ATTACHMENT E – BIOLOGICAL ASSESSMENT

Biological and Essential Fish Habitat Assessment For The Beebe Springs Natural Area Development Phase 3 Project

Chelan, Washington

Prepared by: URS Corporation

For

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May 2010

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ACRONYMS AND ABBREVIATIONS

BA	Biological Assessment
BMP	Best Management Practices
CHSU	Critical Habitat Sub Unit
DPS	Distinct Population Segment
ECOLOGY	Washington State Department of Ecology
EFH	Essential Fish Habitat
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FMO	Foraging, Migratory, and Overwintering
FMP	Fishery Management Plan
HUC	Hydrologic Unit Code
LWD	Large Woody Debris
OHW	Ordinary High Water
NFIP	National Flood Insurance Program
NMFS	National Marine Fisheries Service (also known as NOAA Fisheries)
PCE	Primary Constituent Elements
PHS	Priority Habitats and Species
RM	River Mile
SERVICES	USFWS and NMFS
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WRIA	Watershed Resource Inventory Area

EXECUTIVE SUMMARY

In 2003, the Washington State Department of Fish and Wildlife (WDFW) acquired 182 acres surrounding the Chelan Fish Hatchery. The acquisition provided the opportunity to preserve low elevation Columbia Basin riparian and shrub-steppe habitat, restore habitats on the portion of the property formerly in orchard, and develop education and interpretive opportunities. The Beebe Springs Natural Area will be created on 120 acres of this property. This property sits north of Beebe Bridge along the western shore of Lake Entiat, a reservoir (also known as Rocky Reach Reservoir) on the mainstem of the Columbia River created by Rocky Reach Dam, a hydroelectric dam operated by the Chelan Public Utility District No. 1 (CPUD), Wenatchee, Washington. Highway 97 bisects the property north and south. To the west of Highway 97, the property is composed of post-agricultural lands and native shrub-steppe, cliffs, and talus natural areas. Two springs (North and South Beebe Springs) on the west margin of the property erupted into existence during the Ribbon Cliff earthquake of 1872 and later subsided to form the two, Beebe Springs and Beebe Springs Creek. About 1.5 miles to the south is the town of Chelan Falls, and the City of Chelan is approximately 2.5 miles to the west.

The majority of the proposed development area includes 60 acres that gently slope from Highway 97 east toward the Columbia River. A large rock outcrop is located at the northern part of the property and is abutted by a wetland and pond. The riparian zone along the Columbia, where not impacted by past orchard activities, contains a diverse mix of native and non-native, including invasive species. Narrow strips of fringe wetland border the Columbia River along most of the site, especially in the southern portion.

This Biological Assessment for Phase 3 of the Beebe Springs Natural Area Development considers the creation of a series of new side channels (including a rearing side channel to provide refuge for juvenile salmonids) to Lake Entiat (Columbia River), the enhancement and creation of wetlands, planting of upland and riparian vegetation, removal of a dirt road and two culverts on the south channel of Beebe Springs Creek, enhancement of aquatic habitat in Beebe Springs Creek, hand-carry boat launch, and construction of trails with viewpoints and a viewing pier. Additional phases of this habitat enhancement and watchable wildlife project will be completed at a later date when additional funding is obtained. Phase 1 included the creation of a new spawning/rearing channel (north channel) of Beebe Springs Creek to increase available spawning and rearing habitat for native salmonids. The channel was created to encourage and increase the number of summer/fall-run Chinook salmon, summer-run steelhead (listed as threatened under the ESA), and coho salmon spawning and rearing in Beebe Springs Creek. This channel was completed in 2006 and approximately two thirds of the creek flow is being directed into this channel, with the remainder directed into the original channel (south channel), which serves as additional salmonid habitat and as an overflow channel. Flows in the two channels of Beebe Springs Creek below Highway 97 will be monitored and adjusted to optimize access and available spawning and rearing for salmonids.

Phase 2 included the creation of a side channel to Lake Entiat, the enhancement of wetlands, restoration of upland and riparian vegetation, improved site access from Highway 97 and a portion

of the parking area, as well as trails with three pedestrian bridges, viewpoints, and interpretive displays.

The key goals of this Biological and Essential Fish Habitat Assessment are to determine the level of effect (if any) of the project (Phase 3) on protected species and critical habitats in the project vicinity and to communicate these findings to the federal agencies. Initial consultation with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) resulted in a list of endangered, threatened, proposed, and candidate species and critical habitats listed under the Endangered Species Act (ESA) that are likely to be found in the project vicinity. The species identified were: upper Columbia River spring-run Evolutionarily Significant Unit (ESU) of Chinook salmon (*Oncorhynchus tshawytscha*), upper Columbia River Distinct Population Segment (DPS) of steelhead trout (*O. mykiss*), Columbia River bull trout (*Salvelinus confluentus*) DPS, marbled murrelet (*Brachyramphus marmoratus*), northern spotted owl (*Strix occidentalis caurina*), Canada lynx (*Lynx canadensis*), grizzly bear (*Ursus arctos horribilis*), Ute ladies'-tresses (*Spiranthes diluvialis*) gray wolf (*Canis lupus*), showy stickseed (*Hackelia venusta*), Wenatchee Mountains checker-mallow (*Sidalcea oregano* var. *calva*). Of these, only spring-run Chinook salmon, steelhead trout, bull trout, and Ute ladies'-tresses have been documented to occur in the proposed action area. The remaining seven species (grizzly bear, Canada lynx, marbled murrelet, spotted owl, gray wolf, showy stickseed, and the Wenatchee Mountains checker-mallow) are unlikely to occur in the proposed action area due to a lack of suitable habitat, distance from suitable habitat or documented populations, or lack of migratory corridors to known populations. Critical habitat has been designated for the upper Columbia River spring-run Chinook salmon ESU, upper Columbia River steelhead trout DPS, Columbia River bull trout DPS, Canada lynx, gray wolf, and Wenatchee Mountains checker-mallow; but only designated critical habitat for Chinook salmon and steelhead trout occurs in the proposed action area. A list of Essential Fish Habitat (EFH) species protected under the Magnuson-Stevens Act was also obtained and includes: Chinook salmon and coho salmon (*O. kisutch*). This Biological and Essential Fish Habitat Assessment evaluates potential impacts to these species and their habitat from project implementation based on existing information about the project site's current habitat conditions and suitability for providing the life history requirements of these species. A summary of potential effects to ESA species, critical habitat, and EFH is provided in Tables E-1 and E-2.

This BA is also prepared with the understanding that the proposed Phase 3 activities will all be carried out within the bounds of the protocols established in the July 8, 2008 Biological Opinion (NMFS Tracking No. 2008/03598 and FWS No. 13410-2008-FWS # F 0209) for the Washington State Fish Passage and Habitat Enhancement Programmatic Consultation.

Table E-1
ESA Effects Determination

Species*	ESA Status	Jurisdiction	Effects – Construction	Effects – Long Term	Effects to Critical Habitat
Chinook Salmon (*Oncorhynchus tshawytscha*)	Endangered	NMFS	May affect, not likely to adversely affect	Beneficial-Creation of side channel habitat & revegetation of riparian zone	May affect, not likely to adversely affect
Steelhead Trout (*Oncorhynchus mykiss*)	Threatened	NMFS	May affect, not likely to adversely affect	Beneficial- Creation of side channel habitat & revegetation of riparian zone	May affect, not likely to adversely affect
Bull Trout (*Salvelinus confluentus*)	Threatened	USFWS	May affect, not likely to adversely affect	Beneficial- Creation of side channel habitat & revegetation of riparian zone	Will not destroy or adversely modify/not likely to adversely affect proposed critical habitat
Ute Ladies'-Tresses (*Spiranthes diluvialis*)	Threatened	USFWS	May affect, not likely to adversely affect	Beneficial-Creation of side channel wetland habitat	Critical habitat has not been designated

* These ESA species either occur or have the potential to occur within the Action Area

Table E-2
EFH Effects Determination-Pacific Salmon

Species	Hydrologic Unit Code (HUC)	Effects Determination
Chinook Salmon (*O. tshawytscha*)	Upper Columbia River-Entiat: HUC 17020010	No adverse effect
Coho Salmon (*O. kisutch*)	Upper Columbia River-Entiat: HUC 17020010	No adverse effect

1.0 INTRODUCTION

This Biological Assessment (BA), including an Essential Fish Habitat Assessment, is being prepared to examine whether or not the Beebe Springs Natural Area Development Phase 3 Project in Chelan County, Washington, would affect federally listed and proposed threatened and endangered species or candidates and critical habitats listed under the Endangered Species Act, or Essential Fish Habitat species protected under the Magnuson-Stevens Act. This BA identifies the project impacts, including direct, indirect, interrelated, and interdependent effects, and states conservation measures to be implemented to mitigate those impacts. This BA is also prepared with the understanding that the proposed Phase 3 activities will all be carried out within the bounds of the protocols established in the July 8, 2008 Biological Opinion (NMFS Tracking No. 2008/03598 and FWS No. 13410-2008-FWS # F 0209) for the Washington State Fish Passage and Habitat Enhancement Programmatic Consultation.

A BA is required for federal activities (projects that are authorized, funded or carried out by a federal agency) under Section 7 (c) of the ESA of 1973, as amended. An Essential Fish Habitat Assessment is required for federal activities that may adversely affect EFH. Because of this dual obligation, the Federal action agency and NMFS can find efficiencies by integrating ESA and EFH consultations. EFH consultations can be completed using the ESA section 7 consultation process provided that the Federal action agency supplies the information required by 50 CFR 600.920(g) for an EFH Assessment, and NMFS clearly distinguishes its EFH Conservation Recommendations from ESA Conservation Recommendations under 50 CFR 402.14(j) or any other ESA measures or conditions (NMFS 2001). State agencies and private parties are not required to consult with the Services on ESA or EFH unless state or private actions require a federal permit or receive federal funding (NMFS 1996, 1999a).

Information for this BA was gathered from several sources including recent literature, Washington Department of Fish and Wildlife (WDFW) priority habitat and species (PHS) data, NMFS, USFWS, Washington Department of Natural Resources (WDNR), local agency biologists, and agency species lists (see Appendix A Species Request Letters).

2.0 PROJECT LOCATION

The project site is located in the Chelan Water Resource Inventory Area (WRIA) 47, in Chelan County, Washington (Figure 1 Site Vicinity and Action Area Map). Construction activities will occur in Township 27N, Range 23E, Section 20, Willamette Meridian.

3.0 PROJECT AREA

The "project area" is defined as all areas where project activities would occur (NMFS 2004a). The Phase 3 project area discussed in this document is within the Beebe Springs Creek subbasin of Lake Entiat, a reservoir on the mainstem of the Columbia River and the shoreline of Lake Entiat. The Phase 3 project area is bounded on the west by Highway 97 and on the east by the shoreline of Lake Entiat. The project area extends north along approximately 16,600 feet of Lake Entiat shoreline from the west side of Beebe Bridge. The area includes the new Beebe Springs Creek north (spawning/rearing) channel created during Phase 1 construction in 2006 and approximately 700 feet of Lake Entiat shoreline where a new side channel and wetland habitat was created during Phase 2 construction in 2009.

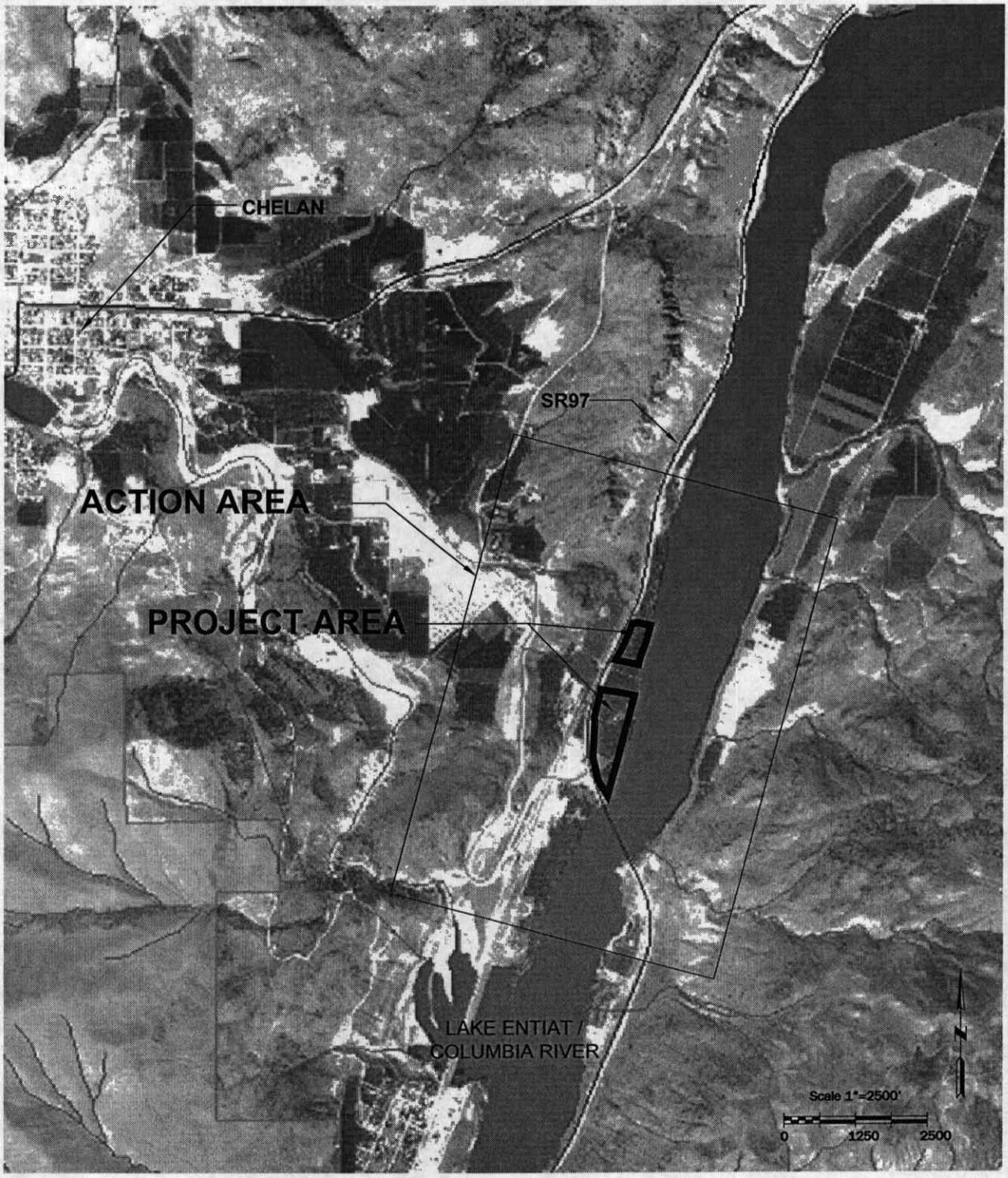
The project area is wholly within the Beebe Springs Creek subbasin and nearshore habitat of Lake Entiat (see Figure 1 of 27 Vicinity Map, Appendix C (Project Plan and Concept Drawings). Photographs of the proposed project action area are presented in Appendix B. All major machinery and staging area activities would occur along the roads and on adjacent property. The north and south side channels will be excavated in the dry and in-water work confined to excavating openings to Lake Entiat deep enough to avoid stranding fish in the new side channels. The window for Lake Entiat in-water work is October 15 to February 28 and the work window for Beebe Springs Creek flow diversion and in-water work is July1 to August 31. The pilings for the viewing pier will be constructed in the dry during a period of the in-water work window when the lake is drawn down. The boardwalks across the north and south channels will be constructed in the dry before the side channels are opened to the lake. The boardwalks will be constructed with their foundations above the Ordinary High Water (OHW) mark of Lake Entiat. A farm road with two concrete culverts crosses Beebe Springs Creek immediately upstream of the confluence of the north and south channels of Beebe Springs Creek. This road and its culverts will be removed. A new channel for Beebe Creek will be excavated in the dry from approximately the head of the pool immediately upstream of the road to just below the pool immediately downstream of the road culverts. The existing stream reach parallel to the new channel will be dewatered by diverting flow the new stream channel and the road and culverts will be removed. The dewatered stream reach and pools will be graded into an enhanced backwater pool habitat for rearing salmonids, a boulder bed control structure will be constructed at the lower end to regulate water levels, and large wood debris will be placed in the new aquatic habitat. The enhanced backwater pool habitat will be reconnected to the new channel. The removal of the culvert and enhancement of stream habitat in the modified pool will be done in accordance with conservation measures and reasonable and prudent measures for incidental take outlined in the July 8, 2008 Biological Opinion for Washington State Fish Passage and Habitat Enhancement Restoration Programmatic Consultation (NMFS and USFWS 2008).

4.0 ACTION AREA

The Action Area is "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action" (Federal Register 1986). In this case, the Action

Area is limited to the project area described above and a region extending a half mile in all directions from the perimeter of the project area. All major machinery and staging activities would occur here. The Action Area is illustrated in Figure A.

Noise associated with trail construction, construction of the side channels, road and culvert removal, aquatic habitat creation and enhancement, landscape restoration, viewpoints, boardwalk, bridge and pier, and hand-carry boat launch is expected to extend no more than 0.5 mile from the construction areas. Potential aquatic effects from construction runoff into Beebe Springs Creek and Lake Entiat extend through a mixing zone (WDE 2003) extending approximately 300 feet downstream from the new side channel construction sites and Beebe Springs Creek from the upstream end of the new channel construction to its mouth. This area falls within the 0.5 mile radius of the project area.



PROPOSED:
BEEBE SPRINGS NATURAL AREA
IN: CHELAN COUNTY P.U.D. No. 1
AT: CHELAN FISH HATCHERY
COUNTY OF: CHELAN STATE: WA
APPL. BY: WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
DATE: MAY 2010
REVISED:
FIGURE A

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE

FACILITY TITLE

BEEBE SPRINGS NATURAL AREA

ACTION AREA / VICINITY MAP

PURPOSE:
DEVELOP A NATURAL AREA THAT WILL INCLUDE SALMON AND WILDLIFE ENHANCEMENT/RESTORATION AREAS AND TRAILS

DATUM: NGVD 29
ADJ. WATERFRONT PROPERTY OWNERS

PREPARED BY:
J.A. BRENNAN ASSOCIATES

5.0 PROJECT DESCRIPTION

5.1 CONSTRUCTION OF TRAILS, VIEWPOINTS, SIDE CHANNELS, AND LANDSCAPE RESTORATION

Phase 3 work for the Beebe Springs Natural Area Development Project will consist of the creation of a series of new side channels to Lake Entiat (Columbia River), the enhancement and creation of wetlands, planting of upland and riparian vegetation, removal of a dirt road and two culverts on the south channel of Beebe Springs Creek, enhancement of aquatic habitat in Beebe Springs Creek, installation of a hand-carry boat launch, and construction of trails with viewpoints and a viewing pier. All of the various actions of Phase 3 are illustrated in the Figures in Appendix C. Detailed grading and layout plans for the north and south side channels are presented in Figures 3-5 in Appendix C and planting plans for the two side channels are presented in Figures 6-10 of Appendix C. Phases 1 and 2 involved the earlier creation of the north channel of Beebe Springs Creek in Phase 1 and the creation in Phase 2 of a side channel connected to Lake Entiat. The side channel constructed during Phase 2 is located north of Beebe Springs Creek and south of the north side channel proposed for Phase 3. The construction of a visitor parking lot, trails and viewpoints, one vault-style restroom, and riparian and shrub-steppe restoration occurred during Phases 1and 2.

5.1.1 Trails

An Americans with Disabilities Act (ADA) compliant pedestrian trail will lead from the parking area to the heart of the restored habitat features on the property. The trail will be constructed of 5/8 inch crushed rock and will be 6 feet wide and 4 inches thick. The total length of trails installed during this phase is about 5,554 feet and corresponds to 0.77 acre (33,324 square feet) of added crushed rock surfacing.

5.1.2 Viewpoints

Along the trail system, up to thirteen (13) strategically placed viewpoints will allow views of Beebe Springs Creek and the new side channels. The viewpoints will be constructed to provide opportunities for visitors to observe spawning and migrating salmon and steelhead as well as other wildlife. Three of the viewpoints will consist of over-water structures and/or boardwalks that cross created open water wetlands, as follows.

- **Boardwalk:** In the northern segment of the north side channel, there will be a viewpoint that wraps around a newly created perched marsh segment of the side channel (Figures 3 and 11, Appendix C). The trail approach will consist of boardwalk where it traverses the perched marsh. The 294-square foot boardwalk will be about 41' long and will include a viewing pop-out.

- **View Dock**: The viewpoint noted as the view dock just to the south of the Beebe Springs Creek outlet, will be sited to minimize the area of wetland disturbance, as well as impacts to native vegetation (Figures 4 and 11, Appendix C). The trail to the dock will be routed

through an area where the invasive species, reed canarygrass, is predominant. The vegetation along the trail sides will be restored with native vegetation, as shown in the Plans. The approach to the dock will consist of crushed rock surfacing atop fill material. The view dock will be constructed with grates, as opposed to lumber decking, to minimize over-water shading. The dock is meant to extend out from where the terminus ends above existing elevation 707.5. The roughly 30-foot dock will include about 198 square feet of grate decking.

- **Boardwalk, South Side Channel:** One of the viewpoints in the south side channel will end on a small island (product of side channel excavation), where the approach will consist of a boardwalk across a newly-created side channel segment (Figures 5 and 11, Appendix C). The 52' long boardwalk and viewing pop-out measure about 360 square feet.

- **Wildlife Viewing Blind, South Side Channel:** A short trail segment will leave the path and extend between landforms and vegetation to a wildlife viewing blind (Figure 4, Appendix C). The roughly 12'x12' viewblind will be constructed so that visitors can view activity along the shoreline and in the side channel areas with minimal disturbance to the fish and wildlife.

Viewpoints will measure approximately 170 square feet and will be surfaced with a 6-inch thickness of crushed rock. Pine-rail fences will be constructed at the viewpoints to discourage public access beyond the viewpoint. Impervious area associated with viewpoint construction is 1,700 square feet.

Total crushed rock pavement:	35,024 square feet (.80 acre)
Total overwater boardwalk (with lumber decking):	654 square feet
Total overwater boardwalk (with grate decking)	198 square feet

5.1.3 Side Channels and Wetland Marsh Enhancements

Off-channel habitat will be created through the construction of a series of side channels on Lake Entiat. One series of channels will be constructed north of the outlet of Beebe Springs Creek, and one series will be constructed to the south of the outlet, and are referred to as the north channel and south channel, respectively. This will conclude side channel creation at the Beebe Springs site. Figures 3-5 of Appendix C detail the layout and grading for the proposed side channels, and cross sectional views of the completed side channel are presented in Figures 15 and 16 of Appendix C. Access for excavation equipment is shown in Figures 12-13 of Appendix C.

North Channel: Approximately 665 feet of shoreline north of Beebe Springs Creek will be modified to create the North Channel. In between the main stem of the river and the channel, three islands will remain. Existing native vegetation, including known Ute ladies'-tresses, and habitat snags will be protected and saved in this area. With more complexity in the proposed shoreline than currently exists, the amount of shoreline will increase significantly. Approximately 950 LF (linear feet) of new shoreline will be created and about 270 LF of existing shoreline excavated to create open channels to Lake Entiat. The channel width will vary between about 50 and 90 feet

with side slopes of 3:1 to 4:1 as well as some flatter areas. The side channels will be excavated to elevation 699 feet.

Hand-carry Boat Launch: A small beach will be created within the North Channel (see Figures 3 and 17, Appendix C) with the intention that park users could launch non-motorized watercraft there. The beach will be made primarily of a small, rounded gravel material.

North Marsh: The north marsh will be a perched marsh, elevated from the main channel by about 3 feet and separated by a small habitat island and woody debris. Most of the north marsh will be in a shallow water situation at all but the lowest water levels (up to 18" of water at the average water level). The water level will be the same level as the river, separated from the main North Channel by cobbles, logs and root wads.

South Channel: Approximately 709 lineal feet of shoreline to the south of Beebe Springs Creek will be modified to create the South Channel. Approximately 1,200 LF (linear feet) of new shoreline will be created and about 230 LF of existing shoreline excavated to create open channels to Lake Entiat. Because the current shoreline in this area is shallower than to the north, the two inlets connecting the side channel to the river will need to be excavated for about 140 lineal feet to be able to achieve the ideal depth at elevation 700, as compared with the 40 to 50-foot long excavations in the north channel. An island of approximately 220 feet in length by 10-40 feet in width will be created at existing grade. Existing native vegetation and habitat snags will be protected and saved in this area. The created side channels will vary in width between about 30 and 100 feet, with side slopes between 3:1 and 4:1, as well as some gentler, flatter areas.

Rearing/Refuge Side Channel: The northern approximately 300 feet of the South Side Channel will be somewhat isolated from the South Side Channel. The intention of this Rearing Side Channel is to create off channel rearing habitat for juvenile salmonids that excludes the adult exotic predator fish that reside in the Columbia River system. The Rearing Side Channel is illustrated in Figures 22 through 27, Appendix C. The Rearing Side Channel pool elevation will be 708, just 6" above the design water elevation of the South Side Channel (707.5), and will be separated from the South Side Channel by a log weir with a predator guard (made of pvc pickets). Juvenile salmonids are expected to enter the Rearing Side Channel by swimming over the weir and between the pickets; yet, the predator guard is intended to prohibit adult fish from entering the Rearing Side Channel, thus creating refuge for the juvenile salmonids. Except for periods of flooding at or above elevation 708, the Rearing Side Channel will not have surface water entering it from the Columbia River. However, a fresh water supply will constantly enter the Rearing Side Channel from Beebe Springs Creek, via a screened intake pipe in a backchannel to be located where existing culverts and farm road will be removed (Figures 18 and 22, Appendix C). The backchannel water level will be regulated by a boulder bed control structure in the creek channel. The intake will be in a screened box with 1.75 mm openings and will collect stream water and divert it through a pipe that will extend approximately 370 feet to a catch basin outlet system at the head of the pool. The catch basin outlet system will discharge water into the pool at flows of approximately .25 to .5 cubic feet per second. Additionally, the banks of the Rearing Side Channel pool will be raised to elevation 710 (average high water) to limit water entering it from the Columbia River except by the outlet. This would also prevent adult predator fish from entering

the Rearing Side Channel from the main stem of the Columbia River over the banks during high water conditions.

During periods of lower water (below 707.5), juvenile salmonids will be able to enter the Rearing Side Channel through a short segment of riffle stream between the pool overflow and the South Side Channel (Figures24 and 25, Appendix C), because it will be constantly fed by Beebe Springs Creek as described above. The riffle substrate will consist of small spawning gravel, interlaced with cobbles and boulders as well as small woody debris. Marsh vegetation will be planted along the edges of the stream segment.

Wildlife Marsh: At the southern extreme of the project a roughly 14,000 square foot (1/3 acre) wildlife pond will be created. This wetland marsh will be fed through subsurface water accumulation, local runoff and periods of extreme high river water levels.

Expected Water Levels: The North and South Channels will be excavated to elevation 699 feet. Therefore, an adequate minimum water depth of approximately 5 feet should be maintained during an average low water level. The design water levels for the off-channel habitat areas range from an expected low of 705 to an average high of 710 feet. This was determined using backwater profile curves available for the Rocky Reach reservoir near the Beebe Bridge based on the headwater and outflow at the dam (BioAnalysts 2000a). Verifications of these water levels are based on dam flow data (DART 2007, USACE 2007, CPUD 2007). The design water level for the site is 707.5 feet. A severe flood event is expected to result in water elevations at approximately 715 feet. Extreme lows may include site water levels at elevation 703. Extreme highs and lows are not expected to be frequent or last very long, therefore they were considered in the design but not used for daily design conditions. During the period of 1997 to 2000 (incl), the water levels were higher than 706.5 over 90 percent of the time. Probably more important, during this same time period the lowest water level elevation was 704.5, and the water level was lower than 705.5 less than 10 percent of the time.

The rising and falling levels of Lake Entiat will affect the development of off-channel habitat, and ultimately the diversification of wildlife and plant life at Beebe Springs Natural Area. New plantings in this area will also enhance fish and wildlife habitat.

Excavation of the existing materials is expected to go smoothly with an excavator. Test pits by hand augering show the presence of soils that are readily excavated with conventional construction equipment. There was no mention of large boulders or bedrock during soils investigation for Phases 1 and 2 or for the construction of Phases 1 and 2 that would indicate difficult construction that would require methods such as hydraulic hoe ramming or blasting. Because of the presence of cobble-laden soils throughout the shoreline area, pile driving and auguring is expected to be difficult and not proposed for Phase 3.

The historic floodplain boundary, which corresponds roughly to elevation 714, according to WDFW, approximately delineates the former shoreline edge and the extent of Native American settlement on-site. Excavation will be kept to a minimum, above or landward of this line, because of the potential presence of below-ground cultural resources.

Preliminary grading plans show that the slopes to be created by excavation for the side channel will be as much as 10 feet deep and range from 4H: 1V to 3H:lV. Slope stability should not be an

issue; however, shallow sloughing of exposed Gravel-Sand may occur during initial excavation or heavy precipitation events until vegetation is established. Therefore, erosion protection measures will be implemented. The typical measures are shown in Figures 12 and 13, Appendix C. In shallower areas where marsh plantings are planned, existing materials will be over-excavated, and imported topsoil will be placed to the required thicknesses.

5.1.4 Culvert Removal and Stream Restoration

A farm road with two concrete culverts crosses Beebe Springs Creek approximately 100 feet upstream of the confluence of the north and south channels of Beebe Springs Creek. This road and its culverts will be removed (see Figures 18 and 19, Appendix C). A new channel for Beebe Creek will be excavated in the dry from approximately the head of the pool immediately upstream of the road to just below the pool immediately downstream of the road culverts. The existing stream reach parallel to the new channel will be dewatered by diverting flow through the new stream channel, and the road and culverts will be removed. The dewatered stream reach and pools will be graded into an enhanced backwater pool habitat for rearing salmonids, and the screened water intake for the rearing side channel will be installed. Large wood debris will be placed in the new aquatic habitat. The enhanced backwater pool habitat will be reconnected to the new channel, and a boulder bed control structure will be installed to regulate the water level in the backchannel (see Figures 20 and 21, AppendixC). The removal of the culvert and enhancement of stream habitat in the modified pool will be done in accordance with conservation measures and reasonable and prudent measures for incidental take outlined in the July 8, 2008 Biological Opinion for Washington State Fish Passage and Habitat Enhancement Restoration Programmatic Consultation (NMFS and USFWS 2008).

5.1.5 Landscape Restoration

Shrub-steppe and riparian vegetation approved by the Washington Department of Fish and Wildlife (WDFW) will be planted to restore the shoreline and upland parts of the area surrounding Beebe Springs Creek as shown on the planting plans and details presented as Figures 6-10 in Appendix C. Phase 3 restoration of the upland and shoreline vegetation in this area will complement the restoration of Beebe Springs Creek completed in Phase 1 as well as work completed in Phase 2. Upland habitat will be seeded with native shrub-steppe grasses and forbs. The seeded area will be planted with live shrubs to recreate the low-elevation shrub-steppe historically present on the site. Enhancement of the Entiat Lake shoreline will include removal of non-native Lombardy poplar (*Populus nigra 'Italica'*) and Himalayan blackberry (*Rubus armeniacus*) and planting of native trees and shrubs to create complex multistory riparian habitat.

- 1.51 acres of emergent plants along the land/water interface of the side channels constructed along Lake Entiat.
- Riparian plantings (1.66 acres) along Lake Entiat, created islands, and banks of side channel areas.
- Shrub-steep grasses and forbs (10.01 acres) will be seeded along the trail and other disturbed areas.

Deep marsh plantings will include spadderdock (*Nuphar polysepalum*), floating-leaved pondweed (*Potamegeton natans*), arumleaf arrowhead (*Sagittaria cuneata*), hardstem and softstem bulrush (*Scirpus acutus* and *S. tabernaemontanii*) and small-fruited bulrush (*Scirpus microcarpus*), planted in an equal mix from containers with a spacing of approximately 18 inches between plants. Shallow marsh plantings will consist of Kellogg's sedge (*Carex lenticularis* var. *lipocarpa*), clustered field sedge (*Carex praegracilis*), sawbeak sedge (*Carex stipata*), ovoid and creeping spikerush (*Eleocharis ovata* and *E. palustris*), fowl mannagrass (*Glyceria striata*), northern waterplantain (*Alisma triviale*), common monkeyflower (*Mimulus guttatus*), Baltic and dagger-leaf rush (*Juncus balticus* and *J. ensifolius*), water smartweed (*Polygonum amphibium*), and narrow-leaf burreed (*Sparganium emersum*), also to be planted in an equal mix from containers with a spacing of approximately 18 inches between plants. A seed mix of most of the same species is to be broadcast or drilled between container marsh plants at a rate of application of 8 pounds per acre.

Water birch (*Betula occidentalis*), white alder (*Alnus rhombifolia*), Columbia hawthorn (*Crataegus columbiana*), peachleaf, Scouler's, and Pacific willow (*Salix amygdaloidse, S. scouleriana,* and *S. lasiandra*), black cottonwood (*Populus trichocarpa*), and ponderosa pine (*Pinus ponderosa*) will be planted at selected riparian and upland locations to provide a native upper-story of trees to provide canopy and shade to Beebe Springs Creek, the side channel, and overflow areas. Most trees will be planted as bareroot stock, but willows will be planted as live stakes and pine trees either as bareroot stock or container plants. Deciduous tree species will be planted in groups, ranging from a minimum of six per group to a maximum of twenty-four per group. Ponderosa pines will be planted in groups ranging from a minimum of three to a maximum of nine.

Douglas maple (*Acer glabrum* var. *douglasii*), serviceberry (*Amelanchier alnifolia*), coyote willow (*Salix exigua*), red-osier dogwood (*Cornus sericea*), mock orange (*Philadelphus lewisii*), tall Oregon grape (*Berberis aquifolium*), choke cherry (*Prunus virginiana*), smooth sumac (*Rhus glabra*), golden and wax current (*Ribes aureum* and *R. cereum*), Nootka and woods rose (*Rosa nutkana* and *R. woodsii*), blue elderberry (*Sambucus cerulea*), and snowberry (*Symphoricarpos albus*) will be planted to provide a multilayered native shrub understory in riparian areas. Spacing of shrubs shall be an average of 48 inches between plants and planted in groups ranging from a minimum of six to a maximum of twenty-four.

A grass seed mix consisting of tufted hairgrass (*Deschampsia cespitosa*), basin wildrye (*Elymus cinereus*), streambank wheatgrass (*Agropyron dasystachium*), Idaho fescue (*Festuca idahoensis*), and fowl mannagrass (*Glyceria striata*) shall be broadcast or drilled between riparian trees and shrubs at a rate of application of 8 pounds per acre.

Bitterbrush (*Purshia tridentata*), big sagebrush (*Artemisia tridentata*), and narrow mule's ear (*Wyethia angustifolia*) will be planted as cover vegetation in upland habitat. A grass seed mix consisting of basin wildrye, Idaho fescue, Sandburg bluegrass (*Poa sandbergii*), Indian ricegrass (*Oryzopsis hymenoides*), and bluebunch wheatgrass (*Pseudoregneria spicata)* shall be broadcast between upland shrubs at a rate of application of 8 pounds per acre.

5.1 CONSTRUCTION SCHEDULE

Project construction will occur, beginning in the late summer of 2010 and being completed by about the end of June 2011. Work will begin with the implementation of an Erosion and Sediment Control Plan, consisting of Best Management Practices (BMPs). BMPs will include compost berms along the OMW of Lake Entiat and around the proposed side channels. Next, the side channels, ponds and marshes will be excavated except for a portion of land immediately adjacent to the river. The off-channel grading will be completed and planted prior to excavating the side channel entrances into Lake Entiat. Excavated material from the side channel area will be removed from that area and placed upland. The upper *2* feet of soil, tested for the presence of organochlorine pesticides, arsenic and lead will be stripped and placed upland, a minimum of 50 feet away from any future flowing surface water. These unsuitable soils will be covered with a minimum of one foot of clean topsoil or be placed under a planned gravel or impervious surface. Remaining soil will be used to create landscape and upland landforms. Site and initial off-channel grading, landscaping, and trail and bridge building will occur in the summer of 2010 using conventional construction equipment. Excavation that will connect the side channel with Lake Entiat will occur in November 2010. Documented Ute ladies'-tresses in the vicinity of the excavation will not be disturbed and if any additional plants are documented during August/September 2010 surveys, the locations of the connecting channels will be adjusted to avoid the new plant locations. Excavation for the placement of the pilings for the viewing pier will occur when the reservoir is drawn down enough during the in-water work period to allow construction to occur in the dry.

5.2 CONSTRUCTION METHODS

The proposed project will require the use of standard construction equipment, including excavators, bulldozers, dump trucks, and water trucks (for control of dust). Clearing activities and installation of sedimentation control devices may require the use of excavators, stump grinders, and chipping equipment. Construction will be phased to reduce the amount of soil exposed at any one time, and the use of temporary compost berms and rock filter outlets during construction will minimize off-site migration of soils into adjacent wetlands, Beebe Springs Creek and Lake Entiat. To control noise, construction equipment will be outfitted with mufflers and all activities will be conducted Monday through Friday during normal working hours (between 7:00 am to 5:00 pm). Removal of mature trees will be limited to those needed to construct the project. Exposed soil will be hydroseeded, covered with plastic, or otherwise maintained to minimize erosion. The mowing of ditches and cleaning out sediment accumulation are the only required maintenance needed.

During construction, the side channels will be excavated to the design depth for the design width, and then the side slopes cut back as close to 3H: 1V as possible, or to the angle of repose, whichever is less steep. A strip of land will be left intact along Lake Entiat during the side channel excavation to avoid excessive siltation of the river, and to keep excavation activities as dry as possible. Groundwater seepage will produce somewhat wetted conditions within the excavation, however breaching the shoreline to create the island feature will be done last. Excavation to connect the side channels with Lake Entiat will be done using a specialized excavator that can work in water up to six feet deep or work from the shore. Construction activity below the OHWM

will be kept to a minimum, but work below the OHWM will need to occur to create the inlets to the side channels. For the longer South Channel inlets, an excavator will remove material to the depth required, moving outwards towards the center of the river channel, and with the excavated material, build a temporary causeway which will provide firm ground for the machine to work out in the water, up to 140' from the shoreline. The causeway will be removed following excavation activities and disposed of in the upland areas, similar to what was done in Phase 2.

5.3 CONSERVATION MEASURES/BEST MANAGEMENT PRACTICES

The following conservation measures protect and minimize the impact to aquatic species and their habitat:

- **Work Timing Window:** The window for Lake Entiat in-water work is October 15 to February 28 and the work window for Beebe Springs Creek flow diversion and in-water work is July1 to August 31.

- **Ute Ladies'-Tresses:** Orange fencing will be placed to protect known locations of ladies'-tresses, and excavation of channels connecting the new side channels to Lake Entiat will be adjusted to avoid any additional plants documented during planned surveys in August and September of 2010.

- **Obtain Local Permits:** The project will obtain and comply with the terms and Conditions of applicable state and federal permits; i.e. NPDES General Permit for Stormwater Discharges from Construction Activities, and Seattle District Office of U.S. Army Corps of Engineers Sections 404 and 10 permits.

- **Sediment Control:** Erosion and sediment control Best Management Practices (BMPs) will be used to select, implement, maintain, and remove appropriate temporary and permanent erosion and sediment controls during restoration. Contractors will implement and utilize an approved Soil Erosion and Sedimentation Control Plan to prevent accelerated erosion and off-site migration of soil from occurring during construction and restoration efforts. The BMPs include but are not limited to:
  - Temporary Erosion Control Practices
    - Compost berms
    - Hay bales
    - Stabilized construction entrances
    - If the off-channel area requires dewatering during construction, dewatered liquids will be filtered through grassy fields prior to discharge to Lake Entiat
    - Dust Control
    - Spill Prevention
    - Marking Construction Limits and protecting existing vegetation beyond construction limits
  - Permanent Erosion and Sediment Control
    - Permanent vegetative plantings and seeding
    - Silt fences in place until vegetation established

- Paved site entrance
- Gravel surfacing on parking areas
- Culvert outlet control
- Maintenance of vegetation, minor erosion that may occur following high rainfall or snow melt.

- **Spill Prevention Control:** Construction contractors will be required to implement and utilize an approved Spill Prevention, Containment, and Countermeasures Plan (SPCC) for spill prevention and containment.
  - Spill kits will be readily available
  - The contractor and crew will be trained in spill prevention and containment techniques
  - Clean and well-maintained equipment and tools will be used.
- **Stormwater Pollution Prevention Plan:**
  - Contractors will develop and implement an approved Stormwater Pollution Prevention Plan prior to initiating construction activities.
- **Preservation of Existing Vegetation:**
  - Existing native vegetation will not be disturbed outside of the construction area.
- **Visual Monitoring:**
  - A construction supervisor will monitor the entire construction process.
- **Clean-up:**
  - All debris or deleterious material resulting from construction shall be removed from the construction area and disposed of at an authorized site.
  - Construction related debris shall not be dumped or allowed to enter the stream channel or floodway.

The following conservation measures meet additional criteria for the culvert removal, installation of in-stream structures, and side channel/off-channel habitat restoration and reconnection categories of restoration actions covered by the July 8, 2008 Biological Opinion for the Washington State Fish Passage and Habitat Enhancement Restoration Programmatic Consultation (NMFS and USFWS 2008). These additional measures pertain to the removal of a dirt road and its culverts and the creation of new off-channel habitat with woody debris placement in and on Beebe Springs Creek:

Culvert Removal and Enhancement of Beebe Springs Creek Habitat

The following conservation measures are required for culvert removal and aquatic habitat enhancement that will occur on Beebe Springs Creek during Phase 3. Prescriptions for habitat restoration projects are covered under the July 8, 2008 Biological Opinion for the Washington State Fish Passage and Habitat Enhancement Restoration Programmatic Consultation (NMFS and USFWS 2008). The conservation prescriptions in Appendix D will be followed during the removal of the culverts and dirt road at the crossing of the north channel of Beebe Springs Creek

upstream of the confluence of the north and south channels of Beebe Springs Creek. The prescriptions will also be followed during the enhancement restoration of Beebe Springs Creek aquatic habitat in the vicinity of the culvert removal. Procedures for fish removal during dewatering of the stream channel during culvert removal are given in Appendix E.

6.0 EXISTING ENVIRONMENTAL CONDITIONS

6.1 BEEBE SPRINGS CREEK WATERSHED AND LAKE ENTIAT NEARSHORE HABITAT IN PROJECT VICINITY

An engineering geological evaluation was done by Nelson Geotechnical Associates, Inc. in 2005 (NGA 2005). The site consists of Quaternary glacial outwash deposits (Qgo) and Quaternary alluvium (Qa) and has a slope of approximately 4 to 5 percent from Highway 97 towards Lake Entiat. Topsoil ranges from 0.2 to 1 feet in depth with an average depth of 0.4 foot. Sandy silt underlies the topsoil from depths of 0.4 to 3.6 feet, and 2 to 12 feet of gravel and sand with varying amounts of cobbles and silt occur below the sandy silt. The sand, gravel, and silt was encountered at an average depth of 3.5 feet and continued to test pit termination at depths of 11 to 14 feet. Groundwater was encountered at depths ranging from 9 to 13 feet, which corresponds to the normal water surface elevation of Lake Entiat, which is at an elevation of approximately 707.5 feet.

The Columbia River in the project vicinity is impounded by Rocky Reach Dam to form Lake Entiat. Lake Entiat extends from RM 473.7 at Rocky Reach Dam, upstream to the tailrace of Wells Dam at RM 515.6. The project area is located where Beebe Springs Creek flows into Lake Entiat at approximately RM 504.5, about three quarters of the way upstream between Rocky Reach and Wells Dams. The Beebe Springs were formed as a result of the 1872 earthquake that induced the Ribbon Cliffs landslide and formed a geyser at the base of base of the Chelan moraine (Hackenmiller 1995, Kerr 1980), which eventually subsided into two springs (North and South Beebe Springs) and Beebe Springs Creek. The project area was part of an orchard operation before being obtained by the WDFW. The orchard operation virtually eliminated native upland habitat, and riparian habitat was reduced by conversion to orchard and degraded by introduced non-native plants. Prior to inundation by Rocky Reach Dam, this section of Columbia River shoreline contained a greater variety of habitat features, including sandbars, backwater channels, and a greater variation of water depth and velocities. Today, the shoreline is a homogeneous stretch of shallow water that lacks the complexity to support a diversity of fish and wildlife.

The design water levels for the off-channel habitat areas range from an expected low of 705 to an average high of 710 feet. This was determined using backwater profile curves available for the Rocky Reach reservoir near the Beebe Bridge based on the headwater and outflow at the dam (BioAnalysts 2000a). Verifications of these water levels are based on dam flow data (DART 2007, USACE 2007, CPUD 2007). The design water level for the site is 707.5 feet. A severe flood event is expected to result in water elevations at approximately 715 feet. Extreme lows may include site water levels at elevation 703. Extreme highs and lows are not expected to be frequent

or last very long, therefore they were considered in the design but not used for daily design conditions.

PROJECT AREA

This Biological Assessment considers the third in a phased habitat enhancement and watchable wildlife project. The Phase 3 project area discussed in this document is within the Beebe Springs Creek subbasin of Lake Entiat, a reservoir on the mainstem of the Columbia River and the shoreline of Lake Entiat. The Phase 3 project area is bounded on the west by Highway 97 and on the east by the shoreline of Lake Entiat. The project area extends north along approximately 16,600 feet of Lake Entiat shoreline from the west side of Beebe Bridge. This area also includes the new Beebe Springs Creek north (spawning/rearing) channel created during Phase 1 construction in 2006 and approximately 700 feet of Lake Entiat shoreline where a new side channel and wetland habitat was created during Phase 2 construction in 2009. In addition to data collected during site visits by a URS biologist, information concerning the south and north channels of Beebe Springs Creek was obtained about the south (original) channel from the Beebe Springs Stream Habitat Survey Report prepared by The Watershed Company (2005b) and information concerning the design of the north (new) channel was obtained from the Phase 1 Biological Evaluation (TWA 2005a, TWA 2006). Initial plans for the new south channel of Beebe Springs Creek constructed during Phase 1 considered the possibility of constructing a stream channel that meandered across the Columbia River floodplain to the south of the original (south) channel. A cultural resource survey (NWAA 2005) identified sensitive areas in this portion of the site. Protection of culturally sensitive areas south of the original stream channel is the primary reason that the new south channel was constructed to meander across the Columbia River floodplain to the north.

The original channel of the Columbia River is located on the eastern side of Lake Entiat. The historical channel averaged approximately 660 feet in width in the vicinity of the project site and began about 450 feet east of the current west bank of Lake Entiat. Depth measurements taken on Lake Entiat from a boat by a URS biologist on February 9, 2007 indicate that the substrate of the lake from the shoreline of the project site to the edge of the historic river channel has an average slope of about 1 foot for every 10 to 12 feet of horizontal distance. This closely agrees with an average slope of 11.8 feet of horizontal distance for every 1 foot of elevation indicated by the topographic lines on the Chelan Falls, Washington quadrangle, U.S. Geological Survey topographic map. The substrate of Lake Entiat in the nearshore of the project area is primarily composed of cobble and gravel with some sand and boulders and very little fine sediment.

A narrow band of sparse macrophyte beds occurs along the Lake Entiat shoreline, becoming denser near the mouth of Beebe Creek (DESI 2001b). These macrophyte beds are dominated by non-native Eurasian watermilfoil (*Myriophyllum spicatum spicatum*) (DESI 2001b, FEMA 2004). The native close-leaved pondweed (*Potamegeton foliosus*) is the second most abundant macrophyte and the native curled pondweed (*Potamogeton crispus*), the third most abundant (DESI 2001b, FEMA 2004). Coontail (*Ceratophyllum demersum*) and waterweed (*Elodea canadensis*) are two other native species common to the reservoir (DESI 2001b, FEMA 2004). Native macrophytes appear to have a competitive advantage to Eurasian watermilfoil in water

deeper than 10 to 12 feet in depth (DESI 2001b, FEMA 2004). None of these species was observed during a site visit by a URS biologist during the winter in February 9, 2007.

Lake Entiat in the project vicinity has a slight current, with a maximum velocity of approximately 1.2 feet/sec, minimum velocity of about 0.2 foot/sec, and average velocity of 0.5 foot/sec (DESI 2001a). Lake Entiat experiences a one to two foot diurnal fluctuation in pool elevation at the project site, based on demand for hydropower and releases of water from Wells and Rocky Reach Dams to meet power demand (BioAnalysts 2000a). Typically, the lowest pool elevations occur between 5 AM and 9 AM in the morning and between 5 PM and 9 PM in the late afternoon (BioAnalysts 2000a).

The Ordinary High Water Mark (OHWM) on Lake Entiat (Columbia River) was established by methodology described in the Wetland Delineation and Impacts Report, Beebe Springs Natural Area—Phase 2, Chelan County, Washington (URS 2007), using criteria described by Tim Erkel, USACE Eastern Washington Coordinator (Erkel 2007).

Plant species were observed and recorded by URS Corporation biologists during February site visits in 2006 and 2007. The timing of the site visit precluded observations of most herbaceous vegetation. Trees observed included black cottonwood, Lombardy popular, and Siberian elm (*Ulmus pumila*). Shrubs observed included Columbia hawthorn, willows, coyote willow (*Salix exigua*), red-osier dogwood, maple (*Acer* sp.), Himalayan blackberry in riparian areas and big sagebrush, gray rabbitbrush (*Chrysothamnus nauseosus*), Russian-olive (*Elaeagnus angustifolia*), and bitterbrush in upland areas. Other plant species observed included native common cattrail (*Typha latifolia*), northern scouring-rush (*Equisetum variegatum*), wild rose (*Rosa* spp.), snow buckwheat (*Eriogonum niveum*), milkweed (*Asclepias speciosa*), goldenrod (*Solidago canadensis*), rush (*Juncus* sp.), yarrow (*Achillea millefolium*), and serviceberry (*Amelanchier alnifolia*). Non-native plants, such as reed canarygrass (*Phalaris arundinacea*), diffuse knapweed (*Centaurea diffusa*), cheat grass (*Bromus tectorum*), clasping pepperweed (*Lepidium perfoliatum*), tumble mustard (*Sisymbrium altissimum*), flixweed (*Descurainia* sp.), Canada thistle (*Cirsium arvense*), St. John's wort (*Hypericum perforatum*), and Swainson-pea (*Sphaerophysa salsula*) dominated much of the plant community.

In mid-September, 2009, Ute ladies'-tresses were discovered at the Beebe Springs Natural Area Development Project site and were documented to occur along approximately 2,200 feet of the Lake Entiat shoreline north of Beebe Springs Creek, beginning about 300 feet north of the mouth of Beebe Springs Creek. All of the plants were located along a narrow wetland (Wetland C) approximately 100 feet in width that paralleled the lake shore and near the OHW line at an elevation of about 708.5 feet.

6.2 LIMITING FACTORS AND MATRIX INDICATORS

Matrices of pathways and indicators are presented in Section 8, Tables 8-1 (Beebe Creek) and 8-2 (Lake Entiat). These tables combine the matrices for ESA listed salmonids under the jurisdiction of the NMFS and bull trout, which are under the jurisdiction of the USFWS. The three indicators listed by the NMFS ("functioning properly", "at risk", and "not properly functioning") are utilized

in this document and Tables 8-1 and 8-2 (NMFS 1996). The USFWS equivalents for bull trout are "functioning appropriately", "functioning at risk", and "functioning at "unacceptable risk" (1998b). Lake Entiat is a run-of-the-river reservoir on the Columbia River and in the proposed project action area it has characteristics of both a lake and a river. Where indicators for pathways given in NMFS (1996) and USFWS (1998b) guidance documents are inappropriate for a non-riverine environment, the most appropriate indicator for the existing reservoir environment is marked in the matrix (Tables 8-1 and 8-2) with "NA" to indicate that the criteria in the guidance document isn't appropriate for the reservoir environment evaluated.

Subpopulation Characteristics: Sub-populations of bull trout in the three watersheds (Wenatchee, Methow, and Entiat Rivers) that produce most of the fluvial/adfluvial bull trout found in the project action area all have over 500 adults, but only approximately 200-250 adult fluvial adults utilize Lake Entiat (FEMA 2004, FEMA 2006). The number of fluvial adults that historically utilized the Columbia River in the project area is unknown and may not have differed significantly from what is currently present, but based on the low number of fluvial/adfluvial adults present, the project area is "at risk" for the bull trout subpopulation size indicator.

Bull trout populations are capable of quick recoveries if suitable habitat is available and readily accessible and exotic species, such as lake trout and brook trout are not present. Brook trout are currently present and abundant in many bull trout spawning and rearing tributaries of the Methow, Entiat, and Wenatchee watersheds. In addition, there is an insufficiency of baseline data to make a determination that this indicator is functioning appropriately. As a result, the growth and survival indicator for bull trout is assigned an "at risk" rating.

The migratory form is present and breeding populations of fluvial bull trout present in the project area occur in three major tributary watersheds (Methow, Wenatchee, and Entiat Rivers), but the is no connectivity with bull trout populations that exist upstream of Grand Coulee Dam and little or no connectivity with populations that exist in the Yakima River drainage and other bull trout populations downstream from the project site. Beebe Springs Creek and Lake Entiat are assigned an "at risk" rating for the life history diversity and isolation bull trout indicator.

Water Quality: As a spring-fed system with a small drainage area, Beebe Springs Creek does not have a formal water quality designation, and neither Beebe Springs Creek nor Lake Entiat is listed on the 303(d) impaired water quality list. Because water in the stream is a mixture of spring water and artesian well water utilized by the Chelan hatchery, temperatures are consistently cool and fluctuate very little. Based on water temperature measurements recorded at the Chelan Fish Hatchery, Beebe Springs Creek temperatures can reach highs of 59 °F in late summer and lows of 51 °F in early spring (Heinlen 2007). These water temperature measurements combined with the fact that the hatchery successfully utilizes this water to rear juvenile salmonids indicates that Beebe Springs Creek should receive a "properly functioning" rating for the temperature parameter.

The water quality numerical criteria for temperature for a Class A water body is either 18 °C (64.4 °F) or no more than a 0.3 °C (0.54 °F) increase over natural temperature. Between 1971 and 1990 water temperature at a WDOE ambient monitoring station at RM 450.9 exceeded 18 °C on 10 different days in July, 16 days in August, 12 Days in September, and 3 days in October (FEMA

2004). Natural conditions may account for some of the temperature exceedences, but the conversion of the Columbia River channel into a series of reservoir is also linked to increased water temperatures due to increased residence time and decreased water velocities. Lake Entiat should receive an "at risk" rating for the temperature parameter between the months of July and October.

There are no reports of suspended sediment or high turbidity levels in Beebe Springs Creek, and it is likely that turbid water never occurs in this stream. All the water flowing through the Beebe Springs Creek channel is derived from a groundwater source and is therefore not affected by rainfall or runoff events, decreasing the potential for high turbidity levels. The hatchery utilizes the well-water/spring-water mixture at its source, and is legally required to screen its effluent for suspended solids using filters and sedimentation ponds before releasing it to Beebe Springs Creek. Fine sediments, primarily sand, are prevalent throughout the Beebe Springs Creek stream channel however (TWC 2005b), and likely act as a limiting factor for spawning and invertebrate production. Fine sandy sediments in the Beebe Springs Creek stream channel are a result of agricultural land use practices that have occurred on upland portions of the site adjacent to the riparian area. A lack of riparian vegetation along the stream channel combined with the upland agricultural practices in highly erodable soils typical of the area allowed fine sediments to be wind-blown or washed into the stream during the infrequent rain events that do occur in the area. The proposed channel reconfiguration/restoration project will restore gravelly substrates to the stream channel and enhance the riparian zone, buffering the stream against future sedimentation from the surrounding upland areas. An "at risk" rating for sediment/turbidity is warranted for Beebe Springs Creek, based on the prevalence of sandy sediments currently present throughout the stream channel.

The Columbia River (Lake Entiat) in the proposed action area generally has low turbidity. The project area consists of igneous and metamorphic rock at the base of the Cascade Mountains to the west, basaltic material from the lava flows that created the Waterville Plateau to the east, and glacial outwash materials from the deep carving of the river valley itself. The tributaries that feed the mid-Columbia River are primarily glacially carved. The result is very low sediment loads. Turbidity does increase during period of high inflow from the tributaries. Monthly sampling data from the WDOE monitoring station below Rock Island Hydroelectric project dam report a range in turbidity of 1.0 NTU (Nephelometric Turbidity Units) to 11.0 NTU, with a mean value of 2.9 NTU (FEMA 2004). Secchi disk transparency in the reservoir is generally over 12 feet during late summer months, but can be lower during spring and early summer when snowmelt runoff in the tributaries is high. Although sandy sediments are present in the substrate of the lake, the substrate is free of fine sediments in most areas and the lake substrate is not utilized by spawning salmonids. Lake Entiat should receive a "properly functioning" rating for the sediment parameter.

Chemical contaminants and nutrients are not currently a problem in Beebe Springs Creek or Lake Entiat and this indicator should appropriately be rated as "properly functioning". Agricultural production along Beebe Springs Creek has been discontinued and upland and riparian restoration projects are planned for the area. The Chelan Fish Hatchery does not transmit significant levels of chemical contaminants, nutrients, or pathogens into Beebe Springs Creek, substantiated in that it received a clean bill of health and is rated as a "Clean Water Station" by the WDFW Fish Health Board, a component of the cooperative management program that was organized under the

Governor's Salmon Recovery Plan (TWC 2006). Hatchery wastewater discharge is regulated under the National Pollutant Discharge Elimination System (NPDES), which is administered by the Department of Ecology (DOE) for state and private hatcheries in Washington State. NPDES permits are only required of larger facilities, defined as those exceeding 20,000 pounds of production per year or 5,000 pounds of feed use per month, although smaller facilities can be issued NPDES permits if they violate state water quality standards. The Chelan Fish Hatchery at Beebe Springs Creek currently holds a NPDES permit from the DOE, and receives annual water quality inspections. The hatchery also monitors settleable solids and suspended solids in its discharge on a monthly basis. The hatchery utilizes two settling basins to precipitate solids from its effluent water before discharging it to Beebe Springs Creek. The monthly water quality samples are taken from water that has passed through these settling ponds as it is discharged to the creek below (TWC 2006).

Habitat Access: Beyond the action area, numerous dams across the Columbia River downstream of the mouth of Beebe Springs Creek negatively affect salmonid fish access to the creek. In addition, channelization to facilitate agricultural production likely increased water velocities within the channel and decreased habitat complexity, potentially limiting juvenile salmonid use of resting or quiet-water rearing areas within the creek. Although fish have been observed to routinely pass through it, the culvert under SR 97 at the upstream end of the project area would have been likely be classified as a barrier if analyzed according to WDFW's 2000 Fish Passage Barrier and Surface Water Screening Assessment and Prioritization Manual. Passage conditions through this culvert were improved when the plunge at its outfall was eliminated in conjunction with Phase 1 of project implementation during. The creation of the new north channel during Phase 1 also provides a complex channel habitat, permitting easier access and adequate resting places for both juvenile and adult salmonid migrants. As a benefit to fish passage conditions, the stream's flow is derived from groundwater sources and is not subject to seasonal fluctuations like other stream systems: Beebe Springs Creek discharge ranges between 10 and 15 cfs throughout the year. The removal of a non-blocking pair of culverts upstream of the confluence of the north and south channels of Beebe Springs Creek will improve fish passage. Although fish passage in Beebe Springs Creek is currently properly functioning, the over-all fish passage in Beebe Springs Creek and Lake Entiat is rated as "at risk" for the habitat access/physical barriers parameter, due to the effects of Columbia River dams downstream from Beebe Springs Creek on fish passage.

Habitat Elements (substrate, large woody debris, pools, and off-channel habitat): A 2005 stream habitat survey (TWC 2005b) of the south (original) channel of Beebe Springs Creek reported a prevalence of fine sediments and moderate amounts of gravel and cobble embeddedness. Sand, small gravels (<1 inch), and cobbles were the most common substrate types observed in most Beebe Springs Creek habitat units. Sand was present in most units, and dominated in many of the pool habitats while cobbles and gravels were somewhat embedded in many of the habitat units. Though there were isolated patches of good spawning gravels positioned in some of the low gradient riffle areas, these were limited in number and generally very small in size throughout Beebe Springs Creek. Based on this stream survey, Beebe Springs Creek was functioning "at risk" for the substrate indicator, but the creation of the more complex north channel in 2006 during implementation of Phase 1, with channel hydraulics designed to maintain suitable spawning substrates changes the rating of the substrate indicator to "properly functioning" for the substrate indicator. The substrate of gravel, cobble, and boulders in the nearshore areas of Lake Entiat in the

proposed action area are somewhat embedded with sand and water velocities are inadequate in the run-of-the-river reservoir environment for salmonids spawning. Lake Entiat is therefore rated as "at risk" for the substrate indicator, relative to the original river channel.

The riparian zone of the south (original) channel of Beebe Springs Creek is generally very narrow on both sides of the creek, and is was dominated by tall Himalayan blackberry thickets with some grasses growing directly adjacent to the stream channel. While the lower 200 feet of the stream (near its confluence with the Columbia River) has a sparse over-story of cottonwood trees with some willow and poplar, the remainder flows through a grassy meadow area (formerly orchard) with no trees. Due to these riparian conditions, large woody debris (LWD) was limited in the original south channel of the creek, generally occurs in the lower 200 feet of the stream, and was composed of medium- to small-diameter willow trees bridging the creek.

The blackberry thickets were removed during implementation of Phase 1 of the project and Phase 2 revegetation activities included planting grasses, shrubs, and trees along the south (original) and north (new) channels of Beebe Springs Creek and the riparian habitat of Lake Entiat in the project area and the new side channel habitat of Lake Entiat. All of the non-native Lombardy poplars will be removed from the site during Phase 3 and replaced with plantings of native trees and shrubs. Additional shrubs and trees were removed in locations that will be excavated to make the south side channel in Phase 3. This included the removal of extensive thickets of blackberries between the mouth of Beebe Springs Creek and Beebe Bridge. It will take some time for planted trees to provide recruitment of LWD to the stream channel of Beebe Springs Creek and in the riparian habitat of Lake Entiat. The lack of high flow events in this spring-fed system limits Beebe Springs Creek's ability to recruit large wood from its riparian corridors, and LWD is not and historically may not have been prevalent in this stream because it is situated in a shrub-steppe ecosystem. To correct for the long-term lack of functional recruitment of LWD to the north and south channels of Beebe Springs Creek, LWD has been placed in both the new and original stream channel. Additional LWD will be placed in Beebe Springs Creek following the removal of two culverts in Phase 3. Based on the fact that LWD has been placed in the north and south stream channels and that the natural environment of the stream lacks recruitment potential from the existing and future riparian corridor, Beebe Springs Creek is rated as "properly functioning" for the large woody debris indicator. The creation of Lake Entiat inundated the natural Columbia River riparian habitat in the project action area and historical agricultural land use activities precluded the growth of riparian trees along most of the shore of Lake Entiat. In addition, the change from a riverine to a reservoir habitat precludes many of the normal LWD recruitment processes that once existed before creation of the reservoir. Trees planted during revegetation of the Lake Entiat shoreline will eventually provide lakeshore canopy over the long-term, but recruitment will only occur when older trees fall into the lake during windstorms or from the activities of beaver (*Castor canadensis*), which are currently present in the project action area. During creation of the side channel habitat, some LWD will be place in the channel and monitored for beneficial effects. The Lake Entiat shoreline is currently rated as "not properly functioning" for the LWD indicator, but Phase 2, Phase 3 and later project phases will add LWD and the potential for LWD recruitment to the project area.

The pool frequency indicator provides a standard of 70 pools per mile in a stream that is 15 feet wide (the original south channel of Beebe Springs Creek average width equals 14.5 feet). The

length of the original south channel of Beebe Springs Creek is 805 feet and it should have over 10 pools to meet the minimum standard, but the 2005 stream habitat survey recorded a total of 8 pools (TWC 2005b, TWC 2006). The new south channel of Beebe Springs Creek is approximately 1,800 feet in length and increases sinuosity of Beebe Springs Creek in the project area from 1.0 to approximately 1.4, and reduces the overall gradient from 2.8 percent to 1.24 percent (TWC 2006). Rather than having a constant slope, gradient in the north channel varies between 2 percent in the upper portions to 0.5 percent near the mouth (TWC 2006). A floodplain bench was created on either side of the new north channel (2006). Approximately two-thirds of the 10 to 15 cubic feet per second (cfs) flow of Beebe Creek will be directed through the new north channel, which was designed to maintain normal channel maintenance functions under this flow regime (TWC 2006). The design flow is essentially the same as the channel-forming flow and the channel design will function properly at all flows the stream is capable of producing. The north channel was constructed in a riffle/pool sequence with approximately equal length of both riffle and pool habitat. The north channel was designed to contain approximately 40 pools over its 1,800 foot length (TWC 2006). Beebe Springs Creek is currently, "properly functioning" for pool frequency and quality, large pools, off-channel habitat, and refugia.

Lake Entiat is a reservoir, and therefore no longer functioning as a river environment. Therefore it is "not properly functioning" for Pool frequency and quality or large pools. The lakeshore of Lake Entiat in the project contains some off-channel habitat in the vicinity of the mouth of Beebe Springs Creek, but over-all is "at risk" for off-channel habitat and refugia. The creation of side channel habitat in Phase 2 and Phase 3 will create new off-channel habitat and refugia for rearing salmonids along the shoreline of Lake Entiat. A small amount of new off-channel habitat will also be created/enhanced during the removal of two culverts on Beebe Springs Creek.

Channel Conditions: Based on the 2005 stream habitat survey (TWC 2005b), the width to depth ratio for habitat units in the south (original) channel of Beebe Springs Creek averaged 11 and ranged from 5 to 28. Width/depth ratio in the upper portion of the new north channel of Beebe Springs Creek is just over 14, and decreases to 8 in the lower portion (TWC 2006). This data indicates that the width/depth ratio indicator is "properly functioning" in Beebe Springs Creek. Lake Entiat no longer functions as a free-flowing river and the river flood plain is now inundated by the reservoir. Lake Entiat is "not properly functioning" for the wetted width/maximum depth ratio indicator

The Phase 1 removal of the dense Himalayan blackberry bushes that dominated both sides of the south (original) channel Beebe Springs Creek that acted to stabilize much, but not all, of the streambanks (TWC 2005b) and creation of the new north channel has created a condition where no streamside vegetation exists to stabilize banks. The soil types of the project area are relatively non-erosive and stream flows are relatively constant and soil in the Phase 1 project area was stabilized with a bonded fiber matrix, but some erosive areas persist, indicating that Beebe Springs Creek is functioning "at risk" for streambank condition. Revegetation activities during Phase 2 and Phase 3 will eventually stabilize stream banks and will be properly functioning in the long-term. An inventory of shoreline erosion on Lake Entiat (CPUD 2001) did not find any erosion site in the project area. Lake Entiat in the project area is "properly functioning" for the streambank condition indicator.

The south (original) channel of Beebe Springs Creek has a straight, high-gradient channel, constructed no wider than necessary to carry its relatively constant flows and with its bottom well below the surrounding landscape. Even without the channelization it was subjected to in association with the agricultural uses of the surrounding landscape, the creek's history is relatively short, being created as a result of springs that did not exist before the 1870s. As such, it has virtually no connectivity to any floodplain. The north (new) channel of Beebe Springs Creek was created with a floodplain bench on either side (2006). The shoreline of Lake Entiat in the project vicinity still retains a portion of the original floodplain terrace and Beebe Springs Creek and another small stream to the north (Toad Creek) flow directly into the lake. With the creation of new connected floodplain for Beebe Springs Creek, a rating of "properly functioning" is assigned to Beebe Springs Creek and Lake Entiat for the floodplain connectivity indicator. Construction of the first new side channel during Phase 2 and two new side channels during Phase 3 will add connectivity between Lake Entiat the remaining Columbia River floodplain on the project site.

Flow/Hydrology: Being a relatively short creek with fairly constant, spring-fed flows ranging from 10 to 15 cubic feet per second, Beebe Springs Creek is considered "properly functioning" with respect to the peak/base flows indicator. Dams on the mainstem Columbia River constructed for hydroelectric, irrigation, and flood control purposes have significantly changed the peak and base flows of the Columbia River and Lake Entiat is assigned a rating of "not properly functioning" for the change in peak/base flow indicator.

SR 97 borders the project area and various other driveways, agricultural access roads, and access road to the state fish hatchery occur within the creek's relatively small drainage basin and have contributed to moderate increases in drainage network density as well, warranting an 'at risk" rating for the drainage network indicator. Similar conditions exist throughout the mainstem Columbia River, but the effects of the increase in drainage network has little potential to create significant changes in river flows and are completely overshadows by the effects of the mainstem dams of flows in the Columbia River. Lake Entiat has a "properly functioning" rating for the increase in drainage network indicator.

Watershed Conditions: As mentioned, SR 97 and various local access roads occur within the Beebe Springs Creek watershed. Road density exceeds the 3mi/mi2 standard, and these roads are mostly located along the Columbia River valley bottom. A driveway to a previous farmhouse is located along portions of the stream channel. The road density and location indicator is therefore "not properly functioning." Historical encampments, agricultural development with water withdrawals and grazing, road building, and exposure of erosive soils in the watershed all combine to warrant an "at risk" rating for disturbance history. Riparian condition is very poor along the existing Beebe Springs Creek channel. Though some cottonwood and other deciduous trees lie within the riparian area near the stream's very mouth at the Columbia and along portions of Lake Entiat, the north and south stream channels within the project area are completely devegetated to within a short distance of the mouth of Beebe Springs Creek. Little shade is afforded to the stream channel shoreline of Lake Entiat and large wood recruitment potential is still impaired along most of the riparian corridor, resulting in a "not properly functioning" rating for the riparian reserves indicator. Since the stream channel is short and the watershed area small for the size of the creek due to its spring-fed source, Phase 2 and Phase 3 project enhancements from revegetation and

creation of three new side channels on Lake Entiat will result in significant improvements on a watershed scale.

Species and Habitat: Fine sediments, stream and reservoir temperatures, and the availability of suitable habitats have been altered in the mainstem Columbia River in the project vicinity and the watersheds (Methow, Entiat, and Wentachee River watersheds) where fluvial bull trout breed and rear as juveniles. Water temperatures are expected to continue to increase through the region in the foreseeable future, increasing competition for critical stream rearing habitat with native rainbow and steelhead trout. Lake Entiat and Beebe Springs are rated as "at risk" for the species and habitat bull trout indicator.

7.0 LISTED SPECIES INFORMATION

7.1 SPECIES PRESENT

Dr. Rob Nielsen, URS biologist, conducted a site visit on February 9, 2007. Mule deer (*Odocoileus hemionus*), beaver, Raccoon (*Procyon lotor*) and river otter (*Lutra canadensis*) tracks were observed along the shoreline of Beebe Springs Creek and Lake Entiat. A coyote (*Canis latrans*) was observed walking across a grassy field in the project area. American robins (*Turdus migratorius*) were observed near open fields, and several species of birds, typical of rural/agricultural areas in the floodplain habitat of the Columbia River basin, were observed in the fields and nearshore riparian area, including American crow (*Corvus brachyrhynchos*), red-winged blackbird (*Agelaius phoeniceus*), western meadowlark (*Sturnella neglecta*), great blue heron (*Ardea herodias*), black-capped chickadee (*Parus atricapillus*), song sparrow (*Melospiza melodia*), and winter wren (*Troglodytes troglodytes*).

Large flocks of waterfowl, including Canada geese (*Branta canadensis*), northern shoveler (*Anas clypeata*) green-winged teal (*Anas crecca*), lesser scaup (*Aythya affinis*), common goldeneye (*Bucephala clangula*), bufflehead (*Bucephalas albeola*), common merganser (*Mergus merganser*), gadwall (*Anas strepera*), American widgeon (*Anas americana*), American coot (*Fulica americana*), and mallards (*Anas platyhynchos*) were observed in the project area in nearshore areas of Lake Entiat and pools of both the south (original) and north (realigned) channels of Beebe Springs Creek.

Mammals typically associated with interior Columbia River basin floodplain habitat include deer mouse (*Peromyscus maniculatus*), sagebrush vole (*Lagurus curtalus*), nuttall cottontail (*Sylvilagus nuttallii*), yellow-bellied marmot (*Marmota flaviventris*), northern pocket gopher (*Thomomys talpoides*), bobcat (*Lynx rufus*), mink (*Mustela vison*), long-tailed weasel (*Mustela frenata*), river otter (*Lutra canadensis*), and muskrat (*Ondatra zibethica*). Larger carnivores native to the region, mountain lion (*Felix concolor*) and black bear (*Euarctos americanus*), may occasionally visit the project site. Western gray squirrels (*Sciurus griseus*), a species listed by Washington State as threatened, have been observed in the project action area (Viola 2007, Fox 2007, USFWS 2007). An increase in sighting of western gray squirrels at the Chelan Hatchery and other nearby sites

may be partially due to the displacement of squirrels from the project action area during construction activities (Viola 2007).

Typical reptiles and amphibians would include western painted turtle (*Chrysemys picta bellii*), short-horned lizard (*Phrynosoma douglassii*), sagebrush lizard (*Sceloporus graciosus*), western fence lizard (*Sceloporus occidentalis*), side-bloctched lizard (*Uta stansburiana*), western skink (*Eumeces skiltonianus*), racer (*Coluber constrictor*), night snake (*Hypsiglena torquata*), Great Basin gopher snake (*Pituophis catenifer deserticola*), western terrestrial garter snake (*Thamnophis elegans*), common garter snake (*T. sirtalis*), western rattlesnake (*Crotalus viridis*), Pacific tree/chorus frog (*Hyla/Pseudacris regilla*), Great Basin spadefoot (*Scaphiopus intermontanus*), western toad (*Bufo/Anaxyrus boreas*), bullfrog (*Rana/Lithobates catesbeiana*), and tiger salamander (*Ambystoma tigrinum*). Common birds typical of this habitat would include dark-eyed junco (*Junco hyemalis*), black-billed magpie (*Pica hudsonia*), belted kingfisher (*Ceryle alcyon*), northern flicker (*Colaptes auratus*), killdeer (*Charadrius vociferous*), house finch (*Carpodacus mexicanus*), turkey vulture (*Cathartes aura*), bald eagle (*Haliaeetus leucocephalus*), red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), California quail (*Callipepla californica*), mourning dove (*Zenaida macroura*), and American goldfinch (*Carduelis tristis*).

Migratory (fluvial) bull trout (Columbia River DPS) that forage in Lake Entiat are listed as threatened under the ESA. Fluvial bull trout have been observed at the mouth of Beebe Springs Creek (TWC 2006). Summer-run steelhead (both hatchery and wild origin) that occur in the project area are part of the upper Columbia River steelhead DPS and are listed as threatened under the ESA. Steelhead use Lake Entiat as a migration corridor, spawn in Beebe Springs Creek, and juveniles rear in both Beebe Springs Creek and Lake Entiat. Spring-run Chinook salmon (upper Columbia River spring-run Chinook ESU), listed as endangered under the ESA, utilize Lake Entiat as a migration corridor, but spawning has not be documented to occur in Lake Entiat or its tributaries. This distribution of listed salmonids is covered in greater detail in Section 7.2.

Other salmonid unlisted stocks that occur in the project area include summer/fall-run Chinook salmon (upper Columbia River summer/fall-run Chinook ESU), coho salmon (*Oncorhynchus kisutch*), Okanogan River ESU sockeye salmon (*O. nerka*), native and hatchery resident rainbow trout (*O. mykiss*), and mountain whitefish (*Prosopium williamsoni*). Occasional westslope cutthroat trout (*O. clarki lewisi*), introduced brown trout (*Salmo trutta*), and introduced brook trout (*Salvelinus fontinalis*) also occur in Lake Entiat. Kokanee (landlocked sockeye salmon) may also occur in Lake Entiat. Sockeye utilize Lake Entiat as a migration corridor to the Okanogan River watershed. Resident rainbow trout spawn in Beebe Springs Creek and westslope cutthroat trout and brook trout may also occasionally spawn in Beebe Springs Creek. Summer/fall-run Chinook of both hatchery and wild origin (up to approximately 30 pairs) have been documented to spawn in Beebe Springs Creek (Heinlen 2007) and have also been observed spawning in the Wells Dam Tailwater, and the Lake Chelan Tailrace (DESI 2001a, Fox 2007). It is unknown if spawning summer/fall Chinook in Beebe Springs Creek and the Lake Chelan Tailrace are returning naturally spawned fish or strays from wild or hatchery fish. Coho salmon occurring in the action area are not considered part of the lower Columbia River coho salmon ESU and presumably represent adult returns from the Yakama Nation Methow River coho reintroduction hatchery program (TWC 2006). During recent years, adult coho have been observed spawning in Beebe Springs Creek (TWC 2006, Heinlen 2007). Summer/fall-run Chinook salmon in the Columbia River basin above

Rocky Reach dam are separated into two stocks, Methow and Okanogan summer Chinook (WDFW 2002). Both stocks are considered healthy (WDFW 2002). Spawning of summer/fall-run Chinook salmon occurs primarily in the Methow and Okanogan Rivers. Spawning of summer/fall-run Chinook salmon in Beebe Springs Creek and the Lake Chelan tailrace generally occurs from October through November (Heinlen 2007).

Non-salmonid native species of fish that are likely to occur in Entiat Lake are Pacific lamprey (*Lampetra tridentatus*), white sturgeon (*Acipenser transmontanus*), speckled dace (*R. cataractae*), longnose dace (*R. cataractae*), redside shiner (*Richardsonius balteatus*), longnosed sucker (*Catostomus catostomus*), largescale sucker (*C. macrocheilus*), bridgelip sucker (*C. columbianus*), mountain sucker (*C. platyrhynchus*), northern pikeminnow (*Ptychocheilus oregonensis*), peamouth (*Mylocheilus caurinus*), chiselmouth (*Acrocheilus alutaceus*), burbot (*Lota lota*), torrent sculpin (*Cottus rhotheus*), prickly sculpin (*C. asper*), and threespine stickleback (*Gasterosteus aculeatus*). Introduced species of non-salmonid fish include channel catfish (*Ictalurus punctatus*), black bullhead (*I. melas*), brown bullhead (A*meiurus nebulosus*), carp (*Cyprinus carpio*), tench (*Tinca tinca*), pumpkinseed (*Lepomis gibbosus*), bluegill (*Lepomis macrochirus*), black crappie (*Pomoxis nigromaculatus*), largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolmieui*)), yellow perch (*Perca flavescens*), and walleye (*Sander vitreus*) (DESI 2001a, BioAnalysts 2000b).

Cyprinids (minnow family), catostomids (suckers), and threespine sticklebacks are the most abundant fish in Lake Entiat (DESI 2001a). Rearing salmonids make up less than 1 % of the fish sampled in the project area vicinity of Lake Entiat, with rearing Chinook salmon juveniles (0.36 %) the most abundant, followed by rainbow/steelhead (0.02 %) (DESI 2001a), although they are probably the most abundant fish present in Beebe Springs Creek. Because retention of salmon, steelhead or rainbow trout is not allowed in Lake Entiat, most anglers target walleye and smallmouth bass (CPUD 2004a, DESI 2000a, BioAnalyists 2000a).

A sampling study of benthic macroinvertebrates in Lake Entiat was conducted in 1999 (DESI & RL&L 2000). The benthic macroinvertebrate community of Lake Entiat was dominated by midges (Chironomidae), caddisfly (Trichoptera), sow bugs (Isopoda), clams and mussels (Bivalvia), snails (Gastropoda), scuds (Amphipoda), water mites (Acari), and bristle worms (Oligochaeta). Combined, these taxa contribute 95 percent of the total number of macroinvertebrates collected, with midge larvae accounting for between 21 and 92 percent of the animals at any given site. Bivalves were seen at every site except the Wells Hydroelectric dam tailrace. The greatest diversity of taxa was found in areas with diverse substrates.

ESA species in the project area are identified in Section 7.2, critical habitat is addressed in Section 8.3, and essential fish habitat (EFH) is addressed in Section 9.0.

7.2 ESA SPECIES

As part of agency consultation, NMFS, USFWS, WDNR, and WDFW were contacted to obtain records of special status species in the vicinity of the site. Section 11 of this report documents the consultation history, and Appendix A contains both the agency response letters and the requested

information. The provided information was used to develop the list of endangered, threatened, proposed, and candidate species with the potential to occur in the vicinity of the project.

The Endangered Species Act Status of West Coast Salmon & Steelhead Summary Sheet (Appendix A) lists the upper Columbia River spring-run Chinook salmon ESU as endangered and the upper Columbia River steelhead DPS as threatened. Of the species listed in the U.S. Fish and Wildlife Service (USFWS) list of listed and proposed endangered and threatened species and critical habitat, candidate species, and species of concern in Chelan County, Washington (Appendix A), only Ute ladies'-tresses and bull trout have been documented to occur in the project action area. The remaining four species (grizzly bear, Canada lynx, marbled murrelet, and spotted owl) are unlikely to occur in the project action area due to a lack of suitable habitat, distance from suitable habitat, or lack of migratory corridors to known populations. Critical habitat has been designated for the Chinook salmon ESU, steelhead trout DPS, and the bull trout DPS, but only designated critical habitat for Chinook salmon and steelhead trout occurs in the project action area. A list of ESA species present in the project Action Area is provided in Table 7-1.

Table 7-1
ESA Species and their Presence/Absence in the Action Area

Species in Mason County	Federal Status	Presence/Absence in the Action Area
Chinook Salmon (*Oncorhynchus tshawytscha*)	Endangered	Migrating spring-run Chinook juveniles and adults present in Lake Entiat. Chinook have access to Beebe Sprngs Creek and spawning and rearing of unlisted Summer/Fall-run Chinook occurs in Beebe Springs Creek and the Lake Chelan Tailrace. Spawning of listed spring-run Chinook does not occur in the action area.
Steelhead Trout (*Oncorhynchus mykiss*)	Threatened	Migrating and rearing juveniles present in Entiat Lake and Beebe Springs Creek. Migrating adults present in Entiat Lake, with spawning occurring in Beebe Springs Creek.
Bull Trout (*Salvelinus confluentus*)	Threatened	Migrating and foraging sub-adult and adult bull trout present in Lake Entiat. Bull in Lake Entiat have access to Beebe Springs Creek, but spawning has not been documented.
Marbled Murrelet (*Brachyramphus marmoratus*)	Threatened	The project and action areas are well outside of any potential use site and WDFW (2007) data shows no occurrences near the action area.
Northern Spotted Owl (*Strix occidentalis caurina*)	Threatened	WDFW (2007) data do not indicate the use of the project vicinity and the project and action area are well outside of any suitable habitat areas or corridors connecting suitable spotted owl habitat.
Canada Lynx (*Lynx Canadensis*)	Threatened	WDFW (2007) data do not indicate use of the project vicinity and lynx are unlikely to utilize the project action area.
Grizzly Bear (*Ursus arctos horribilis*)	Threatened	WDFW (2007) data show no sightings within several miles of the project area and grizzly bear are unlikely to utilize the project action area.
Ute Ladies'-Tresses (*Spiranthes diluvialis*)	Threatened	WNHP (2007) data documents in Chelan County in backwater wetlands or ponds in the vicinity of the Columbia River, but not within project action area. Documented in the project action area in September 2009 (CPUD 2009).
Gray Wolf (*Canis lupus*)	Endangered	WDFW (2007) data do not indicate use of the project vicinity and gray wolves are unlikely to utilize the project action area.
Showy Stickseed (*Hackelia venusta*)	Endangered	Documented populations are confined to Tumwater Canyon and the project and action area are well outside of any suitable habitat areas (USFWS 2005b).
Wenatchee Mountains Checker-mallow (*Sidalcea oregano* var. *calva*)	Endangered	Documented populations are confined to the Wenatchee Mountains and the project and action area are well outside of any suitable habitat areas (USFWS 2004a).

Table 7-2
Critical Habitat in the Action Area

Species	Critical Habitat in the Action Area
Chinook Salmon (*Oncorhynchus tschawytscha*)	Lake Entiat (Columbia River) is designated critical habitat for the upper Columbia River spring-run Chinook salmon ESU.
Steelhead Trout (*Oncorhynchus mykiss*)	Lake Entiat (Columbia River) is designated critical habitat for the upper Columbia River steelhead trout DPS.
Bull Trout (*Salvelinus confluentus*)	Lake Entiat (Columbia River) is proposed as designated critical habitat for bull trout.
Marbled Murrelet (*Brachyramphus marmoratus*)	Critical habitat is not designated within 52 miles of the action area
Northern Spotted Owl (*Strix occidentalis caurina*)	Critical habitat is not designated within 10 miles of the action area.
Canada Lynx (*Lynx Canadensis*)	Critical habitat is not designated within 10 miles of the action area
Grizzly Bear (*Ursus arctos horribilis*)	None designated.
Ute Ladies'-Tresses (*Spiranthes diluvialis*)	None designated.
Gray Wolf (*Canis lupus*)	Critical habitat is not designated in the action area or Washington State.
Showy Stickseed (*Hackelia venusta*)	None designated.
Wenatchee Mountains Checker-mallow (*Sidalcea oregano* var. *calva*)	Critical habitat is not designated in the action area or the Lake Chelan watershed (WRIA 47).

7.2.1 Chinook Salmon

Status: Spring-run Chinook salmon (*Oncorhynchus tschawytscha*) adults and smolts migrating through Lake Entiat are considered part of the upper Columbia River Evolutionarily Significant Unit (ESU), which was federally listed as threatened on March 24, 1999 (NMFS 1999a). On February 11, 2002, NMFS published a notice of findings for six petitions to delist 15 ESUs of Pacific Salmon and steelhead (*Oncorhynchus* spp.), including the Puget Sound ESU of Chinook salmon (NMFS 2002). NMFS determined that a status review was warranted for 14 of the petitioned ESUs, including the Puget Sound ESU and added 10 additional listed ESUs as well as a candidate ESU (Lower Columbia River/Southwestern Washington Coho Salmon). On June 14, 2004, NMFS published proposed listing determinations for 27 ESUs of west coast salmonids, including two additional ESUs (NMFS 2004b). The proposed listing determinations included retaining the listing status of the Puget Sound Chinook salmon ESU as threatened. On June 28 2005, NMFS published the final listing determinations for 16 ESUs of west coast salmon and final 4(d) protective regulations for threatened salmonid ESUs (NMFS 2005a).

Critical habitat for the upper Columbia River spring-run Chinook salmon ESU was designated on February 16, 2000 (NMFS 2000). However, on April 30, the U.S. District Court for the District of Columbia approved a NMFS consent decree withdrawing critical habitat designation for 19 salmon and steelhead populations on the west coast (USDC 2002). The final rule rescinding critical habitat designations for these ESUs plus the Northern California Steelhead ESU was

published by NMFS on September 29, 2003 (NMFS 2003). NMFS published proposed critical habitat designations for 13 ESUs of Pacific salmon and steelhead on December 14, 2004 (NMFS 2004c) and the critical habitat designations for 12 of the ESUs, including upper Columbia River spring-run Chinook salmon, was finalized on September 2, 2005 and took effect on January 2, 2006 (NMFS 2005b).

The general life history of spring-run Chinook salmon includes both freshwater and saltwater phases of development. Incubation, hatching, and emergence occur in freshwater, followed by migration to the ocean at which time smoltification occurs. After several years, maturation begins and adults return to freshwater habitats to spawn in their natal streams. In general, there are two life history forms of Chinook salmon. Stream-type Chinook salmon spend extended periods in freshwater before smoltification, in contrast to the ocean-type, which emigrates to the ocean as a sub-yearling smolt. Ocean-type fish move relatively rapidly through fresh water into coastal or estuarine rearing areas, compared to their stream-type counterparts (Myers *et al.* 1998, Wydoski and Whitney 2003, Healey 1991). Ocean-type Chinook salmon tend to utilize estuaries and coastal areas more extensively for juvenile rearing (Myers *et al.* 1998, Healey 1991). Stream-type juveniles are much more dependent on freshwater stream ecosystems because of their extended residence in these areas (Myers *et al.* 1998).

Ocean-type (summer/fall-run) subyearling Chinook salmon juveniles concentrate in shallow nearshore areas where densities are as much as 15 times higher than in main channels (Dawley *et al.* 1986). When Chinook salmon subyearlings are present in the deeper water of main channels more than 95% are concentrated with 10 feet of the surface (Dawley *et al.* 1986). Subyearlings display a marked preference for water velocities less than 1 foot/second and the majority of subyearling rearing occurs within 80 feet of shore, in water less than 3 feet in depth, and with lateral slopes of less than 30% (Tiffan *et al.* 2006, Sergeant and Beauchamp 2006). Rearing subyearling Chinook salmon do not display an affinity for any particular substrate size (Tiffan *et al.* 2006, Sergeant and Beauchamp 2006). Subyearling Chinook salmon habitat preferences show no direct effects from diel period or piscivore presence (Sergeant and Beauchamp 2006). Apparently, juvenile Chinook salmon will risk exposure to predation in order to utilize preferred habitat and to forage at a high rate (Sergeant and Beauchamp 2006).

Populations in the Project Area: Critical habitat has been designated for the upper Columbia River spring-run Chinook salmon ESU in the project action area and includes the Lake Entiat watershed. The September 2, 2005 rule designating critical habitat for upper Columbia River Chinook salmon defined the lateral extent of critical habitat for each designated stream reach as the width of the stream channel as defined by its bankfull elevation. Bankfull elevation is reached at a discharge which generally has a recurrence interval of 1 to 2 years on the annual flood series. Critical habitat in lake areas, such as Lake Entiat, is defined by the perimeter of the water body displayed on standard 1:24,000 scale topographic maps or the elevation of ordinary high water, whichever is greater. Adjacent floodplains are not designated as critical habitat. However human activities that occur outside the lateral extent of critical habitat have the potential to have demonstrable effects on physical and biological features of critical habitat in designated reaches.

The upper Columbia River spring-run Chinook ESU includes stream-type Chinook salmon spawning in the Wenatchee, Entiat, and Methow Rivers, as well as hatchery populations from the

Chiwawa, Methow, Twisp, Chewuch, and White Rivers, and Nason Creek (Myers *et al.* 1998, NMFS 1999a). The Methow River population is a mixed stock with composite production, and its status is considered "critical," due to chronically low escapement (WDFW 2002).

Lake Entiat (Columbia River) in the vicinity of the project action area is used as a migration corridor for returning adult and out-migrant smolt spring-run Chinook. Reproduction and rearing of Spring-run Chinook migrating past the action area occurs in the Methow River watershed upstream from Wells Dam and does not occur in Lake Entiat (DESI 2001a). Although rearing Chinook salmon juveniles are the most abundant salmonid species present in Lake Entiat in the action area, the size of rearing juveniles and timing of presence in the action area indicates that these fish are composed entirely of unlisted sub-yearling summer/fall-run Chinook salmon (FERC 2004, DESI 2001a). Juvenile summer/fall-run Chinook salmon are likely to be present in the project action area from January (first emergence from gravel) through July (end of out-migration) (FERC 2004, FERC 2006). Unlisted summer/fall-run Chinook salmon have been documented to spawn in Beebe Sprints Creek, the Chelan Dam tailrace, and the Wells Dam tailwater (FERC 2004, FERC 2006, DESI 2001a, Osborne 2007, Heinlen 2007). Spawning of summer/fall-run Chinook occurs in October and November (FERC 2006, Osborne 2007, Viola 2007, Fox 2007). Summer/fall-run Chinook juveniles emerge from spawning gravels from January through April, rearing from one to four months after emerging from the gravel. Juveniles migrate through and out of Lake Entiat as subyearlings, with 90 percent of the juvenile out-migration occurring during June and July (FERC 2004, FERC 2006, Osborne 2007). Juvenile summer/fall-run Chinook use Beebe Springs Creek and nearshore habitat in Lake Entiat (including side channels) from the time of their emergence from the gravel until their downstream migration in June and July. It is likely that juvenile summer-fall-run Chinook salmon migrating downstream from the Methow and Okanogan River watersheds also utilize nearshore habitat in Lake Entiat for short periods during their downstream migration past the project action area (FERC 2004, FERC 2006, Viola 2007, Osborne 2007).

Spring-run Chinook spawners pass along the Columbia River past the mouth of Beebe Springs Creek to return to the Methow River from late May through August, with spawning from early August through September (WDFW 2002, Bugert *et al.* 1998, FERC 2004, FERC 2006, Andonaegui 2000). A single spring-run Chinook was documented to enter Beebe Springs Creek in the vicinity of the Chelan Hatchery, but only summer/fall-run Chinook have been observed to spawn in the creek (Heinlen 2007). In the Methow watershed, fry emergence occurs from late March through early May (Bugert *et al.* 1998, FERC 2004, FERC 2006, Andonaegui 2000). Juvenile spring-run Chinook salmon rear in the Methow River watershed until they become smolts, gradually dropping downstream into the lower mainstem of the Methow River until they become smolts (FERC 2004, FERC 2006, Andronaegui 2000). Smolts migrate downstream and pass through Wells Dam into Lake Entiat during late April through May, with 90% passing through Lake Entiat during the month of May (Bugert *et al.* 1998, FERC 2004, FERC 2006, Andonaegui 2000). Yearling spring-run Chinook salmon smolts are larger than juvenile Chinook salmon sampled in Lake Entiat and limited observations suggest that residence time of juvenile spring-run Chinook salmon in Lake Entiat is no more than a few days to a week because the fish only utilize the lake/river as a navigation route, not rearing habitat (FERC 2004, FERC 2006, Osborne 2007).

It is unclear whether or not thermal intolerance limits the distribution or residence of juvenile spring-run Chinook in the action area. Bjornn and Reiser (1991) reported the preferred temperature for Chinook as 12 to 14°C. In general, salmonids employ a variety of behavioral modifications in response to thermal stress, ranging from diel movements between refugia and foraging habitats (Nielsen and Lisle 1994), to emigration from the system (Roper *et al.* 1994). The average water temperature in Rocky Reach Reservoir reaches 14°C around the beginning of July, which coincides with the end of the out-migration of juvenile Chinook salmon (DART 2007). It is possible that juvenile Chinook within the action area complete their out-migration before water temperatures in Lake Entiat exceed their preferred thermal range.

7.2.2 Steelhead Trout

Status: Steelhead trout (*Oncorhynchus mykiss*) adults and smolts spawning, rearing and migrating through the project action area are considered part of the upper Columbia River (UCR) Distinct Population Segment (DPS), which was federally listed as endangered as the upper Columbia River Evolutionarily Significant Unit (ESU) on August 18, 1997 (NMFS 1997). On February 11, 2002, NMFS published a notice of findings for six petitions to delist 15 ESUs of Pacific Salmon and steelhead (*Oncorhynchus* spp.), including the upper Columbia River ESU of steelhead (NMFS 2002). NMFS determined that a status review was warranted for 14 of the petitioned ESUs, including the upper Columbia River steelhead ESU and added 10 additional listed ESUs as well as a candidate ESU (Lower Columbia River/Southwestern Washington Coho Salmon). On June 14, 2004, NMFS published proposed listing determinations for 27 ESUs of west coast salmonids, including two additional ESUs (NMFS 2004b). The proposed listing determinations included upgrading the listing status of the upper Columbia River steelhead ESU as threatened and also proposed delineation of steelhead 10 steelhead populations (including the upper Columbia River steelhead ESU) as DPSs, rather than ESUs. The new steelhead DPSs were defined as containing only steelhead from anadromous parents and resident O. mykiss were excluded. On January 5 2006, NMFS published the final listing determinations for 10 DPSs of west coast steelhead, including the finalization of threatened status for the upper Columbia River steelhead DPS (NMFS 2006). On June 13, 2007, the U.S. District Court for the Western District of Washington ruled that the UCR steelhead DPS be returned to endangered status (NMFS 2009). The ruling was appealed to the U.S. Court of Appeals for the Ninth Circuit, and on March 16, 2009, the court ruled that the downlisting to threatened did not violate the ESA and that, on remand, the district court should grant NMFS' motion for summary judgement (NMFS 2009). On June 18, 2009, the district court re-instated UCR steelhead to threatened status under the ESA (NMFS 2009).

Critical habitat for the upper Columbia River steelhead ESU was designated on February 16, 2000 (NMFS 2000). However, on April 30, the U.S. District Court for the District of Columbia approved a NMFS consent decree withdrawing critical habitat designation for 19 salmon and steelhead populations on the west coast (USDC 2002). The final rule rescinding critical habitat designations for these ESUs plus the Northern California Steelhead ESU was published by NMFS on September 29, 2003 (NMFS 2003). NMFS published proposed critical habitat designations for 13 ESUs of Pacific salmon and steelhead on December 14, 2004 (NMFS 2004c) and the critical habitat designations for 12 of the ESUs and DPSs, including upper Columbia River steelhead DPS, was finalized on September 2, 2005 and took effect on January 2, 2006 (NMFS 2005b).

Steelhead historically occurred throughout the upper Columbia River Basin. Steelhead exhibit a highly variable anadromous life history. Biologically, steelhead can be divided into two reproductive ecotypes (Moyle 2002, Busby *et al.* 1996), based on their state of sexual maturity at the time of river entry. All steelhead in the project vicinity (and the interior Columbia River basin) are considered to be summer-run steelhead. Summer-run steelhead (also known as stream-maturing or stream type) in the Columbia River basin typically enter freshwater from May October in a sexually immature condition and remain in rivers all winter, spawning the following spring. Summer steelhead are slightly smaller and generally return to cooler streams farther inland than winter-run steelhead characteristic of coastal streams, which enter freshwater from November to April with well developed gonads and spawn shortly thereafter (Busby *et al* 1996). Juveniles generally migrate seaward as smolts in March to early June after 1 to 3 years (typically 2 years) of stream residence, although duration of freshwater rearing can range from 1 to 7 years before juveniles grow large enough (>170 mm) to undergo smoltification.

Populations in the Project Area: Critical habitat has been designated for the upper Columbia River steelhead DPS in the project action area and includes the Lake Entiat watershed. The September 2, 2005 rule designating critical habitat for upper Columbia River steelhead defined the lateral extent of critical habitat for each designated stream reach as the width of the stream channel as defined by its bankfull elevation. Bankfull elevation is reached at a discharge which generally has a recurrence interval of 1 to 2 years on the annual flood series. Critical habitat in lake areas, such as Lake Entiat, is defined by the perimeter of the water body displayed on standard 1:24,000 scale topographic maps or the elevation of ordinary high water, whichever is greater. Adjacent floodplains are not designated as critical habitat. However human activities that occur outside the lateral extent of critical habitat have the potential to have demonstrable effects on physical and biological features of critical habitat in designated reaches.

The vast majority of steelhead migrating through Lake Entiat in the vicinity of the project action area spawn in tributaries of the Columbia River above Wells Dam (FEMA 2006), with the majority of the fish hatchery plants from the Wells Hatchery stock. The majority of returning adults moving past the project action area spawn in the Methow River basin, with some spawning occurring in Okanogan River tributaries (FEMA 2004, FEMA 2006, Osborne 2007, Viola 2007). Methow/Okanogan summer steelhead are identified by WDFW (2002) as a discrete stock within the upper Columbia River steelhead DPS. Methow/Okanogan summer steelhead are characterized as a mixed stock with wild production, and were rated as "depressed" in 2002 due to chronically low escapement (WDFW 2002). Steelhead adults migrate up the Columbia River in the project action area in fall and spring after spending one to three years at sea. Steelhead adults pass Rock Island Dam between July through May of the following year, with the majority of fish passing between August and September (Andonaegui 2000). The fall migrants overwinter in the Columbia River reservoirs and enter spawning tributaries, such as the Methow River, between March and mid-July and spawn soon after reaching their spawning beds (Andonaegui 2000). Fry emerge from the gravel in late spring to August. Fry and smolts disperse downstream in late summer and fall. Most smolts leave the Methow in March through early June, typically after 2-3 years in fresh water (Bugert *et al.* 1998). A recovery goal of 2,500 adults has been set for this stock, but escapements have ranged from 111 to 871 during the period 1986 through 2003 (WDFW 2002).

The Methow/Okanogan steelhead stock utilizes Lake Entiat (Columbia River) as a primary migration corridor for upstream and downstream movement of returning adults and out-migrating smolts (FERC 2004, FERC 2006, Osborne 2007). Limited observations suggest that residence time of Methow/Okanogan steelhead smolts (both naturally spawned and hatchery) in Lake Entiat is no more than a few days to a week because the fish only utilize the lake/river as a navigation route, not rearing habitat (FERC 2004, FERC 2006, Osborne 2007).

The presence of anadromous steelhead has been commonly observed within the project and action areas (Heinlen 2007, Viola 2007). Anadromous steelhead are known to spawn in Beebe Springs Creek, and juvenile rearing is presumed to also take place in and near the proposed action area (Heinlen 2007, Viola 2007, Osborne 2007). As many as 30 pairs of steelhead have been observed spawning in the vicinity of the Chelan Hatchery (Heinlen 2007). The action area has been included in NOAA's recent designation of critical habitat for steelhead trout (NMFS 2005b). Although the mainstem Columbia River once provided spawning habitat for steelhead, the availability of mainstem spawning habitat in the vicinity has been almost completely eliminated due to changes in water velocity and substrate characteristics resulting from the Rocky Reach reservoir that extends past the project site approximately 10 miles upstream to the Wells Dam. However, some spawning may also occur in the Chelan Dam and Well Dam tailwaters. Steelhead typically spawn in smaller tributary streams, where they rear in riffle habitat for their first year, gradually dropping down into mainstream tributary rivers during subsequent years during their freshwater rearing phase before becoming smolts and out-migrating (Moyle 2002, Wydoski and Whitney 2003, FERC 2004, FERC 2006, Osborne 2007). Juvenile steelhead rearing in Beebe Springs Creek do not have a tributary river to migrate to after their first year, but rearing populations are strongly density dependent and it is likely that some migration of older juveniles may occur from Beebe Springs Creek into Lake Entiat because of insufficient habitat within the creek to support the number of fry produced each year. These fish may rear in the nearshore are of Lake Entiat in the project vicinity or may out-migrate as yearling smolts. Fish presence and habitat use surveys have found *O. mykiss* the second most common salmonid species in Lake Entiat, but not present in abundance. It is unknown what proportion of these fish are rearing juvenile steelhead vs resident rainbow trout (DESI 2000a).

7.2.3 Bull Trout

Status: Bull trout (*Salvelinus confluentus*) present in the action area are considered part of the Columbia River Distinct Populations Segment (DPS) of bull trout. The Columbia River DPS of bull trout was originally listed by the USFWS as threatened on June 10, 1998 (USFWS 1998c). All populations of bull trout within the coterminous United States (lower 48 states) were listed as threatened by the USFWS on November 1, 1999 (USFWS 1999a). The USFWS published a final rule on September 26, 2005 designating critical habitat for all five Distinct Population Segments of bull trout in the coterminous United States (USFWS 2005a). A revised designation of critical habitat for bull trout in the coterminous United States was proposed on January 14, 2010 (USFWS 2010).

Four life forms of the bull trout can be distinguished based on life history characteristics: anadromous, fluvial, adfluvial, and resident. Fluvial (migrating to and from larger streams and rivers) and adfluvial (migrating to and from lakes) forms could be present in the Columbia River

in the project vicinity. Juvenile bull trout typically remain in cold, snowmelt-fed, headwater mountain streams where they were hatched until the onset of piscivory, at which point some individuals disperse in search of improved foraging opportunities (fluvial and adfluvial) while others (resident) remain in the natal stream. Sub-adult bull trout often migrate along with adults back to headwater streams during fall spawning migrations, and then return to larger rivers to overwinter. Migratory bull trout grow to be bigger than resident stream fish, and all bull trout favor streams with cold, unpolluted water, clean gravel/cobble substrate, and gentle stream slopes for spawning (USFWS 2002a).

Populations in the Project Area: The action area, including the Columbia River bank at the mouth of Beebe Springs Creek, does not include or adjoin designated critical habitat for bull trout in the Upper Columbia River Basin bull trout Critical Area Unit (CHU 21) (USFWS 2005a). Reservoirs or pools impounded behind dams whose primary purpose is for flood control, energy production, or water supply for human consumption were excluded in the 2005 designated critical habitat for bull trout. As a result, the Lake Entiat portion of the mainstem Columbia River was excluded from designated bull trout critical habitat. A revised designation of critical habitat for bull trout in the coterminous United States was proposed on January 14, 2010 (USFWS 2010). Reservoirs excluded in 2005 have been proposed as designated bull trout critical habitat (USFWS 2010). Lake Entiat has been proposed as part of the Mainstem Upper Columbia River bull trout Critical Area Unit (CHU 22) (USFWS 2010).

Bull trout that occur in the action area are known to reproduce in the Methow River basin upstream of the project area and the Entiat River and Wenatchee River basins downstream. Bull trout in Lake Entiat are known to move through the fish ladders at both Rocky Reach and Wells Dams. Bull trout in Lake Entiat exhibit both fluvial adfluvial life histories (FEMA 2006). Bull trout foraging and migrating in Lake Entiat spend most of their life in the Wenatchee, Entiat, and Methow River basins and enter the Columbia River mainstem reservoirs as fluvial bull trout. Bull trout have been observed passing through Rocky Reach Dam between April and November with 75 to 90% passing during May and June (FEMA 2006). For the years 2000 through 2003, bull trout counts through Rocky Reach were 212, 204, 194, and 246, respectively (FEMA 2006). Bull trout foraging in Lake Entiat spawn in the Methow, Entiat, and Wenatchee River watersheds as early as August, but primarily from mid-September through October, with timing dependant on declining water temperatures (Andonaegui 2000). Radio telemetry of 79 tagged bull trout collected at Rocky Reach Dam during a 2001-2003 study showed movements of all tagged fish into the Wenatchee, Entiat, or Methow Rivers for spawning and fall or fall/winter residence (FEMA 2006, BioAnalysts 2004). One fish passing through Wells Dam entered the Okanogan River for a short time before leaving and entering the Methow River. Other bull radio tagged bull trout were observed as far downstream as Wanapum Dam. Most migratory movements of bull trout in the Columbia River reservoirs occurs in May and June. A correlation appears to exist between the number of bull trout passing Rocky Reach Dam in May through July and the number of redd counts in the Mad River (a major bull trout spawning tributary of the Entiat Rive)(CPUD 2004b). Operations of hydroelectric facilities on the mid-Columbia River did not negatively affect the survival of adult bull trout, but may have slowed migration times (BioAnalysts 2004, CPUD 2004b). Most bull trout entered tributaries by the end of June and were found in possible spawning streams well before the initiation of spawning. Fish entering tributaries either

overwintered in the tributary rivers or reentered the reservoirs to overwinter by late November after their spawning migration.

In conclusion, the presence of fluvial and adfluvial bull trout in the Columbia River in the project vicinity is expected to occur at times. Bull trout are present in Lake Entiat in very low densities compared with other fish species and they have relatively unpredictable migration behavior (CPUD 2004b). Because bull trout leave the reservoir during the summer months, it is unlikely that they utilize the cool, spring-fed flows of Beebe Springs Creek as a thermal refuge. However, bull trout may occasionally feed on juvenile salmonids in the creek or at the mouth of the creek. Bull trout occurring in the project action area would be foraging adults and subadults, with juveniles rearing for approximately 2 years in natal tributary streams before adopting a fluvial life history and entering the Columbia Reservoirs (BioAnalysts 2005).

7.2.4 Marbled Murrelet

Status: The marbled murrelet (*Brachyramphus marmoratus*) in Washington, Oregon, and California was listed as threatened by the USFWS under the ESA on October 3, 1992 (USFWS 1992a). The species is also listed by the State of Washington as threatened. On May 24, 1996, the USFWS published a final rule designating critical habitat on specific tracks of federal land throughout Washington, Oregon, and California for marbled murrelet (USFWS 1996). A Recovery Plan for the marbled murrelet was published in 1997 (USFWS 1997b).

Populations in the Project Area: Marbled murrelet occurrence in Washington State is limited to the marine environment and inland nesting areas within flying distance of the shore. The farthest inland documented breeding site for an individual of this species in Washington is 52 miles. The project and action areas are well outside of any potential use site, and WDFW PHS data (WDFW 2007) show no occurrences near the action area. As well, no critical habitat is designated in Chelan County (USFWS 1996). Thus, the species is not considered further in this document.

7.2.5 Northern Spotted Owl

Status: The northern spotted owl (*Strix occidentalis caurina*) was listed under federal law as Threatened in 1990 (USFWS 1990). The species is also listed by the State of Washington as Endangered. Critical habitat for the species was designated in 1992, and consists of specific tracts of federal land throughout Washington, Oregon, and California (USFWS 1992b). Critical habitat for the species was redesignated in 2008 (USFWS 2008). A draft Recovery Plan for the northern spotted owl was prepared in 1992, but has not been finalized (USFWS 1992d). The primary threat to the species is the significant loss of suitable nesting, roosting and foraging (NRF) habitat throughout its range.

Spotted owl habitat consists of four components: 1) nesting, 2) roosting, 3) foraging, and 4) dispersal. Although spotted owl habitat is variable over its range, some general attributes are common to the subspecies' life-history requirements throughout its range. The attributes of nesting and roosting habitat typically include a moderate to high canopy closure (60 to 80 percent); a multi-layered, multi-species canopy with large (> 30 inches diameter at breast height [dbh]) overstory trees; a high incidence of large trees with various deformities (e.g., large cavities, broken

tops, mistletoe infections, and other evidence of decadence); large snags; large accumulations of fallen trees and other woody debris on the ground; and sufficient open space below the canopy for owls to fly. The species primarily uses mixed conifer stands that may include Douglas-fir, grand fir (*Abies grandis*), and ponderosa pine (*Pinus ponderosa*) on the east slope of the Cascades.

Populations in the Project Area: Suitable habitat for nesting, wintering, or foraging northern spotted owls does not occur in the project area. Spotted owl critical habitat is designated in Wenatchee National Forest, which begins just west of the action area. The species has been largely extirpated in areas where old-growth and mature forest habitat has been reduced or fragmented, and this generally characterizes the area between the designated critical habitat and the action area. No continuous corridor connects the project area to suitable spotted owl habitat and the WDFW PHS data (WDFW 2007) show no occurrences near the action area. Given the absence of habitat in the project area and the proximity of older and more suitable forest in Wenatchee National Forest, the species is not expected to use the project area or immediate vicinity, and it is not addressed further in this document.

7.2.6 Canada Lynx

Status: The contiguous United States (lower 48 states) Canada lynx DPS was listed as threatened by the USFWS under the ESA, effective 24 April 2000 (USFWS 2000). On July 3, 2003, this determination was further defined in a clarification of findings by the USFWS (2003). The species is also listed by the State of Washington as threatened. The USFWS published a final rule on November 9, 2006 designating critical habitat for the contiguous United States DPS of the Canada lynx (USFWS 2006). Critical habitat for the species was redesignated in 2009 (USFWS 2009). The following species description is a summary of the information about lynx contained within the following sources: Brittell *et al.* 1989, Lloyd 1996, Koehler 1994, McKelvey *et al.* 1999, Ruggiero *et al.*, Stinson 2000, Wisdom *et al.* 2000, Witmer *et al.* 1998, and USFWS 2000.

In north central Washington, lynx inhabit subalpine and mixed conifer forests almost exclusively above 4,000 feet elevation in both summer and winter. Lynx in the Lake Chelan area are nearly always associated with Engelmann spruce-subalpine fir or lodgepole pine communities, and avoid Douglas-fir or ponderosa pine communities. Forested habitat is critical to all aspects of lynx life history. Lynx prefer areas that provide cover, avoiding areas such as open meadows that are greater than 300 feet wide. Traveling lynx use forested ridges and riparian areas that provide horizontal and overhead cover, but utilize different stand densities and ages for traveling than for foraging and denning. The differences in forest stand densities and seral stages utilized by lynx for different activities necessitate forest heterogeneity in areas that support robust lynx populations.

Disturbance history determines the suitability of a forest for supporting lynx. Forests with patches of dense, even-aged saplings adjacent to mature stands, and connected to other patches of saplings by forested ridges or riparian areas, would provide excellent lynx habitat. Such a forest would provide foraging habitat connected to other foraging habitat and adjacent to denning habitat.

Populations in the Project Area: Critical habitat has been designated for the Canada lynx in Washington State. Designated critical habitat for the Canada lynx in Washington State occurs only within Chelan and Okanogan Counties above the 4,000-foot elevation contour line from north

of Lake Chelan, the Stehekin River, and Flat Creek; north to the Canadian Border. Critical Habitat in Chelan County extends as far south as Cooper Ridge and in Okanogan County as far east as the North Fork of Salmon Creek. No designated critical habitat areas occur within approximately 10 miles of the project area.

WDFW (2010) data do not indicate lynx use of the project vicinity. It is very unlikely that the species utilizes the project area. The relatively low elevation, level of development, and proximity to a large floodplain hinder this area's usefulness as a travel corridor for lynx. Far more suitable habitat occurs elsewhere in the State and in Chelan County. The project area and immediately surrounding area do not support suitable habitat. Therefore, the species is not considered further in this document.

7.2.7 Grizzly Bear

Status: The grizzly bear was listed on the original list of endangered species in 1967 and downlisted to Threatened status in July 1975 (USFWS 1975). The species is also listed by the State of Washington as endangered. A recovery plan for grizzly bears was approved in 1982 and revised in 1993. The revised grizzly bear recovery plan divided grizzly bear populations in the contiguous United States into six recovery zones, which included the North Cascades Recovery Zone (USFWS 1993). The revised recovery plan did not include a specific recovery plan chapter for the North Cascades Recovery Zone; the recovery plan chapter for the North Cascades was approved in 1997 (USFWS 1997a). Critical Habitat is not designated or proposed for grizzly bears.

The North Cascades Recovery Zone has an estimated population of no more than 50 grizzly bears, with a more likely population of 10 to 20 bears. The North Cascades Ecosystem extends into Canada, where there are an estimated additional 17 to 23 grizzlies (Gaines *et al.* 2000). There are no physical boundaries to bear movement across the international boundary. The Recovery Zone extends from U.S. Interstate 90 north to the Canadian border and includes all of the Wenatchee National Forest and could potentially support an estimated 200 to 400 bears.

Grizzly bears utilize a variety of habitat types, but show an affinity for forest cover. Grizzly bears locate their beds next to trees or logs. Feeding areas such as avalanche chutes and meadows adjacent to tree cover are important grizzly habitat. However, a lack of adjacent forest cover does not preclude grizzly bear habitat use.

Populations in the Project Area: WDFW data (2007) show no sightings of grizzly bears within several miles of the project area. Suitable habitat does not exist for the species within the action area. The occurrence of houses and roads in the action area would discourage grizzly bear use of the project area. As well, more suitable habitat occurs elsewhere in the County and is not connected to the project area by travel corridors. The species is not considered further in this report.

7.2.8 Ute Ladies'-Tresses

Status: The Ute ladies'-tresses, a member of the orchid family, was listed as Threatened in 1992 (USFWS 1992c). It occurs in Colorado, Idaho, Montana, Nebraska, Utah, Wyoming, and Washington. In October 2004, USFWS announced that it would be conducting a status review to determine if delisting is warranted (USFWS 2004b). In Washington State, Ute ladies'-tresses is listed as Endangered by the Washington Natural Heritage Program (WNHP) (WNHP 2010). A Recovery Plan for Ute ladies'-tresses was published in 1995 (USFWS 1995).

The plant was first discovered in Washington in 1997 at a lake near Tonasket, Okanogan County (Calypso Consulting 2000, BBS 2004). In August, 2000, Ute ladies'-tresses was discovered at three separate sites along the Chelan County shore of Lake Entiat while conducting the relicensing environmental surveys (Calypso Consulting 2000 and 2002, BBS 2004) for the relicensing of the Rocky Reach Hydroelectric Project (Rocky Reach Project). In 2005, another new occurrence was discovered along Lake Entiat, yielding a total of four known sites along the mainstem Columbia River in Chelan County. In 2009, two additional occurrences of Ute ladies'-tresses were discovered downriver from the known sites, bringing the total number of sites where the plant is found in Chelan County to six. Currently, Ute ladies'-tresses only occurs in two areas in Washington, one in Chelan County and the other in Okanogan County (WNHP and BLM 2000; WNHP 2010).

The known occurrences of Ute ladies'-tresses along the Lake Entiat shoreline are located in Chelan County between Beebe Bridge at River Mile (RM) 503 and Wells Dam (RM 510) on the Columbia River. These sites are on stabilized gravel bars that are typically inundated early in the growing season and moist throughout the growing season (WNHP 2010). All of the Ute ladies'-tresses populations along the Columbia River are within the Rocky Reach Project boundary. Ute ladies'-tresses occurs in areas along the reservoir where pre-impoundment habitat conditions (based upon pre-Project aerial photos) seemed unsuitable for this species. Pre-impoundment 1930's aerial photos show that shrub steppe and sagebrush habitat existed on the locations where the Ute ladies'-tresses populations are now present. Therefore, Ute ladies'-tresses likely became established after Lake Entiat was created and have persisted under current Project operating conditions (CPUD 2009).

Five of the Ute ladies'-tresses occurrences on the Lake Entiat shoreline are on public land and one is on private land. Occurrences on public land include: two on the Public Utility District No. 1 of Chelan County's (Chelan PUD) land (PUD pond site and the PUD Beebe site); one on Washington Department of Fish and Wildlife (WDFW) land (Beebe Springs site); one on Washington State Department of Transportation (WSDOT) land (Gallagher Flat site); and one U.S. Bureau of Land Management (BLM) land (BLM site). The occurrence on private land (the Stocker site) is located downstream of the BLM site (CPUD 2009).

Individual plants within these populations grow directly along the shoreline within the high water inundation zone. Ute ladies'-tresses is endemic to mesic or wet meadows and riparian and wetland habitats near springs, seeps, lakes, and perennial streams. It occurs where the overstory vegetation is relatively open and not too dense or overgrown (WNHP and BLM 2000; WNHP 2010).

Since the listing, plants have also been found in "seasonally flooded river terraces, sub-irrigated or spring-fed abandoned stream channels and valleys, and lakeshores. In addition, 26 populations have been discovered along irrigation canals, berms, levees, irrigated meadows, excavated gravel pits, roadside borrow pits, reservoirs, and other human-modified wetlands" (Fertig *et al.* 2005). Until the discovery of the Lake Entiat populations, previous populations had been located between 1,500 and 7,000 feet above sea level (WNHP and BLM 1999, Calypso Consulting 2000, BBS 2004). The Lake Entiat populations are found at an elevation of 720 feet above sea level (Calypso Consulting 2000, BBS 2004); accordingly, elevation cannot be used to limit potential habitat determinations.

Ute ladies'-tresses is most recognizable when it is blooming. Along Lake Entiat, this plant generally blooms from late July through August. Despite their distinctive spikes of showy white flowers, these plants can be very difficult to locate within dense, under-story vegetation such as grasses and Canada goldenrod. Plants without blooms are extremely difficult to locate within the vegetation. The orchids do not bloom every year; sometimes only producing leaves during the growing season (if they emerge at all), making them difficult to monitor (Fertig *et. al.* 2005).

In 2009, Chelan PUD received a new Project license from the Federal Energy Regulatory Commission (FERC 2009) for the Rocky Reach Project. Article 404 of the Rocky Reach Project license requires Chelan PUD to control noxious weeds at sites where Ute ladies'-tresses occurs, conduct annual surveys to document plant numbers and distribution, conduct a survey of suitable habitats along the project reservoir every five years to identify any new populations, and to acquire management rights for an occurrence on private land (CPUD 2009).

Threats associated with Ute ladies'-tresses include watershed and stream alterations that degrade natural stream stability and diversity, conversion of riparian/floodplain land to agricultural uses, and competition from noxious weeds (WNHP and BLM 2000; Fertig *et. al.* 2005). Pollinators and pollen-producing plants must be maintained in the vicinity of Ute ladies'-tresses populations to preserve this orchid (WNHP and BLM 2000). Columbia River flows must have an effect on Ute ladies'-tresses occurrence. The benefit or detriment of that effect is unknown, except for the fact that the total numbers of Ute ladies'-tresses and its range have increased under the current flow regime since the plant was first discovered in 2000 (CPUD 2009).

Populations in the Project Area: The Washington Natural Heritage Program documents Ute ladies'-tresses in Chelan County. Three of the four known population in the State occur near each other along the Columbia River, either in backwater wetlands or ponds. The wetland near the mouth of Beebe Springs Creek may be suitable for Ute ladies'-tresses, but project activities will occur outside of the wetland. The south (original) stream channel has steep sides that are flanked by uplands; no habitat is present within the stream.

In mid-September, 2009, Joe Arnett (rare plant botanist for the Washington Department of Natural Resources, Natural Heritage Program) conducted a survey of WDFW lands north of Beebe Bridge and a newly acquired Chelan PUD parcel located immediately south of Beebe Bridge. Mr. Arnett located Ute ladies'-tresses along the two parcels and notified both agencies. Ron Fox (WDFW) also located additional Ute ladies'-tresses along the WDFW property. In early October, the sites were visited and individual plants were marked by placing a white glove tee made of wood

through a doubled length of surveyor's tape and inserting the tee into the ground approximately 1 inch away from the base of each plant. The plant locations were subsequently mapped by GPS. A total of 42 plants were recorded via GPS on the WDFW property (Beebe Springs Site) and 1 was recorded on the Chelan PUD property. Although Ute ladies'-tresses generally bloom from late July through August along previously known Lake Entiat locations, plants at these two locations appear to bloom later, possibly due to cooler subsurface water conditions at these sites.

Ute ladies'-tresses at the Beebe Spring Site were distributed along approximately 2,200 feet of the Lake Entiat shoreline north of Beebe Springs Creek, beginning about 300 feet north of the mouth of Beebe Springs Creek. All of the plants were located along a narrow wetland (Wetland C) approximately 100 feet in width that parallels the lake shore and near the OHW line at an elevation of about 708.5 feet. No Ute ladies'-tresses were found in a similar, but wider, wetland (Wetland D) located between Beebe Springs Creek and Beebe Bridge. This wetland was dominated by reed canarygrass, a species that can out-compete Ute ladies'-tresses. Documented locations of Ute ladies'-tresses in the project area are presented in Appendix C (Figure 3). Photographs of typical locations are presented in Appendix B.

7.2.9 Gray Wolf

Status: The Gray wolf (*Canis lupus*) is federally and state listed as an endangered species in Washington. In 1967, the timber wolf (*Canis lupus lycaon*) was listed as endangered under the first federal endangered species law (Department of the Interior 1967). They gained additional protection in 1974 upon the passing of the Endangered species Act of 1973 (Department of the Interior 1974). Based on the probability of enforcement problems and because the trend among taxonomists was to recognize fewer subspecies of wolves, in 1978 the USFWS clarified the legal and taxonomic confusion by downlisting the Minnesota populations of solves from endangered to threatened, while all other North American gray wolf populations south of Canada remained listed as endangered, without reference to subspecies (USFWS 1978a).

Gray wolves utilize a variety of habitat types, but show an affinity for forest cover. Wolf packs require large blocks of unpopulated and lightly roaded habitat with abundant game herds. Agricultural lands, such as those in the vicinity of the project action area are generally avoided.

Populations in the Project Area: Wolves historically occurred in western, northeastern, and southeastern Washington. They seem not to have occurred on the Columbia Plateau (Dalequest 1948). Wolves are generally associated with the larger hooved mammals on which they feed. Hooved animals, except for mountain sheep and mule deer, may not have occurred on the Columbian Plateau in historic times, and even the deer and sheep probably were scarce (Dalequest 1948). There was probably little food for wolves on the plateau. Wolves were extirpated in Washington State by sometime in the early 1920s, with the last individuals killed or observed on the Olympic Peninsula, in the North Cascades between Lake Chelan and Mount Baker, and in the vicinity of Mount Rainier (Dalequest 1948).

Since 1984, wolves have been seen in the vicinity of Ross Lake on both sides of the international boundary (NOCA 2004). Wolves were photographed near Hozomeen, Washington at the north end of Ross Lake in 1991 (NOCA 2004). Locations of other sightings in the North Cascades

include McAlester Pass in Chelan County, the Pasayten Wilderness and Twisp River drainage of the Okanogan National Forest, Glacier Peak Wilderness, and Stevens Pass (NOCA 2004). Since 1990, biologists have seen three separate groups of adults wolves with pups in the Cascade Mountains (NOCA 2004). The sightings in the mid-90s of gray wolves feeding pups were in remote areas of the North Cascades where wolf/dog hybrids are unlikely (Johnson and Cassidy 1997). Wolves were reintroduced into central Idaho in 1995 (Johnson and Cassidy 1997). No direct evidence of breeding east of the Pend Oreille River exists, but the gray wolf population in the Canadian Selkirks probably enters the extreme northwest corner of the state (Johnson and Cassidy 1997, NOCA 2006). No breeding pairs or packs of wild wolves are currently known to reside in Washington State, but it is increasing likely that wolves will disperse into eastern Washington from Idaho in the near future (WDFW 2006). Although sightings of wolves are becoming more frequent, the sightings are believed to be of animals that have wandered from Canada or Idaho, or wolf-dog hybrids that have been released into the wild (WDFW 2006).

WDFW data (2007) show no sightings of gray wolves outside of the higher elevations of the Cascades Mountains in Chelan County. Suitable habitat does not exist for the species within the action area. The occurrence of houses and roads in the action area would discourage gray wolf use of the project area. As well, more suitable habitat occurs elsewhere in the County and is not connected to the project area by travel corridors. The species is not considered further in this report.

7.2.10 Showy Stickseed

Status: The showy stickseed (*Hackelia venusta*) is federally and state listed as an endangered species in Washington. The showy stickseed was listed as endangered by the USFWS under the ESA on February 6, 2002 (USFWS 2002b). A Draft Recovery Plan for the showy stickseed was published in 2005 (USFWS 2005b). Critical Habitat is not designated or proposed for the showy stickseed. The showy stickseed is restricted to one small population of roughly 600 plants scattered over approximately 40 acres of unstable granitic sand and granite cliffs on the middle and lower slopes of Tumwater Canyon, Chelan County Washington (USFWS 2005b). The plant is dependant upon open, unstable areas of granitic sand and talus or ledges and cracks of vertical granite cliffs (USFWS 2005b). The known habitat of the showy stickseed is between a range of elevation between 1,550 and 2,700 feet (USFWS 2005b).

Populations in the Project Area: The project and action areas are well outside the range of distribution for the one known population of showy stickseed and do not contain any suitable habitat. In addition, the project action area is located well below 1,500 feet in elevation and does not contain any granite cliffs or granitic sand and talus slopes necessary for the growth and reproduction of this plant. Thus, the species is not considered further in this document.

7.2.11 Wenatchee Mountains Checker-mallow

Status: The Wenatchee Mountains checker-mallow (*Sidalcea oregano* var. *calva*) is federally and state listed as an endangered species in Washington. The Wenatchee Mountains checker-mallow was listed as endangered by the USFWS under the ESA on December 22, 1999 (USFWS 1999b). On September 6, 2001, the USFWS published a final rule designating critical habitat for the

Wenatchee Mountains checker-mallow (USFWS 2001). A Recovery Plan for the Wenatchee Mountains checker-mallow was published in 1997 (USFWS 2004a).

The Wenatchee Mountains checker-mallow is restricted to wetlands and moist meadows of the Wenatchee Mountains of central Washington on the east side of the Cascade Mountains (USFWS 2004a). This species is found at mid-elevations, ranging from 1,600 to 3,300 feet. Populations are found in the wetter portions of open forest-moist meadow habitats, in slight topographic depressions (USFWS 2004a). The plant may also be found in open conifer forests dominated by ponderosa pine and Douglas-fir (*Pseudotsuga menziesii*) and on the perimeter of shrub and hardwood thickets dominated by quaking aspen (*Populus tremuloides*) (USFWS 2004a). The species is currently only known from five populations documented to occur only in the Peshastin and Icicle Creek drainages of Chelan County, Washington (USFWS 2004a). This historical range covered an area of approximately 11 by 3 miles, extending south-southeasterly from Leavenworth, Washington, to the area now known as Camas Meadows (USFWS 2004a).

Populations in the Project Area: The project and action areas are well outside the range of distribution for the one known population of the Wenatchee Mountains checker-mallow and do not contain any suitable habitat. In addition, the project action area is located well below 1,600 feet in elevation and does not contain open forest-moist meadow habitats dominated by ponderosa pine, Douglas-fir, or quaking aspen. Lands designated as critical habitat are in the Camas Creek basin (a tributary of Peshastin Creek) approximately 40 miles from the project action area. Thus, the species is not considered further in this document.

8.0 ESA EFFECTS ANALYSIS

8.1 EFFECTS ON NMFS MATRIX INDICATORS

The NMFS and USFWS checklists (Tables 8-1 and 8-2) for documenting the effects of the proposed project on salmonid habitat indicated that the Beebe Springs Natural Area Development Phase 3 Project will not degrade any of the environmental pathways and indicators for Chinook salmon, steelhead trout, and bull trout (NMFS 1996, USFWS 1998a and1998b).

8.1.1 Effects to ESA species

The following section addresses the direct effects of the project on listed species including the interdependent and interrelated actions, as well as the indirect effects of the project.

- Direct effects are defined as the direct or immediate effects of the project on the species or its habitat. Direct effects include those resulting from interdependent or interrelated actions (NMFS 2004a).

- Interdependent actions are those that have no independent utility apart from the action under consideration (Federal Register 1986). Interdependent actions are typically "because of" the proposed action.

- Interrelated actions are those that are part of a larger action and depend on the larger action for their justification (Federal Register 1986). Interrelated actions are typically "associated with" the proposed action.

- Indirect effects are those that are caused by or will result from the proposed action and are later in time, but still reasonably certain to occur (Federal Register 1986).

8.1.2 Chinook Salmon

Direct Effects: Upper Columbia River spring-run Chinook salmon only utilize the project action area as a migration corridor for upstream movement of adult spawners to spawning tributaries upstream of the project action area and downstream movement of smolts. The residence time of yearling spring-run Chinook salmon smolts in the proposed action area is no more than a few days to a week between late April through May, adult spawners passing the proposed action area from late May through August. Spring-run Chinook salmon will not be present in the proposed action area during the November excavation of the openings to the proposed side channel and will not be impacted.

Interdependent/Interrelated Actions: The Beebe Springs Natural Area Development is a multi-phase project. After Phase 3 is completed, additional phases will be completed as additional funding is obtained. Additional phases may include the creation of a new highway 97 underpass for pedestrians and Beebe Springs Creek itself, a service area with restrooms, picnic shelter and concessions building, as well as plantings, more interpretive elements and outdoor classrooms for education groups, access trails west of Highway 97, which also sits on WDFW land. All of the remaining phases have the potential to impact salmonid habitat and would be cumulative impacts, but the impacts would have no effect on the use of Lake Entiat as a migration corridor for spring-run Chinook salmon or direct impacts to spring-run Chinook salmon.

The staging areas and accidental spills would be interdependent and interrelated actions. That is the staging areas and accidental spills would not have occurred without the primary action. The primary staging area will be on site at the parking lot (Appendix C) and additional staging areas will also be created on site in the vicinity of construction areas. A spill prevention plan would be in place to minimize the possibility of accidental discharge of fuel or hydraulic fluids to the Beebe Springs channels or Lake Entiat. The temporary use of hay bales to control silt, and other BMPs will minimize the potential for off-site migration of soils and road contaminants from entering Beebe Springs Creek or Lake Entiat during construction activities.

Indirect effects: The indirect effects of this project involve possible stranding of migrating smolts in the two proposed side channel, the revegetation of the project site and the maintenance of drainage swales. Maintenance will be conducted on a semi-annual and annual basis. The side channels are designed to prevent stranding of juvenile salmonids in the event of a sudden drop in lake surface elevation. Revegetation and maintenance activities would be short-term and at a very low level of frequency and would not adversely affect spring-run Chinook salmon.

8.1.3 Steelhead Trout

Direct Effects: Upper Columbia River steelhead spawn and rear year-round in Beebe Creek and it is likely that a few rearing juveniles are also present in nearshore habitat of lake Entiat in the proposed action area. The residence time of out-migrating steelhead smolts from the Methow and Okanogan River watersheds in the proposed action area is no more than a few days to a week between March through June. Adult spawners pass through the proposed action area from July through May of the following year (almost year-round) and over-winter in the Columbia River reservoirs (including Lake Entiat) until they enter tributary streams (including Beebe Springs Creek) in March to spawn. Small numbers of rearing steelhead juveniles are likely to be present in nearshore habitat of Lake Entiat during the October 15 to February 28 in-water construction window. Over-wintering adult steelhead are also likely to be present, but will likely be holding in deeper portions of the reservoir. Opening the side channel to Lake Entiat during the in-water construction window of October 15 through February 28 has the potential to disturb adult steelhead holding in the lake, but any adult steelhead present would be expected to quickly move to deeper water with injury or harm unlikely. A few juveniles may be present in the substrate gravel and cobble during excavation of the side channel openings into the lake and is possible that an undetermined number of juvenile steelhead may be injured or killed, however juvenile steelhead are also strong swimmers and very alert to the presence of movement and are likely to swim out of the work area during the November excavation of the side channel openings to Lake Entiat. The timing of the work in November should help to minimize injuries because no out-migrant smolts would be present at that time. Rearing juvenile steelhead are likely to be present in the approximately 150-foot reach of Beebe Springs Creek where culvert removal and habitat enhancement will occur. This reach will be dewatered during culvert removal, and fish passage around the site will be provided by a newly constructed channel. The removal of the culvert and enhancement of stream habitat in the modified pool will be done in accordance with conservation measures and reasonable and prudent measures for incidental take outlined in the July 8, 2008 Biological Opinion for Washington State Fish Passage and Habitat Enhancement Restoration Programmatic Consultation (NMFS and USFWS 2008). The dewatering and fish capture protocol of the 2008 BO will be followed during the culvert removal, but there is a potential for a small take of juvenile steelhead during diversion and dewatering of the project area. Culvert removal will occur during the July 1 to August 31 window for in-stream work.

Interdependent/Interrelated Actions: The Beebe Springs Natural Area Development is a multi-phase project. After Phase 3 is completed, additional phases will be completed as additional funding is obtained. Additional phases may include the creation of a new highway 97 underpass for pedestrians and Beebe Springs Creek itself, a service area with restrooms, picnic shelter and concessions building, as well as plantings, more interpretive elements and outdoor classrooms for education groups, access trails west of Highway 97, which also sits on WDFW land. All of the remaining phases have the potential to impact steelhead and their habitat and would be cumulative impacts.

The staging areas and accidental spills would be interdependent and interrelated actions. That is, the staging areas and accidental spills would not have occurred without the primary action. The

primary staging area will be on site at the parking lot (Appendix C) and additional staging areas will also be created on site in the vicinity of construction areas. The parking lot at the Chelan Hatchery may also be used as a temporary staging area during construction of the parking lot. A spill prevention plan would be in place to minimize the possibility of accidental discharge of fuel or hydraulic fluids to the Beebe Springs channels or Lake Entiat. The temporary use of hay bales to control silt, and other BMPs will minimize the potential for off-site migration of soils and road contaminants from entering Beebe Springs Creek or Lake Entiat during construction activities.

Indirect effects: The indirect effects of this project involve increased turbidity in Lake Entiat and the lower portion of Beebe Springs Creek during excavation of the openings to the proposed side channels and removal of two culverts on Beebe Springs Creek, take during dewatering and fish removal during the removal of two culverts at a road crossing on Beebe Creek, possible stranding of juveniles and out-migrating smolts in the proposed side channels, the revegetation of the project site, and the maintenance of drainage swales. Excavation of the side channels will cause a slight increase in turbidity, but the Lake Entiat substrate in the vicinity of the proposed side channel is composed primarily of sand, gravel, and cobble, with very little fine sediment present. Similarly, the south channel of Beebe Springs Creek has a relatively steep gradient with a substrate composed primarily of sand, gravel, and cobble with very little fine sediment present. The increase in turbidity will be very short-lived and is unlikely to harm over-wintering adult steelhead or rearing juvenile steelhead or cause any behavioral changes to steelhead in the vicinity of the proposed action area. The side channel is designed to prevent stranding of juvenile salmonids in the event of a sudden drop in lake surface elevation. Maintenance will be conducted on a semi-annual and annual basis. Revegetation and maintenance activities would be short-term and at a very low level of frequency and would not adversely affect steelhead trout.

8.1.4 Bull Trout

Direct Effects: Fluvial sub-adult or adult bull trout may be present in the nearshore habitat of Lake Entiat during the November excavation of openings to the proposed side channel. Based on numbers of bull trout observed migrating through Wells and Rocky Reach Dams and the fact that a portion of the fluvial bull trout population of Lake Entiat will likely overwinter in spawning tributary watersheds, there are probably less than one hundred bull trout present in Lake Entiat in November, greatly minimizing the risk of bull trout presence at the time of excavation activities. Bull trout are unlikely to be harmed during excavation of the side channel openings.

Interdependent/Interrelated Actions: The Beebe Springs Natural Area Development is a multi-phase project. After Phase 3 is completed, additional phases will be completed as additional funding is obtained. Additional phases may include the creation of a new highway 97 underpass for pedestrians and Beebe Springs Creek itself, a service area with restrooms, picnic shelter and concessions building, as well as plantings, more interpretive elements and outdoor classrooms for education groups, access trails west of Highway 97, which also sits on WDFW land. All of the remaining phases have the potential to impact bull trout and their habitat and would be cumulative impacts.

The staging areas and accidental spills would be interdependent and interrelated actions. That is the staging areas and accidental spills would not have occurred without the primary action. The

primary staging area will be on site at the parking lot (Appendix C) and additional staging areas will also be created on site in the vicinity of construction areas. The parking lot at the Chelan Hatchery may also be used as a temporary staging area during construction of the parking lot. A spill prevention plan would be in place to minimize the possibility of accidental discharge of fuel or hydraulic fluids to the Beebe Springs channels or Lake Entiat. The temporary placement of hay bales to control silt, and other BMPs will minimize the potential for off-site migration of soils and road contaminants from entering Beebe Springs Creek or Lake Entiat during construction activities.

Indirect effects: The indirect effects of this project involve increased turbidity in Lake Entiat during excavation of the openings to the proposed side channel, possible stranding of bull trout in the proposed side channel, the revegetation of the project site, and the maintenance of drainage swales. Excavation of the side channel will cause a slight increase in turbidity, but the Lake Entiat substrate in the vicinity of the proposed side channel is composed primarily of sand, gravel, and cobble, with very little fine sediment present. The increase in turbidity will be very short-lived and is unlikely to harm over-wintering sub-adult or adult bull trout or cause any behavioral changes to bull trout in the vicinity of the proposed action area. The side channel is designed to prevent stranding of juvenile salmonids in the event of a sudden drop in lake surface elevation. Maintenance will be conducted on a semi-annual and annual basis. Revegetation and maintenance activities would be short-term and at a very low level of frequency and would not adversely affect bull trout.

8.1.5 Marbled Murrelet

The species does not occur in the project area and would receive no effects from the project.

8.1.6 Northern Spotted Owl

The species does not occur in the project area and would receive no effects from the project.

8.1.7 Canada Lynx

The species does not occur in the project area and would receive no effects from the project.

8.1.8 Grizzly Bear

The species does not occur in the project area and would receive no effects from the project.

8.1.9 Ute Ladies'-Tresses

Direct effects: Ute ladies'-tresses were documented during September, 2009 surveys in the action area. Yearly August/September surveys are planned to monitor the Beebe Springs Site population. Documented Ute ladies'-tresses will not be disturbed during excavation of the side channels. Once the proposed side channels are constructed and stabilized, the habitat will be similar to the existing locations of the Ute ladies'-tresses nearby and the linear feet of riparian wetland habitat will be increased. Approximately 2,150 linear feet of new shoreline will be created by the construction of the two new side channels and about 500 linear feet of existing shoreline removed by excavation

to connect the side channels to Lake Entiat, for a total of 1,650 additional linear feet of habitat suitable for colonization by Ute ladies'-tresses. The 950 LF of new habitat created in the north side channel will be particularly likely to be colonized by Ute ladies'-tresses, because the band of riparian vegetation near the OHWM has less invasive vegetation, such as reed canarygrass, to compete with the Ute ladies'-tresses. Thus, new suitable habitat will be developed on the site that may be colonized by Ute ladies'-tresses in the future.

Interdependent/Interrelated Actions: The Beebe Springs Natural Area Development is a multi-phase project. After Phase 3 is completed, additional phases will be completed as additional funding is obtained. Additional phases may include the creation of a new highway 97 underpass for pedestrians and Beebe Springs Creek itself, a service area with restrooms, picnic shelter and concessions building, as well as plantings, more interpretive elements and outdoor classrooms for education groups, access trails west of Highway 97, which also sits on WDFW land. All of the remaining phases have the potential to impact Ute ladies'-tresses that may colonize wetland habitat after Phase 3 or suitable habitat created during Phase 3 and would be cumulative impacts.

The staging areas and accidental spills would be interdependent and interrelated actions. That is the staging areas and accidental spills would not have occurred without the primary action. The primary staging area will be on site at the parking (Appendix C) and additional staging areas will also be created on site in the vicinity of construction areas. The parking lot at the Chelan Hatchery may also be used as a temporary staging area during construction of the parking lot. A spill prevention plan would be in place to minimize the possibility of accidental discharge of fuel or hydraulic fluids to the Beebe Springs channels or Lake Entiat. The temporary use of hay bales for silt control, and other BMPs will minimize the potential for off-site migration of soils and road contaminants from entering Beebe Springs Creek or Lake Entiat during construction activities.

Indirect Effects: The indirect effects of this project involve the revegetation of the project site, and the maintenance of drainage swales. Maintenance will be conducted on a semi-annual and annual basis. Herbicides will not be used in the vicinity of documented Ute ladies'-tresses, and manual means of control will be used on invasive vegetation. Revegetation and maintenance activities would be short-term and at a very low level of frequency and would not adversely Ute ladies'-tresses.

8.1.10 Gray Wolf

The species does not occur in the project area and would receive no effects from the project.

8.1.11 Showy Stickseed

The species does not occur in the project area and would receive no effects from the project.

8.1.12 Wenatchee Mountains Checker-mallow

The species does not occur in the project area and would receive no effects from the project.

8.2 EFFECTS TO CRITICAL HABITAT

Critical habitat has not been designated for the grizzly bear, Ute ladies'-tresses, or showy stickseed. Critical habitat has been designated for the bull trout, marbled murrelet, northern spotted owl, Canada lynx, gray wolf, and Wenatchee Mountains checker-mallow, but no critical habitat for these species is designated in the proposed project action area.

On September 2, 2005, NMFS defined the primary constituent elements (PCE) determined to be essential to the conservation of the upper Columbia River spring-run Chinook salmon ESU and upper Columbia River steelhead trout DPS and issued the final determination of critical habitat for these species (NMFS 2005c).

8.2.1 Chinook Salmon

Beebe Springs Creek and Lake Entiat in the proposed action area

The September 2, 2005 rule designating critical habitat for the upper Columbia River Chinook salmon ESU defined the lateral extent of critical habitat for each designated stream reach as the width of the stream channel as defined by its bankfull elevation. Bankfull elevation is reached at a discharge which generally has a recurrence interval of 1 to 2 years on the annual flood series. Critical habitat in lake areas, such as Lake Entiat, is defined by the perimeter of the water body displayed on standard 1:24,000 scale topographic maps or the elevation of ordinary high water, whichever is greater. Adjacent floodplains are not designated as critical habitat. However human activities that occur outside the lateral extent of critical habitat have the potential to have demonstrable effects on physical and biological features of critical habitat in designated reaches.

Action Area Primary Constituent Elements

The September 2, 2005 rule designating critical habitat for the upper Columbia River Chinook salmon ESU identified six primary constituent elements (NMFS 2005). These six primary constituent elements are designed to incorporate what is essential for the conservation of the upper Columbia River Chinook salmon ESU within the specified subbasins. All lands identified as essential and proposed as critical habitat contains one or more of the primary constituent elements for the upper Columbia River Chinook salmon ESU.

1. Freshwater Spawning Sites: The sediment regime of Beebe Springs Creek is functioning at risk for Chinook salmon (Table 8-1). The project would improve the sediment regime of Beebe Springs Creek over the long-term (Table 8-1). Spring-run Chinook salmon do not spawn in the project action area and yearling smolts migrating through Lake Entiat in the proposed action area utilize the habitat as a navigation channel for out-migration with no significant residence time in the reservoir. In-stream construction along Lake Entiat will only occur when excavating openings to the new side channels on Lake Entiat in November when spring-run Chinook salmon are not present.

2. Freshwater Rearing Sites: Spring-run Chinook salmon do not rear in the project action area.

3. Freshwater Migration Corridors: There are no physical barriers to prevent the migration of spring-run Chinook salmon past the proposed project action area (Table 8-1). The project would neither create nor remove physical barriers to spring-run Chinook salmon (Table 8-1). In-stream construction on Beebe Springs Creek will occur between July 1 and August 31 when listed spring-run Chinook spawners will pass along the Columbia River (Lake Entiat) past the mouth of Beebe Springs Creek. There may be a slight increase in turbidity in Beebe Springs Creek during the initial diversion of water around the culvert removal project and when flow is returned to the dewatered reach of the creek, but this will be of brief duration and unlikely to affect spring-run Chinook migrating past the mouth of Beebe Springs Creek.

4. Estuarine Areas: This PCE does not apply to the project action area. The project would have no impact on estuarine habitat.

5. Nearshore Marine Areas: This PCE does not apply to the project action area. The project would have no impact on nearshore marine habitat.

6. Offshore Marine Areas: This PCE does not apply to the project action area. The project would have no impact on offshore marine habitat.

Determination

The PCEs that were determined to be essential to the conservation of the upper Columbia River Chinook salmon ESU are defined in 50 CFR, Part 226 (70 FR 52630). An assessment of the PCEs was completed in part to identify construction methods that can be changed or altered to lessen the impact on PCEs.

For this project, all of the effects of the action have already been discussed in the ESA effects analysis (Section 8.0) and would apply to Chinook salmon critical habitat. No adverse effects to critical habitat would occur. With the exception of excavation in November of openings to the proposed new side channel habitat, construction activities would occur during the dry season on land and outside of the lateral extent of critical habitat. The only in-water work would have no impact to spring-run Chinook salmon spawning or rearing habitat and would have no impact on the use of Lake Entiat as a migration corridor. No toxic chemicals or sediments would be released into the environment.

8.2.2 Steelhead Trout

Beebe Springs Creek and Lake Entiat in the proposed action area

The September 2, 2005 rule designating critical habitat for the upper Columbia River Chinook salmon ESU defined the lateral extent of critical habitat for each designated stream reach as the width of the stream channel as defined by its bankfull elevation. Bankfull elevation is reached at a discharge which generally has a recurrence interval of 1 to 2 years on the annual flood series. Critical habitat in lake areas, such as Lake Entiat, is defined by the perimeter of the water body displayed on standard 1:24,000 scale topographic maps or the elevation of ordinary high water, whichever is greater. Adjacent floodplains are not designated as critical habitat. However human

activities that occur outside the lateral extent of critical habitat have the potential to have demonstrable effects on physical and biological features of critical habitat in designated reaches.

Action Area Primary Constituent Elements

The September 2, 2005 rule designating critical habitat for the upper Columbia River steelhead DPS identified six primary constituent elements (NMFS 2005). These six primary constituent elements are designed to incorporate what is essential for the conservation of the upper Columbia River steelhead DPS within the specified subbasins. All lands identified as essential and proposed as critical habitat contains one or more of the primary constituent elements for the upper Columbia River steelhead DPS.

1. Freshwater Spawning Sites: The sediment regime of Beebe Springs Creek is functioning at risk for steelhead (Table 8-1). In-stream construction on Beebe Springs Creek will occur during the removal of two culverts at a road crossing between July 1 and August 31, after spawning is finished, but while fry may still be in the gravel. The project would improve the sediment regime of Beebe Springs Creek over the long-term and increase the amount of available spawning habitat (Table 8-1).

2. Freshwater Rearing Sites: In-steam construction will temporarily disturb steelhead rearing habitat when excavating openings to the new side channel on Lake Entiat in November when steelhead are not present. The disturbance will end shortly after completion of excavation with no long-term impacts to steelhead rearing habitat. In-stream construction on Beebe Springs Creek will occur between July 1 and August 31 when listed steelhead spawners will pass along the Columbia River (Lake Entiat) past the mouth of Beebe Springs Creek. It is also likely that steelhead juveniles will be rearing in the creek. There may be a slight increase in turbidity in Beebe Springs Creek during the initial diversion of water around the culvert removal project and when flow is returned to the dewatered reach of the creek, but this will be of brief duration and unlikely to affect steelhead migrating past the mouth of Beebe Springs Creek or rearing in the creek. Diversion of Beebe Springs Creek and dewatering the stream channel in the vicinity of the culvert removal project has the potential of creating a take of a small number of juvenile steelhead and will create a long-term increase in available rearing habitat.

3. Freshwater Migration Corridors: There are no physical barriers to prevent the migration of steelhead past the proposed project action area (Table 8-1). The project would neither create nor remove physical barriers to steelhead trout, but removal of the two culverts at the road crossing will improve fish passage (Table 8-1).

4. Estuarine Areas: This PCE does not apply to the project action area. The project would have no impact on estuarine habitat.

5. Nearshore Marine Areas: This PCE does not apply to the project action area. The project would have no impact on nearshore marine habitat.

6. Offshore Marine Areas: This PCE does not apply to the project action area. The project would have no impact on offshore marine habitat.

Determination

The PCEs that were determined to be essential to the conservation of the upper Columbia River steelhead DPS are defined in 50 CFR, Part 226 (70 FR 52630). An assessment of the PCEs was completed in part to identify construction methods that can be changed or altered to lessen the impact on PCEs.

For this project, all of the effects of the action have already been discussed in the ESA effects analysis (Section 8.0) and would apply to steelhead critical habitat. No adverse effects to critical habitat would occur. With the exception of excavation in November of two openings to the proposed new side channel habitat and the culvert removal on Beebe Springs Creek, construction activities would occur during the dry season on land and outside of the lateral extent of critical habitat. The in-water work in Lake Entiat would have no impact to steelhead spawning or rearing habitat and would have no impact on the use of Lake Entiat as a migration corridor. The removal of two culverts at a road crossing of Beebe Springs Creek will have a short-term impact to steelhead spawning habitat, but create more spawning habitat in the long-term. The removal of the culvert and enhancement of stream habitat in the modified pool will be done in accordance with conservation measures and reasonable and prudent measures for incidental take outlined in the July 8, 2008 Biological Opinion for Washington State Fish Passage and Habitat Enhancement Restoration Programmatic Consultation (NMFS and USFWS 2008). No toxic chemicals or sediments would be released into the environment.

Table 8-1

NMFS and USFWS Checklist for Documenting the Environmental Baseline of the Beebe Springs Creek Watershed and the Effects of the Beebe Springs Natural Area Development Phase 3 Project on Chinook, Steelhead, and Bull Trout Pathways and Indicators.

Pathways	Population and Environmental Baseline			Effects of the Action(s)		
Indicators	Properly Functioning	at Risk	Not Properly Functioning	Restore	Maintain	Degrade
Subpopulation Characteristics*						
Subpopulation Size		X			X	
Growth and Survival		X			X	
Life History Diversity and Isolation		X			X	
Persistence and Genetic Integrity		X			X	
Water Quality						
Temperature	X				X	
Sediment		X		X (long-term)		
Chemical Contamination-Nutrients	X				X	
Habitat Access						
Physical Barriers		X		X		
Habitat Elements						
Substrate Embeddedness	X				X	
Large Woody Debris	X			X		
Pool Frequency and Quality	X				X	
Large Pools	X				X	
Off-Channel Habitat	X				X	
Refugia	X				X	
Channel Conditions and Dynamics						
Wetted Width/ Max Depth Ratio	X				X	
Streambank Condition	X (long-term)	X (short-term)			X	
Floodplain Connectivity	X				X	
Flow/Hydrology						
Change in Peak/Base Flow	X				X	
Increase in Drainage Network		X			X	
Watershed Conditions						
Road Density and Location			X		X	
Disturbance History		X			X	
Riparian Conservation Areas		X (long-term)	X (short-term)	X		
Species and Habitat*						
Integration of Species and Habitat Conditions		X			X	

* The indicators for these pathways are based on the bull trout populations utilizing Beebe Springs Creek as foraging habitat.

Table 8-2
NMFS and USFWS Checklist for Documenting the Environmental Baseline of Lake Entiat Nearshore Habitat in the Vicinity of the Beebe Springs Natural Area Development Phase 3 Project on Chinook, Steelhead, and Bull Trout Pathways and Indicators.

Pathways	Population and Environmental Baseline			Effects of the Action(s)		
Indicators	Properly Functioning	at Risk	Not Properly Functioning	Restore	Maintain	Degrade
Subpopulation Characteristics*						
Subpopulation Size		X			X	
Growth and Survival		X			X	
Life History Diversity and Isolation		X			X	
Persistence and Genetic Integrity		X			X	
Water Quality						
Temperature		X			X	
Sediment**	X				X (long-term)	X (temporary)
Chemical Contamination-Nutrients	X				X	
Habitat Access						
Physical Barriers		X		X		
Habitat Elements						
Substrate Embeddedness**		X			X	
Large Woody Debris			X	X		
Pool Frequency and Quality**			X		X	
Large Pools**			X		X	
Off-Channel Habitat		X		X		
Refugia		X		X		
Channel Conditions and Dynamics						
Wetted Width/ Max Depth Ratio**			X		X	
Streambank Condition**	X				X	
Floodplain Connectivity	X				X	
Flow/Hydrology						
Change in Peak/Base Flow**			X		X	
Increase in Drainage Network **	X				X	
Watershed Conditions						
Road Density and Location			X		X	
Disturbance History		X			X	
Riparian Conservation Areas		X (long-term)	X (short-term)	X		
Species and Habitat*						
Integration of Species and Habitat Conditions		X			X	

* The indicators for these pathways are based on the bull trout populations utilizing Lake Entiat as foraging habitat.

** Lake Entiat is an impoundment on the Columbia River mainstem. Although some current exists in the project vicinity, the nearshore habitat is composed of former floodplain with the original river channel on the other bank.

9.0 EFH ASSESSMENT

The objective of this Essential Fish Habitat assessment is to determine whether or not the proposed action(s) "may adversely affect" designated EFH for relevant commercially, federally-managed fisheries species within the proposed Action Area. This report provides a description and assessment of EFH in the project area; a description of the project and its potential impacts on these habitats.

9.1 EFH BACKGROUND

The Sustainable Fisheries Act of 1996 (Public Law 104-297) amended the Magnuson-Stevens Fishery Conservation and Management Act (now called the Magnuson-Stevens Act) to require federal agencies to consult with NMFS on activities that may adversely affect EFH. The EFH guidelines (50 CFR 600.05-600.930) outline the process for federal agencies, NMFS, and the Fishery Management Councils to satisfy the EFH consultation requirement under Section 305(b(2)-(4)) of the Magnuson-Stevens Act. As part of the EFH consultation process, the guidelines require federal action agencies to prepare a written EFH Assessment describing the effects of that action on EFH (50 CFR 600.920(e)(1)). This document has been prepared to satisfy that requirement.

EFH is defined as "those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 U.S.C 1802(10)). For the purpose of interpreting this definition of EFH: "waters include aquatic areas (marine waters, intertidal habitats, and freshwater streams) and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and spawning, breeding, feeding, or growth to maturity covers a species' full life cycle (50 CFR 600.10); Adverse effect means any impact that reduces quality and/or quantity of EFH, and may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey or reduction in species fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions" (50 CFR 600.810). The Magnuson-Stevens Act promotes the protection of these habitats through review, assessment, and mitigation of activities that may adversely affect these habitats. The significance of small-scale projects lies in the cumulative and synergistic effects resulting from a large number of these activities occurring in a single watershed.

The EFH mandate applies to all species managed under a Fishery Management Plan (FMP). In Washington, Oregon, and California, there are three FMPs covering groundfish, coastal pelagic species, and Pacific salmon. Federal agencies must consider the impact of a proposed action on all three types of EFH.

Pacific salmon EFH for the Pacific Coast Salmon FMP includes all streams, lakes, ponds, wetlands, and other water bodies currently and historically utilized by Pacific salmon within

Washington, Oregon, Idaho, and California within the U.S. Geological Survey Hydrologic Unit Code (HUC). Excluded are some areas upstream of certain impassable man-made barriers (e.g., dams as identified by the Pacific Fishery Management Council in Appendix A of Amendment 14 to the Pacific Coast Salmon Plan), and longstanding, naturally-impassable barriers (e.g., natural waterfalls in existence for several hundred years) (PFMC 2000). The project action area is located in Upper Columbia River-Entiat: HUC 17020010, which is considered EFH for Chinook and coho salmon.

Pacific salmon EFH for the Pacific Coast Salmon FMP includes all streams, lakes, ponds, wetlands, and other water bodies currently and historically utilized by Pacific salmon within Washington, Oregon, Idaho, and California within the U.S. Geological Survey Hydrologic Unit Code (HUC). Excluded are some areas upstream of certain impassable man-made barriers (e.g., dams as identified by the Pacific Fishery Management Council in Appendix A of Amendment 14 to the Pacific Coast Salmon Plan), and longstanding, naturally-impassable barriers (e.g., natural waterfalls in existence for several hundred years) (PFMC 2000). The proposed project action area is located in U.S. Geological Survey (USGS) hydrologic unit 17020010 (Upper Columbia River-Entiat), which is considered EFH for Chinook and coho salmon.

Based on the available life history information, freshwater EFH for Pacific salmon consists of four major components: 1) spawning and incubation, 2) juvenile rearing, 3) juvenile migration corridors, and 4) adult migration corridors and adult holding habitat (Roni *et al.* 1999). Important features of essential habitat for spawning, rearing, and migration include adequate: 1) substrate composition; 2) water quality (dissolved oxygen, nutrients, temperature, etc.); 3) water quantity, depth, and velocity; 4) channel gradient and stability; 5) food availability; 6) cover and habitat complexity (e.g., large woody debris, pools, channel complexity, aquatic vegetation, etc.); 7) space (habitat area); 8) access and passage; and 9) floodplain and habitat complexity. Potential threats to these habitat features and life history components include: 1) direct (hydrologic modifications); 2) indirect (loss of prey or reduction of species diversity); 3) site-specific; or 4) habitat-wide impacts that are chemical, biological, and physical in nature and may result in individual, cumulative, or synergistic consequences (Wilbur and Pentony 1999).

9.2 IDENTIFICATION OF THE EFH IN THE PROJECT ACTION AREA

The proposed project action area is located in U.S. Geological Survey (USGS) hydrologic unit 17020010 (Upper Columbia River-Entiat) and is designated EFH for Chinook and coho salmon (PSMFC 2000).

The project site is in the vicinity of Lake Entiat and Beebe Springs Creek, which is a tributary of Lake Entiat which provide essential fish habitat features and beneficial components to the life history stages of several species of salmonids and other fishes.

9.2.1 EFH for Chinook Salmon

Lake Entiat is a migration corridor for spring-run Chinook salmon adult spawners returning to the Methow and Okanogan River watersheds above Wells Dam and smolt out-migrants.

9.2.2 EFH for Coho Salmon

Lake Entiat is a migration corridor for hatchery coho salmon adult spawners returning to the Methow and Okanogan River watersheds above Wells Dam and smolt out-migrants. Beebe Springs Creek is also utililzed by stray hatchery coho salmon for spawning and rearing of juvenile off-spring.

9.3 POTENTIAL ADVERSE EFFECTS OF THE PROPOSED PROJECT

The definition of "adverse effect" is "any impact that reduces quality and/or quantity of EFH, including direct (*e.g.*, contamination or physical disruption), indirect (*e.g.*, loss of prey or reduction in species fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions" (50 CFR 600.810).

For this project, all of the effects of the action have already been discussed in the ESA effects analysis (Section 8.0) and would apply to EFH. All effects of the action are short term and temporary.

9.3.1 Chinook Salmon EFH

The proposed project may result in a minor short-term increase in water turbidity within the nearshore habitat of Lake Entiat during the excavation of entrance channels when constructing the side channel and in the lower portion of Beebe Springs Creek during culvert removal. The substrate excavated is primarily composed of sand, gravel and cobble and turbidity should drop to baseline levels shortly after completion of excavation activities. Excavated habitat will be usable by rearing Chinook salmon juveniles within hours after the completion of excavation. Chinook salmon do not utilize Lake Entiat as spawning habitat and the short-term effects of the excavation of entrance channels to the side channel will not prevent the upstream migration of adult Chinook salmon spawners into Beebe Springs Creek or Lake Entiat. Culvert removal and habitat enhancement on Beebe Springs Creek will temporarily disturb spawning and rearing habitat, but will create a long-term increase in available spawning and rearing habitat. No long-term impacts to Chinook salmon, their prey species, spawning habitat, or rearing habitat will occur from the proposed project. Therefore, the project will have no adverse effect on EFH or Chinook salmon.

9.3.2 Coho Salmon EFH

The proposed project may result in a minor short-term increase in water turbidity within the nearshore habitat of Lake Entiat during the excavation of entrance channels when constructing the side channel and in the lower portion of Beebe Springs Creek during culvert removal. . The substrate excavated is primarily composed of sand, gravel and cobble and turbidity should drop to baseline levels shortly after completion of excavation activities. Coho salmon do not utilize Lake Entiat as rearing or spawning habitat and the short-term effects of the excavation of entrance channels to the side channel will not prevent the upstream migration of adult coho salmon spawners into Beebe Springs Creek or Lake Entiat. . Culvert removal and habitat enhancement on Beebe Springs Creek will temporarily disturb spawning and rearing habitat, but will create a long-term increase in available spawning and rearing habitat. No long-term impacts to coho salmon,

their prey species, spawning habitat, or rearing habitat will occur from the proposed project. Therefore, the project will have no adverse effect on EFH for coho salmon.

10.0 DETERMINATION OF EFFECT

Preparation of the NMFS/USFWS matrix, in addition to a review of the project design, BMPs to be implemented during construction, the existing conditions of the streams, literature review, and species information obtained from federal and state agencies were used to establish the following findings of effects for ESA species, critical habitat, and EFH.

Table 10-1
ESA Effects Determination-Listed Species

Species	ESA Status	Effects Determination
Chinook Salmon	Endangered	May affect, not likely to adversely affect
Steelhead Trout	Threatened	May affect, not likely to adversely affect
Bull Trout	Threatened	May affect, not likely to adversely affect
Marbled Murrelet	Threatened	No effect
Northern Spotted Owl	Threatened	No effect
Canada Lynx	Threatened	No Effect
Grizzly Bear	Threatened	No Effect
Ute Ladies'-Tresses	Threatened	May affect, not likely to adversely affect
Gray Wolf	Endangered	No Effect
Showy Stickseed	Endangered	No Effect
Wenatchee Mountains Checker-mallow	Endangered	No Effect

Table 10-2
ESA Effects Determination-Critical Habitat

Species	Presence in the Project Area	Effects Determination
Chinook Salmon	Lake Entiat (Columbia River) is designated as Critical habitat for the upper Columbia River spring-run Chinook ESU.	May affect, not likely to adversely affect
Steelhead Trout	Lake Entiat (Columbia River) is designated as Critical habitat for the upper Columbia River steehead trout DPS.	May affect, not likely to adversely affect
Bull Trout	Lake Entiat (Columbia River) is proposed as designated critical habitat for bull trout.	Will not destroy or adversely modify/not likely to adversely affect

Table 10-3
EFH Effects Determination-Pacific Salmon

Species	Hydrologic Unit Code (HUC)	Effects Determination
Chinook Salmon (*O. tshawytscha*)	Upper Columbia River-Entiat: HUC 17020010	No adverse effect
Coho Salmon (*O. kisutch*)	Upper Columbia River-Entiat: HUC 17020010	No adverse effect

11.0 COORDINATION/CONSULTATION HISTORY

A request for Priority Habitats and Species (PHS) information was sent to WDFW on February 16, 2010. In a letter dated April 4, 2010, the WDFW provided maps and data identifying special status species and habitats in the vicinity of the proposed project (WDFW 2010). The PHS maps cannot be published in reports under the confidentiality agreement between WDFW and URS Corporation. The ESA and EFH species were addressed in this report.

The USFWS no longer responds to individual requests for site-specific species occurrence. Instead the Upper Columbia Fish and Wildlife Office of the USFWS have posted on their website the species that occur within eastern Washington by county. The most recent (July 7, 2008) copy of the listed species occurrences in Chelan County, Washington was downloaded from the website on April 7, 2010 (USFWS 2010). It is the responsibility of the applicant to determine which species on the county-wide list actually occur in the project area. This can be done by cross-referencing the USFWS list with the WDFW PHS maps. This was done for this project and it was determined that out of twelve federally listed species with potential to be present in Chelan County, the upper Columbia River spring-run Chinook salmon ESU (endangered), upper Columbia River steelhead DPS (threatened), Columbia River bull trout DPS (threatened), and Ute ladies'-tresses (threatened) have been documented to be present in the vicinity of the project action area. Critical habitat designations have been made for the upper Columbia River spring-run Chinook salmon ESU, upper Columbia River steelhead DPS, Columbia River bull trout DPS, Canada lynx, gray wolf, and Wenatchee Mountains checker-mallow; but only designated critical habitat for Chinook salmon and steelhead trout occurs in the project action area. The Action Area is considered EFH for the salmonids listed above in Table 10-3. The most recent (July 1, 2009) status summary of listed salmonid ESUs was obtained from the NMFS ESA website on February 16, 2010.

The most recent update (August 2006) of the Washington Natural Heritage Program GIS data CD-ROM has been provided by WDNR to URS Corporation for species requests. A query of the site vicinity did not result in any plant species or ecosystems of special concern in the vicinity of the project area.

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