed Action)** **Reintroduction and Designation with Adoption of Limited Protective Regulations under ESA Section 4(d)**	**3 (Action Alternative)** **Reintroduction and Designation with Adoption of Current Salmon and Steelhead Section 4(d) Rule**
			interaction between the experimental population and other non-native fish species (i.e., brook trout, grass carp, or Lahontan cutthroat trout), little is known about the population status or life history of these species in the Okanogan subbasin, such that the level of interaction between the experimental spring-run Chinook salmon and non-native fish species cannot be assessed at this time. The regulatory protections afforded the experimental population under Alternative 2 would have no effect on the non-listed, non-native species.	
Aquatic Habitat	**Okanogan Basin Water Quality**	Absence of the reintroduction program and designation of an experimental population would preclude any effects on the water quality of the Okanogan subbasin	The release of an experimental population in the Okanogan subbasin would affect water quality primarily through an increase in marine-derived	Alternative 2 and 3 differ in terms of a separate section 4(d) rule specifically aimed at the experimental population. The regulatory protections afforded the

Resources		ALTERNATIVE		
		1 (No-action) **No Reintroduction, No Designation, and No Adoption of Protective Regulations**	**2 (Proposed Action)** **Reintroduction and Designation with Adoption of Limited Protective Regulations under ESA Section 4(d)**	**3 (Action Alternative)** **Reintroduction and Designation with Adoption of Current Salmon and Steelhead Section 4(d) Rule**
		resulting from the reintroduction. Reaches of the Okanogan mainstem and Similkameen Rivers would remain on the 2008 Clean Water Act section 303(d) list as water quality impaired for failure to meet temperature, dissolved oxygen, and pH standards. Localized areas of high levels of fine sediment in stream substrates as a result of high road densities would continue to impair invertebrate productivity, an important food source for rearing salmonids, until land use changes or habitat actions addressing the sources of sedimentation occur. Current levels of marine-derived nutrient transport and, therefore, availability of food for rearing	nutrients from the decomposing experimental population, and would provide a beneficial effect to the aquatic habitat in the Okanogan subbasin (i.e., availability of increased invertebrate food sources for rearing fishes and salmonid productivity, and growth of riparian forests). The increased decomposing salmon carcasses associated with the reintroduction are not expected to increase the biological oxygen demand and reduce the amount of dissolved oxygen in tributaries or the mainstem Okanogan River to any appreciable extent beyond that described for the No-action Alternative. Under the experimental population	experimental population under Alternative 3 would not directly affect on-the-ground water quality conditions. The biological consequences of Alternative 3 on water quality would be the same as for Alternative 2. The habitat improvement level of effort of key habitat restoration and water quality programs would be expected to be the same under Alternative 3 as under Alternative 2.

Resources		ALTERNATIVE		
		1 (No-action) **No Reintroduction, No Designation, and No Adoption of Protective Regulations**	**2 (Proposed Action)** **Reintroduction and Designation with Adoption of Limited Protective Regulations under ESA Section 4(d)**	**3 (Action Alternative)** **Reintroduction and Designation with Adoption of Current Salmon and Steelhead Section 4(d) Rule**
		fishes, growth of riparian forests, and salmonid productivity would be expected to continue. No additional decomposing salmon carcasses would be available to increase the biological oxygen demand and reduce the amount of dissolved oxygen in tributaries or the mainstem Okanogan River. Ongoing habitat improvement efforts by the CTCR would be expected to continue.	reintroduction program, the CTCR habitat improvement level of effort for key habitat restoration and water quality programs would continue as described under the No-action Alternative, except for the possibility of increased local entity incentives from a successful reintroduction for additional habitat improvement. Reaches of the Okanogan mainstem and Similkameen Rivers would remain on the 2008 Clean Water Act section 303(d) list as water quality impaired, and localized areas of high levels of fine sediment in stream substrates would continue as described under the No-action Alternative. While water quality benefits would be expected from the CTCR's habitat improvement	

Resources		ALTERNATIVE		
		1 (No-action) **No Reintroduction, No Designation, and No Adoption of Protective Regulations**	**2 (Proposed Action)** **Reintroduction and Designation with Adoption of Limited Protective Regulations under ESA Section 4(d)**	**3 (Action Alternative)** **Reintroduction and Designation with Adoption of Current Salmon and Steelhead Section 4(d) Rule**
			efforts, the level of benefit cannot be assessed at this time.	
	Okanogan Basin Water Quantity and Fish Passage	Absence of the reintroduction program and designation of an experimental population would preclude any effects on water quantity and fish passage in the Okanogan subbasin resulting from the reintroduction. Tributary dams and water diversions would continue to affect stream flow and fish passage in the action area of the Okanogan subbasin. Portions of Salmon Creek would continue to be dewatered during low flow periods, and salmon passage would continue to be difficult in mid- to late summer because of elevated water temperatures. Ongoing habitat improvement efforts by the CTCR would be expected to continue.	Release of an experimental population of UCR spring-run Chinook salmon in the Okanogan subbasin would have no direct effect on water quantity and fish passage. Any effect on Okanogan subbasin water quantity and fish passage resulting from the reintroduction would be indirect—namely, an increased incentive by the CTCR, and potentially other entities, to improve flows and fish passage conditions. While water quantity/ fish passage benefits would be expected from CTCR habitat improvements, the level of benefit cannot be assessed at this time.	Alternative 2 and 3 differ in terms of a separate section 4(d) rule specifically aimed at the experimental population. The regulatory protections afforded the experimental population under Alternative 3 would not directly affect on-the-ground water quantity and fish passage conditions. The effects of Alternative 3 on water quantity and fish passage would be the same as under Alternative 2. The habitat improvement level of effort of key habitat restoration and water quantity/fish passage programs would be expected to be the same under Alternative 3 as under Alternative 2.

Resources		ALTERNATIVE		
		1 (No-action) **No Reintroduction, No Designation, and No Adoption of Protective Regulations**	**2 (Proposed Action)** **Reintroduction and Designation with Adoption of Limited Protective Regulations under ESA Section 4(d)**	**3 (Action Alternative)** **Reintroduction and Designation with Adoption of Current Salmon and Steelhead Section 4(d) Rule**
	Okanogan Basin Habitat Availability	Absence of the reintroduction program and designation of an experimental population would preclude any effects on habitat availability in the Okanogan subbasin resulting from the reintroduction. Adequate tributary habitat for spring-run Chinook salmon spawning and rearing in the United States and Canadian portions of the Okanogan subbasin would continue to exist and be improved with the CTCR's habitat improvement efforts.	Release of an experimental population of UCR spring-run Chinook salmon in the Okanogan subbasin would have no direct effect on habitat availability. Any effect on habitat availability resulting from the reintroduction would be indirect—namely, an increased incentive by the CTCR, and potentially other entities, to create additional habitat in the future. Adequate tributary habitat for spring-run Chinook salmon spawning and rearing in the United States and Canadian portions of the Okanogan subbasin would continue to exist and be improved with the CTCR's habitat improvement efforts. Benefits from such improvements cannot be assessed at this time.	Alternative 2 and 3 differ in terms of a separate section 4(d) rule specifically aimed at the experimental population. The regulatory protections afforded the experimental population under Alternative 3 would not directly affect on-the-ground habitat availability. The effects of Alternative 3 on habitat availability would be the same as under Alternative 2.
Wildlife		Species for which salmonids provide foraging opportunities would	The release of up to 200,000 excess Methow Composite stock	The release of up to 200,000 excess Methow Composite stock

Resources	ALTERNATIVE		
	1 (No-action) **No Reintroduction, No Designation, and No Adoption of Protective Regulations**	**2 (Proposed Action)** **Reintroduction and Designation with Adoption of Limited Protective Regulations under ESA Section 4(d)**	**3 (Action Alternative)** **Reintroduction and Designation with Adoption of Current Salmon and Steelhead Section 4(d) Rule**
	continue to forage on fish and other food resources in the Okanogan subbasin. The No-action Alternative would not affect the availability of salmon and salmon carcasses.	smolts would likely increase the food resources available to species for which salmonids provide foraging opportunities, resulting in a beneficial effect on those species.	smolts would likely increase the food resources available to species for which salmonids provide foraging opportunities, resulting in a beneficial effect on those species. Application of the current salmon and steelhead ESA section 4(d) rule to the experimental population would result in a higher level of protection for the experimental population than under Alternative 2, potentially resulting in a greater increase in food resources, compared to the No-action Alternative.
Land Use and Ownership	The current salmon and steelhead ESA section 4(d) rule would continue to apply take prohibitions to actions carried out in the Okanogan subbasin by state, tribal, and local governments, as well as by	Take prohibitions under the current salmon and steelhead ESA section 4(d) rule would continue to apply. A new section 4(d) rule, applying to the experimental population, would not prohibit	Take prohibitions under the current salmon and steelhead ESA section 4(d) rule would continue to apply to UCR steelhead. The presence of additional fish to which the rule would apply could

Resources	ALTERNATIVE		
	1 (No-action) **No Reintroduction, No Designation, and No Adoption of Protective Regulations**	**2 (Proposed Action)** **Reintroduction and Designation with Adoption of Limited Protective Regulations under ESA Section 4(d)**	**3 (Action Alternative)** **Reintroduction and Designation with Adoption of Current Salmon and Steelhead Section 4(d) Rule**
	private parties. The potential for individual local entities to face liability under the ESA would be limited by the application of the current salmon and steelhead section 4(d) rule. Federal agencies that fund, carry out, or permit actions with the potential to affect ESA-listed species would continue to be required to consult with NMFS and USFWS to ensure those actions are not likely to jeopardize the continued existence of any endangered or threatened species or result in the adverse modification or destruction of designated critical habitat.	take of fish from that population if such take results from an otherwise lawful activity. Implementation of the new section 4(d) rule would not likely result in increased ESA liability, compared to the No-action Alternative. The ESA section 7(a)(2) consultation requirement would not apply to the experimental population in the Okanogan subbasin. Instead, federal agencies would merely be required to confer with NMFS before taking actions that are likely to jeopardize the continued existence of the species and would not, therefore, face a substantially increased regulatory burden compared to the No-action Alternative.	result in the implementation of additional restrictions on otherwise lawful land use activities. We cannot predict the nature or extent of any such restrictions, nor the activities to which they could apply. The potential for a substantial increase in ESA liability for local entities compared to the No-action Alternative would be low. The ESA section 7(a)(2) consultation requirement would not apply to the experimental population in the Okanogan subbasin.
Tourism and Recreation	The No-action Alternative would not	The release of up to 200,000	The release of up to 200,000

Resources	ALTERNATIVE		
	1 (No-action) **No Reintroduction, No Designation, and No Adoption of Protective Regulations**	**2 (Proposed Action)** **Reintroduction and Designation with Adoption of Limited Protective Regulations under ESA Section 4(d)**	**3 (Action Alternative)** **Reintroduction and Designation with Adoption of Current Salmon and Steelhead Section 4(d) Rule**
	affect the number of fish available for recreational fishing. Activities carried out under FMEPs—including recreational fishing—would continue to be exempt from take prohibitions under the current salmon and steelhead ESA section 4(d) rule.	excess Methow Composite stock smolts would likely increase the number of fish available for recreational fishing in the Okanogan subbasin compared to the No-action Alternative. Existing take exemptions under the current salmon and steelhead section 4(d) rule would continue. The new section 4(d) rule for the experimental population would not prohibit take of fish from that population if such take results from an otherwise lawful activity, including recreational fishing.	excess Methow Composite stock smolts would likely increase the number of fish available for recreational fishing in the Okanogan subbasin compared to the No-action Alternative. Existing take exemptions under the current salmon and steelhead section 4(d) rule would continue. The presence of additional fish to which the rule would apply could result in the implementation of additional restrictions on otherwise lawful land use activities. We cannot predict the nature or extent of any such restrictions.
Socioeconomics	Tourism associated with recreational fishing opportunities would likely continue to contribute to employment and wages in the analysis area.	The release of up to 200,000 excess Methow Composite stock smolts would likely increase the number of fish available for recreational fishing in the Okanogan subbasin compared to	The release of up to 200,000 excess Methow Composite stock smolts would likely increase the number of fish available for recreational fishing in the Okanogan subbasin compared to

Resources	ALTERNATIVE		
	1 (No-action) **No Reintroduction, No Designation, and No Adoption of Protective Regulations**	**2 (Proposed Action)** **Reintroduction and Designation with Adoption of Limited Protective Regulations under ESA Section 4(d)**	**3 (Action Alternative)** **Reintroduction and Designation with Adoption of Current Salmon and Steelhead Section 4(d) Rule**
	The current salmon and steelhead ESA section 4(d) rule would continue to prohibit take of UCR steelhead in the Okanogan subbasin. Federal agencies that fund, carry out, or permit actions with the potential to affect ESA-listed species would continue to be required to consult with NMFS and the USFWS to ensure those actions are not likely to jeopardize the continued existence of any endangered or threatened species or result in the adverse modification or destruction of designated critical habitat.	the No-action Alternative, with a possible concomitant increase in tourism and associated socioeconomic benefits. Opportunities to engage in recreational fishing would not be reduced by the implementation of any new restrictions under Alternative 2. Federal agencies that fund, carry out, or permit actions that may affect the experimental population would not face a substantially increased regulatory burden under Alternative 2, compared to the No-action Alternative. Any increases in regulatory costs would be minimal.	the No-action Alternative, with a possible concomitant increase in tourism and associated socioeconomic benefits. Existing take exemptions under the current salmon and steelhead section 4(d) rule would continue. The presence of additional fish to which the rule would apply could result in the implementation of additional restrictions on otherwise lawful land use activities. We cannot predict the nature or extent of any such restrictions. Federal agencies that fund, carry out, or permit actions that may affect the experimental population of UCR spring-run Chinook salmon in the Okanogan subbasin would not face a substantially increased regulatory burden compared to the No-action

Resources	ALTERNATIVE		
	1 (No-action) **No Reintroduction, No Designation, and No Adoption of Protective Regulations**	**2 (Proposed Action)** **Reintroduction and Designation with Adoption of Limited Protective Regulations under ESA Section 4(d)**	**3 (Action Alternative)** **Reintroduction and Designation with Adoption of Current Salmon and Steelhead Section 4(d) Rule**
			Alternative.
Cultural Resources	The No-action Alternative would not affect the availability of Chinook and sockeye salmon for ceremonial and subsistence fishing by CTCR tribal members in the analysis area.	The release of up to 200,000 excess Methow Composite stock smolts would likely increase the number of fish available in the Okanogan subbasin for ceremonial and subsistence fishing by CTCR tribal members.	The release of up to 200,000 excess Methow Composite stock smolts would likely increase the number of fish available in the Okanogan subbasin for ceremonial and subsistence fishing by CTCR tribal members. Application of the current salmon and steelhead ESA section 4(d) rule to the experimental population would result in a higher level of protection for the experimental population than under Alternative 2, potentially resulting in a greater increase in opportunities for tribal harvest of excess adult salmon returning to the Okanogan subbasin, compared to the No-action Alternative.

5.0 CUMULATIVE EFFECTS

NEPA defines cumulative impacts as "the impact on the environment which 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 other actions" (40 CFR 1508.7). Section 3, Affected Environment, describes the baseline conditions for each resource and reflects the effects of past and existing actions (including actions by private landowners, municipalities, the State, the Federal Government, and other interests). Section 4, Environmental Consequences, evaluates the direct and indirect effects of the alternatives on each resource's baseline conditions. Section 5, Cumulative Effects, now 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 the resources that would potentially be affected by the action alternatives are analyzed for cumulative effects.

The time frame for the cumulative effects analyses corresponds to the time frame for long-term effects discussed in Subsection 4.1.1.5, Short-term and Long-term Timeframes Used for Analyses. The analysis areas for cumulative effects vary by resource, depending on the geographic area of the direct and indirect effects being analyzed. For physical and biological resources, as well as land use and cultural resources, the cumulative effects analysis area consists of the Okanogan subbasin. For social resources (i.e., tourism and recreation, socioeconomics), the cumulative effects analysis area consists of Okanogan and Douglas Counties and the Colville Reservation.

As discussed in the cumulative effects analysis that was conducted for the Chief Joseph Hatchery program, ongoing and reasonably foreseeable future actions are likely to contribute to adverse effects on aquatic habitat and other environmental conditions for fish and wildlife species in the analysis area. Such actions include agriculture, residential development, road construction and use, and the operation of hydroelectric projects (BPA 2009). The effects of these actions include habitat loss, habitat degradation, and disruption of essential behaviors such as breeding and foraging (BPA 2009).

Another contributory factor to adverse effects on physical and biological resources in the analysis area is climate change. A scientific consensus exists that, because of past and continuing accumulations of carbon dioxide and other greenhouse gases in the atmosphere, worldwide temperatures are rising and many natural systems are being affected (IPCC 2007). Climate change is likely to reduce the amount and impair the quality and accessibility of suitable habitat for many species, exacerbating the adverse effects of other reasonably foreseeable future actions. 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. 2009).

Many of the potential adverse effects of other actions in the analysis area (identified above) would be avoided or offset through the implementation of federal, state, and local statutes and regulations, many of which entail review and permitting processes for proposed projects. Projects with the greatest potential to affect fish and fish-dependent resources—that is, projects occurring in or near the water—are subject to particular scrutiny through several regulatory avenues. Examples of reviews and permits that would limit the potential for adverse effects on physical and biological resources include the following:

- ESA section 7 consultations on federal actions that may affect species listed as threatened or endangered under the ESA
- NEPA and State Environmental Policy Act reviews of agency actions with the potential to significantly affect the quality of the environment
- Clean Water Act section 404 permits for excavating, clearing land, or discharging dredged or fill material into waters of the United States, including wetlands
- Hydraulic Project 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, frequently flooded areas) or in protective buffer zones

In addition to the potential benefits offered by the statutes and permitting processes identified above, many planned and ongoing projects in the Okanogan subbasin are directed at restoring habitat and contributing to the recovery of fish populations. These projects include increasing stream flows, improving fish passage, screening diversions, reducing sediment loads, and restoring stream channel and riparian habitats, and are described further in the cumulative effects analysis in the EIS for the Chief Joseph Hatchery program (BPA 2009). Over the long term, all of these recovery and restoration efforts are expected to result in improved conditions for fish. To the extent that these efforts result in increased numbers of fish in the analysis area, resources that rely on fish (e.g., wildlife that consume fish, recreational fishing and associated economic activity, ceremonial and subsistence fishing by CTCR tribal members) would also be expected to benefit.

As described in Section 4, Environmental Consequences, the direct and indirect effects of either action alternative on fish, aquatic habitat, and fish-dependent resources (i.e., wildlife, tourism and recreation, cultural resources) would be largely positive. These effects would stem primarily from the increased availability of fish in the Okanogan subbasin. Potential negative effects would include an elevated risk of incidental take of UCR steelhead during monitoring and evaluation activities associated with the experimental population of UCR spring-run Chinook salmon, as well as possible competition and other interactions with other species. Potential negative effects on social resources under Alternative 3 include a potential for the implementation of additional restrictions on otherwise lawful activities, including recreational fishing. These effects would not occur under Alternative 2.

Based on the spatial and temporal overlap of the effects of the action alternatives with those of the reasonably foreseeable future actions identified above, the possibility exists for interactions between the two sets of effects, indicating the potential for cumulative effects. We do not expect any substantial adverse effects on fish and wildlife species or their habitat, however, for several reasons. First, neither of the action alternatives would be likely to result in adverse effects on any of the fish species addressed in Subsection 4.2 through Subsection 4.4, or on aquatic habitat (Subsection 4.5), wildlife (Subsection 4.6), fishing-related tourism and recreation (Subsection 4.8), fishing-related economic activity (Subsection 4.9), and cultural resources (Subsection 4.10). Second, the effects of many reasonably foreseeable future actions would be beneficial rather than adverse. Third, many potentially adverse effects of reasonably foreseeable future actions would be avoided, minimized, or mitigated through the implementation of protective measures required under federal, state, and/or local review processes.

Monitoring and evaluation activities associated with the experimental population of UCR spring-run Chinook salmon under the action alternatives could result in incidental take of UCR steelhead. NMFS would analyze these actions under ESA section 7, however, and would allow such take to occur only if it would not jeopardize the continued existence of the listed UCR steelhead. Similarly, other federally authorized or funded activities would be allowed only if they would not jeopardize the species. For proposed actions that are likely to adversely affect ESA-listed species, the section 7 consultation must address the cumulative effects of other federal actions. Through those consultation processes, the potential for the action alternatives, in combination with future federal actions, to result in substantial adverse effects on UCR steelhead would be further reduced. The potential for non-federal actions to adversely affect these species would be minimized through the application of the federal, state, and local regulatory review and permitting processes identified above.

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7.0 GLOSSARY OF KEY TERMS

Action area: Geographic area where the proposed action will take place.

Adfluvial: Fish migrating between rivers or streams and lakes.

Anadromous: Fish that hatch and rear in fresh water, migrate to the ocean to grow and mature, and return to fresh water to spawn.

Anadromy: 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.

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 or vertebrate fish or wildlife that interbreeds when mature. 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 NMFS policy of Pacific salmon, a population or group of populations will be considered a distinct population segment if it represents an evolutionarily significant unit of the biological species. In contrast to salmon, the National Marine Fisheries Service (NMFS) listed steelhead runs under the joint NMFS-United States Fish and Wildlife Service (USFWS) Policy for recognizing distinct population segments (Distinct Population Segment Policy: 61 Federal Register 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.

Evolutionarily significant unit (ESU): The ESA defines 'species' to include subspecies and 'distinct population segments' of vertebrates (16 USC §1532(16); 50 CFR 424.02 (k)). For Pacific salmon, we determined that an ESU constitutes a distinct population segment (56 Fed. Reg. 58612, November 20, 1991). A group of Pacific salmon is an ESU if it is (1) substantially reproductively isolated from other salmon of the same species and (2) represents an important component of the evolutionary legacy of the species.

Fluvial: Fish migrating between rivers and/or streams.

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.

Hyporheic zone: The saturated sediment environment below a stream or river that exchanges ground water and nutrients with surface flowing waters.

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.

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.

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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