8.0 Essential Fish Habitat Assessment for Bureau of Reclamation Rogue River Basin Project Operations

8.1 Action Agency

Bureau of Reclamation, Pacific Northwest Region, Lower Columbia Area

8.2 Project Name

Continued Operation and Maintenance of the Rogue River Basin Project Talent Division, Oregon

8.3 Essential Fish Habitat Background

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) mandates Federal action agencies which fund, permit, or carry out activities that may adversely impact the essential fish habitat (EFH) of federally-managed fish species to consult with the National Marine Fisheries Service (NMFS) regarding the potential adverse effects of their actions on EFH (Section 305 (b)(2)). §Section 600.920(a)(1) of the EFH final regulations state that consultations are required of Federal action agencies for renewals, reviews, or substantial revisions of actions if the renewal, review, or revision may adversely affect EFH. The EFH regulations require that Federal action agencies obligated to consult on EFH also provide NMFS with a written assessment of the effects of their action on EFH (50 CFR § 600.920). Under Appendix A of Amendment 14 to the Pacific Coast Salmon Fishery Management Plan (PFMC, 1999), the Pacific Fisheries Management Council has identified and described EFH for SONCC Chinook salmon and SONCC coho salmon in the middle Rogue River HUC and upper Klamath River HUC within the proposed action area. The statute also requires Federal action agencies receiving NMFS EFH Conservation Recommendations to provide a detailed written response to NMFS within 30 days upon receipt detailing how they intend to avoid, mitigate or offset the impact of the activity on EFH (Section 305(b)(4)(B)).

The objective of this EFH assessment is to describe potential adverse effects to designated EFH for federally-managed fisheries species within the proposed action area. It also describes conservation measures proposed to avoid, minimize, or otherwise offset potential adverse effects to designated EFH resulting from the proposed action.

8.4 Identification of Essential Fish Habitat

The geographic extent of freshwater EFH for the Pacific salmon fishery is proposed as waters currently or historically accessible to salmon within specific U.S. Geological Survey hydrologic units (PFMC 1999). For the Rogue River Basin Project (Project), the aquatic areas identified as EFH for SONCC Chinook salmon and SONCC coho salmon are within the designated critical habitat for coho salmon (Figure 4-1). This includes:

1. Bear Creek and its tributaries downstream from Emigrant Dam (Rogue River basin);
2. The entire Little Butte Creek drainage downstream from Fish Lake Dam on North Fork Little Butte Creek and Agate Dam on Antelope Creek (Rogue River basin); and
3. Klamath River and its tributaries downstream from Iron Gate Dam (Klamath River basin) (PFMC 1999).

Essential fish habitat is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. For the purpose of interpreting the definition of EFH, "waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means habitat required to support a sustainable fishery and a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle.

Reclamation's proposed operation is described in Chapter 2 of the BA for the Project. Chapter 6 of the BA addresses impacts to the threatened Northern California/ Southern Oregon ESU coho salmon (*Oncorhynchus kisutch*), listed as threatened under the Endangered Species Act (ESA). These impacts include adverse effects to the habitat conditions required by coho salmon and which are also identified EFH as provided by the Magnuson-Stevens Act. The Rogue River and Klamath River basins also provide EFH to SONCC Chinook salmon (*O. tshawytscha*), which are covered under the EFH provisions of Magnuson-Stevens Act but are not listed under the ESA. This EFH consultation addresses both species but also refers the reader to more specific information pertaining to the habitat requirements of coho salmon contained in the BA.

8.5 Essential Fish Habitat Requirements for Chinook Salmon and Coho Salmon

Chinook: General life history information for Chinook salmon is summarized below. Further detailed information on Chinook salmon is available in the NMFS status review of Chinook salmon from Washington, Idaho, Oregon, and California (Myers et al. 1998), and the NMFS proposed rule for listing several ESUs of Chinook salmon (NMFS 1998).

The Rogue River and Klamath River basins contain populations of spring-run and fall-run Chinook (Campbell and Moyle 1990, Healey 1991; Vogt, personal communication). Within these basins, there are statistically significant, but fairly modest, genetic differences between the fall and spring runs. The majority of spring- and fall-run fish emigrate to the marine environment primarily as subyearlings, but have a significant proportion of yearling smolts. These Chinook salmon populations all exhibit an ocean-type life history. The majority of fish emigrate to the ocean as subyearlings, although yearling smolts can constitute up to approximately a fifth of outmigrants. However, the proportion of fish which smolt as sub-yearling versus yearling varies from year to year (Snyder 1931, Schluchter and Lichatowich 1977, Nicholas and Hankin 1988, Barnhart 1995). This fluctuation in age at smoltification is more characteristic of an ocean-type life history.

Coho: General life history information for coho salmon is provided in the BA (Chapter 3) and further information is available in the status review (Weitkamp et al. 1995). Primarily, adult and juvenile coho salmon are observed in tributaries and main stems of Bear Creek, Little Butte Creek, and the Klamath River downstream from Iron Gate Dam.

8.5.1 Adult Immigration and Spawning

Chinook*:* Run timing for spring-run Chinook salmon in the Klamath River typically begins in March and continues through August, with peak migration occurring in May and June (Table 8-1). Hardy and Addley (2001) noted that spring Chinook can enter as early as February. Run timing for fall-run Chinook salmon varies depending on the size of the river. In the lower reaches of the Klamath River, fall-run freshwater entry begins later in October, with peak spawning in late November and December–often extending into January (Leidy and Leidy 1984, Nicholas and Hankin 1988, Barnhart 1995). Late-fall or "snow" Chinook salmon from Blue Creek, on the lower Klamath River, were described as resembling the fall-run fish from the Smith River in run and spawning timing, as well as the degree of sexual maturation at the time of river entry (Snyder 1931).

Table 8-1. Summary of timing for key salmon life history events related to EFH.

	Adult Immigration	Spawning	Smolt Emigration
Spring run Chinook	Feb. – Aug.	Late Aug - Sept. peak in Sept.	March - July
Fall run Chinook	Aug. - Sept.	Sept. - early Jan.	April - June
Late-fall run	Nov.- Dec. but may be as late as Feb.	Unavailable	Unavailable
Coho salmon	Sept. - December	Nov. - March	April - July with peak in May

In the Rogue River basin, adult spring Chinook migrate upstream past Gold Ray Dam before August 15; fall Chinook pass this point after August 15 (Vogt, personal communication). Fall Chinook salmon have been observed by the Oregon Department of Fish and Wildlife (ODFW) as far upstream as river mile 23 in Bear Creek; about 4 miles downstream from the confluence of Walker and Emigrant creeks (Vogt, personal communication). Fall Chinook spawning in Bear Creek occurs in November and December. Little spawning habitat occurs in Emigrant Creek downstream from Emigrant Dam. Spring Chinook have been observed about 1.5 miles upstream in South Fork Little Butte Creek. Fall Chinook spawn up to the confluence of North and South Fork Little Butte creeks (Vogt, personal communication). Chinook salmon probably do not spawn very much in Antelope Creek due to its small size.

All Chinook stocks utilize resting pools as they migrate upstream (Myers et al. 1998). As noted in Myers et al. (1998), these pools provide an energetic refuge from river currents, a thermal refuge from high summer and autumn temperatures, and a refuge from potential predators (Berman and Quinn 1991, Hockersmith et al. 1994). Furthermore, the utilization of resting pools may maximize the success of the spawning migration through decreases in metabolic rate and the potential reduction in susceptibility to pathogens (Bouck et al. 1975, Berman and Quinn 1991).

Spawning for spring run Chinook salmon may occur from September through mid - November (Hardy and Addley 2001) and can peak in September (Myers et al. 1998).

Historically, spring-run spawning areas were located in the river headwaters (generally above 400 m). Spawning for fall-run Chinook begins in September through early January.

Coho: In general, river entry and spawn timing showed considerable spatial and temporal variability. Most coho salmon enter rivers between September and February and spawn from November to January (Hassler 1987), and occasionally into February and March (Weitkamp et al. 1995).

8.5.2 Spawning Habitat

Chinook: Chinook salmon spawning generally occurs in swift, relatively shallow riffles or along the edges of fast runs at depths greater than 6 inches, usually 1-3 feet to 10-15 feet. Preferred spawning substrate is clean and loose, medium to large-sized gravel. Hardy and Addley (2001) report that Chinook also use small cobble substrate. Physical habitat modeling indicates that spawning habitat is maximized at approximately 1,300 cfs in the Klamath River between Iron Gate Dam and Shasta River during the October - February time frame (Hardy and Addley 2001). Similar data do not exist for the Rogue River, Bear Creek, or Little Butte Creek. Egg incubation generally occurs from 40-60 days with alevins and fry remaining in the gravel between 2 - 4 weeks and emerging during December. Hardy and Addley (2001) reported that suitable incubation temperatures were assumed to be between approximately 5 °C (41 °F) and 14 °C (57 °F) as significant mortality occurs beyond this range.

Coho: In general, earlier migrating fish spawn farther upstream within a basin than later migrating fish, which enter rivers in a more advanced state of sexual maturity (Sandercock 1991). Spawning is concentrated in riffles or in gravel deposits at the downstream end of pools with suitable water depth and velocity.

Coho salmon eggs incubate for approximately 35 to 50 days between November and March. The duration of incubation may change depending on ambient water temperatures (Shapovalov and Taft 1954). Successful incubation depends on several factors including dissolved oxygen levels, temperature, substrate size, amount of fine sediment, and water velocity.

8.5.3 Rearing Habitat

Chinook: At the time of emergence from their gravel nests, most fry disperse downstream towards the estuary, hiding in the gravel or stationing in calm, shallow waters with fine sediment substrates and riparian bank cover such as tree roots, logs, and submerged or overhead vegetation. As they grow, the juveniles associate with coarser substrates along the stream margin or farther from shore (Healey 1991). Along the emigration route, submerged and overhead cover in the form of rocks, submerged aquatic vegetation, logs, riparian vegetation, and undercut banks provide food, shade and protect juveniles from predation. Chinook salmon in the Southern Oregon and California Coastal ESU exhibit an ocean-type life history, that is, they typically migrate to seawater in their first year of life (NMFS 1998). However, when environmental conditions are not conducive to subyearling emigration, ocean-type Chinook salmon may remain in freshwater for their entire first year (NMFS 1998).

The fish rear in calm, marginal areas of the river, particularly back eddies, behind fallen trees, near undercut tree roots or over areas of bank cover, and emigrate as smolts from April through June. Hardy and Addley (2001) noted that Chinook fry utilized habitat along the stream margins in association with cover versus the use of the main river channel. The authors also noted that a relatively small proportion of Chinook fry were found associated with substrate specific cover compared to inundated streamside vegetation cover types at depths less than 2 feet. This association with shallow, vegetative escape cover indicates the importance of riparian habitat to the early life history stage of juvenile Chinook.

Principal foods of Chinook while rearing in freshwater and estuarine environments are larval and adult insects and zooplankton such as *Daphnia,* flies, gnats, mosquitoes or copepods (Kjelson et al. 1982), stonefly nymphs or beetle larvae (Chapman and Quistdorff 1938) as well as other estuarine and freshwater invertebrates.

Coho: Fry start emerging from the gravel two to three weeks after hatching (Hassler 1987). Following emergence, fry move into shallow areas near the stream banks. As coho salmon fry grow larger, they disperse upstream and downstream and establish and defend a territory (Hassler 1987).

During the summer, coho salmon fry prefer pools featuring adequate cover such as large woody debris, undercut banks, and overhanging vegetation. Juvenile coho salmon prefer to over-winter in large main stem pools, backwater areas and secondary pools with large woody debris, and undercut bank areas (Hassler 1987, Heifetz et al. 1986). Juveniles primarily eat aquatic and terrestrial insects (Sandercock 1991).

Coho salmon typically rear in fresh water for up to 15 months, then migrate to the sea as smolts between March and June (Weitkamp et al. 1995).

8.6 Potential Adverse Effects of Proposed Project

As described in the BA, the proposed action can adversely affect coho salmon by decreasing survival and abundance of several freshwater life history stages of coho, including fry, juveniles, and outmigrating smolts. Although adult coho may be adversely affected by the proposed action in the Rogue River basin, adverse effects to the EFH of Chinook salmon may be greater due to their greater reliance on Little Butte Creek and Bear Creek mainstem habitat and less on tributaries. However, the following summarizes the adverse affects to EFH for both species. Minimal impact is expected in the Klamath River with the minor transbasin diversion under Reclamation's control.

During October through March, the proposed action could adversely affect the EFH function of providing passage conditions for upstream migrating salmon and their spawning success in the Bear Creek and Little Butte Creek drainages. Reclamation-owned diversion structures (i.e. Antelope Creek, Ashland, Oak Street, and Phoenix) all meet NMFS fish protection criteria. However, some Reclamation-owned canals that cross tributaries to Little Butte Creek and Bear Creek (see Tables 4-9, 4-10, and 4-11) likely cause adult fish migration delays and juvenile losses where they do not meet NMFS fish protection criteria.

Spring flows in the main stems and tributaries of Bear Creek and Little Butte Creek provide important EFH that supports rearing functions. During spring months, the proposed action will reduce flows which will adversely affect salmon fry rearing for individuals either originating from the main stems or migrating down from tributaries. Because the amount of suitable EFH in the stream channels is related to the amount of flow for rearing salmon, salmon fry may be adversely affected if sufficient flows are not maintained at appropriate levels. The survival of Chinook salmon fry that cannot find suitable rearing EFH will most likely be adversely affected, thereby resulting in reduced numbers of salmon.

As noted in the section on rearing habitat, much of the salmon rearing is associated with riparian corridors. The riparian zone acts as the interface between terrestrial and aquatic ecosystems by moderating the effects of upslope processes and provides important ecological functions including bank stabilization, nutrient cycling, food-web support, and important stream microclimate and shading functions (Spence et al.

1996, Flosi et al. 1998, NRC 2002). Riparian vegetation, including shaded riverine aquatic (SRA) cover, provides juvenile salmon cover from predators, increases habitat complexity, provides a source of insect prey and provides shade for maintaining water temperatures within suitable ranges for all life stages. The functional values of riparian corridors and the benefits they provide to stream fish populations are well documented (Karr and Schlosser 1978, Wesche et al. 1987, Gregory et al. 1991, Caselle et al. 1994, Wang et al. 1997). As noted by the NRC (2002), the reintroduction or maintenance of the full range of flow regimes to mimic the natural hydrograph, in addition to minimum stream flow, is essential for restoring and sustaining, respectively, healthy riparian systems. The proposed action may result in flows that frequently create conditions that effectively separate much of the riparian zone from the waters of the river, thereby limiting the function of the riparian zone.

In addition to supporting important riparian habitat functions, springtime high flows also facilitate the outmigration of salmon smolts. Although specific relationships between Bear Creek and Little Butte Creek flows and smolt survival have not been established, information from other locations indicates a positive relationship between smolt survival and river flows. Thus, the proposed action will likely affect coho and Chinook smolt survival because of reduced flows.

Adverse effects to EFH will also result from reductions in water quality (e.g., water temperatures). While the relationship between flows and water temperature is poorly understood, the BA concluded that Project irrigation withdrawal at Reclamation-owned diversion dams in Little Butte Creek and Bear Creek removes a majority of the flow and is a contributing factor to water temperatures exceeding the Oregon standard. Minimal adverse effects would occur in stream temperatures in the Klamath River with Rogue River Basin Project-related flow depletions.

8.7 Essential Fish Habitat Conservation Measures

Water conservation and water quality improvement projects contribute to Bear Creek watershed water quality improvements. These projects will continue into the future. An investigation should be conducted to establish which Bear Creek Project diversions and canals that cross tributaries owned by Reclamation warrant corrective fish passage actions. In addition, streamflow requirements of coho and Chinook salmon need to be quantified in the Little Butte Creek and Bear Creek systems that would allow a better prediction of the effects of Federal water operations on stream fish habitat. Additional conservation measures will be developed at the completion of consultation.

8.8 Conclusion

Upon review of the effects, Reclamation's continued operation and maintenance will adversely affect the spawning, rearing and migratory EFH functions of Pacific salmon currently or previously managed under the Magnuson-Stevens Act in Bear Creek and Little Butte Creek and their tributaries. The proposed action would result in a continued decline in EFH conditions in the Rogue River basin over time, and thereby preclude rebuilding of the SONCC coho salmon population and reduce the habitat required to support a sustainable Chinook fishery. Minimal impact to EFH is expected to occur in the Klamath River.

8.9 References

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