ENTIATQUA TRAIL

Biological Assessment

For Federal Endangered Species Act Consultation
on Listed Species Under the Jurisdiction of the
National Marine Fisheries Service and U.S. Fish and Wildlife Service

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

SECTION 1: INTRODUCTION AND SPECIES OF CONCERN

The Public Utility District No. 1 of Chelan County (Chelan PUD) proposes to construct the Entiatqua Trail near Entiat Park and the mouth of the Entiat River in order to comply with the terms and conditions of the Federal Energy Regulatory Commission (FERC or Commission) license for the Rocky Reach Hydroelectric Project (FERC Project no. 2145).

The purpose of this initiation package is to review the proposed Entiatqua Trail Project in sufficient detail to determine to what extent the proposed action may affect any of the threatened, endangered, proposed species and designated or proposed critical habitats listed below. In addition, the following information is provided to comply with statutory requirements to use the best scientific and commercial information available when assessing the risks posed to listed and/or proposed species and designated and/or proposed critical habitat by proposed federal actions. This initiation package is prepared in accordance with legal requirements set forth under regulations implementing Section 7 of the Endangered Species Act (50 CFR 402; 16 U.S.C. 1536 (c)).

Threatened, Endangered, Proposed Threatened or Proposed Endangered Species

This Biological Assessment (BA) addresses the potential effects of the Entiatqua Trail construction on species listed under the ESA and their designated critical habitat. The following listed species may be affected by the proposed action:

Upper Columbia River (UCR) spring-run Chinook salmon (*Oncorhynchus tshawytscha)* ***E***
Upper Columbia River (UCR) steelhead (*Oncorhynchus mykiss)* ***T***
Bull trout (*Salvelinus confluentus)* ***T***
Ute Ladies' Tresses (*Spiranthes diluvialis)* ***T***

SECTION 2: DESCRIPTION OF THE ACTION AND ACTION AREA

2.1 Project Purpose

The Federal Energy Regulatory Commission (FERC or Commission) issued an "Order on Offer of Settlement and Issuing New License" (License) on February 19, 2009, and an "Order on Rehearing and Clarification" on May 21, 2009 for the Rocky Reach Hydroelectric Project. License Article 406 directs Public Utility District No. 1 of Chelan County, Washington (Chelan PUD), to file a revised Recreation Resources Management and Implementation Plan (RRMIP) with FERC within one year of License issuance. The plan as filed, includes (among other actions) the development and construction of improvements to Entiat Park. Approval of the final Recreation Resources Management Plan was received from FERC on October 12, 2010. The Rocky Reach FERC License Article 406(4) and Settlement Agreement Article 9(e) specify that Chelan PUD is responsible for implementing the Entiat Park Revitalization Project in accordance with Section 4.5.3 of Chapter 9 of the Comprehensive Plan. This Plan specifically calls out the development of the Entiatqua Trail.

The purpose of the project is therefore compliance with a FERC license order which mandates the construction of the Entiatqua Trail. The nature of the project and its intended use is highly water dependent. Construction will require access to, and within, the Columbia River for placement of fill. The project is intended to enhance local recreational opportunities while also improving the aquatic environment.

2.2 Project Description

Filling of Rocky Reach reservoir in 1961 resulted in the inundation of the old Entiat Town core. In order to maintain its existence the town was forced to relocate further upland. The Entiatqua Trail Project provides partial mitigation for the impacts associated with the inundation and relocation of Old Entiat. The modern city of Entiat is the District's primary stakeholder for the project. Through agreement with the District, the city will operate and maintain the trail.

Construction of Rocky Reach Dam and subsequent filling of the Rocky Reach Reservoir also required relocation of State Route 97A and the railroad (originally owned by Great Northern Railway). At the confluence of the Columbia and Entiat Rivers two large bridges were reconstructed at a significantly higher elevation to accommodate the predicted higher water flows. In order to provide access on and off the north end of the bridges it was necessary to construct a large earthen ramp. This ramp was constructed using the blasted rock attained from construction of SR97A (the blasted rock coming from the outcroppings located along the western side of the Columbia River adjacent to the modern SR97A). The manmade earthen ramp forms the embankment upon which the proposed trail will reside.

The development of the Entiatqua Trail was proposed by the City of Entiat through the relicensing process. The purpose of the trail will be to connect Entiat Park to the proposed Entiatqua Outdoor Learning Center being developed by the City of Entiat in partnership with the Entiat School District, and will become part of a future trail system that will encircle the City of Entiat.

The Federal Energy Regulatory Commission (FERC or Commission) issued an Order Modifying and Approving Revised Recreation Management Plan to Chelan County PUD on October 12, 2010. The Order directed Chelan County PUD to complete the Entiatqua Trail Feasibility Study and file the study results with the Commission along with documentation of agency consultation.

The Entiatqua Trail will be a bike and pedestrian path located at the confluence of the Entiat and Columbia Rivers. Viewpoints located along the trail will provide interpretive opportunities as well as resting and viewing points for trail users. The trail will parallel the Rocky Reach Reservoir and the Entiat River along an existing earth embankment that supports the Cascade and Columbia (C&C) Railroad and State Route 97A. The trail, approximately 1,776 feet long, will begin at the southern end of Entiat Park and proceed south along an embankment between the C&C Railway and the Columbia River to the point of confluence with the Entiat River (Figure 1). The trail will then pass under the existing railway and SR97A bridges. After passing under the bridges the trail will then turn north and run parallel with SR97A along the existing embankment before proceeding west along the north bank of the Entiat River toward the future Entiatqua Outdoor Learning Center, which is not part of this proposed project.

Figure 1: Entiatqua Trail Conceptual Plan

Entiatqua Trail features include:

- Clear trail width: 7'-3" from outside face of upper retaining structure (gabions) to inside of rail fence.
- Total trail width (including rail fence): 8'-0" from outside face of upper retaining structure (gabion) to inside face of lower retaining structure (Lock+Load or rock wall). Expands to greater width at interpretive signs. The total length of the trail is approximately 1,776 feet long.
- Trail retaining structures: Gabion Baskets along upland side of Trail, Lock+Load (concrete) modules or rock wall along waterward side of trail.
- Trail Surface: Well compacted crushed rock aggregate.
- Mitigation - Large complex wood structures: 4, total, along Columbia River. Each structure has seven (7) logs 18 inches to 30 inches diameter, log type is cedar, Ponderosa pine or Douglas fir. Structures are held in place by ballast boulders 36 inches to 54 inches in diameter.
- Mitigation - A 650 foot long, 3 foot to 15 foot wide riparian corridor includes over 350 trees and shrubs as well as native grasses. Stabilization includes the use of coir logs and fabric. Irrigation system for watering of new plants.
- Wood Rail Fence: Approximately 4 foot 6 inches tall, three rails, totaling 1,833 feet in length (1,559 feet trail; 276 feet park entry road), to be located along the waterward side of trail (protection from fall hazard).
- Chain link fence: 6 feet in height, totaling 6,502 feet in length (1,506 feet trail; 4,997 feet park), to be located above gabions (minimizes pedestrian conflicts with railroad and SR97A to improve safety).
- Viewpoint 1 – A viewpoint with an interpretive sign will be located along the trail on the Rocky Reach Reservoir. This interpretive sign will highlight shoreline erosion techniques employed in the project.
- Viewpoint 2 – A viewpoint with an interpretive sign and bench will be located along the trail on the Entiat River side. This interpretive sign will highlight area fish and wildlife.

An important component of the Entiatqua Trail Project is inclusion of a bio-engineering erosion control demonstration site that is a requirement of the Rocky Reach Comprehensive Settlement Agreement, Comprehensive Plan, Chapter 1: Rocky Reach Shoreline Erosion Management Plan, which was incorporated into the Rocky Reach operating license. This demonstration site incorporates the following features of a bio-engineered shoreline stabilization site:

- Large complex woody structures that provide in-water fish habitat while also dissipating wave action.
- Coir logs and fabric made from the natural fiber of coconut husk to also dissipate wave action and to hold soil in place to establish riparian plantings.
- Plantings consisting of shrubs (willow, dogwood, salmon berry, Nootka rose and spirea), trees (shore pine and water birch) and grass seed (rye, hairgrass and junegrass). Once the plants are established fully their root systems form a framework to help hold earth materials in place. The plantings are intended to provide shade and drop material to help replenish nutrients along the river's edge, further promoting biological activity.

The expectation is that the Entiatqua Trail will receive considerable public use and the erosion control demonstration site will receive significant attention, thus assisting to educate the public as to potential bio-engineering control measures that can be employed on Rocky Reach Reservoir or other water bodies where erosion is an issue.

The project includes the development of a 650 foot long, 3 to 15 foot wide riparian corridor along the Columbia River side of the trail. The corridor will be planted with nearly 350 new shrubs and trees. The shrubs and trees will provide near shore foliage (shade and nutrients). In addition the riparian corridor includes the construction of four large complex woody structures. These structures will provide in-water habitat for a variety of fish. Further supplementing the structures will be the placement of sediment and cobble mix specifically designed for enhancing the near shore aquatic habitat for benthic macroinvertebrates as juvenile fish food source.

To provide for the safety of trail users a wood rail fence is located on the side of the trail closest to the river. The rail fence provides a protective barrier from a 3 to 8 foot high drop off which will be created by retaining the trail as a means to minimize the amount of in-water fill required.

The trail also takes into consideration the needs of the physically disabled by constructing the trail consistent with Accessibility Guidelines for Outdoor Developed Areas. This includes constructing the trail at reasonable grades and providing sufficient trail width to allow two wheel chairs to pass side by side.

Chelan PUD completed a feasibility study of the trail and determined that it can be built. The study involved engineering analyses of the proposed project site, development of preliminary design drawings and cost estimates, and consultation with all agencies identified in the Order and agencies responsible for environmental permitting of the proposed project. This feasibility study provides development information for the trail and assessments regarding environmental permitting, site conditions, accessibility constraints, and the trail's proximity to a major transportation corridor, including highways and bridges.

A primary component of the feasibility study was conducting geotechnical analyses of the "constructability" of the trail along the steep earthen embankment. The analyses consisted of: 1) general site assessment; 2) conceptual design review and recommendations; and 3) preliminary design review and recommendations. The geotechnical analyses evaluated site conditions and recommended differing techniques for trail construction. The preliminary design drawings are based on these recommendations and incorporate comments received from National Marine Fisheries Service (NMFS). The geotechnical analysis evaluated potential impacts to the transportation corridor and concluded trail construction would not adversely impact the corridor. In summary, results of the geotechnical analyses indicate site conditions, while challenging, are not an impediment to trail construction.

During the study period, it was determined that extensive permitting of the trail will not be required by Washington State Department of Transportation (WDOT). Rather, WDOTs only requirement was for Chelan PUD to obtain a General Permit for construction of the trail below the bridge. Chelan PUD has already initiated efforts to attain this permit and believes it will not impede construction of the trail.

The portion of the trail running parallel with the highway north of the bridge is within the Entiat City Limits and, therefore, resides within the jurisdictional limits of the city of Entiat. The city of Entiat and Chelan PUD will therefore be required to enter into a right-of-way agreement for the portion of the trail running adjacent to Highway SR97A. As the primary project stakeholder the city of Entiat has expressed their willingness to enter into right-of-way agreement for the trail. Chelan PUD has acquired the necessary land rights and easements to permit construction of the trail along and below the C&C Railroad.

Construction of the trail as proposed will require the following environmental permits:

- United State Army Corps of Engineers (USACE) 404 permit
- Washington State Department of Fish & Wildlife (WDFW) Hydraulic Project Approval (HPA)
- Shoreline Substantial Development Permit as administered by the City of Entiat

Chelan PUD has conducted a permit pre-application review with NMFS, U.S. Fish and Wildlife Service (USFWS), and WDFW. The pre-application review included site visits, conference calls, and emails to discuss the project as documented in Table 1. Comments and feedback provided by the two agencies has been incorporated into the Joint Aquatic Resources Permit Application (JARPA) drawings. The end result of the pre-application review was a determination that environmental permits to allow construction of the trail can be obtained.

Table 1: Consultation History

AGENCY	CONSULTATION FORMAT	CONSULTATION DATE
NOAA Fisheries (NMFS)	Pre-Application Office and Site Meeting	Sept. 26, 2011
NOAA Fisheries	Conference Call	October 25, 2011
WDFW	Pre-Application Site Mtg.	November 22, 2011
NOAA Fisheries	Conference Call	November 23, 2011
C&C Railroad	E-mail	August 25, 2011
WSDOT	Office Meeting	May 17, 2011
WSDOT	E-mail	Sept. 22, 2011
NOAA Fisheries	E-mail	May 14, 2012
NOAA Fisheries	Site visit	July 10, 2012
NOAA Fisheries	Telephone call	July 26, 2012
NOAA Fisheries	E-mail	July 27, 2012
NOAA Fisheries	E-mail	July 30, 2012
NOAA Fisheries	E-mail	August 14, 2012
USFWS	Site visit	August 29, 2012
USFWS	E-mail	September 14, 2012
USFWS	Telephone call	September 27, 2012

Construction of the Entiatqua Trail will be performed by a qualified licensed earth work contractor as determined through a competitively bid process in compliance with Washington State bid laws. The construction site is located on a relatively steep man-made, blasted rock embankment. The site also contains large rock measuring as much as six feet across in three dimensions. Construction access is limited to the start and end of the trail. Due to the site conditions and difficult access construction is anticipated to be slow and extremely laborious. The use of heavy mechanized equipment up to 10 feet 6 inches wide will be required. Equipment to be used will include excavators, loaders, front-end lifts, dump trucks, and bulldozer.

The implementation schedule for the Entiatqua Trail is as follows:

Proposed Implementation Schedule

Design: January 1, 2012 to November 30, 2012
Permitting: March 1, 2012 to April 30, 2013
Bid & Award: July 16, 2014 to August 31, 2014
Construction: September 1, 2014 – May 15, 2015

Work occurring below the ordinary high water mark (OHWM) will commence after September 1, 2014 and be completed by February 28, 2015. The construction sequence will largely depend on the contractor awarded the project. The project will go to public bid once all permits have been obtained. Preliminary cost estimates have assumed the contractor will build the trail from the bottom up as well as from both ends concurrently. This results in the following construction sequence:

1. Mobilization and staging of project. Mobilization includes the placement of erosion control devices including silt fences.
2. Rough excavation of embankment starting at each end concurrently.
    a. On the Columbia River side rough excavation work will occur to provide access to construct the in-water components (during the approved work window). Specifically this will include placement of the base rock, streambed cobble and sediment, complex wood log structures, etc. During in-water work the contractor will deploy a turbidity curtain to contain suspended sediment in the immediate work vicinity.
    b. On the Entiat River side excavation work will occur in conjunction with construction of the Lock+Load retaining Wall. Because of the narrow working conditions the contractor will likely have multiple iterations of excavation then wall construction.
3. Once the lower walls are constructed various fill materials will be brought in and construction including excavation and building of the other retaining structures upland. The gabions will likely be final retaining wall structure built. Once they are built the embankment just above them will be capped with quarry spall to stabilize the slope directly above the trail.
4. In conjunction with building the trail the contractor will place sono tubes or similar for the construction of the rail and chain-link fences. Placement of the interpretive signs and bench will likely happen during this same time period.
5. The final component will be development of the riparian corridor. This consists of installation of the irrigation system, placement of top soil and coir fabric, planting of native shrubs and trees, placement of soil/gravel mix and finally hydro-seeding with native grasses.

As stated previously, excavation and fill activities are components of the proposed project. Excavation and fill volumes are shown in Table 2.

Table 2: Excavation and fill volumes for the Entiatqua Trail Project

Activity (clear, excavation, fill, etc.)	Impact location	Duration of impact	Amount of material (cubic yards) to be placed in or removed from waterbody	Area (sq. ft. or linear ft.) of waterbody directly affected
Cut existing soil	Below OHW	Short-term – during construction	130	
Cut existing rock	“”	“”	380	
Quarry spall fill	“”	“”	75	
Base rock fill	“”	“”	160	
Streambed cobble fill	“”	“”	180	
Streambed sediment	“”	“”	60	
Anchor rock for complex wood structure	“”	“”	50	
Logs for complex wood structure	“”	“”	28 (7 per structure)	
Root wads for complex wood structure		“”	8	
Habitat improvement (streambed cobble and sediment, wood structure)	“”	“”		6,340 sq. ft./ 625 linear ft.
Cut existing soil	Adjacent	“”	1,100	
Cut existing rock	“”	“”	3,400	
Quarry spall fill	“”	“”	270	
Base/wall rock fill	“”	“”	500	
Soil bags	“”	“”	25	
Top soil	“”	“”	115	
Structural fill	“”	“”	3,300	
Crushed surfacing base course (CSBC)	“”	“”	400	
Gabion baskets	“”	“”	1,350	
Chain link fence	“”	“”		6,502 linear ft.
Rail fence	“”	“”		1,833 linear ft.
Coir log	“”	“”		625 linear ft.
Habitat improvement (shoreline riparian enhancement)		“”		2,500 sq. ft./ 325 linear ft.

Soil erosion and sedimentation control measures will be employed during construction of the trail and submitted with construction drawings. Measures will include, but not be limited to, the following devices: straw wattles, silt fencing and turbidity curtains.

Construction equipment will primarily operate in the dry above the OHWM. Excavator buckets, however, will operate over water and below the OHWM for construction of in-water features. Excavators and loaders will contain hydraulic fluid certified as non-toxic to aquatic organisms.

The majority of work to construct the trail is above the OHWM. Work to be done includes excavation into the existing embankment and temporary stabilization for the construction of retaining structures. Structures include: gabion basket walls and mechanically stabilized earth walls (Lock+Load) pre-cast concrete modular system). The retaining structures will be backfilled with an imported crushed rock specifically designed for structural stability of the trail and retaining system. The trail itself will be 8'-0" wide and have a crushed rock surfacing. The trail includes a 4'-6" high wood rail fence along the edge closest to the river and a 6' high chain link fence on the upland side. Below the trail just above the OHWM along the Columbia River side of the trail will be the 3 foot to 15 foot wide by 625 foot long riparian corridor. The riparian corridor will consist of imported top soil as well as soil bags, coir logs, coir fabric, gravel cobble mulch, grass seed and plantings as illustrated in the JARPA drawings.

Construction access to the trail site is limited by the highway/railroad embankment and the river bodies as illustrated in Figure 1. Construction equipment will access the trail site from Entiat Park or the proposed Entiatqua Outdoor Learning Center. The Learning Center access entails using a 2,000 foot long single lane (narrow), unimproved road. During construction of the trail, equipment would also be constrained to the single lane trail (i.e. no turning movements or passing). These constraining conditions are workable, but result in a more costly and time intensive construction operation.

Because the trail will be built from each end, access and staging is provided at each end. These routes and staging areas are illustrated in Figure 2. The contractor has stringent requirements regarding refueling of machinery. Included in these requirements is for the refueling area to be located 150 feet from either river. Depending on how the contractor arranges Staging Area 1 there may be sufficient space to allow refueling there otherwise the contractor will need to conduct refueling at a location outside the staging and project areas.

Figure 2: Entiatqua Trail Staging Area Map

2.3 Previous Consultation

On February 19, 2009, the FERC issued the Rocky Reach Project, and new 45 year operating license. ESA Section 7 Consultation took place with NMFS and USFWS with Chelan PUD receiving Biological Opinions from both in 2007 and 2008, respectively (NMFS 2007; USFWS 2008).

In its Effects Analyses, NMFS included the statement below in its 2007 Biological Opinion (BiOp) on the Rocky Reach Comprehensive Settlement Agreement, which included the actions in Chelan PUD's Recreation Resource Management Plan:

> *The Recreation Management Plan includes continued operation and maintenance of the Rocky Reach Visitor Center and Park, Entiat Park, Chelan Falls/Powerhouse Park, Beebe Bridge Park, Daroga State Park, and Lincoln Rock State Park; renovations and improvements to several of these parks; construction of a trail linking Lincoln Rock State Park to a platform that overlooks the release point for the fish bypass facility below Rocky Reach Dam; a*

> *recreation resource monitoring and evaluation program; and a recreation needs forecast and analysis. The continued operation and renovation of the parks, of which all except one include shoreline areas with swimming and/or boating access, could adversely affect critical habitat for UCR steelhead and UCR spring-run Chinook if any modifications were proposed that would affect shoreline habitat function or water quality. However, of the proposed park improvements, only two of the projects would affect shoreline areas. The Entiatqua Trail Project and a potential addition of a second dock at the Entiat Park could have the potential to adversely affect designated critical habitats.*

In its Incidental Take Statement (NMFS 2007) for the Rocky Reach license and settlement agreement actions, NMFS applied the same Take Authorization to license elements that it issued to itself for entering into the Rocky Reach Habitat Conservation Plan (HCP) with Chelan PUD in 2003 (NMFS 2003). In the 2007 BiOp, NMFS described further expected levels of incidental take for the new license Settlement Agreement Plans, including the Recreation Resource Management Plan (BiOp action 6.8 referenced below) saying:

> *The incidental take statement issued with the 2003 ITP Biological Opinion to NMFS, together with its reasonable and prudent measures and terms and conditions, is incorporated in full into this Biological Opinion, and is repeated below. Since there is no spawning or rearing habitat of UCR steelhead or UCR Chinook in the migration corridor and tributary projects are to be considered in subsequent Section 7 consultations as projects are proposed, and incidental take due to effects on the migration corridor have been included the 2003 ITP Biological Opinion, NMFS finds that the incidental take described in that statement, and authorized in NMFS's ITP for this project, is the same take that is associated with FERC's Proposed Action considered here.*
>
> *It is expected that none of the actions described in 6.2 through 6.11 will produce take that will result in failure to meet survival standards and as a result, exceed take authorized in the 2003 ITP Biological Opinion. It is important to note that no additional take beyond that allowed in NMFS (2003a) is authorized for the action currently proposed. However, it is recognized that small levels of take may result from implementing the actions described in Section 6. The HCP and the 2003 ITP Biological Opinion require that until survival studies are met, estimates of juvenile fish survival be provided by studies of passage through the Project reservoir and dam, and every 10 years thereafter (NMFS 2002b). It is expected that any take from the actions described in 6.2 through 6.11 will not result in exceeding take previously authorized and will be directly measured and included as part of reservoir mortality. If future survival studies show that survival standards are not being met, additional measures are required by the HCP to bring the Project back into compliance with survival standards and authorized take.*

Based on the excerpts included previously, consultation with NMFS regarding UCR spring-run Chinook salmon and UCR steelhead has been completed for the project. However, consultation on Entiatqua Trail Project effects on bull trout was not included in the USFWS 2008 Rocky Reach relicensing BiOp, so will be considered in this document.

2.4 Project Area

Entiat Park is located on the Columbia River at River Mile (RM) 484, approximately 15 miles north of Wenatchee, Washington. The park lies on the west shore of the river in Chelan County, between two significantly different physiographic areas. To the west (Chelan County) lie the Cascade Mountains, and to the east (Douglas County) the Columbia Plateau. The Entiatqua Trail will be located immediately south of Entiat Park in HUC 17020010, Section 17, Township 25N, and Range 21 E. The Entiatqua Trail Project will encompass the mouth of the Entiat River and a small embayment just upstream of the river mouth and west SR97A, as shown in Figure 1.

2.5 Action Area

The Action Area encompasses the Project Area as well as habitat that could be directly or indirectly affected by the proposed project. To determine the boundaries of the Action Area, consideration was given to the potential reach of mechanisms that may lead to affects on species of concern. The project element with the most potential for the most far-reaching effects would be increased turbidity from in-water fill to create the riparian corridor in the Columbia River. However, turbidity is expected to attenuate within the 300-foot prescribed mixing zone for rivers (WAC 173-201A). During construction, water quality standards and procedures that limit the impact of turbidity will be observed. Based on previous experience with similar construction projects in the Columbia River, it is expected that water quality during and after Project construction will conform to established standards.

The project will also include construction activities under the SR97A and C&C Railroad bridges, and along the small embayment adjacent to SR97A at the mouth of the Entiat River. No in-water work is planned as part of the project in these locations. Best Management Practices (BMPs) will be employed during trail construction in these areas to prevent any degradation to water quality and loss of existing riparian vegetation.

Based on the footprint of the project described previously, the Action Area for the Entiatqua Trail Project is defined as 300 feet upstream and downstream of the Project Area in the Columbia River, the mouth of the Entiat River, and the left bank (looking downstream) shoreline of the Entiat River up to the end of the staging area near what is planned to be the Entiatqua Outdoor Learning Center (Figure 2).

SECTION 3: STATUS OF SPECIES AND CRITICAL HABITAT

3.1 Upper Columbia River (UCR) spring-run Chinook salmon

On May 24, 1999, NMFS formalized listing of UCR spring-run Chinook salmon as endangered under the ESA. The Upper Columbia River (UCR) spring-run Chinook salmon Evolutionarily Significant Unit (ESU) includes spring-run Chinook salmon populations found in Columbia River tributaries between the Rock Island and Chief Joseph dams. NMFS has initially identified three important spawning populations within this ESU: the Wenatchee, Entiat, and Methow populations (Interior Technical Recovery Team 2003). The populations are genetically and ecologically separate from the summer- and fall-run populations in the lower parts of many of the same river systems. Chinook salmon (and their progeny) from the following stocks that are raised in hatcheries are considered part of the listed ESU: Chiwawa River, Methow River, Twisp River, Chewuch River, White River, and Nason Creek. This species occurs within the Action Area.

The construction of Grand Coulee Dam (completed in 1942) blocked anadromous fish from habitat upstream of RM 596.6 after 1938. The concurrent Grand Coulee Fish Maintenance Program (GCFMP) influenced the present distribution of the ESU. Production of non-listed Carson-origin spring-run Chinook salmon has also taken place within the UCR spring-run Chinook salmon ESU. Non-listed spring-run Chinook salmon hatchery populations contained within this ESU include the Leavenworth National Fish Hatchery.

UCR spring-run Chinook use the Rocky Reach Reservoir as a corridor for juvenile and adult migration. The majority of UCR spring-run Chinook returning to the mid-Columbia River are of hatchery origin, but natural production occurs in the Entiat River, a tributary to Rocky Reach reservoir, and the Methow River, a tributary upstream of Wells Dam (Chapman et al. 1995a). Adult UCR spring-run Chinook begin arriving at Rocky Reach Dam in April and most pass the project by the fourth week in June. Spawning in upstream areas occurs from August through September. Juvenile UCR spring-run Chinook migrate through Rocky Reach on their way to the ocean during the months of April and May. Spring-run Chinook juveniles tend to migrate in mid-channel (Ledgerwood et al. 1991, Chapman et al. 1995a, Burley and Poe 1994) for much of their migration. Healy and Jordan (1992) also noted that most juvenile UCR spring-run Chinook migrated in higher velocity water near the center of the river.

3.1.1 Juvenile UCR spring-run Chinook

UCR spring-run Chinook salmon exhibit a classic stream-type life-history strategy. Juveniles emigrate from freshwater as yearling smolts and undertake extensive offshore ocean migrations. J uvenile UCR spring-run Chinook rear in fresh water typically for one year prior to outmigrating to the ocean as smolts. Hatchery smolts are also released as yearlings. Greater than 90% of

juvenile UCR spring-run Chinook passage occurs by early June (Chapman et al. 1995a, Mosey et al. 2000) at Rocky Reach Dam. The modal size of naturally produced UCR spring-run Chinook smolts entering the Columbia River above Rocky Reach Dam has been reported by several authors as ranging from about 80 mm to 110 mm (Chapman et al. 1995a). Hatchery produced smolts are generally larger than 120 mm and range up to 170 mm in length. In 1993, the average length of yearling UCR spring-run Chinook collected at Rock Island Dam (mixture of naturally and hatchery produced individuals) was 138 mm (Chapman et al. 1995a). Juvenile UCR spring-run Chinook in the mid-Columbia migrate actively (averaging about 21.5 km/day from Rock Island to McNary Dam), thus the reservoir residence time is short (Giorgi et al. 1997).

3.1.2 Adult UCR spring-run Chinook

Adult UCR spring-run Chinook mature, generally, at 4 years of age and enter the Columbia River during March through May, with peak migration in the lower river in April and early May (WDFW/ODFW 1994). Most adults pass through the mid-Columbia reach from April through the third week in June. Spawning occurs in the tributaries, beginning in late July and continuing through September. The Wenatchee, Entiat, and Methow Rivers and their tributaries support naturally spawning UCR spring-run Chinook populations. Though summer/fall Chinook salmon spawning has been documented in the tailrace of the Chelan Falls project, there is no documentation to date that UCR spring-run Chinook use the area for spawning grounds.

Chapman et al. (1995a) summarized historical UCR spring-run Chinook runs to the mid-Columbia. UCR spring-run Chinook counts at Rock Island were less than 3,000 fish per year from 1935-38. Counts increased erratically to a high point of about 27,000 in the mid-1980s, a period of high ocean productivity. Since then escapements declined to about 5,800 in 1991, rebounded to over 20,000 in 1993, declined in 1995 to fewer than 1,000 fish, then have ranged from 2,000 – 6,500 since then. It is important to note that current escapement numbers are greatly influenced by harvest rates. Today, harvest on UCR spring-run Chinook in the Columbia River accounts for less than 10% of the returning fish, as compared to over 50% prior to the 1960s.

Today most UCR spring-run Chinook adults returning to the mid-Columbia reach are of hatchery origin. Carie and Hamstreet (1999) summarized recent contributions to adult UCR spring-run Chinook escapements that returned to federal hatcheries in the mid-Columbia. In 1997, 62.3% of adult UCR spring-run Chinook estimated to have entered the Wenatchee River returned to the Leavenworth National Fish Hatchery (NFH). For the period from 1984-1997, that ratio has ranged from 28.8% - 69.0%. Of the 1997 UCR spring-run Chinook escapement counted above Rocky Reach Dam (2014), 13.7% (275) returned to the Entiat NFH and 11.5% (231) returned to the Winthrop NFH. The proportion of UCR spring-run Chinook escapement above Rocky Reach Dam returning to the Entiat and Winthrop hatcheries has ranged from 23.7% - 60.5% from 1984 -1997. In addition to the contribution from federal hatcheries, the State of Washington conducts two UCR spring-run Chinook hatchery programs (Eastbank/Chiwawa Hatchery and Methow

Hatchery) with funding from Chelan and Douglas PUDs. Recently, in an effort to increase survival during years with very low adult escapements, large portions of the native UCR spring-run Chinook run in the Methow River have been intercepted and taken to Methow hatchery for spawning and rearing. The production goals for release of hatchery produced UCR spring-run Chinook juveniles to the mid-Columbia reach are 3.2 million from the three federal hatcheries and supplementation facilities which produce fewer fish than the production goals in years with low adult escapements.

3.1.3 Population Trends and Risks

NOAA Fisheries determined that UCR spring-run Chinook salmon are at risk of becoming extinct in the foreseeable future, listing them as endangered under the ESA on March 24, 1999 (64 FR 14307). On April 4, 2002, NOAA Fisheries defined interim abundance recovery targets for each spawning aggregation in this ESU. These numbers are intended to represent the number and productivity of naturally produced spawners that may be needed for recovery, in the context of whatever take or mortality is occurring. They should not be considered in isolation, as they represent the numbers that, taken together, may be needed for the population to be self-sustaining in its natural ecosystem. For UCR spring-run Chinook salmon, the interim recovery levels are 3,750 spawners in the Wenatchee River, 500 spawners in the Entiat River, and 2,000 spawners in the Methow River.

All three of the existing UCR spring-run Chinook populations have exhibited similar trends and patterns in abundance over the past 40 years. The 1998 status review (Myers et al. 1998) reported that long-term trends in abundance were generally negative, ranging from -5% to +1%. Analyses of the data series, updated to include 1996-2001 returns, indicate that those trends have continued. Based on redd count data series, spawning escapements for the Wenatchee, Entiat, and Methow rivers have declined an average of 5.6%, 4.8%, and 6.3% per year, respectively, since 1958. In the most recent 5-year geometric mean (1997-2001), spawning escapements were 273 for the Wenatchee population, 65 for the Entiat population, and 282 for the Methow population, only 8% to 15% of the interim abundance recovery targets, although escapement increased substantially in 2000 and 2001 in all three river systems. Based on 1980-2000 returns, the average annual growth rate for this ESU is estimated at 0.85%. Assuming that population growth rates were to continue at 1980-2000 levels, UCR spring-run Chinook salmon populations are projected to have very high probabilities of 90% decline within 50 years (87% to 100%).

3.2 Upper Columbia River (UCR) Steelhead

The NMFS listed UCR steelhead as endangered on August 18, 1997, status upgraded to threatened on January 5, 2006, reinstated to endangered status per a U.S. District Court decision in June 2007, and status upgraded to threatened per U.S. District Court order in June 2009.

NOAA Fisheries issued results of a five-year review on August 15, 2011 and concluded that this species should remain listed as threatened. This species occurs within the Action Area.

The Distinct Population Segment (DPS) includes all naturally spawned anadromous *O. mykiss* (steelhead) populations below natural and man-made impassable barriers in streams in the Columbia River Basin upstream from the Yakima River, Washington to the U.S.-Canada border. NOAA Fisheries has initially identified three important spawning populations within this DPS: the Wenatchee, Entiat, and Methow populations (Interior Technical Recovery Team 2003). Six artificial propagation programs are also included in this DPS: the Wenatchee River, Wells Hatchery (in the Methow and Okanogan rivers), Winthrop NFH, Omak Creek, and the Ringold steelhead hatchery programs.

UCR steelhead use the Rocky Reach Project Area as a corridor for juvenile and adult migration. The majority of UCR steelhead returning to the mid-Columbia River are of hatchery origin, but natural production occurs in the Entiat River, a tributary to Rocky Reach reservoir and the Methow River, a tributary upstream of Wells Dam (Chapman et al. 1994b). Adult UCR steelhead pass Rocky Reach Dam from early July through early November. Spawning is believed to take place between March and June, but has been observed as late as July (Fish and Hanavan 1948; Howell et al. 1985). Some UCR steelhead overwinter in the Columbia River, passing Rocky Reach Dam from March through June. Much of the available literature describing distribution within the reservoir does not identify stock or species specific behavior, but it is assumed that most juveniles are similarly distributed within the reservoir. With this in mind, it is likely that, like juvenile UCR spring-run Chinook, juvenile UCR steelhead tend to migrate in the higher velocity water in mid-channel.

Steelhead are not thought to have occurred in large numbers in British Columbia, Canada, in the upper Columbia River basin. Estimates of historical (pre-1960s) abundance specific to this DPS are available from fish counts at dams. Counts at Rock Island Dam from 1933 to 1959 averaged 2,600 to 3,700, suggesting a pre-fishery run size exceeding 5,000 adults for tributaries above Rock Island Dam. Runs may already have been depressed, however, by lower Columbia River fisheries and other habitat degradation problems in the natal tributaries. Grand Coulee Dam blocked anadromous fish from habitat upstream of RM 596.6 after 1938. The concurrent Grand Coulee Fish Maintenance Project (GCFMP) also influenced the present distribution of the DPS. In 1961, the Chief Joseph Dam also blocked anadromous fish from remaining habitat upstream of RM 545.1.

3.2.1 Juvenile UCR steelhead

Life history characteristics for UCR steelhead are similar to those of other inland steelhead ESUs. However, naturally produced smolt age is dominated by 2- and 3-year-olds and some of the oldest smolt ages for steelhead, up to 7 years, are reported from this DPS (Peven 1990). Hatchery smolts are released as yearlings. Over 90% passage at Rocky Reach occurs by early

June (Chapman et al. 1994b, Mosey et al. 2000). Both hatchery and naturally produced UCR steelhead pass Wells and Rock Island dams in May (McGee 1984), and migration timing at Rocky Reach Dam is similar (Peven and Abbott 1994). The size of UCR steelhead smolts passing Wells Dam was reported as ranging from 127 to 203 mm for naturally-produced and 152 to 254 mm for hatchery smolts (Zook 1983). Peven (1990) measured naturally produced UCR steelhead at Rocky Reach Dam in 1988 and found the average length was 170 mm, ranging from 119 to 270 mm. Juvenile UCR steelhead in the mid-Columbia migrate actively (averaging 30.4 km/day), thus the residence time is short (Giorgi et al. 1997).

3.2.2 Adult UCR steelhead

Based on limited data, steelhead from the Wenatchee and Entiat rivers return to freshwater after one year in salt water, whereas Methow River steelhead primarily return after two years in salt water. Similar to other inland Columbia River basin steelhead DPSs, adults typically return to the Columbia River between May and October and are considered summer-run steelhead. Adults may remain in fresh water up to a year before spawning. Unlike Chinook or sockeye salmon, a fraction of steelhead adults attempt to migrate back to the ocean. These fish are known as kelts, and those that survive can migrate from the ocean to their natal stream to spawn again.

Adult UCR steelhead enter the Columbia River during March through October, with peak migration at Bonneville Dam occurring from late June through early September (CBFWA 1990). Adult UCR steelhead migration is much more protracted than that of other anadromous salmonids in the Columbia River. Most adults pass through the mid-Columbia reach from June through late October. Spawning occurs the following year during March through July (Peven 1992, CBFWA 1990). The Wenatchee, Entiat, and Methow rivers and their tributaries support naturally spawning UCR steelhead populations (Peven 1992). Unlike other anadromous salmonids, all UCR steelhead do not die after spawning, but may return to the ocean. An individual UCR steelhead may spawn more than once during its lifetime or may spawn only once and die depending on the condition of the fish after spawning (Chapman et al. 1994b), but repeat spawning is rare for UCR steelhead (2.1% or less) (Brown 1995).

Chapman et al. (1994b) summarized historical escapement of UCR steelhead to the mid-Columbia. At Rock Island Dam, UCR steelhead counts averaged 2,600 – 3,700 from 1933-1959. With the start of increased hatchery production in the 1960s, counts increased to an average 6,700 in the 1960s. Numbers declined in the 1970s to an average of 5,400, increased in the 1980s to an average of 16,500, but decreased again in the 1990s to an average of 7,315 (FPC 2001).

Most UCR steelhead adults returning to the mid-Columbia reach are of hatchery origin (Brown 1995). Naturally produced adult UCR steelhead passing Wells Dam during 1982-1993 comprised about 10% of the UCR steelhead counted (range 3% to 13%) (Mullan et al. 1992; Chapman et al. 1994b). Naturally produced UCR steelhead accounted for an average of 19% of the adults counted from 1986 to 1995 at Priest Rapids Dam (range 10% to 29%) (Brown 1995). Naturally

produced juveniles averaged 24% of UCR steelhead sampled at Rock Island during 1986 to 1994, (range 15% to 38%) (Chapman et al. 1994b). Total releases of hatchery produced UCR steelhead juveniles to the mid-Columbia reach from 1982 to 1993 ranged from approximately 700,000 to 1.2 million per year (Brown 1995). Current production continues at a program level of about 1 million fish.

3.2.3 Population Trends and Risks

NOAA Fisheries determined that UCR steelhead are at risk of becoming extinct in the foreseeable future, listing them as endangered under the ESA on August 18, 1997 (62 FR 43937). On April 4, 2002, NOAA Fisheries defined interim abundance recovery targets for each spawning population in this DPS (UCSRB 2007). These targets are intended to represent the number and productivity of naturally produced spawning adults that may be needed for recovery, in the context of whatever take or mortality is occurring. They should not be considered in isolation, as they represent the numbers that, taken together, may be needed for the population to be self-sustaining in its natural ecosystem. For UCR steelhead, the interim recovery levels are 2,500 spawning adults in the Wenatchee River, 500 spawning adults in the Entiat River, and 2,500 spawning adults in the Methow River (UCSRB 2007).

3.3 Columbia River Bull Trout

On June 10, 1997, the USFWS listed bull trout as threatened under the ESA. This species occurs in the Action Area.

Bull trout (*Salvelinus confluentus*) occurred historically throughout the Columbia Basin, but today primarily reside in upper tributary streams and several lake and reservoir systems. All bull trout life stages are associated with complex forms of cover including large woody debris, undercut banks, boulders, and pools. Bull trout spawn between August and November in streams with cold, unpolluted water, clean gravel and cobble substrate, and gentle stream slopes when water temperatures range from 5-9^{O} C (Reiman and McIntyre 1993). Spawning areas are commonly associated with cold water streams or areas where stream flow is influenced by groundwater.

Two life history types, resident and migratory, are found within the Columbia Basin. The resident populations are typically found in headwater areas above migration barriers and occupy the same area throughout their lives. The migratory life history type is made up of fluvial, adfluvial, and anadromous forms. Bull trout of the fluvial type move between mainstem rivers and smaller tributaries. The adfluvial type matures in lakes or reservoirs and spawns in tributaries where the young reside for one to three years (Fraley and Shepard 1989; Holton 1990). Adults usually rear in rivers, lakes, or reservoirs for two to three years before spawning (Fraley and Shepard 1989). The anadromous form is migratory, using rivers for freshwater rearing and spawning, and shorelines for estuarine and marine rearing (USFWS 1998).

Anadromous populations frequently migrate between lower mainstem rivers and estuaries (Platts, et al. 1993). It appears unlikely that anadromous bull trout occur within the Action Area.

Bull trout have been well documented to occur in the Action Area, but because of limited data and literature, their abundance and timing is not as clear as are UCR spring-run Chinook and UCR steelhead. Three years of ladder counts at Rocky Reach were used to estimate abundance and timing of adult bull trout in the Action Area. It appears that the peak in adult bull trout abundance occurs between the end of May and mid-June. Data from the juvenile surface collector at Rocky Reach indicate that juveniles seldom migrate through the project and are probably present in the reservoir in very small numbers.

Bull trout are native to Northwestern North America and are widely distributed throughout many major watersheds in the United States and Canada. In the contiguous United States, bull trout are currently found in several major watersheds in the Columbia and Snake River Basins, as well as tributaries to Puget Sound and coastal areas of Washington, the Klamath River Basin in Oregon, and the St. Mary River System east of the Continental Divide in Montana (Cavender 1978; Hass and McPhail 1991). Bull trout populations have declined substantially over the past century and the species is currently listed as threatened in the contiguous United States (USFWS 1999). As a result of population declines, the USFWS developed a draft recovery plan for bull trout in 2002 which delineated recovery units for the species (USFWS 2002). Delineation of bull trout recovery units and critical habitat units was further refined in 2010 to reflect updated information regarding the distribution, abundance, life history, and evolutionary history of the species (USFWS 2010). Bull trout in the Upper Columbia River are part of the USFWS Mid-Columbia recovery unit which includes twelve separate critical habitat units in the Columbia River upstream of the John Day Dam and in the Lower Snake River (USFWS 2010).

Bull trout are broadly distributed within the three core areas. The USFWS currently recognizes a total of 19 local populations in the Mid-Columbia River recovery plan and the associated critical habitat unit: seven in the Wenatchee River (Peshastin Cr., Icicle Cr., Chiwaukum Cr., Nason Cr., Chiwawa R., Little Wenatchee R., White R.), two in the Entiat River (Entiat R., Mad R.) and ten in the Methow River (Gold Cr., Beaver Cr., Wolf Cr., Goat Cr., Early Winters Cr., Lake Cr., Twisp R., Chewuch, R. Lost R., West Fork Methow R.). Bull trout in these local populations exhibit resident, fluvial, and adfluvial life history types. During 2001-2009, Chelan PUD conducted bull trout radio telemetry and PIT-tagging studies to document movement and survival of adult and sub-adult trout between the different sub-basins (core areas) and the mainstem Columbia River (BioAnalysts 2004; Stevenson et al. 2006; 2007; 2008; 2009a; 2009b;) within Wells, Rocky Reach, Rock Island, Wanapum, and Priest Rapids reservoirs. These studies and others (Nelson et al. 2007; Nelson and Nelle 2008; 2011; Nelson et al. 2009; 2011) have shown that most migratory bull trout return to their natal stream to spawn and many utilize the Columbia River for migrating, foraging and overwintering.

The USFWS considers bull trout in the Upper Columbia Basin to have varying levels of threats that could affect population persistence. Bull trout rely on large, connected rivers to access multiple habitat types throughout their life cycle and fragmentation of important migratory corridors has been recognized as a threat to bull trout persistence throughout the species' range (Rieman et al. 1997a; USFWS 2002). Three mainstem dams currently separate the three core areas in the Upper Columbia River. Although bull trout have been observed migrating upstream and downstream of these dams, the specific impact of the dams on individual bull trout populations remains unclear. Two smaller dams, Tumwater Dam and Dryden Dam, may affect bull trout habitat within the Wenatchee Basin. Furthermore, numerous culverts, irrigation diversions and canals, and natural barriers (waterfalls, log jams) exist within the three sub-basins. The effects of these different barriers vary depending on their location, structure, and whether or not improvements have been made to facilitate fish passage. Non-native brook trout (*S. fontinalis*) have also been recognized as a threat to bull trout populations through direct competition (Gunckel et al. 2002; Rodtka and Volpe 2007) and hybridization (Kanda et al. 2002; DeHaan et al. 2010). Historically brook trout were stocked throughout the Upper Columbia Basin, and they occur sympatrically with bull trout in several tributaries (USFWS 2002; Nelson et al. 2011; Nelson and Nelle 2011). Recently, the effects of climate change have also been identified as a threat to bull trout population persistence (Rieman et al. 2007). Although the Upper Columbia Basin has been identified as an area where bull trout may be less susceptible to the effects of climate change, the effects of climate change presumably will still result in habitat loss and fragmentation in the Upper Columbia (Rieman et al. 2007).

3.4 Ute Ladies' Tresses

Ute Ladies' Tresses (*Spiranthes diluvialis*) is an orchid that occurs in Colorado, Idaho, Montana, Nebraska, Utah, Wyoming, and Washington (Fertig et al. 2005). The U.S. Fish and Wildlife Service (USFWS) listed *S. diluvialis* as threatened in 1992 (USFWS, 1992). In Washington State, *S. diluvialis* is listed as Endangered by the Washington Natural Heritage Program (WNHP 2003). Prior to August 2000, there was only one known occurrence of *S. diluvialis* in Washington State, located within Okanogan County (WNHP Web site 2003). In August 2000, *S. diluvialis* was discovered at three separate sites along the Chelan County shore of Rocky Reach Reservoir while conducting environmental surveys (Beck 2003, 2004; Calypso Consulting 2002) for the relicensing of the Rocky Reach Hydroelectric Project (Rocky Reach Project). In 2005, another new occurrence of *S. diluvialis* was discovered along Rocky Reach Reservoir, yielding a total of four known sites along the mainstem Columbia River in Chelan County. In 2009, two additional occurrences of *S. diluvialis* were discovered downriver from the known sites, bringing the total number of sites within Chelan County to six. These sites are located on stabilized gravel bars that are typically inundated early in the growing season and remain moist throughout the growing season (WNHP Web site 2003).

Known *S. diluvialis* sites along Rocky Reach Reservoir have been surveyed annually to document the population's numbers and distribution. Since 2004, the total number of *S. diluvialis* plants observed at the known sites along Rocky Reach Reservoir has increased as much as 152%. This increase is partially attributed to an expansion at the historic sites as well as the discovery of new sites in 2005 and 2009 (Chelan PUD 2011).

All of the *S. diluvialis* populations along the Columbia River are within the Rocky Reach Project boundary. *S. diluvialis* occurs in areas along the reservoir where pre-impoundment habitat conditions (based upon pre-impoundment 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 *S. diluvialis* populations are now present. Therefore, *S. diluvialis* likely became established after Rocky Reach Reservoir was created and have persisted under current Project operating conditions.

3.5 Designated Critical Habitat

As part of its responsibilities under the ESA, the federal government is required to designate "critical habitat" for any species listed under the ESA. On August 12, 2005, National Marine Fisheries Service released its final critical habitat designations for Upper Columbia River (UCR) spring-run Chinook salmon and UCR steelhead, and on September 30, 2010, the U.S. Fish and Wildlife Service designated critical habitat for bull trout throughout their U.S. range. The Upper Columbia River, in which the proposed work will occur, is included in the designated critical habitat for UCR spring-run Chinook, UCR steelhead, and bull trout. Effects of project actions on critical habitat Primary Constituent Elements (PCE) are described below.

3.5.1 UCR spring-run Chinook salmon and steelhead

The following PCE have been determined essential to the conservation of Pacific salmon and steelhead:

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation, and larval development.

   Existing condition: The area is used primarily as a migration corridor for both juvenile and adult UCR spring-run Chinook and UCR steelhead. Neither species is known to spawn within the Action Area.

2. Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.

Existing condition: The area is of good water quality and water quantity sufficient to support juvenile growth and mobility. Natural cover is very limited within the Action Area.

3. Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

Existing condition: The area is of good water quality, but contains limited natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks. The area is used as a migration corridor for both juvenile and adult UCR spring-run Chinook and UCR steelhead during both outmigration and the migration back to their natal waters.

3.5.2 Bull trout

The following Primary Constituent Elements have been determined essential to the conservation bull trout:

1. Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) to contribute to water quality and quantity and provide thermal refugia.

Existing condition: The baseline condition for the project area on Columbia River does not contain this habitat PCE for bull trout. The shallow springs, seeps, and ground water sources are not expected to occur in this location as part of the baseline condition, and therefore do not function as part of the baseline to contributing to water quality and thermal refugia for bull trout.

2. Migratory habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.

Existing condition: Migratory adult bull trout have the potential to be in the project area in the mainstem Columbia River during construction. The existing baseline condition relative to this migratory habitat PCE, as affected by the current dock structure, is expected to be fully functional. No structural, hydraulic, chemical, or water quality barriers are known to exist for bull trout as a result of the current structure at this site in the Columbia River.

3. An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.

Existing condition: The baseline condition for this PCE is not affected by existing features on the Columbia River. Adult adfluvial bull trout are almost exclusively piscivores and can forage on 26 species of salmonid and non-salmonid fishes in the mainstem Columbia River. Juvenile bull trout primarily

rear and grow in tributaries to the Columbia, the Entiat River being the nearest tributary. The current project does not affect the baseline condition of this PCE in the Entiat River.

4. Complex river, stream, lake, reservoir, and marine shoreline aquatic environments and processes with features such as large wood, side channels, pools, undercut banks and substrates, to provide a variety of depths, gradients, velocities, and structure.

Existing condition: The baseline condition for this habitat element in the location of the existing project may currently provide complex habitat for bull trout using the mainstem reservoir. Other components of this habitat element do not exist as part of the baseline condition (i.e. existence of large wood, side channels, pools, undercut banks, or substrates) as they apply almost exclusively to more lotic, stream environments, not large reservoir systems like Rocky Reach Reservoir.

5. Water temperatures ranging from 2 to 15 °C (36 to 59 °F), with adequate thermal refugia available for temperatures at the upper end of this range. Specific temperatures within this range will vary depending on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shade, such as that provided by riparian habitat; and local groundwater influence.

Existing condition: The baseline condition for water temperature ranges in Rocky Reach Reservoir at the existing site location range from approximately 5 °C degrees to 19 °C.

6. Substrates of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount (e.g., less than 12 percent) of fine substrate less than 0.85 mm (0.03 in.) in diameter and minimal embeddedness of these fines in larger substrates are characteristic of these conditions.

Existing condition: The baseline condition of this PCE in the location of the existing project does not support habitat or substrates for this life history function for adfluvial bull trout. Bull trout are not known to spawn in the mainstem Columbia River. All known current and historical spawning locations which consist of adequate substrate composition for spawning, egg incubation and fry emergence are geographically distant from the current project location, more than 20 miles upstream in the Entiat River (and in the Wenatchee and Methow rivers).

7. A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, they minimize departures from a natural hydrograph.

Existing condition: The baseline condition of this bull trout PCE in the location of the proposed project is expected to be fully functional at present. The project

will not affect conditions of natural river hydrograph, including the high, low, or baseline flows in the Columbia River during adult adfluvial bull trout migration periods.

8. Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.

Existing condition: The baseline condition of this PCE is fully functional at the project site on the Rocky Reach Reservoir. Baseline levels of normal reproduction, juvenile rearing, and survival are not expected to be affected currently based on the location of the project site. The upper Entiat River is the nearest location where this habitat PCE functions for bull trout (i.e. Mad river, upper Entiat River, etc.) is far removed from the current project site location No spawning or age 0+ and 1+ juvenile rearing is known to occur in the mainstem Columbia at the current project site.

9. Few or no nonnative predatory (e.g., lake trout, walleye, northern pike, smallmouth bass; inbreeding (e.g., brook trout); or competitive (e.g., brown trout) species present.

Existing condition: The baseline condition of this PCE is currently not affected on the Columbia River at the project site. Brook trout are present in the Entiat River, but mostly at upper watershed sites. The existing fish species assemblages in the Columbia River and Entiat River are not affected by the project as part of the baseline condition at the project site.

SECTION 4: ENVIRONMENTAL BASELINE

This section includes a description of the factors affecting the environment of the species and critical habitat in the action area. The ecological pathways considered part of this project are water quality and habitat elements.

Indicators of water quality are:

- Temperature
- Contamination of water and sediments by toxic and deleterious materials
- Turbidity

Indicators of habitat elements are:

- Fish Use
- Substrate
- Noise
- Large woody debris
- Off-channel habitat
- Riparian vegetation
- Aquatic vegetation

4.1 Water Quality

The Columbia River from the Washington/Oregon border has been given a use designation of salmon spawning/rearing. Additionally, the revised water quality standards require this reach of the river meets or exceeds requirements for primary contact, all water supply uses, and all listed misc. uses (WAC 173-201A-602: Table 602). However, water quality within this reach of the Columbia region occasionally does not meet state and federal water quality standards for certain parameters (e.g. total dissolved gas, water temperature). Compared to other rivers in the United States, the Columbia River carries a large volume of relatively unpolluted surface water and has few sources of pollution and wastewater.

4.1.1 Water temperature

Water temperatures in the Action Area are similar to temperatures elsewhere in the Columbia River system (USACE 1993). The thermal regime of the mid-Columbia River is largely influenced by releases from Grand Coulee dam, which is the main upstream deep-water storage project. The mid-Columbia hydroelectric projects are run-of-river facilities with very limited capability for storage and flow regulation. In general, the very rapid flushing rates of the pools at these facilities limit the potential for warming. Water temperature in the Rocky Reach Reservoir at the project site ranges from 5 °C to 19 °C. Currently, water temperature has not been identified as a problem for salmonids in the Action Area.

4.1.2 Toxic/Deleterious Materials

Current levels of toxic and deleterious materials within the Action Area are well within DOE's and Public Health requirements (Chelan PUD 1991).

4.1.3 Turbidity

The Columbia River in general has relatively low turbidity. The Mid-Columbia 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 of the geologic setting is very low sediment loads in the tributaries and mainstem of the river.

Turbidity levels collected between October 1977 and January 1989 at the DOE's water monitoring site located just downstream of Rock Island Dam were used to determine an average turbidity in the reservoir during that time period. The resultant average was 4.4 NTU, which compares to DOEs standard of <5 NTU.

There are no indications that existing turbidity has adverse impacts on juvenile or adult salmonids.

4.2 Habitat Elements

4.2.1 Fish Use

As part of Chelan PUD's Habitat Conservation Plan (HCP) for Rocky Reach, biologists monitor the out-migration timing of juvenile salmon and steelhead passage at Rocky Reach Dam each season from April 1 through August 31. Chelan PUD crews sample the number of outmigrating smolts moving downstream through the Juvenile Fish Bypass System at the dam. This sampling provides daily "index" counts of smolts for each species that are then uploaded into the University of Washington's Program Realtime juvenile outmigration forecaster. This program uses historic and current passage index numbers to determine when smolts arrive, the date when a given percentile of each species passes the dam, and when the run has completed its outmigration past the Project. Chelan PUD's fish spill programs are based on this run-timing information. Chelan PUD used these data to establish the project work window (September 1 through February 28), and determine that the proposed work on the Entiatqua Trail Project is likely to have only minimal affects on listed UCR spring-run Chinook, UCR steelhead, and non-listed salmon (sockeye and subyearling summer Chinook) in the Action Area. The juvenile out-migration monitoring data presented in the next sections for UCR spring-run Chinook salmon, steelhead, subyearling Chinook and sockeye salmon are for the years 2004 through 2011.

4.2.1.1 UCR spring-run Chinook salmon

On average, the first juvenile UCR spring-run Chinook salmon arrives at Rocky Reach Dam by April 1. The average 95-percentile passage date for UCR spring-run Chinook at Rocky Reach Dam is June 1, with the last fish observed at the dam on average by August 15 (range July 4 to August 29) (Columbia Basin Research 2012).

Juvenile UCR spring-run Chinook salmon and steelhead are known to inhabit smaller tributaries for up to 7 years (steelhead), but primarily 1 to 2 years prior to migrating downstream to major rivers and, ultimately the ocean (Groot and Margolis 1991; Chapman et al. 1994, Chapman et al. 1995; Quinn 2005). Spring-run Chinook juveniles tend to migrate in mid-channel (Ledgerwood et al. 1991, Chapman et al. 1994, Burley and Poe 1994) for much of their migration. Healy and Jordan (1992) also noted that most juvenile UCR spring-run Chinook migrated in higher velocity water near the center of the river.

Additionally, the Washington Department of Fish and Wildlife (WDFW) conducted an electrofishing survey in Rocky Reach Reservoir for Chelan PUD in October 2012 as part of an investigation to determine the number of predatory fish species, primarily smallmouth bass, inhabiting locations with high concentrations of over-water structures (docks) in nearshore areas. Twenty sites of 400 m in length were sampled for a total of 11,914 seconds in Rocky Reach Reservoir. Of 1,687 fish captured, only 9 were Chinook salmon. No steelhead or other salmonids were captured. The 9 Chinook salmon appeared to be either subyearling Chinook that remained in the reservoir, possibly for overwintering, or mini-jacks that were preparing to move upstream to spawning locations.

UCR spring-run Chinook salmon of the mid-Columbia region reach peak abundance in the lower Columbia River in April and May, with 50 percent of adults passing Rock Island Dam in mid-May (Chapman et al. 1995a).

4.2.1.2 UCR steelhead

On average, the first juvenile UCR steelhead arrives at Rocky Reach Dam by April 2. The average 95-percentile passage date for UCR steelhead at Rocky Reach Dam is May 31, with the last fish observed at the dam on average by August 20 (range July 19 to September 3) (Columbia Basin Research 2012). Juvenile migration timing has been documented to be faster than the water particle travel time in large rivers (Groot and Margolis 1991; Quinn 2005) and mainstem Columbia River reservoirs (Chapman et al. 1994b, Chapman et al. 1995a; Quinn 2005). As with UCR spring-run Chinook salmon, it is widely acknowledged that UCR steelhead smolts use, primarily, the thalweg of the mainstem Columbia River for downstream migration (Chapman et al. 1994b).

Adult steelhead from the mid-Columbia region enter the Columbia River between May and September, pass Rock Island Dam from July through the following May, and spawn in the spring (Chapman et al. 1994b).

4.2.1.3 Summer/Fall Chinook salmon

On average, the first subyearling summer Chinook salmon arrives at Rocky Reach Dam by May 25. The average 95-percentile passage date for subyearling summer Chinook at Rocky Reach Dam is August 11, with the last fish observed at the dam on average by August 31 (range August 31 to September 4) (Columbia Basin Research 2012). Small subyearling Chinook appear to use shallow, nearshore areas in mainstem Columbia River Reservoirs, moving into deeper water as they grow (Chapman et al. 1994a). Subyearling migration is characterized as a 'rearing migration" (Chapman et al. 1994a) instead of an "active" migration exhibited by UCR spring-run Chinook and sockeye salmon and UCR steelhead. Because of the rearing migration characteristic and documentation of reservoir overwinter rearing behavior, subyearling Chinook salmon juveniles could be present in the Action Area during construction of the Entiatqua Trail.

Adult summer/fall Chinook salmon pass Rocky Reach Dam from mid-June through November, with peak passage occurring in mid-July (Chelan PUD 2012). Spawning in the Lake Chelan Project tailrace occurs in October and November, with peak spawning in mid-October (Steve Hays 2012a, personal communication).

4.2.1.4 Sockeye salmon

On average, the first juvenile sockeye salmon arrives at Rocky Reach Dam by April 10. The average 95-percentile passage date for sockeye at Rocky Reach Dam is May 28, with the last fish observed at the dam on average by August 14 (range July 4 to September 4) (Columbia Basin Research 2012). Juvenile sockeye exhibit downstream migration characteristics and behavior nearly identical to UCR spring-run Chinook and steelhead juveniles: timing, schooling behavior, smoltification process, actively swimming downstream (positive rheotaxis), response to photoperiod and water temperature, etc. (Groot and Margolis 1991; Quinn 2005). Sockeye juveniles have been documented to travel deeper in the water column than other spring migrating juvenile salmonids (Chapman et al. 1995b). Differences in run timing and smolt size between the Lake Osoyoos and Lake Wenatchee populations were determined at Rock Island Dam: Lake Osoyoos smolts tended to be larger than Lake Wenatchee smolts, and Lake Wenatchee smolts arrived at Rock Island Dam earlier than those emigrating from Lake Osoyoos (Chapman et al. 1995b). Due to these similarities, it is widely acknowledged that sockeye smolts use, primarily, the thalweg of the mainstem Columbia River for downstream migration.

Adult sockeye salmon pass Rocky Reach Dam from June through early September, with peak passage occurring in mid-July (Chelan PUD 2012). Adult sockeye passing Rocky Reach are bound for the Okanogan River with spawning occurring in the Okanogan River between Lake Osoyoos and Skaha Lake. Some sockeye passing Rock Island Dam are bound for the Wenatchee

River, spawning above Lake Wenatchee primarily in the White River. The Wenatchee River population arrives earlier at Rock Island Dam than the Osoyoos population (Chapman et al. 1995b). Spawning in both populations occurs primarily in August and September, with peak spawning in mid to late September (Chapman et al. 1995b).

4.2.1.5 Bull trout

A total of 219 adult bull trout were counted passing Rocky Reach Dam in 2012 between April 14 and November 15. Peak passage occurred from late May through early June (Chelan PUD 2012). A slight increase in upstream movement was observed from late October through mid-November when an additional 40 adult bull trout were counted during that time period.

Chelan PUD has conducted the most rigorous bull trout movement monitoring in the Columbia River system (BioAnalysts 2000; 2004; Stevenson et al., 2009a; 2009b). Some results from the monitoring data cited previously are as follows:

1. Bull trout tagged and released, both upstream and downstream from Rocky Reach Dam made significant migrations upstream and downstream in the mainstem Columbia River;

2. Bull trout tagged and released, both upstream and downstream from Rocky Reach Dam made significant migrations into the Wenatchee, Entiat, and Methow rivers;

3. A vast majority of tagged bull trout entered tributaries in the months of June and July, particularly the Entiat River;

4. A majority of adult bull trout that entered either the Entiat or Mad rivers to spawn exited those tributaries and entered the Columbia River after October 31;

5. From 2001 to 2003, 33 percent of bull trout detected entering the Entiat River were last detected residing in the Entiat River during the respective year.

6. A majority of adult bull trout exiting either the Entiat or Mad rivers did not reside near the mouth of the Entiat River or even in Rocky Reach Reservoir, moving further downstream in the Columbia River, even downstream of Rock Island Dam; and

7. A majority of adult bull trout residing in Rocky Reach Reservoir inhabited deeper water and could not be detected during radio-telemetry tracking surveys.

Sub-adult bull trout ecology demonstrates residence in tributaries for overwintering. Additionally, from 2010 through 2012 an average of only 4 sub-adult bull trout were counted passing upstream of Rocky Reach Dam from September 1 to November 15 (Chelan PUD 2012). However, both sub-adult and adult bull trout inhabit the Entiat River year round, exhibit

movements into and out of the Entiat River into the Columbia River during most of the year, and could be present in the Action Area during construction of the Entiatqua Trail.

4.2.2 Substrate

The substrate within the area of the Entiatqua Trail project in the Columbia River is comprised primarily of fine, sandy loam mixed with some gravel. The area at, and inside, the mouth of the Entiat River is comprised of fine sand and silt, with dense aquatic vegetation in the small embayment inside the mouth of the river.

4.2.3 Noise

Current noise at the project site is created by activity near the boat launch in Entiat Park, vehicle traffic on SR97A, and passage of the C&C Railway train two to three times per week.

4.2.4 Large Woody Material

There is currently no large woody debris on the project site.

4.2.5 Off-channel Habitat

The small embayment at the mouth of the Entiat River adjacent to the west of SR97A provides off-channel rearing habitat for juvenile salmonids and other native species (e.g., chiselmouth, peamouth, whitefish, redside shiner, suckers, stickleback), and forage habitat for adult fish species, such as bull trout, northern pikeminnow, and other native fish species (e.g., chiselmouth, peamouth, whitefish, redside shiner, suckers, stickleback). The area upstream in the Entiat River from the SR97A corridor is a depositional area that has created wetland and riparian zones from the original closure of Rocky Reach Dam. The area was void of any vegetation and wetland area after Rocky Reach Dam was closed for operation in 1961 (Steve Hays 2012b, personal communication). Wetland and riparian areas have been created since that time through sediment deposition from high flow events in the Entiat River. A high flow channel has been created over time between the Entiat River Road and the riparian/wetland area that is functional at high river flows that flows into the small embayment adjacent to SR97A (Figure 2.)

4.2.6 Riparian Vegetation

Chelan PUD Wildlife Biologists conducted vegetation surveys of the trail site on May 20 and August 22, 2011. The following is a summary of the survey results.

The shoreline facing Rocky Reach Reservoir does not support any riparian vegetation along the riprap bank except at the upstream-most of the proposed project area, where reed canary grass clumps begin. Higher in elevation near the highway there is some smooth sumac, black locust, and scattered perennial grasses. One snowberry shrub was observed along the bank. Only 2 small shrubs exist along the riprap shoreline under the highway/RR bridges (water birch and a willow). The remainder of this slope is dry and weedy (knapweed).

After passing under the bridges, the low slope consists of riprap with a very narrow (3') band of riparian vegetation. Much of it is young cottonwoods and water birch interspersed with reed canary grass and cattails. Some sedges and rushes are apparent along this stretch. One mature Douglas-fir exists halfway up the slope and west of SR97A, along with a nearby patch of hackberry, elderberry, dogwood, and snowberry. Where the Entiat River Road intersects the highway, the area becomes steep, sandy, and weedy. Except right at the water's edge, vegetation is very sparse in the section of the proposed trail.

A primary component of the Entiatqua Trail project as mitigation is the creation of a riparian corridor along the shoreline bordering the Columbia River where little or no vegetation exists currently. Additionally, impact minimization measures, as described in the Project Description, will be employed during trail construction on the Entiat River portion to protect the existing riparian vegetation along the shoreline. The proposed bio-engineering approach to creating the new shoreline along the Columbia River portion of the trail will prevent bank hardening to the greatest extent practicable to encourage riparian vegetation growth and additional habitat enhancement for fish, particularly ESA listed species.

4.2.7 Aquatic Vegetation

Aquatic vegetation in the Rock Island and Rocky Reach reservoirs includes the non-native Eurasian watermilfoil (*Myriophyllum spicatum*), and several native species that include *Potomogeton crispus, P. pusillus, P. pectinatus, P. richardsonii*, and *Elodea canadensis* (Keesee 1985; Truscott 1991). Eurasian watermilfoil is the predominant species in both the Rocky Reach and Rock Island reservoirs, displacing many native species. In the Rock Island reservoir, Eurasian watermilfoil accounted for approximately 55% of the aquatic vegetation in 1991 (Truscott 1991) as opposed to only 28.2% in 1985 (Keesee 1985). In 1991, 63% of the aquatic vegetation community in the Rocky Reach reservoir was comprised of Eurasian watermilfoil (Truscott 1991), a dramatic increase since 1985's estimate of just 26.9% (Keesee 1985). The 1991 estimates constitute approximately 990 acres in the Rocky Reach reservoir and 220 acres in the Rock Island reservoir (Truscott 1991).

4.3 Safe Migration Routes

4.3.1 Predation

Predation on juvenile salmonids occurs throughout the Action Area. The primary predators are northern pike minnow and several avian species (Caspian terns, double-crested cormorants, Common mergansers, and ring-billed gulls).

Chelan PUD currently implements the most rigorous predator control program on the Columbia River. From 2003 through 2012 (data not yet complete), Chelan PUD has funded removal of a total of 645,232 Northern pikeminnow (NPM) from Rocky Reach and Rock Island reservoirs,

which is 62.2 river miles of reservoir, for an average of 64,523 per year. In comparison, the BPA predator control program has removed, over the same time period a total of 1,848,192 PM, an average of 165,222 per year, from a total of 644.1 river miles. The Chelan PUD program has an average catch per river mile 1,038 NPM compared to the BPA average catch per river mile of 287 NPM.

SECTION 5: EFFECTS OF PROPOSED ACTION

5.1 Direct Effects

This section presents the direct effects, indirect effects, interrelated and interdependent actions, cumulative effects, potential take, and effects on critical habitat of the proposed Project within the Action Area, and describes interrelated and interdependent actions that may lead to effects on the listed species.

Trail Construction

Construction of the Entiatqua Trial will be conducted primarily above the OHWM. However, fill will be placed in the Columbia River to create a corridor for establishing riparian vegetation that will cause short-term increases in turbidity and loss of existing substrate. Additional turbidity is will occur during construction of bio-engineered erosion control measures and placement of large complex woody structures.

Impact minimization measures, such as use of turbidity curtains and silt fencing, will reduce the overall affect of turbidity during project construction. Affects to listed species are expected to be negligible because no adult and juvenile UCR spring-run Chinook salmon, no juvenile and few adult UCR steelhead, and few sub-adult and adult bull trout are likely to be present in the project area during the agreed upon in-water work window of September 1 through February 28 based on the biological life history information provided in section 4.2.1. Juvenile subyearling Chinook salmon may also be present during project construction during overwintering in the reservoir, though few if any are expected also based on the information presented in section 4.2.1.

Additionally, mitigation measures and enhancements built into the project, such as woody structure placement, riparian corridor establishment, and bio-engineered erosion control measures, and impact minimization measures, such as turbidity curtains, silt fencing, Jersey barrier placement, and other elements highlighted in the Project Description, will provide protection during construction and greater biological benefit to listed species and other aquatic and terrestrial biota than what exists currently at the site. Therefore, no long-term negative effects are expected from trail construction. Use of BMPS during construction will reduce or eliminate any potential effects during construction. Planned mitigation will provide greater benefit to aquatic and terrestrial resources than those existing currently at the site after trail construction is completed.

Water Quality

Temperature

The proposed trail construction will result in minor removal of existing vegetation that provides minimal shade to the mid-Columbia River. The addition of vegetation along the shoreline

through creation of the riparian corridor will provide long term greater amount of shade than existing conditions. The proposed project involves plantings and seeding that will create an amount of native riparian species significantly greater that the amount removed. The proposed project will likely result in temporary reductions in riparian function within the action area on the Columbia River shoreline while the riparian vegetation becomes established. No affect to riparian vegetation will result in the Action Area near the mouth of the Entiat River since no existing riparian vegetation will be disturbed during trail construction. This project will maintain and improve this criterion.

Toxic/Deleterious Materials

Trail construction will have no effect on toxic and deleterious materials. Current substrate levels of toxic chemicals within the Action Area are well within DOE's and Public Health requirements as described in section 4.1.2. Therefore, the Project will maintain this criterion.

Turbidity

Short-term, localized project-related increases in existing mid-Columbia River turbidity levels are likely as a result of activities associated with adding fill material for riparian corridor development, constructing bio-engineered erosion control measures, and placing woody structures in the Columbia River below the OHWM. However, several erosion and sediment control measures are proposed that will significantly minimize the potential for excessive project-related turbidity to occur in the action area. These measures include the development and implementation of the Erosion and Sediment Control Plan (ESCP) and the use of sediment control conservation measures. Use of these conservation measures is expected to provide adequate containment for controlling turbidity that may occur during construction. No long-term negative effects are expected from sediment or turbidity.

In addition, work conducted below the OHWM will occur within an agency-approved in-water work window of September 1 and February 28, a period when water levels within the mid-Columbia River are typically at their lowest and ESA listed-fish are less likely to be present within the river.

Potential, short-term, localized project-related increases in background turbidity resulting from temporary work below the OHWM are expected to be negligible and will not result in any net change in function of the in-stream habitat. Implementation of project sediment and erosion control plans will minimize significantly the potential for sedimentation within the Columbia River. It is expected that the concentration of any suspended sediments (turbidity levels) resulting from the proposed actions will be short in duration, low enough, and spatially contained to not result in any significant effect to listed fish or their designated critical habitat. Therefore, this project will maintain and improve this criterion.

Fish Use

Adult steelhead, sub-adult and adult bull trout, and juvenile subyearling Chinook salmon have the potential to be present in the Action Area during trail construction. Based on biological information presented in section 4.2.1 and conducting in-water work during the approved work window (September 1 through February 28), the incidence of these species at all life stages is expected to be few, if any, individuals present during trail construction. Placement of woody structures in the Columbia River and development of a riparian corridor along the Columbia River shoreline will have short-term, isolated affects on the Action Area during construction. However, these Project features will provide a significant increase in the amount of habitat available to juvenile ESA listed species, non-listed juvenile salmonids, particularly subyearling Chinook salmon, and other native fish species. While these woody structures may increase the potential for predator ambush locations, the overall benefit of providing these in-water and riparian Project features will provide a significant increase in the amount of available aquatic habitat. Therefore, the Project will maintain and improve this criterion.

Substrate

Substrate will be affected during initial trail construction as fill to create the riparian corridor, bio-engineered erosion control measures, and woody structures are placed and constructed in the Columbia River. These effects will be short term as placement of cobble substrate a part of the mitigation for fill and long-term enhancement of aquatic and riparian habitat is developed as part of the project. Therefore, the Project will maintain and improve this criterion.

Noise

Noise in the Action Area is currently produced from vehicle traffic passing along SR97A and two to three train trips per week on the C&C Railway. The project will not affect the noise level in the Action Area. Therefore, the Project will maintain this criterion.

Large Woody Material

Very little LWM exists currently within the Action Area. A small log exists near the opening of the small embayment near the mouth of the Entiat River and several other small wood pieces are embedded in sediment in the Columbia River off the mouth of Entiat River. The Project proposes to install 4 large complex woody structures along the shoreline of the Columbia River as mitigation for fill, provide wave energy dissipation for erosion control, and habitat enhancement to provide cover and forage habitat for juvenile salmonids and other native fish species where none currently exists. The Project will increase, significantly, the amount of LWM in the Action Area. Therefore, the Project will maintain and improve this criterion.

Off-Channel Habitat

Off channel habitat located in the Entiat River will not be affected by project construction. Impact minimization measures (i.e., placement of Jersey barriers to protect existing riparian

vegetation, installing silt fences, fueling equipment off-site to prevent spills, etc.) will protect existing off-channel habitat. This criterion will be maintained.

Riparian Vegetation

Very little riparian vegetation currently exists in the Action Area along the shoreline of the Columbia River and the SR97A corridor along the small embayment at the mouth of the Entiat River. What little vegetation does exist along the Columbia River will be destroyed during trail construction. Deployment of BMPs along the small embayment near the mouth of the Entiat River will protect existing riparian vegetation during construction. The Project feature of developing a 650 foot long riparian corridor along the Columbia River will provide a significant increase in the amount and quality of riparian vegetation from existing conditions. Short term affects are likely prior to plantings becoming established. However, irrigation provided will increase the likelihood of more rapid colonization and plant survival. Once plantings become established, the riparian corridor will provide significantly greater aquatic and terrestrial biological benefit to many species that likely do not use, or use sparingly, the Action Area currently. The Project will maintain and improve this criterion.

Aquatic Vegetation

Some aquatic vegetation will be destroyed during fill placement to develop the riparian corridor installing bio-engineered erosion control measures, and placing woody structures along the Columbia River shoreline. Aquatic vegetation in the small embayment near the mouth of the Entiat River will remain undisturbed. Aquatic vegetation loss will be short term, as most aquatic vegetation species will recolonize and grow rapidly. The addition of in-water habitat features of the Project will provide an overall long-term increase in the amount of in-water habitat available to fish and other aquatic species. Small-sized substrate placed at the toe of the bio-engineered erosion control features, most of which will be placed in relatively shallow water, will provide additional substrate for aquatic vegetation colonization. Therefore, the Project will maintain and improve this criterion.

Predation

Placement of LWM structures in the Columbia River as mitigation for substrate disturbance and aquatic habitat enhancement will provide additional locations for predatory fish and, potentially, avian predators, to prey on juvenile salmonids and native fish species. However, since virtually no LWM exists on much of the Columbia River and little aquatic vegetation exists near the mouth of the Entiat River, the placement of habitat structures will provide a significant increase in the amount of available rearing habitat for juvenile fish of all species, particularly ESA listed salmonids. Much of the water depth in the area where LWM structures are proposed is relatively shallow, likely precluding heavy use by large predatory fish, primarily Northern pikeminnow. Having developed the Project features in coordination with NMFS, USFWS, and WDFW personnel, the conclusion is that the increase in potential predation will be more than off-set by

the increase in juvenile fish rearing habitat. Therefore, the Project will maintain and improve this criterion.

Ute Ladies' Tresses
As noted in Section 3.4, Ute Ladies' Tresses do not occur within the Action Area and suitable habitat for this species does not occur on or in the proximity to the project site. There will be no effects related to construction, use, or maintenance of the project on the baseline condition for this species or its habitat.

5.2 Indirect Effects

An indirect effect of the proposed project will be an increase in the amount of human presence and pedestrian traffic in the Action Area due to trail construction. While this is the intent of the Project, to provide an additional public recreational opportunity, it does have the potential to adversely affect the aquatic and terrestrial environment that is part of the Project mitigation and enhancement. The primary components designed to protect the natural environment and direct human access is the fencing, both chain link and wood, and view point locations. The chain link fencing will prevent access from SR97A and C&C Railway, and the wood fencing will limit pedestrian access within the proposed planting areas. The viewpoints are designed to provide public educational opportunities and access to the Columbia and Entiat rivers for fishing and wildlife viewing. The shoreline area near these viewpoints will be structured appropriately to address public access.

Another indirect effect common to construction projects is the introduction of invasive species through soil disturbance that facilitate their recruitment. Although there is always potentially an indirect effect of new invasive species introductions after ground-disturbing actions, the current site conditions combined with the proposed site restoration measures will reduce the probability of invasive species recruitment and increase the amount and survival of native species within the Action Area.

5.3 *Interrelated and Interdependent Actions*

Associated effects from interdependent and interrelated actions are expected to be minimal with the most likely effects being an increase in the amount of foot traffic and human presence in the Action Area due to trail construction, as stated in the previous section. These effects will be minimized through fencing on both sides of the trail and improved facilities in Entiat Park after revitalization activities are completed.

5.4 ***Cumulative Effects***

From an ESA perspective, a required component is analysis of cumulative effects that may affect habitats and listed species in the Action Areas. Cumulative effects are defined as all "non-federal" actions (i.e., state, local, private, and tribal) reasonably certain to occur in the foreseeable future. Such actions may include, but are not limited to additional road, residential and commercial development, maintenance and upgrading of existing infrastructure, and watershed enhancement.

The Project will increase recreational and public use within the Action Area. Effects to the natural environment within the Action Area will be minimized by the chain link and wood fencing proposed as part of the Project. These elements will control public access to directed areas and protect created and enhanced habitat throughout the Project Area.

As described in Section 2.1, the city of Entiat and Chelan PUD have acquired all land rights and easements required to construct the Entiatqua Trail. Because the trail corridor will be controlled by these entities through the required land acquisitions and easements, anticipated road development, residential and commercial development, population growth, farming or agricultural use, and other human activities are not expected to increase due to implementation of this Project. Therefore, cumulative effects related to this Project are anticipated to be minimal.

5.5 Potential Incidental Take Resulting from Project Activities

The proposed project will likely result in a more than negligible probability of "take" for UCR spring-run Chinook salmon and UCR steelhead due to effects associated in-water construction activities. Potential, short-term, localized project-related increases in background turbidity resulting from temporary work below the OHWM are not expected to result in any net change in the function of the in-stream habitat. Implementation of project sediment and erosion control plans will significantly minimize the potential for sedimentation within waterways. In addition, work conducted below the OHWM will occur within an in-water work window (September 1 – February 28), a period when water levels within the mid-Columbia River are typically at their lowest and listed fish are less likely to be present within the river.

5.6 Effects of Action on Designated Critical Habitat

Aquatic ESA-listed species and their respective designated critical habitat(s) occur in or in the vicinity of the proposed Project Area. UCR spring-run Chinook salmon, UCR steelhead, and Columbia River bull trout and their designated critical habitat, listed under the ESA, are known to occur in the mid-Columbia River and could potentially occur in the vicinity of the proposed project (at various times of the year). Some concerns related to project work could include: degraded water quality, short-term riparian and aquatic vegetation disturbance, and short-term

substrate disturbance. The potential effects to designated Critical Habitat of the project are described in detail previously in Section 5.1. Additionally, the threatened Ute Ladies' Tresses could potentially, but is unlikely to, occur in the vicinity of the proposed project area, and no designated critical habitat has been determined for this species.

While some short-term destruction of Critical Habitat will occur, post project Critical Habitat will be improved significantly for riparian areas and in-water functions through restoration and creation of habitat not present currently. Developing the riparian corridor will increase significantly shoreline riparian vegetation. Placement of bio-engineered erosion control measures and LWM structures will provide additional aquatic habitat for fish, particularly ESA-listed species.

SECTION 6: CONSERVATION MEASURES

The proposed construction of the Entiatqua Trail will have minor effects that can be mitigated through careful design and planning, and providing habitat enhancements. To minimize impact on fish, wildlife, and ESA listed species and their critical habitat, the following Best Management Practices (BMPs) will implemented to minimize affects:

Aquatic and upland conservation measures:

- The Project will utilize an in-water work-window between September 1, 2014 and February 28, 2015. This window the primary means to minimize contact and affects on juvenile and adult UCR spring-run Chinook, UCR steelhead, and bull trout. This window reduces the greatest extent of effects based on current guidance from National Marine Fisheries Service and consultation with U.S. Fish and Wildlife Service.
- The use of clean fill materials will minimize the impacts to the water quality of the Columbia River during construction.
- Turbidity curtain will be used for all in-water work
- Bio-engineered shoreline stabilization for riparian corridor (coir logs, coir fabric, soil bag, seed mix, plantings).
- Jersey barriers placed along the Entiat River side of the trail to protect existing riparian vegetation and prevent erosion during trail construction.
- To ensure that no petroleum products, hydraulic fluids, machinery coolants, chemicals, or other toxic or deleterious materials are allowed to enter the water, all equipment used will be inspected for signs of leaks before and after work starts each day and will be repaired if necessary prior to beginning work.
- All work vehicles and equipment will be fueled 150 feet from the rivers or at an off-site location to avoid fuel/oil contamination with water and shoreline areas.
- An on-site shoreline erosion and sediment control plan has been developed and will be adhered to during construction activities.

Mitigation has been incorporated into the overall design of the proposed project. Mitigation will include the development of a riparian corridor and placement of large complex woody structures. The project design calls for earth retaining structures to avoid and minimize the need for filling of in-water habitat. Material being placed below the OHWM includes: base boulders for retaining the corridor, streambed cobble and sediment in front of the base boulder, and complex large woody material structures to provide aquatic habitat.

Placement of fill below the OHWM is for the development of a 3 foot to 15 foot wide by 650 foot long riparian corridor. The Columbia River shoreline is currently void of vegetation having value to the near shore aquatic environment. The corridor will be planted with nearly 350 new

shrubs and trees. The shrubs and trees will provide near shore foliage (shade and nutrients). Native shrubs and trees from the following list will be used: Red-osier dogwood, Nootka rose, salmonberry, Douglas spirea, shore pine, water birch, and coyote willow. A native hydro-seed mix of blue wild rye, great basin wild rye, tufted hairgrass, and prairie grass will be used.

In addition the riparian corridor includes the construction of four large complex woody structures. These structures will provide in-water habitat for a variety of fish. Further supplementing the structures will be the placement of sediment and cobble mix specifically designed for enhancing the near shore aquatic habitat.

To provide for the safety of trail users a wood rail fence is located on the side of the trail closest to the river. The rail fence provides a protective barrier from a 3 to 8 foot high drop off which will be created by retaining the trail as a means to minimize the amount of in-water fill required.

The trail also takes into consideration the needs of the physically disabled by constructing the trail consistent with Accessibility Guidelines for Outdoor Developed Areas. This includes constructing the trail at reasonable grades and providing sufficient trail width to allow two wheel chairs to pass side by side.

SECTION 7: CONCLUSIONS AND DETERMINATIONS

7.1 UCR spring-run Chinook salmon and steelhead

The determination for Project construction is **may affect, likely to adversely affect** UCR spring-run Chinook and UCR steelhead juveniles due to the temporary increases in turbidity, and potential take occurring due to fill placement for riparian corridor development and placement of woody complex structures. To minimize the adverse effects, Chelan PUD will implement the impact minimization measures detailed in Section 6 above. The risk of take to adult UCR spring-run Chinook and UCR steelhead is negligible because no UCR spring-run Chinook, adults and juveniles, and no UCR steelhead juveniles and few adults are expected to be present in the Project Area. Additionally, steelhead adults are highly mobile and will be able to avoid areas where construction is occurring.

7.2 Columbia River Bull trout

The determination for Project construction is **may affect, likely to adversely affect** Columbia River bull trout. The proximity of the Action Area to the mouth of the Entiat River increases the probability of adult and sub-adult bull trout being in the Project Area during construction activities. As presented in Section 4.2.1.5, the probability of adult and sub-adult bull trout being in the Project Area during the in-water work window and construction period is very low. However, the potential still exists for bull trout to be present in the Project Area during construction activities.

Implementation of BMPs and Conservation Measures is designed to reduce the potential for take to the greatest extent practicable during Project construction. Short-term water quality effects will be reduced through BMP implementation (i.e., work window, turbidity curtain, implementing a shoreline erosion and sediment control plan). Effects to riparian vegetation will be short-term, mitigated through implementation of BMPs, and enhanced through development of a riparian corridor along the Columbia River. Effects to in-water habitat will be short-term, and mitigated through implementation of project elements (i.e., work window, gravel-cobble placement at toe rock slope, LWM structure placement). The proposed project is not expected to have any observable or measurable effect on bull trout reproduction, growth, or survival.

7.3 Ute Ladies' Tresses

The determination for Project construction is **no effect** on Ute Ladies' Tresses. The nearest identified population of Ute Ladies' Tresses is approximately 20 miles upstream of the project, and therefore, no impacts from construction are expected.

7.4 Designated Critical Habitat

The determination for Project construction is **may affect, likely to adversely affect** designated critical habitat of the UCR spring-run Chinook salmon ESU, UCR steelhead DPS, and Columbia River bull trout DPS. The project will result in the minor alteration of in-water substrates and the placement of new in-water structures within designated critical habitat. However, these actions are not expected to result in long-term negative impacts to the project area substrate or other primary constituent elements.

Based on existing substrate conditions it is unlikely that the Action Area provides suitable habitat for salmonid spawning. Existing substrate and aquatic vegetation along the shoreline provides suitable rearing and/or foraging habitat. The proposed construction actions will be limited in duration and will occur within a relatively small, isolated in-water work area. Potential short-term, localized project-related increases in background turbidity resulting from temporary work below OHWM are expected to be negligible and will not result in any net change in function of the in-stream habitat. Short-term work will affect riparian vegetation, but mitigation and enhancement elements of the Project will increase significantly the amount of riparian vegetation from existing conditions. Implementation of project sediment and erosion control plans will significantly minimize the potential for sedimentation during project construction. This effect determination is based on an evaluation of the best data available from the Chelan PUD, NMFS, USFWS, and other appropriate sources.

SECTION 8: LITERATURE CITED

Beck Botanical Services. 2004. *Spiranthes diluvialis* survey, 2004. Public Utility District No. 1 of Chelan County. Final Report, December 1, 2004.

Beck Botanical Services. 2003. *Spiranthes diluvialis* survey, 2003. Public Utility District No. 1 of Chelan County. Final Report, November 1, 2003.

BioAnalysts, Inc. 2004. Movement of bull trout within the mid-Columbia River and its tributaries, 2001-2004. Report to Chelan, Douglas, and Grant Public Utility Districts. Final report May 26, 2004.

Brown, L. G. 1995. Mid-Columbia River summer steelhead stock assessment. Washington Department of Fish and Wildlife, Progress Report.

Burley, C.C. and T.P. Poe. 1994. Significance of predation in the Columbia River from Priest Rapids Dam to Chief Joseph Dam. Prepared for Chelan, Douglas, and Grant County PUDs.

Calypso Consulting. 2002. Spiranthes diluvialis survey, 2001. Summary report to Public Utility District No. 1 of Chelan County. March 15, 2002.

Carie, D.G. and C.O. Hamstreet. 1999. Adult salmonid returns to Leavenworth, Entiat, and Winthrop National Fish Hatcheries in 1997. U.S. Fish and Wildlife Service, Leavenworth, Washington.

Cavender, T. M. 1978. Taxonomy and distribution of the bull trout, Salvelinus confluentus, (Suckley) from the American Northwest. California Fish and Game 64:139-174.

Chapman, D., A. Giorgi, T. Hillman, D. Deppart, M. Erho, S. Hays, C. Peven, B. Suzumoto, and R. Klinge. 1994a. Status of summer/fall Chinook salmon in the mid-Columbia region. Don Chapman Consultants, Boise, Idaho. February 28, 1994

Chapman, D., C. Peven, T. Hillman, A. Giorgi and F. Utter. 1994b. Status of summer steelhead in the mid- Columbia River. Don Chapman Consultants, Boise, Idaho. July 28, 1994.

Chapman, D., A. Giorgi, T. Hillman, and F. Utter. 1995a. Status of spring Chinook salmon in the mid-Columbia region. Don Chapman Consultants, Boise, Idaho. April 24, 1995.

Chapman, D., C. Peven, A. Giorgi, T. Hillman, F. Utter, M. Hill, J. Stevenson, and M. Miller. 1995b. Status of sockeye salmon in the mid-Columbia region. Don Chapman Consultants, Boise, Idaho. May 7, 1995.

Chelan County Public Utility District No. 1 (Chelan PUD). 1991. Application for raising the pool elevation from 707' to 710'. Rocky Reach hydroelectric Project. Chelan County Public Utility District, Wenatchee, Washington.

Chelan County Public Utility District No. 1 (Chelan PUD). 2011. Ute Ladies' Tresses (*Spiranthes diluvialis*) Surveys. Rocky Reach Reservoir of the Columbia River. Rocky Reach Hydroelectric Project. September 2011 Final Report. Public Utility District No. 1 of Chelan County Fish and Wildlife Department Wenatchee, Washington.

Chelan County Public Utility District No. 1 (Chelan PUD). 2012. 2012 summary fish passage data from Rocky Reach and Rock Island dams.

Columbia Basin Fish and Wildlife Authority (CBFWA). 1990. Integrated System Plan for Salmon and Steelhead Production in the Columbia River Basin. Northwest Power Planning Council, Portland, Oregon.

Columbia Basin Research 2012. Inseason **S**tock maps and Forecasts. School of Aquatic and Fishery Sciences, University of Washington. http://www.cbr.washington.edu/crisprt/info.html

DeHaan, P.W., L.T. Schwabe, and W.R. Ardren. 2010. Spatial patterns of hybridization between bull trout, *Salvelinus confluentus*, and brook trout, *Salvelinus fontinalis* in an Oregon stream network. Conservation Genetics 11:935-949.

Fertig, W., R. Black and P. Wolken. 2005. Rangewide Status review of Ute Ladies' Tresses (*Spiranthes diluvialis*). Prepared for the US Fish and Wildlife Service and Central Utah Water Conservancy District. September 30, 2005.

Fish, F.F., and M.G. Hanavan. 1948. A report on the Grand Coulee Fish Maintenance Project 1938-1947. U.S. Fish and Wildlife Service Special Scientific Report No. 55. In Chapman, D., C. Peven, T.

Fish Passage Center (FPC). Adult Data Base. 7 February 2001.http://www.fpc.org/adult.html. (20 February 2001).

Fraley, J., and B. Shepard. 1989. Life history, ecology, and population status of migratory bull trout (Salvelinus confluentus) in the Flathead Lake and River system, Montana. Northwest Science. 63 (4): 133-143.

Giorgi, A. E., T. W. Hillman, J. R. Stevenson, S.G. Hays and C.M. Peven. 1997. Factors that influence the downstream migration rates of juvenile salmon and steelhead through the hydroelectric system in the mid-Columbia River Basin. North American Journal of Fisheries Management. 17:268-282.

Groot, C. and L. Margolis. 1991. Pacific salmon life histories. UBC Press. University of British Columbia. 6344 Memorial Rd, Vancouver, B.C.

Gunkel, S.L., A.R. Hemmingsen, and J.L. Li. 2002. Effect of bull trout and brook trout interactions on foraging habitat, feeding behavior, and growth. Transactions of the American Fisheries Society 131:1119-1130.

Hass, G. R., and J. D. McPhail. 1991. Systematics and distribution of Dolly Varden (*Salvelinus malma*) and bull trout (*Salvelinus confluentus*) in North America. Canadian Journal of Fisheries and Aquatic Sciences 48:2191-2211.

Healy, M.C. and F.P. Jordan. 1992. Observations on juvenile chum and chinook and spawning chinook in Nanaimo River, B.C. during 1975-1981. Can. MS. Rept. Fish. Aquat. Sci. 1659:31.

Holton, G.D. 1990. A field guide to Montana Fishes. Montana Department of Fish, Wildlife and Parks, Helena, Montana.

Howell, P., K. Jones, L. LaVoy, W. Kendra, and D. Ortmann. 1985. Stock assessment of Columbia River anadromous salmonids. Volume II: Steelhead stock summaries, stock transfer guidelines –information needs. Report to Bonneville Power Administration, Proj. No. 83-335, Contract No. DE-AI79-84BP12737.

Interior Technical Recovery Team. 2003. Independent populations of Chinook, steelhead, and sockeye for listed evolutionarily significant units within the interior Columbia River domain. Interior Columbia Basin Technical Recovery Team. Working draft, July 2003.

Kanda, N., R.F. Leary, and F.W. Allendorf. 2002. Evidence of introgressive hybridization between bull trout and brook trout. Transactions of the American Fisheries Society 131:772-782.

Keesee, Barry. G. 1985. Results of 1985 survey of Eurasian watermilfoil on the Columbia River from Rock Island Dam to Wells Dam. Chelan Count PUD No.1, Wenatchee, Washington.

Ledgerwood, R., F. Thrower and E. Dawley. 1991. Diel sampling of migratory juvenile salmonids in the Columbia River estuary. In: Chapman, D., A.Giorgi, T. Hillman, D. Deppert, M. Erho, S. Hays, C. Peven, B. Suzumoto, and R. Klinge. 1994. Status of summer/fall chinook salmon in the mid-Columbia region. Don Chapman Consultants, Boise, Idaho.

Lewis, S. 2012. Email and phone communication from S. Hemstrom, Chelan PUD to S. Lewis, Hydro and Energy ESA Coordinator, USFWS.

McGee, J.A. 1984. Migration timing of juvenile salmonids in the Wells Dam forebay April-July 1984. Douglas County Public Utility District No. 1, East Wenatchee, Washington.

Mosey, T. K. Murdoch, and B. Bickford. 2000. Biological and hydraulic evaluation of the Rocky Reach fish bypass system, 1999. Chelan County PUD, Wenatchee, Washington.

Mullan, J.W., K. R. Williams, G. Rhodus, T.W. Hillman, and J.D. McIntyre. 1992. Production and habitat of salmonids in mid-Columbia River tributary streams. U.S. Fish and Wildlife Service Monograph I.

Myers, J. M., R. G. Kope, G. J. Bryant, D. Teel, and L. J. Lierheimer. 1998. Status review of Chinook salmon from Washington, Idaho, Oregon, and California. NOAA Technical Memorandum NMFSNWFSC-35. U.S. Department of Commerce. Northwest Fisheries Science Center, Seattle, WA.

Nelson, M. C., D. B. Conlin, and R. D. Nelle. 2007. Upper Columbia Recovery Unit bull trout telemetry project: 2006 progress report for the Methow Core Area. April 6, 2007. U.S. Fish and Wildlife Service, Leavenworth WA.

Nelson, M. C. and R. D. Nelle. 2008. Seasonal movements of adult fluvial bull trout in the Entiat River, WA: 2003-2006. U.S. Fish and Wildlife Service, Leavenworth, WA.

Nelson, M. C. and R. D. Nelle. 2011. Seasonal movements of adult fluvial bull trout in the Entiat River, 2007-2010. U.S. Fish and Wildlife Service, Leavenworth, WA.

Nelson, M. C., A. Johnsen, and R. D. Nelle. 2010. Migration patterns of adult fluvial bull trout in the Methow and Columbia rivers during 2007. U.S. Fish and Wildlife Service, Leavenworth, WA.

Nelson, M. C., A. Johnsen, D. Pearson, and R. D. Nelle. 2009. Seasonal movements of adult fluvial bull trout in Icicle Creek, WA. 2008 annual report. U. S. Fish and Wildlife Service, Leavenworth, WA.

Nelson, M. C., A. Johnsen, D. Pearson, and R. D. Nelle. 2011. Seasonal movements of adult fluvial bull trout in Icicle Creek, WA. 2009 annual report. U. S. Fish and Wildlife Service, Leavenworth, WA.

NMFS 2003. Endangered Species Act – Section 7 (a)(2) Consultation. Biological Opinion, Unlisted Species Analysis, and Magnuson-Stevens Fishery Conservation and Management Act Consultation for Proposed Issuance of a Section 10 Incidental Take Permit to Public Utility District No. 1 of Chelan County for the Rocky Reach Hydroelectric Project. (FERC No. 2145) Anadromous Fish Agreement and Habitat Conservation Plan and Construction of a Small Turbine Unit in the Attraction Water Conduit of the Adult Fishway. National Marine Fisheries Service, Northwest Region, Hydropower Division. August 13, 2003.

NMFS 2007. Endangered Species Act – Section 7(a)(2) Consultation. Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Consultation on the Federal Energy Regulatory Commission's proposed license for the Rocky Reach hydroelectric project license (FERC No. 2145). NMFS Consultation No. 2005/07435. NOAA Fisheries, Northwest Region, Hydropower Division. July 9, 2007.

Peven, C.M. 1990. The life history of naturally produced steelhead trout from the mid-Columbia River Basin. MS Thesis. University of Washington.

Peven, C.M. 1992. Population status of selected stocks of salmonids from the mid-Columbia River Basin. Chelan County Public Utility District Fish and Wildlife Operations, Wenatchee, Washington.

Peven, C.M. and A.M. Abbott. 1994. Rocky Reach fish guidance system 1994 developmental testing, final report. Chelan County Public Utility District, Wenatchee, Washington.

Platts, W.S., Hill, M., Hillman, T., and Miller, M. 1993. Preliminary status report on bull trout in California, Idaho, Montana, Nevada, Oregon, and Washington. Don Chapman Consultants, Boise, Idaho.

Quinn, T. P. 2005. The behavior and ecology of Pacific salmon and trout. American Fisheries Society and University of Washington Press.

Reiman, B. E. and J. D. McIntyre. 1993. DRAFT Report: Demographic and habitat requirements for bull trout. USDA Forest Service Intermountain Research Station, Boise, Idaho.

Rieman, B.E., D.C. Lee, and R.F. Thurow. 1997a. Distribution, status, and likely future trends of bull trout within the Columbia River and Klamath River basins. North American Journal of Fisheries Management 17:1111-1125.

Rieman, B., D. Isaak, S. Adams, D. Horan, D. Nagel, C. Luce, C. and D. Myers. 2007. Anticipated Climate Warming Effects on Bull Trout Habitats and Populations Across the Interior Columbia River Basin. Transactions of the American Fisheries Society 2007; 136: 1552-1565.

Rodtka, M. C. and J. P. Volpe. 2007. Effects of water temperature in interspecific competition between juvenile bull trout and brook trout in an artificial stream. Transactions of the American Fisheries Society 136: 1714-1727.

Steve Hays. 2012a. Personal communication regarding summer/fall Chinook salmon spawning timing in the Lake Chelan Project tailrace and habitat channel.

Steve Hays. 2012b. Personal communication regarding condition of the Entiat River mouth shortly after closure of Rocky Reach Dam.

Stevenson, J. R., D. J. Snyder, and P. Westhagen. 2006. Bull trout radiotelemetry monitoring associated with up and downstream passage through Rocky Reach and Rock Island dams and reservoirs, 2005. Report prepared for Chelan County Public Utility District, Wenatchee, WA.

Stevenson, J. R., D. J. Snyder, and P. Westhagen. 2007. Movements of radio-tagged bull trout through Rocky Reach and Rock Island dams and reservoirs: 2006. Report prepared for Chelan County Public Utility District, Wenatchee, WA.

Stevenson, J. R., D. J. Snyder, S. J. Mallas, and P. Westhagen. 2008. Movements of radio-tagged bull trout through Rocky Reach and Rock Island dams and reservoirs: 2007. Report prepared for Chelan County Public Utility District, Wenatchee, WA.

Stevenson, J. R., D. J. Snyder, and S. J. Mallas. 2009a. Movements of radio-tagged bull trout through Rocky Reach and Rock Island dams and reservoirs: 2008. Report prepared for Chelan County Public Utility District, Wenatchee, WA.

Stevenson, J.R., D.J. Snyder and M. Miller. 2009b. Movements of radio-tagged bull trout through Rocky Reach and Rock Island dams and reservoirs: 2005-2009. Report prepared for Chelan County Public Utility District, Wenatchee, WA.

Truscott, K. 1991. 1991 Survey of Eurasian Watermilfoil on the Columbia River, Rock Island and Rocky Reach Reservoirs. Chelan County PUD No. 1, Wenatchee, Washington.

Upper Columbia Salmon Recovery Board (UCSRB). 2007. Upper Columbia spring Chinook and steelhead recovery plan. August 2007.

U.S. Army Corps of Engineers, North Pacific Division. 1993. 1993 Dissolved gas monitoring for the Columbia and Snake Rivers. Portland, Oregon.

U.S. Fish and Wildlife Service. 1992. Final rule to list the plant *Spiranthes diluvialis* (Ute Ladies' Tresses) as a threatened species. Federal Register Vol. 57 (17 January): 2048-2054.

U.S. Fish and Wildlife Service. 1998. Bull trout interim conservation guidance. Lacey, Washington.

U.S. Fish and Wildlife Service. 1999. Endangered and threatened wildlife and plants; determination of threatened status for bull trout in the coterminous United States. Federal Register 64:(1 November 1999):58910-58933.

U.S. Fish and Wildlife Service. 2002. Bull trout draft recovery plan. U.S. Fish and Wildlife Service, Portland, OR. available online at: http://www.fws.gov/pacific/bulltrout/Recovery.html

U.S. Fish and Wildlife Service. 2008. Biological Opinion for the Rocky Reach Hydroelectric Project Proposed License. Federal Energy Regulatory Commission. USFWS Reference: 13260-2007-F-0108; 13260-2008-F-0116; 13260-2006-P-0006.

U.S. Fish and Wildlife Service. 2010. Revised designation of critical habitat for bull trout in the coterminous United States, Final Rule. Federal Register 75: (18 October 2010):63898-64070.

Washington Natural Heritage Program (website). 2003. Rare plants information available from the Washington Natural Heritage Program. http://www.dnr.gov/nhp/refdesk/plants.html

WDFW/ODFW (Washington Dept. of Fish and Wildlife/Oregon Dept. of Fish and Wildlife). 1994. Columbia River fish runs and fisheries, 1938-1993. Status Report, Washington Dept. of Fish and Wildlife and Oregon Dept. of Fish and Wildlife.

Zook, W.J. 1983. Resident fisheries of Wells pool (a review) – Draft. 1990. Fulton Fisheries Advisors. Prepared for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington. 56p.

SECTION 9: ESSENTIAL FISH HABITAT

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996, established procedures designed to identify, conserve, and enhance Essential fish Habitat (EFH) for those species regulated under a federal fisheries management plan. The MSA requires federal agencies to consult with NMFS on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (MSA Section 305(b)(2)). Adverse effect means any impact that reduces quality and/or quantity of EFH, and may include direct (*i.e.,* contamination or physical disruption), indirect (*i.e*., 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).

EFH means those waters and substrate necessary for spawning, breeding, feeding, or growth to maturity (MSA Section 3). For the purpose of interpreting this definition of EFH "waters" include aquatic areas 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 600.110).

9.1 Description of Proposed Action

The proposed action is the construction of the Entiatqua Trail connecting Entiat Park to the Entiat Outdoor learning Center, a project yet to be constructed and not part of this proposed action. The Entiatqua Trail will be a bike and pedestrian path located at the confluence of the Entiat and Columbia Rivers. Viewpoints located along the trail will provide interpretive opportunities as well as resting and viewing points for trail users. The trail will parallel the Rocky Reach Reservoir and the Entiat River along an existing earth embankment that supports the Cascade and Columbia (C&C) Railroad and State Route 97A. The trail, approximately 1,776 feet long, will begin at the southern end of Entiat Park and proceed south along an embankment between the C&C Railway and the Columbia River to the point of confluence with the Entiat River (Figure 1). The trail will then pass under the existing railway and SR97A bridges. After passing under the bridges the trail will then turn north and runs parallel with SR97A along the existing embankment before proceeding west along the north bank of the Entiat River toward the future Entiatqua Outdoor Learning Center.

The project includes in-water components that occur at and below the OHWM in the Columbia River, consisting of bio-engineered erosion control measures, development of a 650 foot long corridor along the Columbia River shoreline for establishing riparian vegetation, plantings and

irrigation to develop a riparian corridor, and placement of LWM structures to provide aquatic habitat enhancement. Included in the project are proposed significant mitigation and enhancement measures to compensate for effects of the project (Federal requirements), to address habitat mitigation requirements of state and local governments, and to further stewardship of the natural environment by establishing functioning habitat within the proposed project area that balances the recreation use with wildlife and fisheries resources. An in depth description of the project is provided in Section 2.2 of this BA.

The proposed project area is located within the geographical ranges of the Upper Columbia River evolutionarily significant unit (ESU for UCR spring-run Chinook salmon (*O. tshawytscha*).UCR spring-run Chinook salmon were listed as endangered on March 24, 1999 under the ESA (56 FR 14308), with its endangered status reaffirmed on June 28, 2005 (70 FR 37160). Critical habitat for this ESU was published on September 2, 2005 (70 FR 52630) with an effective date of January 2, 2006 and includes the project areas.

9.2 Addresses EFH for Appropriate Fisheries Management Plans (FMP)

For the Pacific West Coast, there are three Fishery Management Plans (FMP), covering groundfish, coastal pelagic species, and Pacific Salmon. Because of the location of the proposed project activities, the only FMP that may be affected is the Pacific Salmon FMP dealing with Chinook, coho, and Puget Sound pink salmon. Of these three species, only Chinook and coho occur in the Action Areas. EFH for the Pacific coast salmon fishery means those waters and substrate necessary for salmon production needed to support a long-term sustainable salmon fishery and salmon contributions to a healthy ecosystem.

9.3 Effects of the Proposed Action

9.3.1 Effects on EFH

Potential Adverse Effects to Salmon EFH
These effects are addressed in the Section 5.1. Direct Effects above.

Adverse Effects to Ground Fish EFH
This is a freshwater area (mid-Columbia River). There are no Ground Fish Effects.

Adverse Effects to Coastal Pelagic EFH
This is a freshwater area (mid-Columbia River). There are no Coastal Pelagic Effects.

9.3.2 Effects on Managed Species

Impacts of the proposed project would be extremely limited or non-existent given the conservation measures in 11.4 below.

9.3.3 Effects on Associated Species, Including Prey Species

Impacts of the proposed project would be extremely limited or non-existent given the conservation measures in 11.4 below.

9.3.4 Cumulative Effects

Cumulative effects are defined as all "non-federal" actions (i.e., state, local, private, and tribal) reasonably certain to occur in the foreseeable future. Such actions may include, but are not limited to additional road, residential and commercial development, maintenance and upgrading of existing infrastructure, and watershed enhancement. Anticipated road development, residential and commercial development, population growth, farming or agricultural use, and other human activities are not expected to increase due to implementation of this Project. Therefore, cumulative effects related to this Project are anticipated to be minimal. Cumulative effects are described in greater detail in Section 5.5 of this BA.

9.4 Proposed Conservation Measures

Appropriate measures have been incorporated into the proposed project design to minimize and avoid adverse effects to fish species and EFH. These measures address in water work, erosion and sediment control, containment of construction materials, handling of hazardous materials, and disturbance of riparian vegetation. Conservation measures are outlined in Section 6 above.

9.5 Conclusion by EFH

The effects to the EFH of UCR spring-run Chinook have been addressed in Section 5.6 above. Because they have similar life histories and also use the Action Area primarily as a migration corridor, the effects of construction activities on the EFH of coho are very similar to those impacts on UCR spring-run Chinook EFH. Any adverse impacts will be mitigated by adherence to the conservation and impact minimization measures detailed in Sections 6.

The proposed project has the potential to result in the incidental take of juvenile spring Chinook salmon of the UCR ESU in the in-water work area and in-water construction activities. The probability of listed fish species occurring in the action area during the proposed in-water construction period (September 1 – February 28) is relatively low given the life cycle of these species. Although the conservation measures associated with the proposed in-water activities will minimize incidental take for the project as a whole, proposed actions may result in minor habitat modification in the short term that could impair or disrupt behavioral patterns of fish, including feeding and sheltering. To further minimize incidental take of fish, all in-water work will be conducted during the in-water work period (September 1 – February 28). Furthermore, containment measures outlined in the Best Management Practices (BMPs) and conservation measures will minimize the potential for direct harm to fish from project construction activities. Based on the best scientific data, take resulting from temporary turbidity associated with this

project is largely unquantifiable in the short term and not expected to be measurable in the long term.

Potential impacts on ESA-listed anadromous fish species in the project area are expected to be extremely limited. Based on the analysis contained in this BA, the determination of the proposed project is **may affect, likely to adversely affect** the Essential Fish Habitat of UCR Chinook and coho salmon.