United States Department of Agriculture
Forest Service

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Chewuch River Restoration River Miles 15.5-20

Environmental Assessment

Methow Valley Ranger District, Okanogan-Wenatchee National Forest, Okanogan County, Washington

Photo of the Chewuch River by Barbara Jackson, Landscape Architect, USDA Forest Service

For More Information Contact:

Gene Shull
Zone Fisheries Biologist
Methow Valley District Ranger
24 West Chewuch Road
Winthrop, WA 98862
Phone: 509-996-4013

Contents

Chapter 1 Purpose and Need

1.1 Introduction

The Methow Valley Ranger District (Forest Service [FS]), in partnership with The Confederated Tribes and Bands of the Yakama Nation (Yakama Nation) and Bonneville Power Administration (BPA), propose to re-establish, enhance and improve the diversity of aquatic habitat for Endangered Species Act (ESA) listed fish in the River Mile (R.M.) 15.5 - 20 reach of the Chewuch River. These actions would take place on the Methow Valley Ranger District of the Okanogan-Wenatchee National Forest in Okanogan County in north central Washington State starting in the summer of 2017. The Chewuch River flows into the Methow River, a tributary of the Columbia River. Bonneville Power Administration is considering whether to fund construction as part of the Mid-Columbia Restoration Program.

This Environmental Assessment (EA) was prepared pursuant to the National Environmental Policy Act (42 U.S. Code [USC] 4321 *et seq.*) and the Council on Environmental Quality implementing regulations, which require federal agencies to assess the impacts that their actions may have on the environment. The Forest Service is the lead agency and BPA is a cooperating agency in the development of this Environmental Assessment (EA).

This EA was prepared to determine if the Proposed Action would significantly affect the quality of the human environment and thereby require the preparation of an Environmental Impact Statement (EIS). Preparing this EA fulfills agency policy and direction to comply with the National Environmental Policy Act (NEPA). Details of the proposed action are in Chapter 2 beginning on page 12.

1.2 Proposed Project Location

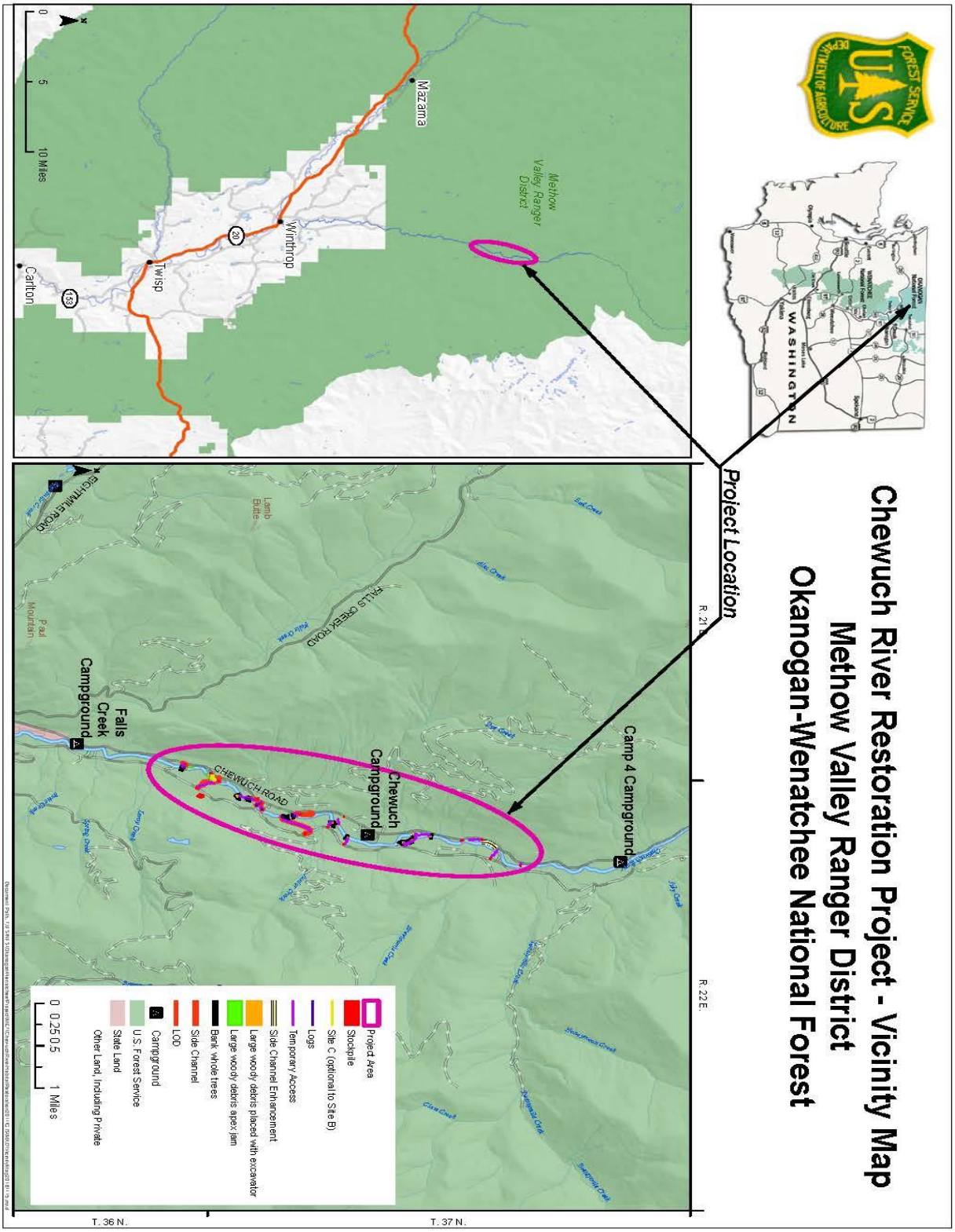
As shown in Figure 1, Project and Vicinity Map, the project is north of Winthrop, Washington at Chewuch R.M. 15.5 - 20. It includes construction of features at approximately 29 treatment sites on National Forest System. Up to 7 ½ acres would be potentially disturbed, depending on the final decision and final road/access trail locations.

The proposed action is not within an Inventoried Roadless Area, Wilderness, or other congressionally designated area. The area is within an eligible river segment for potential scenic classification under the Wild and Scenic River Act.

1.3 Project Area Description

The Chewuch River historically produced large numbers of salmon, steelhead, and bull trout and so is a key watershed for the delisting of the upper Columbia listed species. However, it has been slow to recover from the removal of wood in the early half of the 1900's and the construction and removal of dams in the Columbia River system. Many of the forested stands within the project area provide low rates of natural wood recruitment due to low tree densities with the presence of few snags. In addition, channel and streambank alterations have reduced the ability of stream channels to meander and effectively retain wood. Recreation and road development have also reduced the potential for new wood to fall into the river. As a result of these and other factors, there has been a decrease in the amount of pool habitat compared to natural stream conditions (Shull and Butler 2014).

Figure 1 Project & Vicinity Map



Processes affecting large wood availability, recruitment, and retention have been altered and are unlikely to recover on their own. Natural restoration of the underlying processes would take many decades or centuries (e.g. growth of large trees and more natural wood recruitment rates), and in some cases, such as with bank armoring associated with a roadway, may never be fully recovered.

Large wood and pools in rivers provide important habitat to many aquatic species both in the main river channel and in side channels, or alcoves. Large wood provides shelter, hydraulic refuge, and forms pools with slow water that are important for rearing salmon in the first year of life. Large wood increases food production by increasing invertebrate production. Wood also contributes to the creation of vegetated islands that provide important nutrient inputs for many aquatic species. Off-channel habitat is important for juvenile rearing as refugia from high stream temperatures, predators, and high flows during spring runoff.

Essential Fish Habitat (EFH), as defined under the Magnuson-Stevens Act, is all suitable habitat for salmon that currently is, or historically was, necessary to fish for spawning, breeding, feeding, or growth to maturity. Chinook salmon habitat within the project area of the Chewuch River is currently functioning at risk.

The lack of habitat diversity in the Chewuch River limits fish productivity for Endangered Species Act (ESA) listed fish in the Methow sub-basin (USDA-FS 1994a), (UCSRB 2007), (USDA-FS 2010).

The proposed action could affect the "Outstandingly Remarkable Values" of the Chewuch River, identified in the Okanogan Forest Plan as scenic, wildlife, fish, and recreation.

Most of the large woody debris/trees would be hauled in from other areas but a few would be taken on site and pulled/pushed over into the river. A few trees would be cut along access routes to the river. Trees and other material brought in would be stored at an existing gravel pit on the east side of the river.

Above the floodplain, mixed conifer plant communities occur; Ponderosa pine, western larch, and Douglas-fir trees are the primary overstory species. Dogbane is an interesting understory forb occurring in large patches. This plant was used by the Native Americans to make rope and nets. Other understory species noted were Kinnikinnick, Oregon grape, Spirea, and serviceberry. Pinegrass is the most common grass.

On the floodplain area, mesic and riparian vegetation predominates, with an overstory of Engelmann spruce, occasional western red cedar, and close to the riverbank, alder and cottonwood. Understory shrubs include red osier dogwood, snowberry, and various willows, especially on the riverbank. A few thimbleberry are present. Horsetails occur in moist areas.

All map boundaries and acreage figures are approximations based on best available information at the time, and actual implementation may differ slightly to better reflect on the ground conditions or methods that would cause less environmental impacts.

1.4 Purpose and Need

The purpose of the project is to re-establish, enhance, and improve the diversity of fish habitat for threatened and endangered anadromous fish species including Chinook salmon, steelhead, and bull trout in the R.M. 15.5 - 20 reach of the Chewuch River. Lack of habitat diversity in the Chewuch River is limiting fish productivity for anadromous fish listed under the Endangered Species Act.

BPA needs to decide whether to provide funding to the Yakama Nation to construct, re-establish, enhance, and improve fish structures in the Chewuch River.

There is a need to restore habitat diversity by increasing large wood quantities, pool frequency and quality, and re-establishing side- and off-channel habitat to improve fish habitat for ESA-listed species.

For BPA, the alternatives should meet the following purposes:

- Support efforts to protect, mitigate, and enhance fish and wildlife for effects of the Federal Columbia River Power System (FCRPS) in the mainstem Columbia River and its tributaries pursuant to the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Northwest Power Act) (16 USC 839(h)(10)(A)).
- Assist in carrying out commitments that are contained in the 2008 Columbia Basin Fish Accords Memorandum of Agreement with the Yakama Nation, and others.
- Implement BPA's Fish and Wildlife Implementation Plan EIS and Record of Decision (ROD) policy direction, which calls for protecting weak stocks, like the Upper Columbia steelhead and spring Chinook, while sustaining overall populations of fish for their economic and cultural value.

Project objectives are to:

1. Increase Large Wood Complexity

   The need for large wood is established by the Record of Decision for the Okanogan National Forest Plan (USDA-FS 1989b) and the Interim Strategies for Managing Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH 1995) and are detailed in *Chewuch River Large Wood, Pool, and Off-channel Habitat* (Shull and Butler 2014). Quantities of large wood in R.M. 15.5 - 20 of the Chewuch are below the desired amount. There is a need to add enough large wood, in key locations, to improve the health of the channel structure and support future natural wood recruitment.

   A purpose of this project is to increase the frequency and size of large wood, and the frequency of log jams in the R.M. 15.5 – 20 reach of the Chewuch River to start moving the reach toward the desired condition.

2. Enhance Pool Habitat

   The Okanogan National Forest Plan (USDA-FS 1989b) describes a desired pool frequency of about 15 per mile for complex pools more than three feet deep. Pool density in the Chewuch River is lower, between 6 - 9 pools per mile, and most of the existing pools lack cover, such as large wood or root wads, which are important for protecting juvenile and adult fish from predators and other hazards.

   A purpose of this project is to enhance resting and holding habitat for salmon and steelhead; moving this reach of the Chewuch River toward the desired condition by increasing pool frequency, and improving pool quality, and increasing the percent of the area with pools.

3. Increase the quantity and quality of off-channel rearing habitat

   Side channel habitat in R.M. 15.5 – 20 are present, but lack the structure, stability, and cover associated with ideal over-wintering habitats. Many areas are losing, or lack, river connectivity. Some side channels are filling in with fine sediment and lacking complex cover for protecting juvenile fish.

   To move the R.M. 15.5 – 20 channel toward the desired condition of providing high quality summer and overwintering habitat for juvenile salmonids, a purpose of this project is to increase the frequency and quality of off-channel areas in this reach of the Chewuch River.

1.5 Regulatory Framework

The Okanogan Forest Plan (Forest Plan) provides direction, standards, and guidelines for the management of the Chewuch River Restoration Project area (USDA-FS 1989b). Currently, the Chewuch River is the boundary between two different land management areas. To the west, the Record of Decision and Environmental Impact Statement for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl (USDA-Forest Service and USDI-Bureau of Land Management, 1994) amended the Forest Plan in 1994. To the east, PACFISH amended the Forest Plan in 1995.

The proposed action, which includes the design criteria, mitigation, and monitoring measures described in Chapter 2, is designed to be consistent with standards and guidelines from the Forest Plan, as amended. The following regulatory framework discussion is separated into three different management plans and they are the Forest Plan, the Northwest Forest Plan, and PACFISH. A fourth guidance document is the Pacific Northwest Invasive Plant Program Final Environmental Impact Statement.

Okanogan Forest Plan

The Forest Plan's desired condition for water bodies like the Chewuch River is habitat that supports fish rearing, spawning, and migration to be in an improved state. Habitat management objectives that apply to this project are to maintain and improve fish habitat capability, and integrate fish and riparian habitat management into other multiple use activities. Pertinent goals of the proposed activity are for fish habitat to be managed to maintain or enhance its biological, chemical, and physical qualities. The structural and functional properties of aquatic systems would be managed to promote bank and channel stability and riparian areas would be managed to provide a continuing supply of large wood for fish habitat.

Appendix G of the Forest Plan discusses Wild and Scenic River management, beginning on page G-2. The determination of potential classification of eligible river segments for Wild and Scenic river classification is based on the existing conditions at the time of the assessment (1989). Under the Scenic category, it states "Those rivers or segments of rivers that are free of impoundments, with shorelines or watershed still largely primitive and shorelines undeveloped, but accessible in places by roads." (Refer to Appendix G for the full text).

The Okanogan Forest Plan identifies management indicator species for mature and old growth forest habitat, dead and defective tree habitat, deciduous and riparian habitat, and winter range habitat. Details on habitat use, ecology, and amount of each habitat on the Forest for these species are in the Wildlife Management Indicator Species Report (USDA, Forest Service 2011). The Forest-wide viability determination for each species is included in project files.

The Forest Plan contains a number of Forest-wide Standards and Guidelines that pertain to fisheries, including fish habitat rehabilitation (page 4-31) and river segments designated or candidate for Wild and Scenic designation (page 4-39). The project occurs in Riparian Reserve and open land designated as Matrix on the west side of the river and roaded natural recreation and scenic viewing on the east side of the river. Specific applicable Standards and Guidelines (S&G) considered for plan conformance are listed below (Figure 2).

Figure 2: Forest Plan Standards and Guidelines

Forest-wide Standards and Guidelines	
3-1	Maintain or enhance biological, chemical, and physical qualities of Forest fish habitats
3-2	Rehabilitate fish habitats where past management activities have adversely affected their ability to support fish populations.
3-3	Sediment in fishery streams shall be maintained at levels low enough to support good reproductive success of fish populations as well as adequate instream food production by indigenous aquatic communities to support those populations.
3-4	Manage streams for high quality pool habitat consistent with the potential for the stream to provide it thorough natural or artificial means.
3-5	Provide an average of at least 20 pieces of large wood per 1,000 lineal feet of stream channel on fish bearing streams to provide for aquatic needs.
6-8	Manage disturbing activities so they occur outside of critical habitat periods to protect wildlife.
6-10	Active raptor nest sites shall be protected through the nesting seasons (until young are fledged).
6-17	Threatened and endangered species shall be managed according to recovery plans.
6-18	Consultation with the U.S. Fish and Wildlife Service shall be initiated when threatened or endangered species may be affected by resource proposals.
6-19	Sensitive plants and animals should be protected.
7-11	Manage to perpetuate native plant species used for food, medicine, and religious purposes by Native American Tribes consistent with the goals of the management area.
9-3	The potential scenic classification attributes within a one-fourth mile wide corridor on each side of the following eligible river segments {Chewuch} shall be protected pending Congressional action on river designation.
12-1	Control noxious weeds to the extent practical.
12-2	New infestations of noxious weeds should be the first priority for eradication.
12-3	Emphasis on noxious weed control shall be the prevention of infestations, especially into unroaded areas and wilderness.
Standards and Guideline for Management Area 5	
MA5-8A	The visual quality objective is retention (the proposed action would occur within the foreground of the Chewuch River. It is also within the foreground of the East and West Chewuch Roads (FSR 5100000 and 5010000) and several developed or dispersed recreation facilities and sites.)

Northwest Forest Plan (NWFP)

The Northwest Forest Plan amended the Okanogan Forest Plan in 1994. This plan includes an Aquatic Conservation Strategy (ACS) with four components: Riparian Reserves, Key Watersheds, Watershed Analysis, and Watershed Restoration. In addition, the ACS includes nine objectives to direct management at the watershed scale that focuses on maintaining and/or improving conditions and processes associated with streams and adjacent riparian areas. The lower Chewuch River watershed is a designated Key Watershed and a priority for habitat restoration. Standards and Guidelines in the NWFP for Riparian Reserves of particular relevance to this habitat restoration project in a Key Watershed include (Figure 3):

Figure 3: Standards and Guidelines

Standards and Guidelines	
WR-1	Design and implement watershed restoration projects in a manner that promotes long-term ecological integrity of ecosystems, conserves the genetic integrity of native species, and attains ACS objectives.
FW-1	Design and implement fish and wildlife habitat restoration and enhancement activities in a manner that contributes to attainment of the ACS objectives.

This document and analysis tier to the January 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines. The 2005 Survey and Manage species list was used for this analysis (see Appendix B of the Botany Specialist Report and Biological Evaluation in project files).

PACFISH

PACFISH amended the Okanogan Forest Plan in 1995. PACFISH includes five components directing management of riparian areas: Riparian Habitat Conservation Areas (RHCAs), Riparian Goals, Riparian Management Objectives (RMOs), Key Watersheds, and Watershed Analysis. The RMOs include eight objectives to guide management at the watershed scale that focus on maintaining and/or improving conditions and processes associated with streams and adjacent riparian areas. The lower Chewuch River watershed is a designated Key Watershed and is a priority for habitat restoration. The two applicable RMOs include "pool frequency" and "large woody debris" (Figure 4). The RMOs suggest a pool frequency should be around 23 pools/mile and suggest large wood levels should be more than 20 pieces/mile that are greater than 12" in diameter and 35 foot long.

Figure 4: Riparian Management Objectives

Riparian Management Objective	
WR-1	Design and implement fish and wildlife habitat restoration and enhancement actions in a manner that contributes to attainment of the Riparian Management Objectives.
FW-1	Design and implement fish and wildlife habitat restoration and enhancement actions in a manner that contributes to attainment of Riparian Management Objectives.

Invasive Plant Program Guidance

The Record of Decision for the Pacific Northwest Invasive Plant Program Final EIS (USDA-FS November 2005) [2005 PNW ROD] provides direction for the management of invasive species. This project is intended to comply with the Okanogan National Forest Weed Management and Prevention Strategy and Best Management Practices (USDA-FS 2002), the Guide to Noxious Weed Prevention Practices (USDA-FS 2001) supporting the February 3, 1999 Executive Order on Invasive Species and the National Strategy and Implementation Plan for Invasive Species Management (USDA-FS October 2004).

Federal, State, and Local Laws and Guidance

The Endangered Species Act: The Endangered Species Act of 1973 (16 USC 1531 et seq.) requires that any action authorized by a federal agency shall not be likely to jeopardize the continued existence of a threatened or endangered (T&E) species, or result in the destruction or adverse modification of habitat to such species that is determined to be critical.

The Magnuson-Stevens Fishery Conservation and Management Act is the primary law governing marine fisheries management in U.S. federal waters. First passed in 1976, the Act fosters biological and economic sustainability of our nation's marine fisheries out to 200 nautical miles from shore.

The Clean Water Act (CWA), as represented collectively by the Water Quality Act of 1987, the Clean Water Act of 1977, and the Federal Water Pollution Control Act Amendments of 1972. The CWA characterizes water pollution from forestland use activities as "non-point source pollution", and describes the use of best management practices (BMPs) as the most effective means of preventing and controlling non-point source pollution. It also establishes state roles in water resource classification, development of water quality standards, and identification of waters that are unlikely to comply with these standards.

The Wild and Scenic Rivers Act: The National Wild and Scenic Rivers System was created by Congress in 1968 (Public Law 90-542; 16 USC 1271 et seq.) to preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations.

The Okanogan National Forest Land and Resource Management Plan (1989) determined the Chewuch River, from the Thirtymile Trailhead to the Forest Boundary, is an eligible river segment for potential Scenic River designation. Section 7 of the Wild and Scenic Rivers Act directs federal agencies to protect the free-flowing condition and other values of designated rivers.

The National Forest Management Act of 1976 reorganized, expanded, and otherwise amended the Forest and Rangeland Renewable Resource Planning Act of 1974, which called for the management of renewable resources on National Forest System lands. This Act requires the Secretary of Agriculture to assess forestlands, develop a management program based on multiple uses, sustained yield principles, and implements a resource management plan for each unit on the National Forest System.

The Migratory Bird Treaty Act makes it unlawful to pursue, hunt, take, capture, or kill migratory birds. Executive Order 13186, 66 Fed. Reg. 3853 (2001) Responsibilities of Federal Agencies to Protect Migratory Birds, along with the Memorandum of Understanding between the USDA Forest Service and the U.S. Fish & Wildlife Service to Promote the Conservation of Migratory Birds (2008) require proposed federal actions to be evaluated for effects on migratory birds.

The National Historic Preservation Act (NHPA) of 1966 (16 U.S.C. 470), as amended, is the foremost legislation that governs the means to identify, administrate, and preserve objects and landscapes significant to cultural and social heritage for the enrichment of future generations. Implementing regulations that clarify and expand upon the NHPA include 36 CFR 800 (Protection of Historic Properties), 36 CFR 63 (Determination of Eligibility to the National Register of Historic Places), and 36 CFR 296 (Protection of Archaeological Resources). The Pacific Northwest Region (R6) of the Forest Service, the Advisory Council on Historic Preservation (ACHP), and the Washington State Historic Preservation Office (SHPO), signed a programmatic agreement (PA) regarding the management of cultural resources on National Forest System lands in 1997. The 1997 PA outlines specific procedures for the identification, evaluation, and protection of cultural resources during activities or projects conducted on National Forest System lands. It also establishes the process that the SHPO utilizes to review Forest Service undertakings for NHPA compliance.

Other Guidance or Recommendations

Watershed Analysis

The Chewuch Watershed Analysis (1994) describes habitat conditions below Lake Creek as having a "lack of habitat complexity due to low amounts of large wood and loss of side-channel processes due to debris cleanouts in the river and reduction in large streamside recruitment trees." The analysis cited historic wood cleanouts as "possibly the most damaging affect that humans have had on the aquatic and riparian ecosystem structure and function of the Chewuch River below Lake Creek". This activity resulted in river channel straightening, increased bank erosion, lack of pools and deep pools, channel down cutting, and over-simplified habitat that does not provide desirable fish habitat.

Aquatic habitat restoration, which includes large wood placement, was identified as a need to increase the accumulation of wood in the lower Chewuch River, below Lake Creek.

It also included recommendations to perform surveys for threatened, endangered, and sensitive plant species at least one year in advance of disturbance, and to maintain a database of any sites found.

Forest Service Handbook (FSH) and Manual Direction (FSM)
FSH 1909.12, 82.5 gives direction for management of rivers, such as the Chewuch that have been determined potentially eligible for Wild and Scenic River designation. It states that the Responsible Official can authorize site-specific projects on National Forest System land within eligible river corridors when the project is consistent with the following:

1. The free-flowing character of the river is not modified by the construction or development of stream impoundments, diversions, or other water resources projects;
2. Outstandingly remarkable values of the identified river area are protected; and
3. Construction of structures to protect and enhance fish habitat should harmonize with the area's largely undeveloped character and fully protect identified river values.

FSM 2670 directs the Forest Service to manage habitats for all existing and desired native plants, fish, and wildlife species in order to maintain at least viable populations of such species. To conduct activities and programs "to assist in the identification and recovery of threatened, endangered, and sensitive plant and animal species". To avoid actions "which may cause a species to become threatened or endangered".

Bonneville Power Administration (BPA)

The project would meet BPA's objectives mandated under several federal laws. BPA is a federal power marketing agency that is part of the U.S. Department of Energy. BPA's operations are governed by several statutes, such as the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Northwest Power Act) (16 U.S.C. 839 et seq.). Among other things, the Northwest Power Act directs BPA to protect, mitigate, and enhance fish and wildlife affected by the development and operation of the Federal Columbia River Power System (FCRPS). To assist in accomplishing this, the Act requires BPA to fund fish and wildlife protection, mitigation, and enhancement actions consistent with the Northwest Power and Conservation Council's (NPCC) Fish and Wildlife Program. Under this program, the NPCC makes recommendations to BPA concerning which fish and wildlife projects to fund. The NPCC determined that this project was consistent with the Fish and Wildlife Program, and BPA would use the analysis in this EA to decide whether to fund the project.

The project would also assist in carrying out commitments related to the 2008 Columbia Basin Fish Accords Memorandum of Agreement with the Yakama Nations and others.

Additionally, this project would help BPA meet its obligations under the Endangered Species Act (16 U.S.C. 1531 et seq.) by fulfilling commitments to implement Reasonable and Prudent Alternative 35, which calls for identifying tributary habitat restoration projects in the 2008 FCRPS Biological Opinion, as amended by a Supplemental Biological Opinion in 2010 and 2014 (National Oceanic and Atmospheric Administration Fisheries 2008, 2010, 2014).

1.6 Consultation and Public Involvement

This project has been on the Okanogan-Wenatchee National Forest Schedule of Proposed Actions (SOPA) since October 2016. On September 2, 2016, government-to-government consultation letters were sent to the Yakama Nation and Confederated Tribes of the Colville Indian Reservation (Colville Tribe) per Executive Order 13175. The only response letter was from the Colville Tribe agreeing with the Area of Potential Effect (APE) that had been selected for Cultural Resource surveys.

On September 7, 2016, the Okanogan County Commissioners were sent a letter seeking input on the project. No project specific concerns were received from the Commissioners.

Public scoping began on September 9, 2016. The letter was sent to adjacent landowners to the project and individuals who had permits at the Brevicomis Recreation Residence site. No comments were received.

The interdisciplinary team discussed, reviewed, and modified the proposal presented by the Yakama Nation to better fit existing guidance documents.

1.7 Issues

Issues for analysis were identified during interdisciplinary team discussions. Those issues and the indicators for measuring effects are listed below and discussed in the appropriate resource section under Existing Condition and Environmental Consequences beginning on page 26 of this document.

1. The constructed features could degrade the scenic outstandingly remarkable value by decreasing visual quality as seen from the river and the East and West Chewuch Roads, and increasing development along the river.

   Indicators: Scenic Quality.

2. The constructed features could affect the recreation outstandingly remarkable value by changing the landscape character as seen from developed or dispersed campgrounds.

   Indicators: Overall Recreation Experience.

3. Access and site work by equipment, such as excavators, used to enhance pools, install large wood or complete side- or off-channel work might damage or remove *Sanicula* populations, a Region 6 Sensitive Plant Species.

   - Proposed access to site B is adjacent to a *Sanicula* population. A population is known to have previously occurred along the planned route to sites O and P, but this population was not located during field surveys.

   Indicators: Acres of Habitat, Number of Populations, Number of Individuals.

4. Constructed features may pose a safety hazard to boaters who could be caught on or pulled under the structures.

   Indicators: Recreation Safety.

5. Disturbance from access and construction during critical periods, including nesting season, may affect Nesting Birds or federally listed wildlife species.

   Indicators: Disturbance during critical periods; Disturbance during nesting season; Disturbance to federally listed species.

6. Removal of large diameter cedar, cottonwood, and aspen trees during access and construction could affect unique riparian habitat.

   Indicators: Loss of large diameter cottonwood, cedar, and ponderosa pine trees.

7. Site access and construction would include soil disturbance and may use equipment and materials contaminated with weed seed.

   Indicators: Establishment of new infestations.

8. Existing populations of invasive plants in the project area could be spread by project activities such as site access, construction, and reclamation.

   Indicators: Spread of existing infestations.

Issues Considered but Dismissed

1. Constructed features, such as logjams, could break loose and move downstream, impacting private property.
   - Such occurrences are unlikely and not reasonably foreseeable. As described in the Chewuch RM 15.5 - 17 Fish Habitat Conceptual Design Report (Inter-Fluve, May 2014) and the River Mile 17 - 20 Conceptual Design Report (Inter-Flueve, March 2016), the features are designed to remain stable through the 100-year flood event.

Chapter 2 Alternative Description

Chapter 2 describes in detail the alternatives analyzed for the Chewuch River Restoration R.M. 15.5 – 20 Project. Where there are no unresolved conflicts concerning the alternative uses of available resources (NEPA, section 102(22)(E)), the EA need only analyze the proposed action and proceed without consideration of additional alternatives (36 CFR220.7 (b)(2)(i)). Chapter 2 provides readers and the deciding official with a summary of the entire project, displaying the alternative design criteria, mitigation, monitoring requirements, and a comparison of the effects of the alternatives.

2.1 Proposed Action and Alternatives

2.1.1 Alternative Formulation

Because no unresolved conflicts emerged during scoping, an action alternative to the Proposed Action was not developed. This EA addresses one action alternative, the Proposed Action, including design criteria and required mitigation/monitoring to prevent unacceptable resource damage and ensure Forest Plan, as amended, compliance. No other action alternatives were considered for detailed analysis.

2.1.2 No Action Alternative (Alternative 1)

The No Action alternative provides a baseline to compare against for the analysis of environmental effects.

The No Action Alternative would not restore wood or stream side channels in the 15.5 – 20 R.M. reach nor any other river restoration activities. The wood needed for increasing large wood complexity would occur through natural processes. Recovery of pool habitat and restoring the quantity and quality of off-channel rearing habitat in the river would occur through natural processes.

Although recent wildfires in the upper watershed have created a potential source of in-stream wood, the processes affecting large wood recruitment and retention have all been altered over time and are unlikely to fully recover on their own. For example, an ample supply of large wood exists upstream from past fires; however, riparian roads, channel cleaning, riparian harvest, bank armoring, etc. have altered the stream banks and channelized the flow reducing the ability of the stream to retain large wood that becomes available. Furthermore, natural restoration of the underlying processes would take many decades or centuries (e.g. growth of large trees and more natural wood recruitment rates), and in some cases, such as with bank armoring associated with a roadway, may never be fully recovered (Shull and Butler 2014).

2.1.3 Proposed Action (Alternative 2)

The Forest Service and the Yakama Nation, funded by BPA, are currently proposing restoration actions on the Chewuch River from R.M. 15.5 to 20.0. This is the fourth in a series of Chewuch River restoration projects. Additional project proposals may occur in future years, but information about site locations or designs is not available. The proposed project has been designed to enhance fish habitat and to improve fish habitat diversity by:

- Increasing habitat complexity by the introduction of large wood,
- Increasing pool habitat, and
- Restoring historical off-channel habitat.

The proposed action is based on projects described in the Chewuch River Mile 15.5 - 17 Fish Habitat Conceptual Design Report (Inter-Fluve May 2014) and the River Mile 17 - 20 Conceptual Design Report (Inter-Flueve March 2016) and includes the following below activities. Locations for each of the sites and associated access routes is shown on Figure 1, page 2, Project & Vicinity Map, and Figures 5, 6, and 7 Conceptual Design Drawings, pages 15, 16, and 17.

GENERAL TREATMENT DESCRIPTIONS

Field survey and analysis have determined the following project types are feasible and appropriate within the project reach. They include the following:

Bank Jams: Bank margin large wood would be employed where natural wood deposition naturally occurs – such as the outside of meander bends – to enhance juvenile rearing and adult holding habitat. Because this treatment simulates lateral logjams, the density of the wood in this treatment is high, encompassing 40 -70 feet of bank, with roughly 35 – 60 large woody debris (LWD) pieces consisting of both root wad and straight pieces. A bank buried structure such as this will usually extend into the river 15-20 feet. The diversity of LWD size class will range from 17 – 25" in diameter at breast height. Bank margin large wood treatment zones can be viewed in the drawing set in project files.

Side Channel Reconnection: There is an old side channel near R.M. 15.5 that is currently backwatered by the Chewuch River. It was once an active flow through side channel with an inlet near R.M. 16.3. Over time, the side channel was abandoned as local channel elevations lowered. The inlet to the side channel would be opened up to provide perennial flow to the side channel that is currently disconnected from the river. Site work includes creating a new inlet to the side channel, and installing log structures that would improve direct flow to the side channel. The structure would require a total of 80 LWD pieces, which include straight pieces for ballasting. The total length of channel excavation is 600 feet with an estimated 5,700 cubic yards of material to be removed off site.

Bar-Apex Jams: Bar-apex large wood jam treatments are centered at the head of gravel bars or braided channel islands. They also enhance existing wood deposit zones by increasing the mass and vertical height of the large wood deposit, which can help trap and retain additional wood. These structures create pools at the head of the structure, encourage side channel inlet flow conditions, and can encourage/enhance meander migration. If used in larger numbers, they can create a high degree of channel complexity. Bar-apex structures are typically made up of 15 to 25 LWD pieces. This includes both root wad and straight sticks for ballasting. Size of the structure is more dependent on current conditions that are encountered at the time of construction. Bar-apex large wood locations can be viewed in the drawing set in project files.

Whole Tree Placements: Whole tree cover wood placements involves pushing/pulling over existing large conifer trees, laying them over the bank edge relatively intact, and ballasting them with piles in order to provide near-bank cover habitat. Ideally, trees used for this treatment would be far enough from the river to insure they could not naturally enter the river through natural migration processes. The size and location of the trees would be determined by the USFS.

Treatment sites where these treatments could be used are located in the drawing set and identified as WP1, 2, or 3. These treatment sites are focused in areas with existing pool areas and little cover and/or areas where tree placement could rapidly scour and create new complex habitat.

Pool Cover Habitat Jams: Wood would be placed in two existing pool features to add hiding cover and to create more complex pool habitat. This treatment involves ballasting wood in the banks and extending into existing pools that will provide immediate cover habitat in slow water areas.

Side Channel Pool and Cover Habitat Enhancement: There are existing side channel habitats with minimal pool depth that could be enhanced using heavy equipment to excavate pool bedform features and then enhanced with large wood cover. This type of project could be completed in a segment of channel with difficult access using an excavator in combination with helicopter large wood delivery.

Specific project sites are discussed below, and are shown in Figures 5, 6, and 7 on pages 15, 16, and 17.

SITE A – Bank Jam

Site A is a right bank surface bar log jam to supplement an existing wood deposit. Imported wood would be placed and ballasted using vibratory driven piles. The jam would be constructed to take advantage of and use an existing natural large spruce tree to enhance existing processes and provide both low and high flow rearing habitat.

SITE WP2 – Whole Tree Placement

The project site is a left bank large wood cover. Standing trees along the river would be pushed/pulled over to form cover in existing pool habitat. Two to four trees would be pulled/pushed over and placed in the channel. The trees would not be ballasted by vertical piles and would adjust along the bank in subsequent high flows.

SITE D – Apex Jam

Site D is an apex jam at a location naturally suited to wood deposition. The jams is intended to provide a large surface area to collect incoming natural large wood and increase rearing habitat at both low and high flows. Vertical piles would be used to ballast the wood in place. Bank height is approximately eight feet. Total bank length is approximately 40 feet.

SITE E – Bank Jam

Site E is a right bank buried log jam extending out into the river 25 – 30 feet. The jam is ballasted in place through burial and vertical piles placed within the matrix of the structure. Bank height is approximately eight feet. Total bank length is approximately 60 feet long and would enhance an existing pool with no cover.

SITE F – Apex Jam

To enhance flow into a high-flow side channel, an apex logjam would be constructed. The apex jam would not provide low-flow habitat but instead enhance high-flow habitat within an existing high-flow channel. It would do so by reducing local channel capacity downstream of the side channel inlet, causing lower flows to run into the side channel than would occur without the jam.

SITE G – Pool Cover Habitat Jam

Site G is a small habitat cover log jam within a backwater side channel along the right bank. The jam is intended to provide rearing cover habitat within a backwater during high flows. Some wood would be extended down over an existing pool. The project would be ballasted with vertical piles. Bank height is approximately eight feet. Total bank length is approximately 40 feet long and would enhance an existing pool with no cover. As part of reclamation of the trail down the 8’ bank to the river, a set of hardened stairs would be constructed.

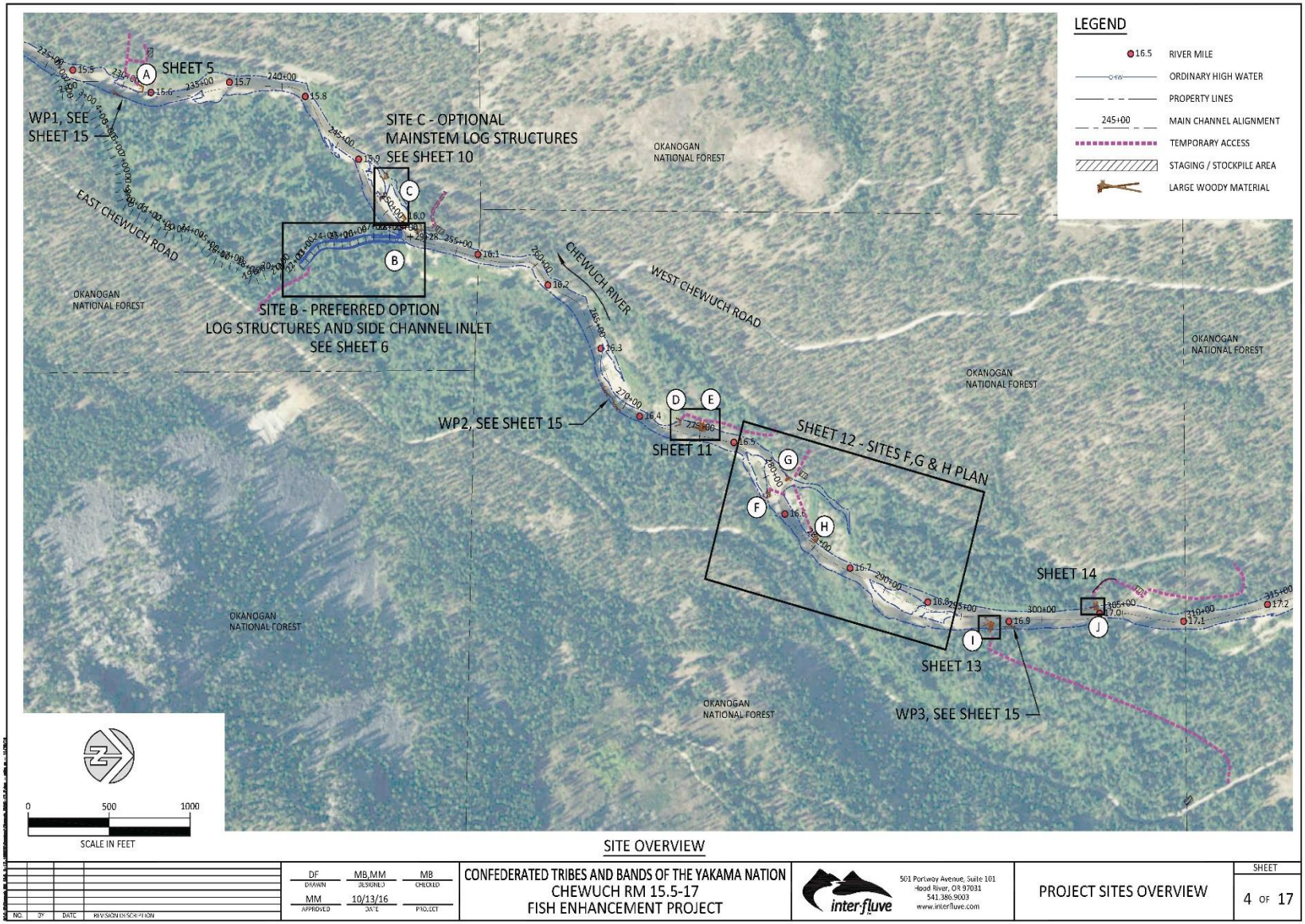
SITE H – Apex Jam

Site H is an apex jam within an area that could accumulate natural wood. Imported wood would be placed and ballasted using vibratory driven piles. The jam would be designed to accumulate native large wood and accelerate left bank migration into an old channel complex and riparian area. As left bank migration occurs, mature spruce trees would be incorporated into the channel further improving ecologic and fish habitat complexity.

SITE I

The project site is a left bank buried and pile ballasted log jam to provide cover habitat over an existing pool. Total bank distance is 40-60 feet long in a gap between large trees adjacent to the pool and extending into the river 30 feet. The structure would be ballasted in place through burial and vertical piles placed within the wood matrix. Additionally, standing trees along the river would be pushed/pulled over to form cover in existing pool habitat.

Figure 5: Conceptual Design Drawing.



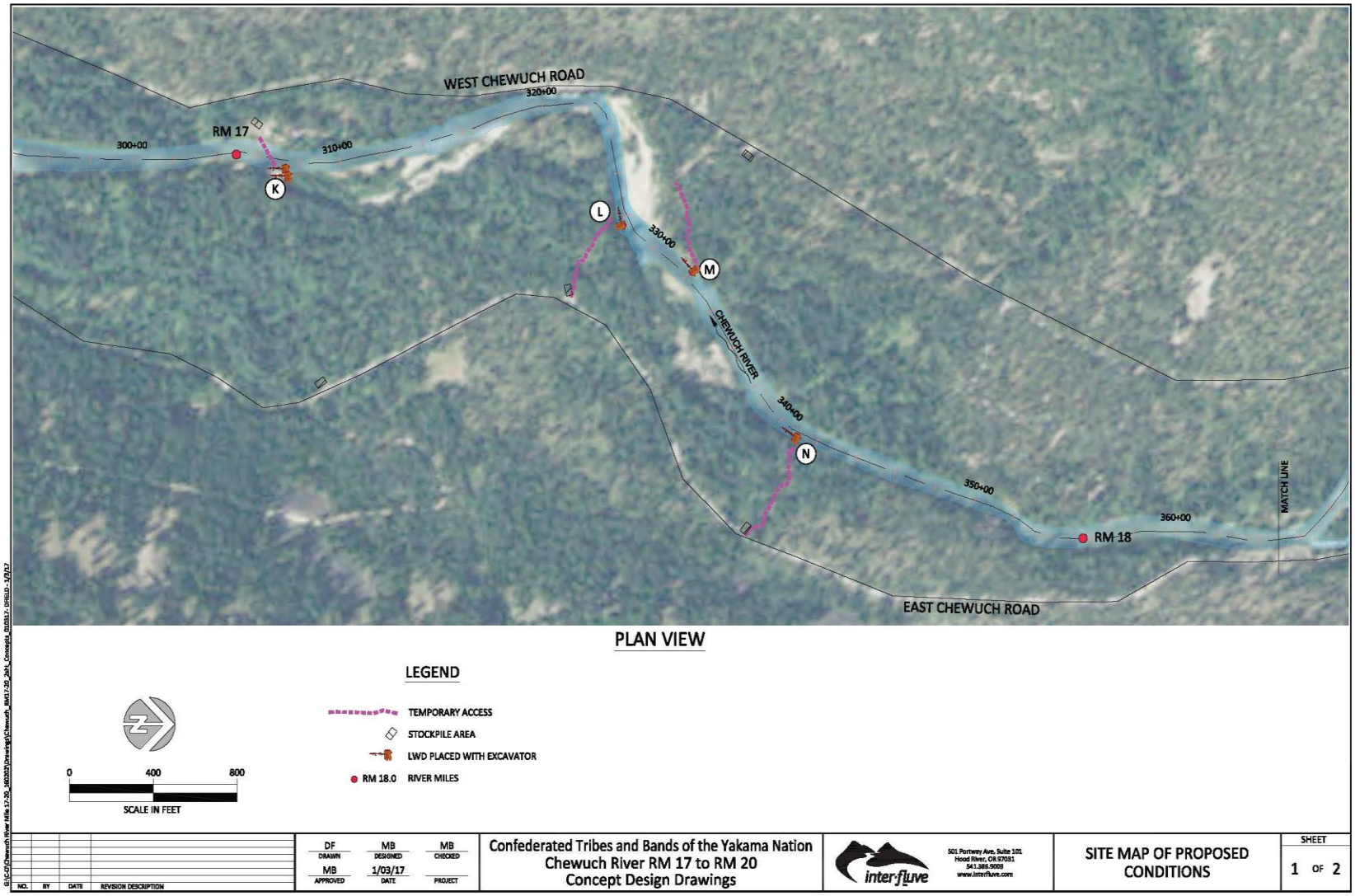
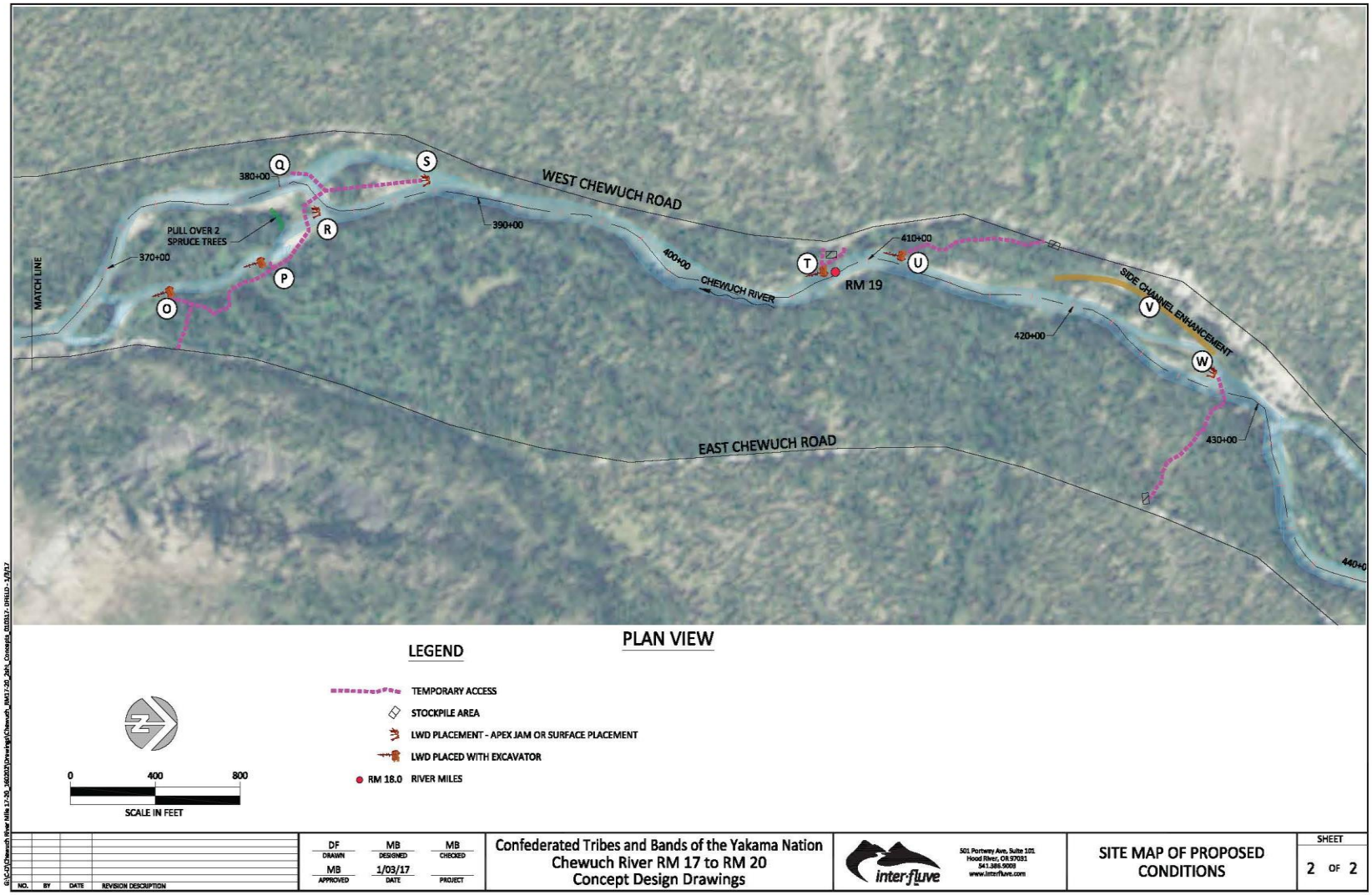


Figure 6: Conceptual Design Drawing.

Figure 7: Conceptual Design Drawing



SITE I Access Route Tree Removal

Up to 16 live spruce trees would be either pushed/pulled over or cut down to place in the river for constructing the large wood debris structure at Site I. Tree sizes range from 8" to 30" in diameter at breast height. The Forest Service would determine the size and location of trees.

SITE WP3 – Whole Tree Placement

The project site is a left bank large wood cover. Standing trees along the river would be pushed/pulled over to form cover in existing pool habitat. Two trees would be pulled/pushed over and placed in the channel. The trees would not be ballasted by vertical piles and would adjust along the bank in subsequent high flows.

SITE J – Bank Jam

The project site is a right bank buried and pile ballasted log jam. Bank height is approximately eight feet. Total bank length is approximately 50 feet long and would enhance an existing pool with no cover.

SITE K – Bank Jam

The project site is a left bank buried and vertical pile ballasted log jam extending into the river approximately 20 feet. The wood complex would be extended back into an adjacent higher terrace. The left bank/bar is 2-3 feet high. Total jam height would be approximately 8 feet (or near 1.5 times the bankfull stage height). This work would enhance an existing pool at low and high flows.

SITE L – Bank Jam

Existing meander migration processes have created a scalloped pocket in the bank that would naturally collect large wood or tend to retain an undermined tree. Currently there are no trees that would be undermined. However, a buried and pile ballasted left bank jam would be constructed to enhance habitat. The site would require tree removal and that material would be used in the jam construction.

SITE M – Bank Jam

The project site is a right bank buried and pile ballasted log jam. Bank height is approximately eight feet. Total bank length is approximately 40 feet long and would enhance an existing pool with no cover.

SITE N – Bank Jam

The project site is a left bank buried and pile ballasted log jam to provide cover habitat over an existing pool. Total bank distance is 40-60 feet long in a gap between large trees adjacent to the pool.

SITE N - Access Route Tree Removal

Up to 11 live spruce trees would be either pulled/pushed over or cut over to be place in the river for wood at Site N. Tree sizes range from 12" to 24" in diameter at breast height.

SITE O – Bank Jam

Between R.M. 18.1 and 18.5, the Chewuch becomes braided. Two main channels exist and would be referred to as the West and East channels. The West channel is larger and has more channel capacity than the East channel. However, the East channel currently has more flow and is in the process of expanding capacity via lateral bank erosion. A natural apex wood deposit splits the two channels. The West channel is dry during low flows.

The project site is a left bank buried and pile ballasted log jam in the East channel. The jam is centered on an existing spruce encompassing approximately 40 feet of 5-6 foot high bank length.

SITE P – Bank Jam

The project site is a left bank buried and pile ballasted log jam in the East channel. The jam would be adjacent to an existing pool and cover approximately 40 feet along a 5-6 foot high bank length.

SITE GREEN STRIP (between site P and Q)

The project site is near the apex of an island at R.M. 18.4. Three spruce trees would be removed for use at site Q.

SITE Q – Pool Cover Habitat Jam

The project site is a right bank buried and pile ballasted log jam in the West channel. The jam would provide cover to an existing pool and cover approximately 40 feet of channel length. At low flow, the pool is not connected by surface water but is connected by hyphoreic water. Currently any fish left behind in this pool would likely be lost to predation. A jam here is intended to allow fish to hold until the following spring runoff.

SITE R – Apex Jam

The upstream head of the island separating the East and West channels is a natural wood deposition zone. The site currently has natural wood deposited on it but the wood does not extend down to low water elevations. A project here would add additional imported wood to the apex emulating natural process and thereby enhancing high- and low-flow cover habitat.

SITE S – Apex Jam

To enhance flow into a high-flow side channel, an apex logjam would be constructed. The apex jam would not provide low-flow habitat but instead enhance high-flow habitat within an existing high-flow channel. It would do so by reducing local channel capacity downstream of the side channel inlet, causing lower flows to run into the side channel than would occur without the jam.

SITE T – Bank Jam

The project site is a right bank buried log jam. The jam would be adjacent to a large existing pool and cover approximately 40 feet of channel length. The bank is over 7 feet high and sufficient to ballast the jam.

SITE U – Bank Jam

The site is a small right bank jam in an existing small cove area. The jam would be less than 30 feet long and would be ballasted by both vertical piles and burial. The jam would provide high- and low-flow cover in an existing pool habitat.

SITE V – Side Channel Pool and Cover Habitat Enhancement

A well connected side channel running along the west valley toe offers an opportunity to enhance side channel rearing and cover habitat. The opportunity has two parts. The first would enhance pool habitat by excavating pools and creating bar surfaces with the excavated alluvium. The second would fly in large wood to provide cover habitat in the enhanced pool segments using a heavy lift helicopter.

Site W – Apex Jam

To enhance flow into a high-flow side channel on river right, an apex log jam would be constructed on an island in the main channel. The upstream head of the island forming a braided flow split is a natural wood

deposition zone. The site currently has natural wood deposited on it. A project here would add additional imported wood to the apex emulating natural process and thereby enhance habitat and flow into the side channel described previously (project site RM 19.2 to 19.3).The apex jam would not provide low-flow habitat but instead enhance high-flow habitat within an existing high-flow channel. It would also put more flow down the side channel to help maintain the pools constructed there.

2.1.4 Design Criteria, Mitigation, and Monitoring Features

Figure 8: Design Criteria, Mitigation, and Monitoring Features

Number	Design Feature	Why Necessary	Efficacy	Consequences of Not Applying	Monitoring Required
1	Vertical members needed for structural stability should be varied in height. Tops should look more natural.	To reduce deviations to landscape character.	Moderately effective at maintaining a natural look.	Greater impact to scenic quality	Implementation Monitoring
2	Use trees with limbs attached when possible, and integrate brush or small trees with limbs attached into structures.	To reduce deviation of the dominating form of the structure by adding texture to the landscape character.	Moderately effective at adding texture to the landscape character.	Greater impact to scenic quality	No
3	Install bumper logs on bank and apex structures.	Reduce the risk of boaters being caught on or pulled under the structure.	Moderately–Highly effective at deflecting boaters from being caught by the structures.	Increased risk to boaters	Implementation Monitoring
4	Place logs and vertical members in a random "messy" pattern.	Reduce impact on scenic quality.	Moderately effective at reducing impact to the scenic quality.	Degrade scenic value	No
5	Protect dispersed campsites, user-created trails, and access points to the river during construction, and restore them after the project is complete. Restoration measures include the following, as necessary; chip or scatter slash, re-grade the camping area or access area, reconstruct fire rings, vegetate site by seeding or transplanting, maintaining open road access, protecting or reconstructing fences, and reconstructing trails.	Avoid long-term impacts to existing dispersed campsites.	Highly effective at maintaining campsite quality post-project.	Campsites near structures J, M, and U could become less desirable.	Check each site near the end of construction to ensure restoration elements are completed.
6	Reseed and replant all access roads, trails, and streambanks. Outside of high use areas, consider minimizing screening of plants and marking planting sites with steel posts.	Avoid long-term scenic degradation.	Highly effective at reducing traffic and re-naturalizing the area.	Long-term negative effects on scenic values.	Check each site near the end of construction to ensure restoration elements are completed.

Number	Design Feature	Why Necessary	Efficacy	Consequences of Not Applying	Monitoring Required
7	Implementation timing of July 1 - 30.	Avoid disturbance to nesting harlequin ducks (May 15 – June 20).	Avoiding construction or other disturbance during the main nesting period would be extremely effective at preventing disturbance.	Potential for adverse impact to Region 6 Sensitive species.	No
8	Bald eagle and osprey nest surveys would be completed each spring until the project is implemented.	Avoid disturbance of active raptor nests during the nesting season (May 1 – August 15).	Annual spring surveys to determine if active raptor nests are present is the primary method used to avoid disturbance from Forest activities (FSM 2670).	Potential for adverse impact to Region 6 Sensitive Species and raptor species.	Yes
9	Design restoration sites to avoid the need to fell large diameter cottonwood, cedar, aspen, and ponderosa pine trees.	Prevent/minimize loss of unique riparian habitat features.	Avoiding large diameter cottonwood, cedar, aspen, and ponderosa pine trees would be extremely effective at maintaining them.	Potential for adverse impact to migratory birds and unique riparian habitat.	No
10	Best Management Practices (BMPs) would be utilized. All access routes and existing road templates encountered within the project area would be rehabilitated and restored to promote vegetation recruitment, soil productivity and hydrologic functions. The road/access route prism would be ripped at a minimum and/or fully recontoured to reduce soil compaction, increase infiltration capacity and prevent unauthorized motorized access.	To help prevent the establishment of new infestations and the spread of existing infestations of invasive species. Avoid long-term scenic degradation.	Good. Planting native vegetation in areas of soil disturbance would be effective at reducing bare soil areas and helping to prevent the establishment of new invasive plants and effective at avoiding scenic degradation.	Higher potential for disturbed soils areas to be infested with invasive plants and degrading scenic value.	Check each site near the end of construction to ensure restoration elements are completed.
11	Straw or mulch used for restoration of disturbed soil must be weed-free.	To help prevent the establishment of new infestations and the spread of existing infestations.	Good. The use of weed-free materials would prevent the introduction of new weed seeds to the project area.	Higher potential for dirty materials to introduce weed seeds from outside the project area.	Yes

Number	Design Feature	Why Necessary	Efficacy	Consequences of Not Applying	Monitoring Required
12	If avoidance of a cultural resource were not possible, mitigation would be developed in consultation with the State Historic Preservation Officer (SHPO) and the Tribal Historic Preservation Officers (THPO) for the Yakama Nation and the Confederated Colville Tribes.	To follow 1997 Programmatic Agreement and protect cultural resources.	Moderately effective.	Newly discovered cultural resources may not be protected.	No
13	All disturbed soil areas would be annually inspected for invasive plants.	To help prevent establishment of new infestations.	Early detection and rapid response is the best way to prevent new infestations from becoming established.	There may not be early detection of new infestations allowing them to become established.	Yes, monitor annually for three years.
14	Do not fall trees within 100 feet of *Sanicula marilandica* populations. In areas where this is not possible, fall trees away from populations.	Prevent mechanical damage to and loss of individuals and/or degradation of habitat.	Good	Loss of individuals and/or occupied habitat.	Yes, Forest Service Botanist
15	All equipment shall be washed immediately prior to entering National Forest System lands and Sensitive plant sites.	Prevent spread of invasive plant species within sensitive plant populations and to prevent the establishment of new infestations of invasive plants.	Good	Loss of habitat, potential loss of individual sensitive plants. Higher potential for dirty equipment to introduce weed seeds from outside the project area.	Equipment Inspection
16	Design access routes to avoid *Sanicula marilandica* populations or individuals. Move route to site B slightly north around a flagged population of *Sanicula marilandica* to avoid and protect it.	Limit the loss of individuals and degradation of habitat. Protect the population.	Good	Loss of individuals and/or occupied habitat. Protect the population or otherwise it could be obliterated at site B.	A Forest Service. Botanist would be present when the access route to Sites B, O, and P are finalized.
17	The Forest Service prior to and after project implementation would treat existing infestations of invasive plant species annually.	To help prevent the spread of existing invasive plants.	The annual treatment of know infestations would prevent the production of new seeds that could easily be dispersed by project activities.	There would be a higher potential for project activities to move seeds or other plant parts to different areas.	No

Number	Design Feature	Why Necessary	Efficacy	Consequences of Not Applying	Monitoring Required
18	In order to comply with applicable ESA and Clean Water Act laws this project would follow a suite of design criteria described under the Conservation Measures for Programmatic Biological Opinion for Aquatic Restoration Activities in the States of Oregon and Washington (ARBO II) (FWS No.: 01EOFW00-2013-F-0090 & NMFS Tracking No.: NWP-2013-9664).	Required per consultation	Good	Need to re-consult on the project	Yes
19	The Yakama Nation would obtain necessary permits from the Army Corps of Engineers, Washington Department of Ecology, and Washington Department of Fish and Wildlife.	Required by law or regulation	Highly effective	Not meet law and regulations	By permitting agency

2.1.5 Comparison of Alternatives

Figure 9: Comparison of How the Alternatives Address the Key Issues

Issue	Indicator/Measure	Alt 1/No Action	Alt 2/Proposed Action
1. The constructed structures could degrade the scenic outstandingly remarkable value by decreasing visual quality as seen from the river and the East and West Chewuch Roads, and increasing development along the river.	Scenic Quality: Scenic integrity objective and Visual Quality Objective	High Scenic integrity objective, and Retention Visual Quality Objective met.	Overall, High Scenic integrity objective, and Retention Visual Quality Objective met.
	Scenic Quality: Development along the river.	The shoreline is largely undeveloped, 2 structures for a previous project would be noticeable and increase the developed look.	Structures "C" and "U" would moderately alter the view along the river from campsites. Outstanding opportunities would still dominate, and popularity of the areas would not decrease. Three structures, J, M, and U would cause short-term impacts to the use of adjacent dispersed sites, which would be closed during construction. Site restoration mitigation measures would return the sites to the original condition, with no long-term impact on popularity or use. Overall, the undeveloped character would be retained.
2. The constructed structures could affect the recreation outstandingly remarkable value by changing the landscape character as seen from developed campgrounds and dispersed campsites.	Recreation Experience: Overall changes to recreation opportunities.	No changes in overall recreation opportunities.	No changes to most recreation activities along the river. Outstanding recreation opportunities would still dominate, and popularity of the area would not decrease.

Issue	Indicator/Measure	Alt 1/No Action	Alt 2/Proposed Action
3. Access and site work by equipment, such as excavators, used to enhance pools, install large wood or complete side- or off-channel work might damage or remove *Sanicula* populations, a Region 6 Sensitive plant Species found at sites B, O, and P.	Acres of occupied *Sanicula* Habitat;	30.6	30.6 With design feature of avoiding one population, no loss).
	Number of individuals and populations of *Sanicula*	1,948 individuals, 6 populations	1,948 individuals, 6 populations remaining with design feature of avoiding one population.
	Change in unique habitats containing cedar, cottonwood, and aspen.	No change	Slightly better than existing conditions where small diameter cedar trees are being replanted if removed and Engelmann spruce are felled in cottonwood and aspen stands.
4. Constructed structures could pose a safety hazard to boaters who could be caught on or pulled under the structures.	Recreation Experience: Changes to Boater Safety	No increase in risk to boaters.	All structures designed to reduce risk to boaters and for logs to not span the river.
5. Disturbance from access and construction during critical periods, including nesting season, may impact nesting birds or federally listed wildlife species.	Disturbance during critical periods; Disturbance during nesting season; Disturbance to Federally listed species.	No disturbance from river restoration project.	Disturbance would occur outside of critical nesting period for harlequin ducks. Disturbance to Federally listed species such as grizzly bear and gray wolf would be limited to a short duration during the middle of summer.
6. Removal of large diameter cedar and cottonwood (> 16") during access and construction would impact unique riparian habitat.	Number of large diameter cedar or cottonwood trees felled.	0	0
7. Site access and construction would include soil disturbance and would use equipment and materials that may be contaminated with weed seed.	Use of clean equipment and materials. Yes/No	No equipment or materials used.	Yes. Weed free equipment and materials required.
8. Existing populations of invasive plants in the project area could be spread by project activities such as site access and construction.	Amount of soil disturbance.	0	7.5 acres of temporary disturbance; Design criteria/mitigation to minimize the spread of invasive species.
	Activity within existing site. Yes/No	No project activity within known sites; recreational activities could occur within sites.	Yes. Design criteria and mitigation measures minimize potential for spread.

Figure 10: Comparison of How the Alternative Addresses the Purpose and Need

Resource Element	Resource Indicator	Measure	Alt 1/No Action	Alt 2/Proposed Action
Channel Morphology/Fish Habitat	Wood Density	Log Jams/mile	0.7	Increase of~6.2
	Pools	Pools/mile	6.7 – 9.5	~5.8 pools/mile created
		Deep, Complex Pools/mile	5.8 – 7.5	~2.2 pools/mile created
	Off-Channel Habitat	Number of off-channel habitat areas	4 features present	1 new off-channel habitat feature created and 1 existing feature improved.
Maintain Water Quality	Sediment	NTU	No-effect; Properly functioning	Small temporary increase during construction; remains same over time.
Wild & Scenic River Outstandingly Remarkable Values/Biological Effect to Fisheries.	Outstandingly remarkable fishery Value/ESA Fish Species.	Non-functioning, Functioning At Risk, Properly Functioning.	Functioning at Risk	Improve; moving toward Properly Functioning.
Wild & Scenic River Outstandingly Remarkable Values for Recreation.	Outstandingly remarkable Recreation Value for scenery and visual quality objective.	Scenic integrity objective and Visual Quality Objective	High scenic integrity objective and recreation visual quality objectives met.	Overall, high scenic integrity objective and recreation visual quality objectives met.
Wild & Scenic River Outstandingly Remarkable Values/Biological Effect to Wildlife.	Outstandingly remarkable wildlife value.	Any direct and adverse effect that would diminish the value for wildlife.	No disturbance from river restoration project. No change in Outstandingly remarkable value for wildlife.	Direct and adverse effects limited in time and space. Outstandingly remarkable value for wildlife would not be diminished.

Chapter 3 Existing Condition and Environmental Consequences

This chapter summarizes the potential physical and biological impacts of the proposed action and no action alternatives for each impacted resources. Resources that were not impacted and therefore not further analyzed including fire and fuels, range, air quality, transportation, socio-economics, and vegetation.

Environmental consequences are described in terms of direct, indirect, and cumulative effects. Direct effects are those effects caused by the action, occurring at the same time and place. Indirect effects are caused by the action occurring later in time or further removed in distance, but are still reasonably predicted. Cumulative effects are the incremental effects of the Chewuch River Restoration R.M. 15.5 – 20 Project alternatives when considered with the overall effects of all past, present, and reasonably foreseeable future actions.

In order to understand the contribution of past actions to the cumulative effects of the proposed action, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions on natural events that have affected the environment and might contribute to cumulative effects.

The cumulative effects analyses do not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century, and beyond, and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible.

Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, focusing on the impacts of past human actions risks ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at current conditions, residual effects of past human actions and natural events are captured, regardless of which particular action or event contributed those effects. Third, public scoping for this project did not identify any public interest or need for detailed information on individual past actions. Finally, the Council on Environmental Quality (CEQ) issued an interpretative memorandum on June 24, 2005 regarding analysis of past actions, which states, “agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions."

Past actions are described as part of the existing condition/affect environment information.

3.1 Botany

3.1.1 Affected Environment

Figure 11: Resources Considered but Not Analyzed in Detail

Resource	Rationale for Dismissing from Further Analysis
Endangered Plant Species	Two Endangered plant species are known to occur on the Okanogan-Wenatchee National forest, showy stickweed (*Hackelia venusta*) and Wenatchee Mt. checker-mallow (*Sidalcea oregana* var. *calva*). There are no known populations of these species on the Okanogan portion of the Forest. These species were not located during field inventory and there is no suitable habitat for them within the project area.
Threatened Plant Species	Two Threatened plant species are suspected to occur on the Okanogan-Wenatchee National forest, water howellia (*Howellia aquatalis*) and Ute ladies'-tresses (*Spiranthes diluvialis*). There are no known populations of these species on the Okanogan portion of the Forest. These species were not located during field inventory and there is no suitable habitat for them within the project area.

Resource Indicators and Measures

Resource indicators and the measures used for assessing project effects to botany are described below (Figure 12). Reference information is contained in the full specialist report in the analysis file.

Figure 12: Resource Indicators and Measures for Assessing Effects

Resource Element	Resource Indicator	Measure (Quantify if possible)	Used to address: P/N, or key issue?	Source (LRMP S/G; law or policy, BMPs, etc.)?
R6 Sensitive plant *Sanicula marilandica* ([Maryland] black snake-root)	Occupied *S. marilandica* habitat (black snake-root)	Acres of occupied habitat lost.	Yes	S/G 6/19, FSM 2620, FSM 2670
	Individuals or populations of *S. marilandica*	Number of individuals or populations lost.	Yes	S/G 6/19, FSM 2620, FSM 2670
Unique habitats containing cedar, cottonwood, or aspen.	Change in unique habitats containing cedar, cottonwood, and aspen.	Quality of cedar, cottonwood, and aspen	Yes	FSM 2620 and 2670

Methodology and Impact Level Definitions

The methodology used to analyze each resource indicator is described below.

A prefield review of sensitive plant information was conducted before field surveys were done. A search was made in the USDA Forest Service Natural Resource Information System, and Geographical Information System (GIS) data on sensitive plants. No sensitive plant locations were noted in the analysis area for this project. Populations of *Sanicula marilandica* (black snake-root) are recorded in the vicinity of the analysis area.

The Forest Service also reviewed USDA National Agriculture Imagery Program (NAIP) aerial photography of the area to look for likely sensitive plant habitat. From the review of maps and photography, the following habitats could be recognized: Chewuch River riparian area and associated floodplain vegetation, and some upland coniferous forest. Because of the relatively low elevation of 2300 to 2500 feet, high elevation species e.g. whitebark pine, were considered unlikely to occur in the analysis area.

A complete field survey was done of all areas proposed for activity, including access routes, potential logjam sites, excavation areas, and a gravel pit that may be used for storage of material. Field surveys were

done in July and August of 2015 and 2016, when sensitive plants are recognizable. The species list used for the survey was the Regional Forester's special status list of 2015.

Resource Indicator: Occupied *S. marilandica* Habitat

Occupied habitat is suitable habitat, which occurs within delineated population boundaries established during pre-disturbance fieldwork. A loss of occupied habitat would constitute an alteration of the habitat such that one or more features of that habitat, thought to be crucial to support *S. marilandica* (black snake-root) populations, are severely degraded or lost – barring some form of mitigation or restoration after-the-fact. In order to determine effects to occupied habitat, it must be determined that actions would, in fact, cause a loss of suitable habitat. Actions such as bulldozing, yarding, re-grading, and filling across the ground level or altering the over-story or shrub layers within delineated populations would constitute a loss of suitable occupied habitat. While impacts of ground-disturbing activities are relatively simple to quantify in terms of acreage, a loss of over-story may have a more complex effect in terms of shade regime and root-death. For this analysis, loss of occupied habitat was determined based on overlap of proposed ground-disturbing activity and delineated *S. marilandica* populations. Access routes were assumed to have a footprint 20 ft. wide.

Resource Indicator: Individuals or Populations of *S. marilandica*

For each population within the project area, a total count of *S. marilandica* (black snake-root) individuals is known or estimated. Because *S. marilandica* is stoloniferous, clusters of plants growing near each other were assumed to be clonal, and were counted as single individuals. Based on this number, and field reconnaissance of areas of proposed disturbance, the loss of individuals can be estimated based on the area of disturbance proportional to the area occupied, as well as field-estimates of the estimated number of individuals occurring in the proposed disturbance.

For these analyses, a distance of less than 3000 feet of mostly suitable habitat between individuals may be used to distinguish populations. This is subjective, based on the biology of the species and the habitat within which it is located. If significant barriers to seed dispersal or large areas of unsuitable habitat exist between individuals then the distance may be smaller. Loss of a population would entail a complete loss of individuals or a loss of supportive habitat features with an initial retention of individuals but an ultimate loss of individuals.

Resource Indicator: Change in Unique Habitats Containing Cedar (*Thuja plicata*), Cottonwood (*Populus balsamifera subsp. trichocarpa*) and Aspen (*Populus tremuloides*).

Cedar is not found in abundance across the landscape on the Methow Valley Ranger District. They are usually found in mesic microsites and are commonly associated with R6 Sensitive *Botrychium spp.* (moonworts).

In dry east-side forests, aspen and wetland ecosystems are limited across the landscape and are biodiversity hotspots for wildlife and plant species. These unique habitats usually have deeper, richer soils than the surrounding coniferous forests. The partial shading overstory and rich soil in the understory supports many herbs, forbs, and grasses in the understory community (Seager et al. 2013). Aspen's palatable twigs and foliage, and tendency to develop cavities, make it valuable habitat for wildlife such as deer (*Odocoileus* sp.), elk (*Cervus elephas*), woodpeckers, and songbirds (Swanson et al. 2010).

Black cottonwoods are usually associated with low- to- moderate elevation rivers and streams.

It provides food and cover for a variety of wildlife species, including deer, elk, and beaver. Large birds use the crowns for nesting sites and various animals rely on trunk cavities, which commonly result from heart rot in stands nearing maturity. The rotten trunks of black cottonwood provide an important wildlife habitat

otherwise scarce, especially in the Cascades. The aggressive root systems of black cottonwood are effective soil stabilizers and make the species useful in restoration of riparian areas, where it also provides protection for the aquatic environment, especially in helping to maintain low water temperatures through shading (NRCS, Black Cottonwood Plant Guide). Black cottonwood communities were much more common in the past than today. Recent alterations to rivers and associated floodplains such as agriculture, dam building, and channelization have caused drastic declines in black cottonwood habitat and communities (especially at low elevations) (Kovalchik and Clausnitzer, 2004).

Aspen and cottonwood are also associated with *Botrychium spp.* and *S. marilandica*.

Botany Impact Level Definitions

The definitions below would be used to describe effects of the proposed actions on this resource.

Impact Types for botanical resources are:

- **Beneficial**: No disturbance to or loss of *S. marilandica* populations, individuals, or occupied habitat that would lead to further listing of the species. No disturbance to sites containing cedar, cottonwood, or aspen trees that would cause the tree species to no longer thrive in those habitats. An increase in aspen stand vigor and plant diversity in unique habitats.

- **Adverse**: Disturbance that would cause a loss of *S. marilandica* populations, individuals or occupied habitat, leading to further listing of the species. A disturbance to sites containing cedar, cottonwood, or aspen trees that would cause the tree species to no longer thrive in those habitats. A decrease in aspen stand vigor and plant diversity in unique habitats.

Impact Durations for botanical resources are:

- **Short-term**: Immediately through the first growing season after treatments.

- **Long-term**: 1 to 20 years.

Impact Intensities for botanical resources are:

- **Negligible**: A change to botany resources that would be so small that it would not be of any measurable or perceptible consequence. Sensitive plants and unique habitats containing cedar, aspen, or cottonwood would not be affected or the effects to these plants would not be detectable.

- **Minor**: Change to sensitive plants, unique habitats containing cedar, aspen, or cottonwood would be detectable, although these effects would be localized and of little consequence. Activities would not physically disturb individual sensitive plants. Unique habitats may experience alterations; however, overall ecological functioning would be inconsequential and immeasurable.

- **Moderate**: A change to botany resources that would be readily apparent and measurable. Measurable effects could include physical disturbance or removal of sensitive plants, and disturbance to unique habitats that alters the overall ecosystem function.

- **Major:** Effects to sensitive plants, occupied habitats, and unique habitats would be readily apparent, measurable, severe, and would occur on a regional scale. The viability of plant populations, occupied habitats, and unique habitats would be altered. Mitigation measures to offset effects would be extensive and success would not be assured.

Affected Environment

There are six populations (totaling 1,948 individuals) of the sensitive plant *Sanicula marilandica* (black snake-root) occurring in the analysis area. *Sanicula* is considered a Sensitive species according to the Region 6 Interagency Special Status & Sensitive Species Program (ISSSP) 2015 list. It is considered secure globally and nationally, but imperiled in the state of Washington. *Sanicula marilandica* grows in moist, low areas, such as meadows, riparian flood plains, moist woods, and marsh edges.

Within the analysis area, cedar extends from dry upland - Ponderosa pine (*Pinus ponderosa*) -Douglas fir (*Pseudotsuga menziesii)* sites, to transitional zones between upland and riparian habitats, to riparian areas in the floodplain of the Chewuch. Cedar in the upland habitats is not common; usually trees are small and few in number. In riparian habitats, cedar can be found under dense canopies of Engelmann spruce, as it is a shade tolerant species. As noted above, cedar is uncommon across the analysis area and the Methow Valley R.D. Cedar within the analysis area have been relatively undisturbed.

Cottonwood and aspen occur along the floodplain of the Chewuch River and can be found on benches in dry upland habitats. This type of deciduous vegetation comprises 75 acres (or 3.18%) of the 2359 acres of the analysis area. Cottonwood and aspen are shade intolerant trees, and in some areas are being outcompeted by Engelmann spruce. Conifers can outcompete cottonwood and aspen for sunlight, nutrients and water. In areas where this is noticeable, cottonwood and aspen are showing signs of stress through dead tops and insect and disease damage.

Figure 13: Resource Indicators and Measures for the Existing Condition

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Existing Condition (Alternative 1)
R6 Sensitive plant *Sanicula marilandica* (black snake-root)	Occupied *S. marilandica* habitat	Acres	30.6
	Individuals and populations of *S. marilandica*	Number of individuals and populations.	1,948 individuals; 6 populations
Unique habitats containing cedar, cottonwood, or aspen.	Change in unique habitats containing cedar, cottonwood, and aspen.	Quality of cedar, cottonwood, and cedar	Fair

Resource Indicator: Occupied *S. marilandica* Habitat, Individuals, and Populations by Site

Figure 14: Acres of Occupied *Sanicula marilandica (black snake-root)* Habitat by Site

Site	Project Group	Acres of Occupied Habitat	Number of Individuals
Site 06080400507	River Mile 16 and Junior Creek	23.95	Est. 800
Site 06080400627	River Mile 16	1.10	35
Site 06080400234	River Mile 16	1.93	43
Site 06080400228	Junior Creek	0.45	70
Site 06080400226	Brevicormis Creek	1.93	Est. 800
Site 06080400230	Brevicormis Creek	1.24	Est. 200

Resource Indicator: Distribution of Unique Habitats Containing Cedar, Cottonwood, and Aspen

Figure 15: Distribution of Unique Habitats across the Analysis Area

Acres of deciduous vegetation	Total acres within analysis area	% of acres of deciduous vegetation within analysis area
75	2359	3.17

3.1.2 Environmental Consequences

Alternative 1 – No Action

This alternative would have a long-term, minor, benefit for *S. marilandica* habitats, populations, and individuals. Plant habitat conditions and trends in the analysis area would remain unaltered. Existing populations of *S. marilandica* (black snake-root) would be expected to remain stable or increase in size and number. There may be a trend of understory build-up occurring, which could contribute to large wildfires in the future. This could cause a long-term, moderate, adverse impact on *S. marilandica*. The response of *S. marilandica*, the only known Sensitive plant in the analysis area, to wildfires is unknown. Natural fluctuations in hydrology and associated land-features such as river side-channels could have a long-term, moderate, adverse impact that potentially alters habitat conditions at sensitive plant sites. There would be no change to unique habitats containing cedar, cottonwood, and aspen. The accumulation of Engelmann spruce in cottonwood and aspen stands would have a long-tem, moderate, adverse impact, causing competition for sunlight, nutrients, and water.

Alternative 2 – Proposed Action

Figure 16: Resource Indicators and Measures for Alternative 2

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 2
R6 Sensitive plant *Sanicula marilandica*	Occupied *S. marilandica* habitat	Acres	30.6
	Individuals and populations of *S. marilandica*	Number of individuals and populations.	1,948 individuals; 6 populations
Unique habitats containing cedar, cottonwood, or aspen.	Change in unique habitats containing cedar, cottonwood, and aspen.	Quality of cedar, cottonwood, and cedar	Slightly better than Existing Conditions where cedar trees are being replanted and Engelmann spruce are felled in cottonwood and aspen stands.

Resource Indicator: Occupied *S. marilandica* Habitat

All but three access routes within occupied *S. marilandica* habitat are existing (with the exception of Site B, which is discussed below), and no new access roads are planned within occupied *S. marilandica* habitats. A population of *S. marilandica* was historically located on the access routes going to Sites O and P; however, two field visits to the location did not find the population. This suggests that either the population is gone, or the GPS points used to initially capture it were not accurate. Design criteria and mitigation measures, such as having the District Botanist present when the access routes to B, O, and P is finalized, have been established to protect the viability of occupied *S. marilandica* habitat. Even though access roads going through occupied S. *marilandica* habitats are pre-existing, planned activities would have a minor, short-term, adverse impact, as heavy equipment entering these sites would cause a minor amount of ground disturbance and loss of understory vegetation. The minor amount of disturbance caused would be offset by the revegetation plan that is in place for access roads.

Resource Indicator: Individuals and Populations of *S. marilandica*

A population of *S. marilandica* was found near an access route at Site B. Heavy equipment would potentially use the access route, which is within the current side channel, to go to work sites. Moving the access route a few feet farther from the population would keep direct adverse impact from occurring. There is a population of Tansy ragwort (*Senecio jacobaea*) at Site B, in between the road and a population of *S. marilandica*. This population of Tansy ragwort has been treated and machinery would be washed prior to entering the adjacent *S. marilandica* population. A population of *S. marilandica* is known to occur along the planned access routes to Sites O and P. As noted above, this population was not located during field surveys, but, in order to protect undetected plants, the District Botanist would be present when the route to these sites is constructed. Planned project activities would have a negligible impact on individuals and populations of *S. marilandica*. Design criteria and mitigation measures are in place to protect populations and individuals.

Resource Indicator: Change in Unique Habitats Containing Cedar, Cottonwood, and Aspen

The existing access route into Site K contains a small pocket (less than ten) of small diameter (less than an inch dbh), cedar trees. This pocket of cedar would be disturbed, as they occur within and adjacent to the access route. The revegetation plan for this project has prescribed that for every cedar disturbed, five would be replanted within the immediate area.

The long access route going into Site I goes through an aspen and cottonwood stand. Engelmann spruce would be removed for access. There would be no removal of aspen or cottonwood when clearing the access route. The only removal of these species would be due to incidental felling of Engelmann spruce. The removal of Engelmann spruce would create an opening for aspen and cottonwood suckers to establish and would remove some competition for resources within this area.

Project activities would have a minor, short-term, adverse effect on unique habitats, as ground disturbance would occur. However, the replanting or cedar and the removal of Engelmann spruce, would have a long-term, moderate, beneficial impact.

3.1.3 Cumulative Effects

Spatial and Temporal Context for Effects Analysis

The spatial boundaries for analyzing the cumulative effects to *Sanicula marilandica* populations encompass all known populations in the Chewuch Watershed, because they occur within a distance that they are capable of intermixing genetically, via pollination. Spatially, this area comprises the Chewuch River valley from the confluence of Twentymile Creek, south to the confluence of Eightmile Creek, and then extending northwest up the bottom of Eightmile Creek to Township 36 North, Range 24 East, Section 9. The area is restricted to the valley-bottoms, with two exceptions. Two populations occur on the western slopes of the canyon, one at Township 37 North, Range 22 East, Section 30, and one in section 18.

The temporal boundaries are from the time of implementation, forward 20 years, because grazing and herbicide treatments are expected to continue indefinitely in the Eightmile drainage. The populations identified in this analysis are closest to the small, somewhat distinct population in the Eightmile drainage, and are thus the most likely to contribute genetically to it. Small populations of *Sanicula* are more susceptible to complete removal or eradication due to decreased reproductive success. Maintaining the possibility of gene flow to this population is essential to ensuring its continued viability.

Invasive plant herbicide treatments are expected to commence/continue at populations occurring within the cumulative effects analysis area. Herbicide treatments would not occur within Sensitive plant sites.

Past, Present, and Reasonably Foreseeable Activities Relevant to Cumulative Effects Analysis:

Stray cattle might also walk along the route and access the population, although the area is fenced and cattle seldom get into the area. Quick revegetation and restoration would reduce the probability of this.

Grazing is expected to continue at the *S. marilandica* population on Eightmile Creek indefinitely.

Resource Indicator: Occupied S. Marilandica Habitat (Figure 17)

Figure 17: Occupied Habitat Cumulative Effects

Project	Overlap In Time Space		Measurable Cumulative Effect?	Extent, Detectable?
Forest Service Grazing	Yes	Yes	No	Grazing is expected to continue indefinitely. One population up Eightmile Creek is actively grazed. A loss of individuals in the project area may diminish the likelihood of gene flow to this population. Grazing stress and small population size, combined with decreased potential for gene flow may diminish the viability of this population, decreasing the amount of occupied habitat. However, it is also possible for livestock to spread the seed of this plant, as it is burr-like. Furthermore, ongoing monitoring of the population has documented very little impact due to grazing.
Forest Service Invasive Plant Treatment with Herbicides	Yes	Yes	No	Treatment of Invasive plant populations with herbicide is expected to occur in the future. Left un-treated, invasive plants have the potential to invade Sensitive plant habitat. Judicious and careful herbicide application would not have an effect on Sensitive plant populations. In cases where invasive plants occur within occupied Sensitive plant habitat, spraying would be prohibited. No effect to occupied habitat would be expected.

Resource Indicator: Individuals and populations of S. marilandica (Figure 18)

Figure 18: Individuals and Populations of *S. Marilandica* Cumulative Effects

Project	Overlap In Time Space		Measurable Cumulative Effect?	Extent, Detectable?
Forest Service Grazing	Yes	Yes	No	Grazing is expected to continue indefinitely. One population up Eightmile Creek is actively grazed. A loss of individuals in the project area may diminish the likelihood of gene flow to this population. Grazing stress and small population size, combined with decreased potential for gene flow may diminish the viability of this population, decreasing the number of individuals. However, it is also possible for livestock to spread the seed of this plant, as it is burr-like. Furthermore, ongoing monitoring at the population has documented very little impact due to grazing.
Forest Service Invasive Plant Treatment with Herbicides	Yes	Yes	No	Treatment of Invasive plant populations with herbicide is expected to occur in the future. Left un-treated, invasive plants have the potential to invade Sensitive plant habitat. Judicious and careful herbicide application would not have an effect on Sensitive plant populations. In cases where invasive plants occur within occupied Sensitive plant habitat, spraying would be prohibited. No effect to individuals or populations as a whole would be expected.

Resource Indicator: Change in Unique Habitats Containing Cedar, Cottonwood, and Aspen (Figure 19)

Figure 19: Change in Unique Habitats Containing Cedar, Cottonwood, and Aspen

Project	Overlap In Time Space		Measurable Cumulative Effect?	Extent, Detectable?
Forest Service Grazing	Yes	Yes	No	Repeated grazing of young aspen would eventually have a long-term, moderate, adverse impact on the aspen clone. Healthy stands of black cottonwood can usually withstand moderate grazing pressure due to the abundance of understory shrubs. Browsing and grazing of cedar has not been evident on the Methow Valley R.D. Cattle grazing within the project area in these unique habitats is very minimal, as cattle are not permitted in the Chewuch due to listed fish species.
Forest Service Invasive Plant Treatment with Herbicides	Yes	Yes	No	Treatment of Invasive plant populations with herbicide is expected to occur in the future. Left un-treated, invasive plants have the potential to invade unique habitats. Judicious and careful herbicide application would not have an effect on cedar, aspen, or cottonwood.

3.1.4 Conclusion

Under Alternative 2, there would be negligible cumulative effect to occupied *S. marilandica* (black snake-root) habitats, populations and individuals, and unique habitats. Under Alternative 2, there would be a minor, short-term, adverse impact on occupied *S. marilandica* habitat, as heavy equipment entering these sites would cause a minor amount of ground disturbance and loss of understory vegetation. The minor amount of disturbance caused would be offset by the revegetation plan that is in place for disturbed areas. Project activities would have a negligible impact on individuals and populations of *S. marilandica*. Design criteria and mitigation measures are in place to protect populations and individuals. Project activities would have a minor, short-term, adverse impact on unique habitats, as ground disturbance would occur. However, the replanting of cedar and the removal of Engelmann spruce would have a long-term, moderate, beneficial impact. In conclusion, when combined with past, present, and reasonable foreseeable future actions, Alternative 2 would be expected to have short-term, negligible to minor adverse and moderate beneficial impacts on occupied *S. marilandica* habitats, populations and individuals, and unique habitats.

3.1.5 Other Relevant Mandatory Disclosures

Compliance with LRMP and Other Relevant Laws, Regulations, Policies and Plans

Okanogan Forest Plan

S&G 6-19 addresses Sensitive species, stating, "Sensitive plants and animals should be protected." Through design criteria and mitigation measures, this project would be in compliance with FP S&G 6-19.

Chewuch Watershed Analysis

In compliance with the watershed analysis, surveys were performed a year or more in advance prior to activities.

Forest Service Manual

This project complies with FSM 2670 in that a Biological Evaluation was prepared and the project is properly designed and mitigated to maintain viable populations, and does not contribute to or trend these species toward being listed as threatened or endangered.

This project is in compliance with FSM 2620 in that it considers the distributions of species and habitats and ensures that habitat is provided for the number and distribution of reproductive individuals needed to ensure the continued existence of a species throughout its geographic range.

3.1.6 Summary of Botany Effects

With a No-Action alternative, there would be a long-term, minor, benefit for *S. marilandica* habitats, populations and individuals. Plant habitat conditions and trends in the project area would remain un-altered. Existing populations of *S. marilandica* would be expected to remain stable or increase in size and number. There may be a trend of understory build-up occurring, which could contribute to large wildfires in the future. This could cause a long-term, moderate, adverse impact on *S. marilandica*. The accumulation of Engelmann spruce in cottonwood and aspen stands would have a long-term, moderate, adverse impact, causing competition for sunlight, nutrients, and water.

Under Alternative 2, there would be no cumulative impact to the *S. marilandica* population if the routes to Sites B, O, and P are quickly blocked and revegetated after work is completed. With mitigation, this project would have short-term, minor, adverse impacts to occupied S. *marilandica* habitats. Project activities would have a negligible impact on individuals and populations of *S. marilandica*. Design criteria and mitigation measures are in place to protect populations and individuals. Project activities would have a minor, short-term, adverse impact on unique habitats containing cedar, cottonwood, and aspen, as ground disturbance would occur. However, the replanting of cedar and the removal of Engelmann spruce would have a long-term, moderate, beneficial impact.

Determination of Effects

Threatened, Endangered, and Proposed Plants

For *Howellia aquatilis* – No Effect

For *Spiranthes diluvialis* – No Effect

For *Sidalcea oregana var. calva* – No Effect

For *Hackelia venusta* - No Effect

Figure 20: Determination of Effects for *S. marilandica*

Species	ALT 1	ALT 2
Sanicula marilandica	No Impact	May Impact Individuals or Habitat, But Will Not Likely Contribute to a Trend Towards Federal Listing or Loss of Viability to the Population or Species

3.2 Invasives

3.2.1 Affected Environment

The prevention of new invasive plant infestations includes the use of clean equipment and materials to prevent seed dispersal, the limiting of soil disturbance, and the restoration of disturbed sites with native vegetation. All of these are part of the proposed action. The proposed action would create about 7 ½ acres of new soil disturbance.

The control of existing invasive plant infestations includes containment and reduction or eradication of existing infestations through treatment. Containment of an infestation includes the prevention of heavy equipment use within the infested site.

The project area is a relatively low elevation riparian forest in a part of the Methow Valley Ranger District that receives a lot of human use in the form of driving, camping, hunting, swimming, and floating on the river. Because of the low elevation and prevalence of human use, the area is susceptible to invasive plant infestations. There are more invasive plant species that are adapted to low elevations; humans and vehicles can be dispersal vectors for weed seeds into the area. Due to this susceptibility, Forest Service personnel inspect the area annually for presence of invasive plants.

The project area is susceptible to invasion of new infestations of invasive plants due to open public roads on both sides of the area and the Chewuch River running through the middle of the area. Short dirt roads access five dispersed campsites within the project area. Vehicles are a major vector for carrying and distributing weed seeds, rivers and streams can transport weed seeds.

3.2.2 Environmental Consequences

Alternative 1 – No Action

There would be no new infestations or increase in the potential for spread of existing populations of invasive plants species established due to river restoration activities. There would be no use of equipment or materials that might introduce weed seeds, no restoration equipment activity within the existing infestations and there would be no new soil disturbance.

Alternative 2 – Proposed Action

Equipment used at the restoration sites would be required to be cleaned prior to entering the National Forest. Materials used to restore the site would be weed-free. Soil would be disturbed at each of the restoration sites. Rehabilitation of each site and all the temporary access trail/roads would include the use of native plants for revegetation. Post project annual inspections of each site and all temporary access locations would be effective at early detection of any new invasive plant infestations.

Known invasive plant sites would be inspected and treated annually by the Forest Service prior to and after the implementation of this project. There is potential for unintentional spread by project activities. Weed seeds in the soil can live for years and it is possible that project activities could spread these. Post project annual inspections of each restoration site and all temporary access locations would be effective at early detection of any new invasive plant infestations. With these measures in place, no increase in invasive weeds are expected.

The design features and mitigation measures included in Alternative 2 minimize the potential for the establishment of new infestations and the spread of existing infestations.

3.2.3 Cumulative Effects

Spatial and Temporal Context for Effects Analysis

The spatial boundaries for analyzing the cumulative effects to invasive plant species are the same as the project area because the proposed activities would not affect any areas outside the project boundaries. The temporal boundaries are ten years because that is the maximum estimated life span for seeds in the soil for most invasive plant species.

Past, Present, and Reasonably Foreseeable Activities Relevant to Cumulative Effects Analysis

Past and present activities have resulted in the existing condition. Reasonably foreseeable future activities include the completion of the Okanogan-Wenatchee National Forest Forest-wide Site-Specific Invasive Species Treatment EIS. This would increase the treatment options available for the Forest Service to use on existing populations of invasive plant species. It would authorize the use of new generation herbicides that are more effective and environmentally safer than those currently used.

Figure 21: Invasive Plant Control Cumulative Effects

Project	Overlap In Time Space		Measurable Cumulative Effect	Extent, Detectable
Okanogan-Wenatchee National Forest Forest-wide Site-Specific Invasive Species Treatment EIS	Yes	Yes	Yes	Implementation of the EIS would increase the options for control of existing populations and would authorize treatment options that are more effective than those currently used. No increase in invasive species is expected.

3.2.4 Other Relevant Mandatory Disclosures

Alternative 2 would be compliant with the Okanogan National Forest Land and Resource Management Plan (Forest Plan) because it follows the applicable standards and guidelines. It includes design criteria and mitigation measures that are from the 2005 PNW ROD.

3.2.5 Summary

Alternative 1 would have no effect on invasive plant species. Alternative 2 would result in an increase in the potential for the spread of existing populations and the establishment of new populations. However, design criteria and mitigation measure activities would minimize this potential.

3.3 Water Resources

3.3.1 Affected Environment

The project analysis area contains habitat for fish species listed under the Endangered Species Act (ESA), Management Indicator Species (MIS), and species for which Essential Fish Habitat (EFH) has been designated under the Magnuson-Stevens Fishery Conservation and Management Act (Figure 22). There are no Region 6 Sensitive Species within the project area.

Figure 22: Fish Species Present in the Project Analysis Area by Category

ESA	MIS	EFH
Spring Chinook (Endangered)	Spring Chinook	Chinook
	Westslope Cutthroat	Coho
Summer Steelhead (Threatened)	Interior Redband Rainbow	
Bull Trout (Threatened)	Steelhead	
	Bull Trout	
	Eastern Brook Trout	

The project area provides spawning and rearing habitat for Upper Columbia River spring-run Chinook and Upper Columbia River steelhead, listed as endangered and threatened under the ESA. Columbia River bull trout, which are listed as threatened under the ESA, use this area for migration, rearing, and over-wintering habitat. Additionally, the project area provides habitat for MIS and EFH listed above. National Marine Fisheries Service and U.S. Fish and Wildlife Service have designated the Chewuch River as critical habitat for Chinook salmon, steelhead, and bull trout.

Considered but Not Analyzed In Detail

The following indicators were considered but were dropped from further analysis as listed in the rationale in Figure 23.

Figure 23: Resource Indicators Considered But Not Analyzed in Detail

Resource Indicator	Rationale for Dismissing from Further Analysis
Chemical contaminants	Use of equipment or the fueling of equipment in proximity to streams can add toxins to waterways. These potential effects are mitigated to negligible levels through the implementation of design criteria that keep chemical contaminants outside areas where they could be delivered to streams in measurable volumes or contaminants are contained by BMPs.
Physical barriers	There are no causal mechanisms in the proposed action that would create (or remove) migration barriers for fish.
Water Quantity	This project would not affect water yield in any measurable way from vegetation cover removal or increase/decrease in the drainage network (roads).
Water Quality (temperature)	This project would not have a measurable effect upon temperature at the reach or HUC scale. Small-localized benefits to temperature through the creation of deeper pools and connectivity to hyphoreic flow in the backwater alcoves may occur. Direct solar radiation is the largest driver for temperature alteration and the removal of a few overstory trees in the riparian area would not decrease shading or increase temperatures. Revegetation after implementation of the project would increase shade and have a positive effect on temperature.
Soil Resources	This project would have a short-term impact on soil resources (porosity and areas of bare soil). The impacts would be minimal, short-lived and mitigated by BMPs and rehabilitation. The project would restore porosity, productivity, nutrient cycling, and vegetation establishment with the decommissioning of access routes and site restoration.
Essential Fish Habitat (EFH)	This project would have a short-term impact to the river. Impacts would be short-term in duration (a few weeks) and the project would improve habitat conditions once completed. The project would not adversely modify EFH in the project area. This project results in a "will not adversely affect" EFH determination.
Management Indicator Species (MIS)	The MIS analysis addresses effects to Westslope cutthroat trout, Redband rainbow trout, and eastern brook trout. The other species are addressed as ESA listed species. The project covers less than 1% of suitable Westslope cutthroat trout, Redband rainbow trout, and eastern brook trout habitat across the Forest. We expect some localized negative effects to individual fish and sediment levels that could lead to a low-level temporary effect to MIS. A very small proportion of MIS habitat in the project area and the Forest would be impacted by the action. Once the project is complete, MIS habitat would be in an improved state. Therefore, the effects of the action to MIS are consistent with the Forest Plan and thus continued viability of MIS is expected on the Okanogan-Wenatchee National Forest.

Resource Indicators and Measures

Resource indicators and the measures (Figure 24) used for assessing project effects to water resources are described below. Reference information is contained in the full specialist report in the analysis file.

Figure 24: Resource Indicators and Measures for Assessing Effects

Resource Element	Resource Indicator	Measure	Key Issue	Source
Channel Morphology/Fish Habitat	Wood Density	Log Jams/mi	Yes	(Shull and Butler 2014) (USDA-FS 2008)
	Pools	Pools/mi	Yes	(Shull and Butler 2014)
		Deep, Complex Pools/mi		
	Off-Channel Habitat	Quantity of Habitat	Yes	(Shull and Butler 2014)
Water Quality	Sediment	Nephelometric Turbidity Units (NTU)	No	Normal turbidity meter methods
Scenic River Outstanding Remarkable Values/Biological Effect to Fisheries	Outstandingly Remarkable Fishery Value/ESA Fish Species	Non-functioning, Functioning At Risk, Properly Functioning[1]	Yes	(Shull and Butler 2014) (USDA-FS 2008) (PACFISH 1995) (USDA-FS 1989) USDA, USDC, and USDI 2004

Methodology and Impact Level Definitions

Aquatic Habitat Assessment Method

Information used to establish baseline and desired fish habitat conditions came from a few sources: the most recent Chewuch River stream survey report (USDA-FS 2008) and the Desired Condition Report (Shull and Butler 2014). The stream survey report provided information on instream wood levels, pool quantities and qualities, stream sediment levels, and off-channel habitat conditions. The Desired Condition Report summarized the range of desirable wood levels (number of pieces and logjams per mile), pool frequencies, and off-channel habitat based on local rivers, new scientific research, and federal land management direction. Habitat conditions were also compared to the Okanogan Forest Plan Standards and Guidelines, PACFISH RMOs, and the Habitat Indicators Table from the 2004 Analytical Process for Developing Biological Assessments for Federal Actions Affecting Fish within the Northwest Forest Plan Area (PACFISH 1995; USDA-FS 1989) and (USDA-FS and others 2004). These documents provided a comparison of desired fish habitat conditions to existing conditions.

Resource Indicator: Wood Density

Large wood is important for reducing river energy, forming pools, and adding overall habitat complexity. The project hydrologist and fish biologist relied upon the most recent detailed Chewuch River habitat survey to identify existing large wood quantities within the project reach (USDA-FS 2008). This provided the size of large wood (LW), number of pieces, number of logjams, and their position in the river channel. Wood data from this was compared to the quantities (per mile) from the recent Desired Condition Report (Shull and Butler 2014), which summarizes the range of desirable wood levels (number of pieces and logjams) based on local rivers, new scientific research, and federal land management direction. This document defines a range of wood pieces per mile, key pieces per mile (greater than 32 inches dbh), and logjams per mile that occur under properly functioning wood conditions. This allowed the project

[1] These determinations are based on the condition of the existing large wood, pool habitat, and off-channel pool habitat as compared to the NMFS and FWS habitat indicator table, in project files.

hydrologist and fish biologist to determine where existing wood levels were departed from desired conditions.

The proposed wood treatment is to construct engineered logjams that would function as a single unit rather than individual pieces of wood. Individual pieces of wood are a natural component of a river and are important for habitat diversity. However, because multiple pieces of wood would influence river process as an individual logjam, the unit of measure for assessing the changes to habitat diversity would be the number of logjams per mile.

Resource Indicator: Pools

Pool habitat provides important rearing habitat for juvenile salmon and trout and deep pools are important cool water holding areas for adults. The pool indicator was split into total pools per mile (pool frequency) and total deep, complex pools per mile. Deep, complex pools are defined as pools deeper than 3 feet with cover from woody debris. The Forest Service used data on total pool frequencies and deep, complex pool frequencies inventoried in the Chewuch River to establish baseline conditions (USDA-FS 2008). The pool frequencies were compared to ranges defined in the Desired Condition Report (Shull and Butler 2014). The project hydrologist and fish biologist determined if existing pool frequencies are departed from desired conditions. The units of measure for assessing existing conditions and the changes to habitat diversity would be the number of total pools and deep, complex pools per mile.

Resource Indicator: Off-Channel Habitat

Off-channel areas provide important rearing areas for juvenile salmonids during spring runoff periods and other times throughout the year. The 2008 Chewuch River survey (USDA-FS 2008) provided data on existing off-channel habitat conditions which included a number of habitat features like pools, cover, large wood, and their accessibility. Numerical standards or desired number of off-channel features available does not exist. Desired conditions are described as off-channel habitat existing at a frequency and condition that occurs naturally (USDA-FS and others 2004). Alluvial fans are key geomorphic features in the Chewuch River bottom that naturally form off-channel habitat upstream. The project hydrologist and fish biologist compared existing off-channel habitat to what is expected to occur in areas above alluvial fans.

Resource Indicator: Sediment

Fish species in the Chewuch River are sensitive to high sediment levels in spawning substrates. Excessive fine sediments reduce pool habitat, spawning habitat quality, and the availability of off-channel rearing habitat. Fish survival rates decrease when excess fine sediment reduce habitat quality and accessibility. McNeil Core Sediment surveys conducted in 2012 (USDA-FS 2012) provided fine sediment data to assess fine sediment levels in the Chewuch River,. Sediment data was compared to the Okanogan Forest Plan's sediment standard of percent fines (<1mm) in spawning areas. The project hydrologist assessed sediment effects using professional judgment based on past effectiveness of the proposed design criteria.

Resource Indicator: Outstandingly Remarkable Fishery Values/ESA Fish Species

Attributes of outstandingly remarkable fishery values includes the following attributes: cold and clean water, clean channel substrates, stable streambanks, healthy streamside vegetation, complex channel habitat created by large wood, cobbles, boulders, streamside vegetation, and undercut banks, deep pools, off-channel habitat and waterways free of barriers. Large wood levels, deep pool habitat, and off-channel habitat are the most applicable attributes for this project.

Fish habitat in the lower Chewuch River below Lake Creek is identified as a Priority 2 area for salmon and steelhead recovery (RTT 2013; Inter-Fluve 2013). Priority 2 areas are defined as water bodies that support federally endangered and threatened fish species and have a high level of at-risk habitat indicators.

Existing habitat conditions were compared to the Okanogan Forest Plan standards, PACFISH RMOs, the Desired Condition Report, and the Habitat Indicators Table from the 2004 Analytical Process for Developing Biological Assessments for Federal Actions Affecting Fish within the Northwest Forest Plan Area (HIT) (PACFISH 1995; Shull and Butler 2014; USDA-FS 1989) and (USDA-FS and others 2004). The project fish biologist assessed whether fish habitat conditions for ESA fish was non-functioning, functioning at risk, or properly functioning.

This project would result in some unintended short-term negative effects to ESA listed fish species and their critical habitats. The project fish biologist made an ESA project effect determination to listed fish species and their designated critical habitat. ESA effects determination to listed fish and their habitat was determined by considering project effects during construction with anticipated impacts to and biological needs of the fish species present. The project fish biologist assed short-term effects based on the proposed action and fish life stages present during the work. The Programmatic Biological Opinion for Aquatic Restoration Activities in the States of Oregon and Washington (FWS No.: 01EOFW00-2013-F-0090 & NMFS Tracking No.: NWP-2013-9664) provided ESA effect determinations from similar activities analyzed in the past.

Impact Framework and Duration Definitions

Impact topics have been selected for this analysis based on their potential to affect important resources and other key issues identified during planning. Analyses in this section are qualitative assessments based on review of scientific literature and information collected by the field specialists and provided by other agencies.

Nature of Effect for Hydrologic and Aquatic Resources

Beneficial—Moves the system to or towards desired conditions (river complexity and fish habitat quality) and fish abundance improves or maintains robust local populations.

Adverse—Moves the system outside of or away from the desired conditions (river complexity and fish habitat quality) and fish abundance declines.

Duration of Effect for Hydrologic and Aquatic Resources

Short-term—an effect that would not be detectable within a short amount of time, generally within hours to a few weeks after the proposed activity has been carried out.

Long-term—a change in a resource that would not return to its condition prior to the activity for more than a few weeks.

Effect Intensities for Hydrologic and Aquatic Resources

None: No impact to hydrologic or aquatic resources.

Negligible: A change that would be so small that it would not be of any measurable or perceptible consequence. Aquatic or hydrologic resources would not be affected or the effects on these resources would not be detectable.

Minor: A change that would be small and localized and of little consequence. Effects on aquatic or hydrologic resources would be detectable. These effects would be localized, short-term, and inconsequential.

Moderate: A change that would be readily apparent and measurable, localized, and possibly long-term. Measurable effects could include a substantial sediment delivery disturbance or a measurable increase in logjams. Mitigation measures proposed would help offset adverse effects.

Major: A noticeable change to a physical or biological resource that would be measurable and result in a severely adverse or major beneficial impact. Effects on hydrologic or aquatic resources would be readily apparent, measurable, severe and long-term and felt on a regional scale. Mitigation measures proposed to offset adverse effects would be extensive and success would not be assured.

Water Resources Affected Environment

Figure 25: Resource Indicators and Measures for the Existing Condition

Resource Element	Resource Indicator	Measure	Existing Condition
Channel Morphology/Fish Habitat	Wood Density	Log Jams/mi	0.7
	Pools	Pools/mi	6.7-9.5
		Deep, Complex Pools/mi	5.8-7.5
	Off-Channel Habitat	Quantity of Habitat	Four off-channel habitat features present
Water Quality	Sediment	NTU	Properly Functioning
Scenic River Outstanding Remarkable Values/Biological Effect to Fisheries	Outstandingly Remarkable Fishery Value/ESA Fish Species	Non-functioning, Functioning At Risk, Properly Functioning	Functioning At Risk

Resource Indicator: Wood Density

Background

Large wood (LW) plays an important role in aquatic ecosystems especially in the Cascade Mountain hydro-physiographic province. Instream wood influences stream channel shape and form by increasing channel diversity, pool frequency, and other favorable fish habitat conditions. Since European settlement, the amount and size of large wood in stream systems has decreased because of human activities. A reduction in wood quantities has resulted in adjustments to channel maintenance processes such as a loss of complex pool habitats and high quality spawning areas. This general trend is evident in the Chewuch River.

Past riparian management actions reduced habitat complexity in the Chewuch River. Examples include; the Forest Service constructed roads adjacent to the Chewuch River, logged trees on the floodplain, and removed large wood from the River. These past actions altered processes necessary for the supply and retention of instream wood. Impaired processes include the following:

- Past clearing and development of riparian and floodplain areas reduced wood recruitment to the river.
- Stream channelization, bank armoring, roadways, and protection of property reduced the river's ability to naturally erode the banks and recruit large wood from riparian areas and floodplains.
- Reduced in-channel recruitment and retention simplified the river and reduced the river's ability to retain wood once it has been recruited. The lack of available large "key pieces" necessary to capture other large wood pieces has also contributed to less in-channel retention.

The processes affecting large wood availability, recruitment, and retention in the Chewuch River have been altered to varying degrees and they are unlikely to fully recover on their own with the existing road network and continued fire suppression. Natural restoration of the underlying processes would take many decades or centuries (e.g. growth of large trees and more natural wood recruitment rates) and in some cases, as bank armoring associated with a roadway, may never fully recover. Current fish habitat conditions are functioning at risk and limiting the recovery of ESA-listed fish. Restoration of in-channel large wood is necessary in the near-term to increase channel complexity and contribute to the recovery of ESA-listed salmonids until more natural wood recruitment and loading occurs.

Desired Conditions

The Desired Condition Report (Shull and Butler 2014) identified large wood, logjams, and pool quantities (features per mile) that make up high quality salmon and trout habitat within the Chewuch River (Figure 17). These desired conditions were developed from a collection of sources including historic wood quantities in the Chewuch River, reference reach wood and pool quantities, and recent scientific studies on natural wood loading levels in unmanaged rivers of the eastern Cascade Mountains. See the Desired Condition Report, in project files, for more details.

The desired density of wood greater than 12" in diameter is 105 to 172 pieces per mile. The desired density of large wood pieces greater than 20" in diameter and 35' long is $\geq$ 33 pieces per mile. The desired logjam density is between 10 and 19 jams per mile (Figure 26).

Figure 26: Desired wood densities for the Chewuch River project reach.

Large Wood/mile (>12" diameter)	Large Wood/mile (> 20" diameter)	Log Jams /mile
105 – 172	$\geq$ 33	10 – 19

Existing Conditions

The 2008 Chewuch River survey measured wood in the following categories:

- small > 6" in diameter and >20' long
- medium >12" in diameter and >35' long
- large >20" in diameter and >35' long

Total wood numbers ranged from 20.1 to 37.2 pieces per mile and medium and large pieces ranged from 15.3 to 23.3 pieces per mile. Large pieces greater than 20 inches in diameter were scarce at only 2.2 to 5.8 pieces per mile (USDA-FS 2008). Values from the 2002 survey were similar.

Key logs are large stable pieces that promote logjams and form pools, which are important for forming quality fish habitat. Using values from (Fox and Bolton 2007), the estimated key log volumes for rivers the size of the Chewuch are in the range of 9.75-10.5 m^3 per mile. Log volumes were not specifically measured during the Chewuch stream surveys.

Logjams were inventoried over a 4.5-mile reach from RM 15.5 to RM 20.0 with only four jams observed. Logjam density was 0.7 jams per mile (Figure 27).

Figure 27: Existing Wood Densities for the Chewuch River Project Reach.

Large Wood/mile (>12" diameter)	Large Wood/mile (> 20" diameter)	Log Jams /mi
15.3-23.3	2.2-5.8	0.7

Natural wood accumulation has occurred and some active wood recruitment is happening currently and is increasing the habitat diversity. The level of instream wood and logjams within the project reach is well below the desired wood loading for complex, high quality fish habitat.

Instream large wood is one of the most important habitat sources and cover for salmon and trout (MacDonald and others 1991). Large wood provides suitable habitat over a wide range of flow conditions. (Bisson and Sedell 1984), (Sedell and others 1984), and (Bisson and others 1987) found that relationships exist between large wood, habitat complexity, and salmon and trout production. Large wood also provides cover to facilitate juvenile rearing and downstream migration (Murphy and others 1986), (Bisson and others 1987), (Everest and Chapman 1972). Wood cover also reduces predation (Bisson and Sedell 1984). Studies observed decreases in fish numbers when wood was removed citing the number and size of pools decreased and water velocity increased (Fausch and Northcote 1992). These studies suggest instream wood is important for fish production and the existing low wood levels in the project reach are likely limiting fish production.

Resource Indicator: Pools

Background

Wood and sediment deposition patterns function as primary factors in pool formation in the mainstem Chewuch. Pool habitat is low in quantity and quality in many segments of the Lower Chewuch River below the confluence with Lake Creek (RM 24.3). In systems like the Chewuch River, which have low gradient alluvial bottoms and pool/riffle sequences, large wood plays a major role in the formation of pools. The lack of large woody material in the channel has led to the low frequency and quality of pools. Over time as wood from fires is redistributed some additional pool formation is expected to occur. In the interim, wood additions are necessary to accelerate pool formation.

Desired Conditions

The Desired Condition Report (Shull and Butler 2014) identified desired pool frequencies for total pools and deep, complex pools (Figure 28). The desired pool density is 19 to 31 pools/mile and for deep, complex pools, density is 12-15/mile. The desired percent pool habitat by reach is in the range of 50 to 80 percent.

Figure 28: Desired pool condition for the Chewuch River project reach.

Pools/Mile	Deep, Complex Pools/Mile	% Pool Habitat
19 - 31	12 - 15	50-80%

Existing Conditions

Chewuch pool inventories identified the frequency and quality (depth and cover) of pools within this segment of the river. Quality pools are defined as having depths at least 3 feet with 40 percent or greater cover. Pools from the 2008 habitat survey ranged from 6.7 to 9/mile depending on the reach and deep pools ranged from 5.8 to 7.7 pools/mile. The percent pool habitat ranged from 25.2% to 35.2%. This is displayed in Figure 29.

Figure 29: Existing pool condition for the Chewuch River project reach.

Pools/Mile	Deep, Complex Pools/Mile	% Pool Habitat
6.7 – 9.5	7.1-7.7	25.2-35.18%

Existing pool habitat is generally below the desired condition. Total pools and deep, complex pools per mile range from well below to slightly below desired conditions. The percentage of pool area is also below desired conditions. Deep, complex pools are the most important habitat feature lacking in the project area.

Pools provide important habitat throughout all salmon and trout life stages (Bjornn and Reiser 1991) (Meehan 1991). Pools are critical for adult fish resting habitat; as juvenile and sub-adult rearing habitat for various species; as optimal spawning and inter-gravel rearing locations; and as refuge habitat from drought, cold winter temperatures, and high flows. Pools slow the transport of nutrients and store them to foster food production within them and in adjacent riffles. Pools serve as sediment storage sites, which help to buffer the detrimental effects of sediment pulses on stream biota during high discharge periods. Pool tails provide optimal spawning areas for salmonids due to hydraulic gravel sorting and inter-gravel flow characteristics (USDA-FS 1994). Baigun and others (2000) observed adult steelhead select deep pool habitat over other habitats such as glides and riffles. They cited the cooler temperatures associated with the deeper pools as providing more preferred habitat.

Resource Indicator: Off-Channel Habitat

Background

Off-channel areas provide important rearing habitats for juvenile salmonids in the Upper Columbia River System. Off-channel habitats are created and maintained in certain settings by fluvial geomorphic processes. (Benda and others 2003) found that alluvial fans create nick points in receiving rivers and the effect is an increase in channel aggradation and a decrease in channel gradient above. They found wide floodplains and side channels associated with these increases in sediment storage. Side channel habitat in floodplains is generally formed by large floods that reshape or redirect the river channel via bank migration and channel avulsions. Surface flow side channels are associated with abandoned river channels (Beechie and others 1994). Some sort of control such as a logjam is frequently needed to maintain the channel flow. Backwater pools tend to form along the channel margin by an eddy downstream from obstructions or from backwatering upstream from an obstruction (Bisson and others 1982).

Off-channel habitat in the project reach is functioning at risk due to apparent infilling from excess fine sediment. The river is believed to have down cut over the years disconnecting the main channel from accessing the floodplain. This has led to juvenile fish access being cut off from important off-channel habitat that provides refuge from high flows.

Desired Conditions

There is no numeric target established for the amount or condition of side channel or off-channel habitat within the project area. Based on conditions described in the Desired Condition Report, the desired condition is for side channel and off-channel habitat to occur in reaches just above alluvial fans, have habitat complexity, and to provide high quality summer and overwintering habitat for juvenile salmonids.

Existing Conditions

The project area has low energy, depositional segments formed by alluvial fans deposited by tributary streams which is consistent with observations by (Benda and others 2003). Both active and remnant side channel and backwater habitats are present, but lack the structure, stability, and cover associated with ideal over-wintering habitats. Off channel habitat between Boulder Creek (RM 9.5) and Lake Creek (RM 24.3), which includes the project reach, consisted of 4.2% of the total habitat. Four off-channel habitat features exist within the project area that total about 0.4 miles of habitat. Much of the habitat has become disconnected likely due to infilling with fine sediments during high spring run-off. Many areas are losing or lack river connectivity. As an example, in a 2002 survey, over 1,000 spring Chinook juveniles and six rainbow/steelhead juveniles were observed in a 300-meter long side channel on the right side of the floodplain at RM 12.2. No salmonids were observed in the same side channel in 2008. The water temperature was noticeably warmer due to the lack of flow in the side channel. Backwater habitat features exist but they lack adequate cover to protect juvenile fish against predators. Therefore, the existing off-channel habitat is below desired conditions.

Resource Indicator: Sediment

Background

Weathered granitic soil is common throughout the upper two-thirds of the watershed and that is conducive to high erosion rates. The Chewuch watershed naturally has moderate to high erosion potential on about two thirds of the drainage area (Okanogan National Forest 1994). Since 2001, the Chewuch has seen substantial wildfire activity that burned in total about 60% of the basin. The extensive wildfire activity increased sediment loads for a few years following the fires that ranged from fine to boulder-sized rocks.

The naturally high levels of erosion and sediment delivery to the Chewuch River likely peaked following major disturbances such as fire and flood. This was accompanied by large wood, gravel, and, in the cases of landslides and debris torrents, larger rocks. Today the nature of sediment delivery to the Chewuch has shifted from being sporadic in nature to having a higher chronic or constant delivery component. This chronic component is delivered from roads in tributary drainages and bank erosion from channel down cutting in the lower 25 miles of the river. This type of sediment arrives as fine silt without other structure such as logs and gravel. Fine sediment fills in pool habitat and off-channel habitat reducing their frequency and availability.

Desired Conditions

The Okanogan Forest Plan set a standard for fine sediment levels in spawning habitat for fine particles < 1 millimeter as being less than 20% of the substrates. Fine sediment levels of this percentage are considered properly functioning conditions.

Existing Conditions

In 2004, short duration, high intensity storms and subsequent landslides in the burned areas produced high flows and turbid waters. The percent of fine sediments in spawning gravels increased substantially in all four sampled reaches of the Chewuch River subsequent to the landslides and the 2006 spring run-off, which mobilized the sediment.

All four reaches sampled for sediment in the Chewuch River in 2012 were well below the 20% guideline in the Forest Plan. Data collected in 2012 is displayed in Figure 30 showing the percentage of fine sediment smaller than 1 mm in spawning substrate in the Chewuch River. In 2012, the percent fine sediments < 1% increased from 2011 in two of the three reaches that were sampled in both years (reaches 2 to 4).

Figure 30: Summary of 2012 Chewuch McNeil Core Data: % Fine Sediment < 1 mm

Reach	River Mile	Mean % fines <1 mm	Standard deviation <1mm	95% CI	Meets Forest Plan Standards[1]
1	21.7	9.26	5.11	6.02<μ<12.51	Yes
2	17.5	11.08	2.40	9.55<μ<12.60	Yes
3	15.4	14.49	3.58	12.22<μ<16.76	Yes
4	9.3	13.35	5.31	9.97<μ<16.72	Yes

[1]Okanogan Forest Plan standards calls for < 20% fine sediments <1 mm in size in spawning gravels.

Surface fines in transport reaches are below the Forest Plan standard and overall well below. Therefore, we consider the Lower Chewuch River to be at desired condition for fine sediment levels and considered properly functioning.

Resource Indicator: Outstandingly Remarkable Fishery Values/ESA Fish Species

Background

The Lower Chewuch River watershed is important for spring Chinook salmon and steelhead trout spawning, rearing, and adult holding. Historically, the Chewuch River was considered an excellent producing area for Chinook salmon and steelhead. It is extremely well suited for the production of early running varieties of Chinook salmon and steelhead based on the channel gradient, natural substrate composition, and habitat complexity. In the past, road construction, grazing, wood removal, and agricultural practices have degraded habitat conditions by contributing to elevated stream temperatures, increased sedimentation and channel embeddedness, reductions in the extent of riparian vegetation, and lack of large wood and pool habitat. Because of these various activities, salmon, steelhead, and other fish species have decreased in abundance compared to historical abundance in the Upper Columbia River system.

Desired Conditions

The desired conditions for the "outstandingly remarkable fishery values" are for the above habitat indicators to be within the described desired conditions. This may take years to achieve, but once the large wood levels, pool habitat, and off-channel habitat conditions are within desired conditions, fish habitat quality within the project reach would be near or at full capacity. Habitat conditions of this nature generally result in properly functioning fish production, which describes a desired condition for fishery values that would be associated with a Wild and Scenic River.

Existing Conditions

A high percentage of the spring Chinook salmon that return to the Methow Sub-basin spawn and rear in the Chewuch River. A small proportion (~12%) of the steelhead spawn and rear in the Chewuch River. Past stream cleaning (wood removal), riparian logging, and road development has greatly reduced the amount of instream wood in the lower 24 miles of the Chewuch River that includes the project reach. The lack of large woody material in the channel is believed to have led to the low frequency and quality of pools. Off-channel habitat is lacking as the river has become disconnected from side-channels in many areas. Current fine sediment levels are within desired conditions but are likely higher than natural conditions because the existing road network is contributing excess sediment that otherwise would not occur. Many habitat elements within the Chewuch River are functioning on National Forest System lands. Connectivity and access between the varieties of habitats required by migratory fishes is good. Riparian habitat in the watershed is generally in good condition.

Some challenges remain such as the high density of riparian roads and past timber harvest in riparian areas that continues to result in reduced large wood levels and reduced recruitment potential. Roads and naturally high sediment loads have affected the river in the recent past.

Total pool frequencies, deep and complex pool frequencies, and instream large wood are lacking in the river and within the project reach. Data suggests that quality and access to off-channel habitat may be reduced due to reduced large woody debris levels, reduced wood recruitment, and natural sedimentation. The "outstandingly remarkable fishery values" for the river and project reach are below desired conditions and considered functioning at risk. The habitat conditions for ESA fish species is considered functioning at risk.

3.3.2 Environmental Consequences

Alternative 1 – No Action

If chosen, the 15.5-20 mile reach of the Chewuch River would remain below desired conditions for the indicators of large wood, pools, and off-channel habitat. Wood accumulation has occurred and some active wood recruitment is happening; increasing the habitat diversity. The level of instream wood and logjams are well below the desired wood loading for complex, high quality fish habitat. The processes affecting large wood availability, recruitment, and retention have all been altered over time, and are unlikely to fully recover on their own with the existing road network and continued fire suppression. Natural restoration of the underlying processes would take many decades or centuries (e.g. growth of large trees and more natural wood recruitment rates), and in some cases, such as with bank armoring associated with a roadway, may never be fully recovered (Shull and Butler 2014).

Existing pool habitat is below desired condition metrics. Total pools and deep, complex pools per mile range from below to slightly below desired conditions. The percentage of pool area is also below desired conditions. These habitat features are important for juvenile and adult fish to avoid predators and to potentially provide cool water habitat during the summer. The desired condition for deep, complex pools is 12-15 pools/mile and the existing deeper pools are less than 5 feet deep, lacking wood or live vegetation cover. The total amount of pool habitat may be near natural ranges, but the amount of deep pool habitat (>5ft) and complex cover within pools is deficient.

Off-channel habitat is present in the form of backwater and side channel habitat, but connectivity, cover, and complexity in off-channel areas is below desired conditions and would remain so in the foreseeable future.

Alternative 2 – Proposed Action

Project Design Features and Mitigation Measures

In order to comply with applicable ESA and Clean Water Act laws, this project would follow a suite of design criteria described under the Conservation Measures for Programmatic Biological Opinion for Aquatic Restoration Activities in the States of Oregon and Washington (ARBO II) (FWS No.: 01EOFW00-2013-F-0090 & NMFS Tracking No.: NWP-2013-9664). Design criteria include measures to minimize disturbances to riparian vegetation, the river channel, and to ESA listed fish. Some example measures include working in the river during the Washington State designated instream work window of July 1-31, isolating the work area in the river channel, removing all fish from the work area prior to excavation using the (Service 2000) electrofishing guidelines, and using standard erosion control features like protecting disturbed banks with native vegetation. These design criteria have been used for a decade and have proven to be effective in minimizing project effects to fish species and their habitat. See the above document for detailed descriptions for all design and mitigation criteria.

Figure 31: Resource Indicators and Measures for Alternative 2, Constructed Features Added

Resource Element	Resource Indicator	Measure	Alt 2
Channel Morphology/Fish Habitat	Large Wood	Log Jams/mi	~6.2
	Pools	Pools/mi	~5.8 pools/mile of various sizes created from large wood additions.
		Deep, Complex Pools/mi	~2.2 pools/mile created from large wood additions and with adding wood to existing pools.
	Off-Channel Habitat	Quality/Quantity of Habitat	1 new off-channel habitat feature created and one existing feature improved.
Water Quality	Sediment	NTU	Small temporary increase, remain same over time.
Scenic River Outstanding Remarkable Values/Biological Effect to Fisheries	Remarkable Fishery Value/ESA Fish Species	Non-functioning, Functioning At Risk, Properly Functioning	Improved; moving towards properly functioning

Resource Indicator: Wood Density

Approximately 28 wood structures would be constructed. The structures include constructing 13 bank jams, 7 apex jams, 2 cover habitat log structures, 1 side channel enhancement (3 log structures + 3 pools excavated), and 3 sites where trees would be pulled over. Approximately 850 logs, of various sizes (189 per/mile), would be added to the river over these 28 log jams. The addition of 28 log structures would increase existing jams by 6.2 jams/mile. Post project, the log jam density would be 6.9 jams per mile which is below desired conditions (10 -19 jams/mile). The intent of the project is to not move all indicators to desired conditions at once, but to perform an adjustment over existing conditions to allow more time for natural large wood recruitment and geomorphological processes to bring the river in a balance with large wood. Adding wood to the river would be a moderate, beneficial effect to the wood density indicator.

Resource Indicator: Pools

Twenty three of the constructed log jams sites would be located in areas that do not have pool habitat. These jams would scour deep pools and provide diverse habitat for juvenile and adult fish within a few years. At one existing side channel, three pools would be excavated to provide juvenile rearing habitat. Trees would be added to two existing pools to provide juvenile and adult cover. The treatments would create ~26 new pools and change two existing simple pools into complex, cover habitat type pools with the added wood. This would increase total pool frequency from 6.7 - 9.5/mile to 12.5 - 15.3/mile, almost doubling pool frequency. Deep complex pool frequency would go from 5.8 - 7.5 per mile to 8.0 - 9.7/mile, an increase of 30 - 38 percent. Total pool area would increase as well. The increase in pool habitat and wood cover would almost double the amount of quality juvenile rearing and adult holding habitat within this reach. Increasing total pool habitat and the amount of complex, deep pools would be a long-term moderately beneficial effect to the pool indicator. Survival of juveniles and adults using this reach would be expected to improve.

Resource Indicator: Off-Channel Habitat

One old side channel (~ ½ mile long) would be opened to provide off channel habitat for juvenile rearing. Pools would be excavated and wood added to one other existing side channel to provide deep, complex

pools in off-channel habitat. There is no numeric target cited in literature for desired off-channel habitat quantities, but adding a ½ mile of off-channel habitat more than doubles the amount of habitat for this reach. The desired condition is to create more off-channel and side channel habitat near spawning reaches to provide high quality summer and overwintering habitat for juvenile salmonids. Doubling the amount of quality, off-channel habitat would be a long-term moderately beneficial effect to the off-channel habitat indicator.

Resource Indicator: Sediment

Potential short-term negative impacts to the sediment indicator could result from this project. Placement of dewatering structures (large sandbags), excavating into the riverbanks and riverbed and placement of large wood would result in short-term sediment increases. Instream work scheduled for this project would take place during the July 1 to 31-work window. Typical flows present in the Chewuch River during this time can be high, as this period is on the descending limb of peak flow runoff. Flows would not be at their lowest and some turbidity downstream is expected. Following applicable design criteria and Best Management Practices (BMP), the turbidity downstream of the site is expected to only be measurable for up to 100 feet downstream and for a period of no more than one hour following construction. Isolating the work area and dewatering the site would limit sediment deposition effects on site and downstream. Deposited sediment effects are not expected to be measurable to any spawning habitat below the sites. The effects to the current stream sediment levels would be a short-term, minor adverse effect. Fine sediment levels would quickly return to the existing condition and, in the long-term, the high quality condition would remain.

Resource Indicator: Outstandingly Remarkable Fishery Values/ESA Fish Species

Due to the presence of spring Chinook, steelhead, and possibly bull trout in the river while heavy equipment operations would be occurring, the project may result in some physical harm or acute mortality to a few individuals. To minimize direct effects to fish, the work area would be isolated and fish would be removed, but during this process, direct effects to juveniles, sub-adults, and adults could occur. Fish within the area would be displaced during this process to an area where they may be more vulnerable to predators. Adult fish are few in number and they would likely move out of the area and be unharmed. Juveniles are the mostly likely life stage to be impacted because there are more of them and they do not swim as fast. The project fish biologist estimates up to 100 juveniles would be disturbed across the entire project area and less than five would be harmed or killed.

Some temporary degradation of habitat would occur due to potential bank alteration, sediment delivery, reduction in riparian vegetation, and increases in nutrients in project area streams. This would disrupt normal feeding and hiding behavior that would displace fish during this process to areas where they may be more vulnerable to predators.

The long-term effects to fisheries habitat would be an increase in fish habitat complexity. Adding logjams would increase the frequency from 0.7 jams/mile to 6.2 jams/mile, which would substantially increase fish cover and promote pool formation. The number of total pools and deep, complex pools would increase by 58-86 percent. The amount of off-channel habitat features would double in size. Project reach sediment levels would have a short-term, increase, but would remain principally the same quality in the long-term (Figure 32). Increasing fish habitat complexity with more off-channel habitat, wood cover, and pool habitat would be a long-term moderately beneficial effect to the Outstandingly Remarkable Fishery Value/ESA Fish Species.

Habitat qualities for endangered Chinook and threatened steelhead would improve substantially within this reach. Increased wood cover and deep, complex pools would improve juvenile rearing and adult holding habitat. The capacity of the Chewuch River to produce smolts and sustain a population of Chinook salmon

and steelhead would increase. Improvements to pool habitat is expected to be long-term because placed wood is expected to remain in channel for decades due to the stable flow regime of the river and the stable designs being proposed.

Figure 32: Estimates of Pool Habitat and Increases of Pool Area with Proposed Addition of Large Wood into the Upper Chewuch River.

Habitat Indicator	Current Conditions	Post Project Conditions	Change in Condition
Total Pools/mile	6.7 – 9.5	12.5 - 15.3	+58 - 86%
Deep Complex Pools/mile	5.8 – 7.5	8.0 - 9.7	+30 - 38%
Log Jam/mile	0.7	6.9	+88.5%
Off-Channel Habitat	4 existing habitat features 0.4 miles in total length	1 new habitat feature 0.5 mile long with full access and one existing feature improved.	Off-channel habitat length is doubled within this reach, with in natural areas where these elements would occur.
Sediment	Properly Functioning	Properly Functioning	No Change

The Chewuch River would move towards being an outstandingly remarkable fishery value and towards functioning properly. This would move the river towards meeting the eligibility criteria for a Wild and Scenic River designation.

3.3.3 Cumulative Effects

Spatial and Temporal Context for Effects Analysis

The spatial boundaries for analyzing the cumulative effects to aquatic resources for the indicators of large wood, pools, and off-channel habitat are the stream reach where the project is taking place. Past projects such as riparian harvest, road building, and channel cleaning have altered the stream reach but they are described in the existing condition.

The resource indicator for sediment would overlap with grazing impacts, the road network, and recreation.

The outstanding remarkable value for fisheries would be cumulatively impacted by past large wood projects in the Chewuch River.

The temporal boundaries for the analysis of cumulative effects include similar actions to the spatial boundaries. The indicators of large wood, pools, and off-channel habitat would not overlap in time with any other planned activity. The indicator for sediment would overlap in time with grazing, recreation, and the transportation network. The outstanding remarkable value for fisheries would be cumulatively impacted by past large wood projects in the Chewuch River. The temporal scale for cumulative effects on water quality, riparian function, and watershed condition is 10 years.

Past, Present, and Reasonably Foreseeable Activities Relevant to Cumulative Effects Analysis

Resource Indicator: Wood Density

There are no projects in the area that would have cumulative impacts upon this indicator.

Resource Indicator: Pools

There are no projects in the area that would have cumulative impacts upon this indicator.

Resource Indicator: Off-Channel Habitat

There are no projects in the area that would have cumulative impacts upon this indicator.

Resource Indicator: Sediment

The overlap with grazing impacts, the road network, future timber harvest, and recreation would have slight cumulative impact upon sediment but the effects would not be measurable.

Figure 33: Sediment Cumulative Effects

Project	Overlap In Time Space		Measurable Cumulative Effect?	Extent, Detectable?
Grazing, Recreation, Transportation Network	Yes	Yes	No	Grazing, recreational activities including camping, floating, hiking etc., as well as recreational use of the transportation network would still occur. These activities are all capable of producing sediment. There would be an overlap in timing of these activities with Chewuch large wood additions. During implementation of the project, suspended sediment would be measurable during construction of the structures in the immediate vicinity of the project. The additional sediment production would be of a short duration, minimal, and decrease to background upon cessation of the implementation work due to mitigation measures and design criteria. There would be no measurable cumulative impact upon sediment from interacting with grazing, recreation, or the transportation network.

Resource Indicator: Outstandingly Remarkable Fishery Value/ESA Fisheries

This project with past large wood projects in the Chewuch River would enhance fish habitat and have a beneficial impact on the outstandingly remarkable value for fisheries.

Figure 34: Fishery Value Cumulative Effects

Project	Overlap In Time Space		Measurable Cumulative Effect?	Extent, Detectable?
Scenic River Outstandingly Remarkable Fishery Value (ORV)/ESA Fisheries	Yes	Yes	Yes	Past projects have added large wood and off-channel habitat to stream reaches below the project area on private, state, and National Forest System lands. The area is within an eligible river segment for potential scenic classification under the Wild and Scenic River Act and one of the ORVs making it eligible is its high fisheries value. The project would have a measurable cumulative impact upon fisheries and the impact would be primarily beneficial. There may also be additional large wood projects in the future but none has been identified to date. All of these treatments are designed to benefit fish habitat, the purpose and need of these projects is to increase suitable habitat for ESA listed fish species. When analyzed cumulatively the past, current, and possibly future large wood projects would have a beneficial cumulative impact upon this ORV.

3.3.4 Conclusion

The proposed action would have a May Affect, Likely to Adversely Affect to chinook, steelhead, and bull trout species and their critical habitat. Adverse impacts would be temporary and negligible to minor in consequence. The project would be a long-term, moderately beneficial change for ESA fish species. This project would contribute towards the recovery of these species across the Upper Columbia River Basin.

3.3.5 Other Relevant Mandatory Disclosures

Scenic River Outstanding Remarkable Values (Fishery Value)

Riparian vegetation and floodplain habitat along the Chewuch River would be temporarily disturbed during project construction and until it stabilizes and re-vegetation occurs, which would be a few years. During that time, these values would be slightly disturbed. The riparian area and floodplain would be rehabilitated with native vegetation and stabilized. After a few years, the area would return to and most likely improve over the current condition and represent quality habitat.

ESA Fish Species and Critical Habitat Effect Determination

Due to the presence of spring Chinook, steelhead, and possibly bull trout in the river while heavy equipment operations would be occurring, the project would affect these species temporarily and may result in "take" of the species. As a result, the project is considered "likely to adversely affect" spring Chinook, steelhead, and bull trout for the short term. The project would result in a temporary "may affect, likely to adversely affect" designated critical habitat for these species. Consultation with the U.S. Fish and Wildlife Service and NOAA Fisheries was completed under ARBO II.

Compliance with LRMP and Other Relevant Laws, Regulations, Policies, and Plans

The project site is located on the boundary of the Northwest Forest Plan (NWFP) and PACFISH management areas, which is the Chewuch River. This project conforms to the Okanogan Forest Plan (the Forest Plan), as amended by the Decision Notice and Environmental Assessment for the Interim Strategies for Managing Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH, USDA and USDI 1995). On the west side of the river, the project is within a Key Watershed under the NWFP. On the east side of the river, the project is within a Key Watershed under PACFISH. The project is consistent with standards and guidelines of these management plans.

Okanogan Forest Plan

The project area lies within a riparian area on land designated as Matrix on the west side of the river and roaded natural recreation and scenic viewing on the east side of the river. The Plan contains a number of Forest-wide Standards and Guidelines (S&Gs) that pertain to fisheries including fish habitat rehabilitation (page 4-31). Specific applicable S&Gs considered for plan conformance are listed below:

S&G 3-1 - Maintain or enhance biological, chemical, and physical qualities of Forest fish habitats.

The project is specifically intended to enhance the physical qualities of the project reach by increasing habitat complexity, pool habitat, cover habitat, and off-channel refuge habitat for all life stages of fish. This would benefit the biological value of the fishery resource.

S&G 3-2 - Rehabilitate fish habitats where past management activities have adversely affected their ability to support fish populations.

Past wood removal, riparian logging, and road construction has reduced the amount of instream wood and natural wood recruitment, thereby reducing habitat quality in the Chewuch River. The project is specifically intended to move habitat conditions towards more natural desired conditions. Once complete, the project reach would support greater fish production.

S&G 3-3 - Sediment in fishery streams shall be maintained at levels low enough to support good reproductive success of fish populations as well as adequate instream food production by indigenous aquatic communities to support those populations.

Existing fine sediment levels in the Chewuch River are functioning properly. Design criteria and mitigation measures such as isolating the work sites would minimize short-term sediment impacts. Fine sediment levels are expected to remain in good condition.

S&G 3-4 - Manage streams for high quality pool habitat consistent with the potential for the stream to provide it through natural or artificial means.

The project is specifically intended to increase quality pool habitat to improve juvenile rearing and adult fish holding habitat.

S&G 3-5 - Provide an average of at least 20 pieces of large wood per 1,000 lineal feet of stream channel on fish bearing streams to provide for aquatic needs.

The project is specifically intended to increase large wood quantities in the river and would move habitat conditions towards meeting this standard.

Northwest Forest Plan

The project area lies within a Riparian Reserve on land designated as Matrix. The Lower Chewuch River Watershed is designated as a Key Watershed, which are identified as priority areas for restoration. Specific applicable S&Gs considered for plan conformance are listed below:

The project is specifically intended to restore aquatic habitat complexity.

WR-1 - Design and implement watershed restoration projects in a manner that promotes long-term ecological integrity of ecosystems, conserves the genetic integrity of native species, and attains Aquatic Conservation Strategy objectives.

The project is specifically intended to enhance aquatic habitat by increasing habitat complexity, pool habitat, cover habitat, and off-channel refuge habitat for all life stages of fish. This would increase aquatic habitat resilience to natural and human caused disturbances, improve production of native fish species, and move habitat conditions towards desired aquatic and riparian conditions, which are goals of the Aquatic Conservation Strategy.

FW-1 - Design and implement fish and wildlife habitat restoration and enhancement activities in a manner that contributes to the attainment of Aquatic Conservation Strategy objectives.

See above consistency statement for Northwest Forest Plan WR-1.

PACFISH

The project area lies within a RHCA and a designated Key Watershed. Fisheries priority within these watersheds is to restore habitat for ESA listed fish species. Specific applicable S&Gs considered for plan conformance are listed below:

WR-1 - Design and implement watershed restoration projects in a manner that promotes the long-term ecological integrity of ecosystems, conserves the genetic integrity of native species, and contributes to attainment of Riparian Management Objectives.

The project is specifically intended to enhance aquatic habitat by increasing habitat complexity, pool habitat, cover habitat, and off-channel refuge habitat for all life stages of fish. This would increase aquatic habitat resilience to natural and human caused disturbances, improve production of native fish species, and move habitat conditions towards desired aquatic and riparian conditions.

FW-1 - Design and implement fish and wildlife habit restoration and enhancement actions in a manner that contributes to attainment of the Riparian Management Objectives.

See above consistency statement for PACFISH WR-1.

3.3.6 Summary

The project would increase the large wood level, total pool and quality pool habitat frequencies, and would double the amount of off-channel habitat. In the short-term, this project would disturb the river channel, riverbanks, and riparian vegetation. Design criteria and mitigation measures would minimize these effects. In the long-term, this effort would increase aquatic habitat complexity and improve fish habitat conditions. Fish survival and localized production is expected to increase, thereby improving the biological resource condition and enhancing the outstandingly remarkable fisheries value. All applicable aquatic and riparian standards and guides would be met with the project design features.

Due to the presence of spring Chinook salmon, steelhead, and possibly bull trout in the river while heavy equipment operations would be occurring, the project would affect these species temporarily and may result in "take" of these species. As a result, the project "may affect, likely to adversely affect" spring Chinook, steelhead, and bull trout for the short-term. The project would result in a temporary "may affect, likely to adversely affect" designated critical habitat for these species. The impacts would be temporary and negligible to minor in consequence. The project would be a long-term, moderately beneficial change for ESA fish species and their designated critical habitat within the project area. This project would contribute towards the recovery of these species across the Upper Columbia River Basin.

Degree to Which the Purpose and Need for Action is Met

The primary purpose and need for the project is to increase aquatic habitat diversity within the project area. The long-term effects of the project to fisheries habitat would be an increase in total pool and depth, complex pool habitat, log jams/mile, and off-channel habitat, which would successfully meet the need. Aquatic habitat diversity within the project area would move towards meeting the desired condition, as defined by (Shull and Butler 2014). The number of logjams/mile would increase to within about 75% of the desired range. Total pools and deep, complex pools per mile would be adjusted to within about 70 and 80% of what the desired number is for the Chewuch River. Off-channel habitat would double in size.

Figure 35: Summary Comparison of How the Alternatives Address the Purpose and Need

Resource Element	Resource Indicator	Measure	Alt 1	Alt 2
Channel Morphology/Fish Habitat	Large Wood	Log Jams/mi	0.7	Increase of~6.2
	Pools	Pools/mi	6.7 – 9.5	Increase of ~5.8
		Deep, Complex Pools/mi	5.8 – 7.5	Increase of~2.2
	Off-Channel Habitat	Quantity of Habitat	4 off-channel habitat features 0.4 miles long present	The quality/quantity of off-channel habitat would double
Maintain Water Quality	Sediment	NTU	No-effect	Small temporary increase, remain same
Scenic River Outstanding Remarkable Values/Biological Effect to Fisheries	Remarkable Fishery Value/ESA Fish Species	Non-functioning, Functioning At Risk, Properly Functioning	Functioning at Risk	Improve toward Properly Functioning

3.4 Wild and Scenic Rivers (Recreation and Scenery)

3.4.1 Affected Environment

Resource Indicators and Measures

Reference information is contained in the full specialist report in the analysis file. Resource indicators and the measures used for assessing project effects to Wild and Scenic Rivers (Recreation and Scenery) are described below.

Wild and Scenic River Act Compliance

The proposed action could affect the "Outstandingly Remarkable Values" of the Chewuch River, identified as scenic, wildlife, fish, and recreation. The proposed action would not be designed to interfere with the free-flowing nature of the river, and is designed to improve the fish value, but could have a direct and adverse effect on, or diminish the scenic and recreation values, and invade the river. The project may diminish the scenic value if the constructed features do not mimic natural features in terms of duration of viewing and frequency, size, shape, and material. The recreational value could be affected if the constructed structures degrade the scenic setting from the Falls Creek Campground or established dispersed campsites, or if they pose a safety threat to boaters on the river.

There are approximately 50 established, improved dispersed campsites on the banks of the Chewuch River. Each has an access route, and most have a fire ring. Several have been improved through a program called "Respect the River." These sites have buck and pole fences delineating the spot, and blocking vehicle access to the riverbank.

The Chewuch River is popular with recreationists, who enjoy camping and picnicking on the riverbanks. There are some professional or highly skilled people who go down the river in canoes or kayaks, but very few non-professional river-users use this stretch of river for recreation (MIG, 2014). The constructed features could pose a danger if people climb on them, or create a hazard to boaters.

Figure 36: Resource Indicators and Measures for Assessing Effects

Resource Element	Resource Indicator	Measure (Quantify if possible)	Used to address P/N, or key issue?	Source (LRMP S/G; law or policy, BMPs, etc.)?
Wild and Scenic River Eligibility	Shorelines and immediate environment should not show substantial evidence of human activity.	Evidence of human activity visible from the shoreline and immediate vicinity.	Yes	LRMP
	Scenery	Scenic Integrity Objective, Visual Quality Objective	Yes	LRMP
	Recreation	Overall changes to recreation opportunities.	Yes	LRMP
	Recreation	Changes in landscape character within view of Falls Creek Campground	Yes	LRMP
	Recreation	Changes in	Yes	LRMP

		landscape setting of dispersed campsite by structure J		
	Recreation	Changes in landscape setting of dispersed campsite by structure M	Yes	LRMP
	Recreation	Boater Safety	Yes	LRMP

Methodology

Wild and Scenic River Outstandingly Remarkable Values

The effects were analyzed following the process described in Appendix C of "Wild and Scenic Rivers Act: Section 7, October 2004", U.S. Forest Service. The scenic and recreation outstandingly remarkable values are detailed in this report using the following analysis methods.

Resource Indicator: Scenery

The scenic quality would be assessed by describing the deviations in landscape character that would be caused by each structure and the resulting scenic integrity objective.

The analysis area for cumulative effects would be bounded by the reach of the river determined eligible for Wild and Scenic River designation, under the Scenic classification (Thirtymile Trailhead to the north, and the National Forest System boundary south of Eightmile Ranch to the south), and the view of the surrounding landscape. The view from the East and West Chewuch roads (5100000 and 5010000) is also considered as allocated by the MA-5 prescription as well as all developed and dispersed recreation sites located within the project area.

Resource Indicator: Recreation

The specific dispersed campsites and developed campgrounds that may be affected would be described and potential changes to the setting or view from the campsites or campgrounds that could affect their popularity. Boater safety would be evaluated by considering the design of the constructed features, and how safety was addressed.

The analysis area for cumulative effects would be bounded by the reach of the river determined eligible for potential Wild and Scenic River designation, under the Scenic classification (Thirtymile Trailhead to the north, and the National Forest System boundary south of Eightmile Ranch to the south), and the view of the surrounding landscape.

Affected Environment

The Okanogan Forest Plan determined the Chewuch River was within an eligible river segment for potential scenic classification under the Wild and Scenic Rivers Act. It is classified thus from the Thirtymile Trailhead near the boundary of the Pasayten Wilderness to the National Forest System land boundary south of Eightmile Ranch. The outstandingly remarkable values for the river are scenic, wildlife, fish, and recreation. Scenery and recreation are addressed in more detail below.

Figure 37: Resource Indicators and Measures for the Existing Condition

Resource	Resource Indicator	Measure	Existing Condition

Element	(Quantify if possible)	(Quantify if possible)	(Alternative 1)
Wild and Scenic River Eligibility	Shorelines and immediate environment should not show substantial evidence of human activity.	Evidence of human activity visible from the shoreline and immediate vicinity.	Three developed campgrounds, dispersed campsites, and some road segments are visible from the river. Additionally, fish habitat improvement structures constructed in 2011 and 2013 are visible, although only 2 cause noticeable deviations from the undeveloped landscape character.
	Scenery	Scenic Integrity Objective, Visual Quality Objective	The current Scenic integrity objective is High, and Visual Quality Objective meets Retention overall. One fish habitat structure constructed in 2013 has a Scenic integrity objective of Low and a Visual Quality Objective of Modification. Another 2013 structure has a Scenic integrity objective of Moderate and a Visual Quality Objective of Partial Retention.
	Recreation	Overall changes to recreation opportunities.	Area is popular for camping in developed campgrounds and dispersed campsites, and boating/rafting.
	Recreation	Changes in landscape setting of dispersed camp site by structure J	Site is popular because of the proximity to river, flat ground, sandy swimming beach, and large trees.
	Recreation	Changes in landscape setting of dispersed campsite by structure M	Site is popular because of proximity to river, flat ground, isolated location,
	Recreation	Boater Safety	People boat or raft along the river. Existing logjams are potential risks to boaters, especially during high water when most of the boating occurs.

Resource Indicator: Scenic Quality

The Scenery Management System (SMS), as detailed in Agriculture Handbook Number 701, "Landscape Aesthetics, A Handbook for Scenery Management" (USDA Forest Service, 1995) established the method used in this analysis to evaluate the impacts of the proposed action on the scenic quality of the project area. Scenic quality is an important amenity in our lives. Research has shown that high-quality scenery, especially related to natural-appearing forests, enhances people's lives and benefits society. The Landscape Character and Visual Sensitivity of the project area are described, and Scenic Integrity of each site is described.

Landscape Character and Visual Sensitivity

People have been drawn to the Chewuch River valley for decades because of its scenery, and the abundant recreation opportunities there. The existing landscape character of the Chewuch River corridor is forested with some variation in texture created by varying thickness of the trees. The East and West Chewuch roads (5100000 and 5010000) follow the river on either side from the Thirtymile Trailhead to the Forest Boundary. The views from the river are of forests broken up by natural and natural-appearing openings that give views to the surrounding ridgelines and the Chewuch River. The forests follow the land up to the surrounding ridgelines, with natural openings becoming more frequent near the ridgetops, with the forest texture becoming finer because of the more distant view. Most of the river has thick riverside vegetation. Breaks in this vegetation open views into the surrounding forests and the ridgelines and mountains in the background. Naturally occurring log jams and downed trees in the river provide variety, along with rapids separated by deeper pools. The riverbanks vary in height from areas that are flat with oxbow channels and sand bars to areas where the riverbank extends up to 10 feet above the water level, becoming more pronounced when the water flow is low.

The Chewuch River flows through forested land largely unaltered by human activities, and the overall undeveloped view is the basis for the scenic outstanding remarkable value identified in the eligibility determination. There are sections where roads are close to and visible from the river. River Mile 15.5 to 20 includes the Camp Four and Chewuch Developed Campgrounds, a summer home tract, popular dispersed campsites, and short road segments within the seen area. Overall, the landscape character is natural appearing and undeveloped as viewed from the Chewuch River corridor.

Scenic Integrity

The Scenic integrity objective for the project area is High, as specified with the LRMP Visual Quality Objective of foreground retention. A High scenic integrity is defined in the Landscape Aesthetics Handbook (USDA FS, 1995) as follows:

High scenic integrity refers to landscapes where the valued landscape character "appears" intact. Deviations may be present but must repeat the form, line, color, texture, and pattern common to the landscape character so completely and at such scale that they are not evident (See project files for definitions of these terms).

The following figure shows the measurements used to evaluate the impact of a structure on the visual quality in terms of deviation in landscape character.

Figure 38: Measurements of Deviations in Landscape Character

Deviations in Landscape Character	Measurement	Low Impact	Moderate Impact	High Impact
Form: Most dominant element Type of structure: engineered log jam, backwater enhancement Cover enhancement:	Height of structure.	At water surface, mostly flush with ground, sand bars, and islands.	In scale with existing bank height.	Taller than existing bank height.
	Percentage of channel spanned.	Less than 10%.	11% to 25%.	Over 25%.
Line: Second most dominant element	Number of layers of horizontal parallel logs.	Two or less	Three to four	Five or more
	Orientation of logs relative to water flow, orientation of root wads facing upstream.	Majority of logs are parallel to water flow. Most root wads face upstream.	Fewer than 25% of the logs are perpendicular to water flow. Roughly, 25% of root wads face perpendicular to flow or downstream.	Over 25% of logs are perpendicular to water flow. Over 25% of root wads face perpendicular to flow or downstream.
	Number of upright piers	None	One to four	Five or more
Color & Texture	Incorporation of trees with limbs attached and/or brush. Incorporation of boulders.	Strong incorporation of limbs and brush.	Moderate incorporation of limbs and brush.	Little or no incorporation of limbs and brush.
Pattern	Shape	Random appearing	Somewhat angular	Strongly angular
	Geometric Pattern	No noticeable geometric pattern.	Amount of geometric pattern limited by size of structure or lack of obvious angles.	Repeating, strong geometric pattern with parallel lines and obvious angles.
Visibility from Chewuch River or	Amount of existing vegetation screening	Enhancement structure is screened	Enhancement structure is partially screened by	Enhancement structure is not screened by

East and West Chewuch roads (5100000 and 5010000)	and placement along river corridor	by existing vegetation or islands and blends in. Not noticeable.	existing vegetation and is moderately noticeable.	existing vegetation and is highly visible.
Visibility from recreation sites	Amount of time structure is viewed	Structure not visible from developed or dispersed campsites. Only view would be passing by in a boat.	Structure is visible from an established dispersed campsite.	Structure is visible from a developed campsite.

The Forest Service and Yakama Nation have implemented previous projects that constructed fish habitat improvement structures in the Chewuch River. Overall, the previously constructed structures meet the High scenic integrity objective, and are not having a direct impact on the scenic "Outstandingly Remarkable Value" of the Chewuch River. Maps showing the location of structures completed in the prior stages are available in project files.

The restoration project completed in 2012 covered the stretch of the Chewuch River between River Miles 9.56 and 13. The installed structures meet the High scenic integrity objective because their form, line, color, texture, and pattern blend with the surrounding landscape and mimic naturally occurring features along the riverbank. They are not negatively affecting the "Outstanding Remarkable Value" of scenery, and comply with the LRMP standard and guideline of visual quality objective of retention. The following two photographs (Figures 39 and 40) show two of the structures in the reach, located along the banks by the Eightmile Ranch.

Figure 39: Photograph of constructed log structures on the south end of Eightmile Ranch riverfront. The vertical members on the right-hand side of the photo meet scenic quality objectives because of there are only two, and they have different heights and angles.

Figure 40. Photograph looking upstream at the constructed log structures on the south end of Eightmile Ranch riverfront.

Another phase of the fish habitat restoration project was completed in 2013. Most of the structures have a High scenic integrity objective because they blend with the surroundings in terms of form, line, color, texture, and pattern.

Even though the 2013 project is meeting the visual quality objectives overall, two the structures are having a negative impact on the scenic "Outstandingly Remarkable Value". Structure 13B (Figure 41) is a backwater enhancement structure that has created important cover habitat for aquatic species, thus improving the fish habitat outstandingly remarkable value, but is having a direct and negative impact on the scenic outstandingly remarkable value. The following picture shows the structure from the river side.

Figure 41: View of Structure 13B from the Chewuch River

This structure has a scenic integrity objective of Very Low because the size of the structure is out of scale, the lines in the structure (both horizontal and vertical) are strongly parallel, and the pattern is very angular and geometric.

The structure also does not comply with Forest Plan standard and guideline MA5-8A, since it does not meet the visual quality retention standard. The following picture (Figure 42) shows the view of the structure from the East Chewuch road.

Figure 42: View of Structure 13B from the East Chewuch Road.

The structure does not meet Retention, and would be considered an unacceptable modification at this time. As vegetation regrows and the logs weather, it may meet the Very Low to Low end of Modification. It does not mimic natural appearing logjams in overall size and shape. The placement of logs dominates and does not reflect natural appearing deposits. Vertical pillars appear uniform in size and height, and do not appear naturally random, but reflect an extreme geometric and linear pattern.

The structure is negatively affecting recreation at the dispersed recreation site along the river, and creating a potential hazard to people who may climb on the structure. The following picture (Figure 43) shows the structure from the bottom of a user-created trail leading to the backwater area and riverside gravel bar.

Figure 43: View of Structure 13B from the user-created trail leading to the backwater area.

The uniform, geometric pattern of the structure is easily reached from the banks of the river, and creates a tempting climbing structure. The structure has no elements to reduce hazards to people – such as flattened tops on the logs, railings, or abutments.

Structure 13C (Figure 44) is also having a direct and negative impact on the scenic value of the river, however since it is only viewed by people passing by in a boat, the overall impact is diminished. The following photo shows the structure from the river side.

Figure 44. View of Structure 13C from the river

The vertical pillars in the structure are dominating due to consistent height and even row appearance. The blunt ends of the logs are perpendicular to the flow of the river and extend into the waterway. Since much of this structure extends into the water, future vegetation growth would not substantially reduce the visual impact. The structure would likely blend into the surroundings more over time as the logs weather, and the structure catches debris and logs, somewhat hiding the parallel pattern of the upright piers.

Resource Indicator: Recreation

The Chewuch River is a popular recreation destination. The two types of recreation that could be impacted from the proposed action are camping and boating.

The Chewuch Campground is within the project area. This sixteen-site campground sits on the bank of the Chewuch River, with river access. The campground is popular because it has low to moderate use, open sites and river access. The campground is set in a stand of large trees that provide welcome shade in the hot summer months. It is also located relatively close to the town of Winthrop. The campground is full most weekends and holidays between Memorial Day and Labor Day, and approximately 75% full on weekdays. The site for Structure N is located across and south from the campground, on the other side of the river.

Some of the people who camp in the project area prefer to not stay in one of the developed campgrounds, but instead pull off one of the roads and set up camp among the trees. Dispersed camping is especially popular during the general firearm season in October, and with large groups looking for a place where everyone can camp together. Most of these campers stay in some sort of recreational vehicle, although some stay in tents.

Three of the proposed structures are near established dispersed campsites. Structures J, M, and U are by well-developed sites popular throughout the summer. The sites sit next to the river; have fire rings and buck and pole fencing to keep vehicles away from the river. They are popular because of the location on the river's edge, swimming access, flat ground, and large trees providing shade.

A relatively low number of people boat or raft down the Chewuch River each year. Log jams can be dangerous to boaters if the boaters become caught in or under a structure. The structures completed in the previous projects were designed to reduce the risk to boaters. "Bumper logs" were placed along the outer edge of most of the structures. If a boat or raft were to hit one of the structures, it would bump off this log and away from the structure, or simply float along the log until downstream of the structure.

A company called MIG conducted a Recreation and Large Wood Assessment in 2013 on Chewuch River Mile 0 - 21. At low flow (probably considered the most dangerous, 1,020 cfs) R.M. 15 – 20 had the following large wood barriers: 8 sweeper logs, 3 Type C, 2 Type D, 3 Type E, and 1 Type F barriers. Types A and B were not included since consequences to rafters and kayakers are generally low from these type of barriers. A Type C: Routine navigation allows a floater to avoid contacting a Type C, but contact could occur if a floater is inattentive or unskilled. A Type D: Boaters would need to engage in active navigation (at least one substantial potential maneuver to avoid contact). Routine navigation may not be sufficient to avoid the barrier. A Type E: A boatable channel may exist, but substantial active and accurate navigation is likely needed to avoid contact. Type F: portage required.

Most of the river use occurs in the summer during low water flow and is short-distance inner-tubers. The river can be dangerous to use by rafters and kayakers due to cold water temperatures, rapidly moving water during high flows, and low flow exposing more dangerous barriers. Low flows and warm air temperatures increase the amount of inner tube use on the river, however the flow is generally too low for canoes, kayaks, and rafts later in the year. Most inner tube users drift in the river for approximately 100 yards then get out of the river, or use the tubes to sun bathe (MIG, 2014). Observed use was very low; boating/floating activity was observed on only five of the 15 days sampled. Most of this activity was characterized as short-distance floating and tubing. No rafters or kayakers were witnessed on-the-water; one was observed on land. All activity observed occurred below Memorial Campground near R.M. 9.

The limited scope and timeframe of this study and a previous study prevented them from being used as a statistically valid estimate of use, however it does demonstrate that river use is low. Jonason (2012) concluded that the factors preventing more recreation use on the section below R.M. 15.5 included:

- Very low water conditions;
- Technical and tight rocky rapids;
- Channels without enough water to negotiate through;
- Cold water temperatures; and
- A general lack of experience to navigate this style river.

In early spring of 2013, MIG administered an online questionnaire targeting Chewuch River boaters who had paddled or floated the Chewuch River within the most recent two-year period. 34 people with experience recreating on the Chewuch River completed the questionnaire.

3.4.2 Environmental Consequences

Alternative 1 – No Action

Alternative 1 would not change the current condition of the "Outstandingly Remarkable Values" along this reach of the Chewuch River. The scenic quality would not be changed, and the shoreline, whether viewed from a camp site or a boat would remain largely undeveloped, with the existing exceptions of developed campgrounds and roads that can be seen from the river. There would be no new structures posing a potential danger to boaters, or altering the setting of dispersed campsite or developed campgrounds.

Alternative 2 – Proposed Action

Figure 45: Resource Indicators and Measures for Alternative 2

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 2
Wild and Scenic River Eligibility	Scenery	Scenic Integrity Objective, Visual Quality Objective	High Scenic Integrity Objective, Retention Visual Quality Objective
	Recreation	Overall changes to recreation opportunities.	No changes to most recreation activities along the river. Outstanding opportunities would still dominate, and popularity of the area would not decrease.
	Recreation	Changes in landscape character within view of dispersed sites by C.	One structure would moderately alter the view of the riverbank upstream from popular dispersed site. Would not change the popularity of the campground.
	Recreation	Changes in landscape setting of dispersed campsite by structure J and M.	No apparent change in setting. The structure would appear natural and not interfere with usefulness of site. There would be a short–term impact to the use of the site, which would be closed during construction. Site restoration mitigation measures would return the site to the original condition, with no long-term impact on popularity or use.
	Recreation	Changes in landscape setting of dispersed campsite by structure U.	The structure would be a dominant feature in downriver view from the campsite. It would be an obstacle to boaters launching from the site. There would be a short–term impact to the use of the site, which would be closed during construction. Site restoration mitigation measures would return the site to the original condition, with no long-term impact on popularity or use.
	Recreation	Boater Safety	All structures designed to minimize risk to boaters.

Resource Indicator: Scenic Quality

Overall, Alternative 2 would meet the High scenic integrity objective, and Retention visual quality objective. Approximately 28 structures would be constructed within the 4½-mile stretch of the Chewuch River. The riverbanks would still appear undeveloped, although structures would be noticeable constructed features, slightly deviating from the undeveloped landscape character. Figure 46 details each structure, from where the structure would be viewed, deviations from landscape character, and scenic quality objective of each structure.

Resource Indicator: Recreation

Alternative 2 would change a portion of the landscape viewed from the viewpoints along the road and one established dispersed campsite. Structure C would be located up river from the dispersed site and visible from the river where people spend time. This would not change the elements of the setting of the site that make it popular – direct river access, shallow water, swimming beach, large trees, and relatively close proximity to Winthrop. People would be able to see the structure from the beach and river, and it would look like an obviously constructed structure because of its height, perpendicular orientation of the logs to the water flow, and angular shape. The structure would not dominate the view, however, and would be subordinate to the overall setting. Short-term noise disturbance from work on site N could occur to visitors at Chewuch Campground. Short-term displacement of visitors wanting to use dispersed sites is likely to occur as the sites may be temporarily closed during construction. Expected time is one month to six weeks, and with many other sites open visitors are likely to find a different spot.

Figure 46: Each Structure, from Where the Structure Would be Viewed, Deviations from Landscape Character, and Scenic Quality Objective of Each Structure.

Type of Structure Site Location	Existing Condition	Viewing Location and Duration	Deviation in Landscape Character	Scenic Integrity Objective (SIO)
Sites A, C & U Structures (bank margin log jam, apex jams, gravel bar, whole tree wood)		Boaters passing by on the river would see the structures. Some would be seen from East or West Chewuch Roads or some dispersed sites within site distance.	**Form**: Moderate Impact; three stacked logs high but in scale with existing bank. **Line**: Moderate Impact; three horizontal parallel layers, no upright piers, most logs perpendicular to water flow, over half of the root wads face upstream, bumper logs would be visible and parallel to water flow. **Color and Texture**: Low Impact; color would blend with surrounding setting, root wads and tree limbs would add texture **Pattern**: Moderate Impact; structures would be somewhat angular, but geometric pattern would be limited due to limited size.	**Meets High SIO, Retention VQO.** Despite the moderate deviation from some components of landscape character, the structures would be viewed for short periods as boaters pass by, and would be in scale with the bank height.

Type of Structure Site Location	Existing Condition	Viewing Location and Duration	Deviation in Landscape Character	Scenic Integrity Objective (SIO)
Sites B and V		Boaters passing by on the river would see structure.	**Form**: Moderate Impact; large stacked logs at site B, but in scale with existing bank. **Line**: Moderate Impact; horizontal parallel layers, upright piers mixed and buried, most logs perpendicular to water flow, over half of the root wads face upstream, bumper logs would be visible and parallel to water flow. **Color and Texture**: Low Impact; color would blend with surrounding settings, root wads and tree limbs would add texture **Pattern**: Moderate Impact; structures would be somewhat angular, but geometric pattern would be limited due to limited size.	**Meets High SIO, Retention VQO.** Despite the moderate deviation from some components of the landscape character, the structures would be viewed for short periods as boaters pass by, and would be in scale with the bank height.

All structures would be designed and constructed to minimize risk to boaters, with bumper logs installed to reduce the chance of people becoming caught in or under the structures.

3.4.3 Cumulative Effects

Spatial and Temporal Context for Effects Analysis

The spatial boundaries for analyzing the cumulative effects to the outstandingly remarkable values of the Chewuch River are the river span from the Thirtymile Trailhead to the National Forest System Boundary south of the Eightmile Ranch. This section of river was found eligible for potential Wild and Scenic River designation under the Scenic classification.

The temporal boundary is from the time of construction of the West and East Chewuch Roads and the Falls Creek Campground, until sometime in the future when these constructed features are no longer maintained or evident.

Past, Present, and Reasonably Foreseeable Activities Relevant to Cumulative Effects Analysis

Figure 47: Resource Indicators and Measures for Cumulative Effects

Resource Element	Resource Indicator	Measure	Alternative 2 (Units)	Past, Present, and Future Actions (Units)	Cumulative Effects (Units)
Wild and Scenic River Eligibility	Scenery	Scenic Integrity Objective, Visual Quality Objective	High Scenic Integrity Objective, Retention Visual Quality Objective overall, however 2 structures would not meet visual quality objectives. Shoreline would	Past - 2 structures previously built do not meet visual quality objectives. Future – design criteria would	Some degradation of scenic quality, with 2 structures previously built between R.M. 9.5 - 15.5 that do not meet visual quality objective. Shoreline would appear more developed, but would not have a direct and adverse impact on

			appear more developed near these structures; however, they would be spaced far enough apart to minimize visual impact.	limit impacts from new built features.	the scenic outstandingly remarkable value of the Chewuch River because they would not be clumped together, and the majority of the shoreline would appear unaltered.
	Recreation	Overall changes to recreation opportunities.	No changes to most recreation activities along the river. Outstanding recreation opportunities would still dominate, and popularity of the area would not decrease.	Overall, no long-term changes to recreation activities or opportunities.	No cumulative effect.
	Recreation	Changes in landscape character within view of dispersed sites	One structure would moderately alter view of the riverbank upstream from a dispersed site. Would not change the popularity of the campground.	No effect.	No cumulative effect.
		Boater Safety	All structures designed to minimize risk to boaters	There would be an increase in the number of structures in and along the river that could pose a hazard to boaters.	The risk to boaters would be increased over current condition, but structural components, namely bumper logs, would minimize risk.

Resource Indicator: Scenic Quality

Figure 48: Scenic Quality Cumulative Effects

Project	Overlap In Time Space		Measurable Cumulative Effect?	Extent, Detectable?
Fish habitat structure construction in Chewuch River between R.M. 15.5 - 20.	Yes	Yes	Yes	Some degradation of scenic quality, due to the number of structures and the inherent change in adding additional structures to the river. The shoreline would appear more developed in this stretch, but would not have a direct and adverse impact on the overall scenic outstandingly remarkable value of the Chewuch River because new features would not be clumped together, and the majority of the shoreline would appear unaltered.

Resource Indicator: Boater Safety

Figure 49: Boater Safety Cumulative Effects

Project	Overlap In Time Space		Measurable Cumulative Effect?	Extent, Detectable?
Fish habitat structure construction in Chewuch River between river miles 15.5 and 20.	Yes	Yes	Yes	The risk to boaters would be increased over the current condition, but structural components, namely bumper logs, would minimize risk.

3.4.4 Other Relevant Mandatory Disclosures

Public Safety

Alternative 2 would increase the risk for boaters in the Chewuch River because of the potential for boaters to become caught on or pulled under the constructed structures. The risk would be minimized by placing bumper logs along the structures most likely to pose a risk. The logs would help bump people away from the structure, or serve as a barrier between the boat and structure.

Compliance with LRMP and Other Relevant Laws, Regulations, Policies, and Plans

Wild and Scenic River Eligibility (see project files for complete analysis)

This analysis follows the process used to determine if the proposed activity would have a direct and adverse impact on the free-flowing nature of the river and it has identified "Outstandingly Remarkable Values" but only includes the portions specifically related to Scenic and Recreation.

How would the proposed activity directly alter within-channel conditions?

Alterations to within-channel conditions would be minimal. The constructed structures would result in additional large woody debris (anchored to the streambanks, anchored to apexes) within the channel, however the constructed structures are not designed to divert or obstruct the existing free-flowing nature of the river. They would not alter channel geometry, slope, or form. The bank structures would be designed to shed floating logs by placement of "bumper logs" at the upstream end of the structures. There is no guarantee that this would prevent all potential capture of natural logs, so there would be a possibility of channel-spanning logs being established due to the structures, though that possibility is remote. In the unlikely event that channel-spanning logs were collected on the structures, it would directly alter the navigation of the river by people in canoes, kayaks, or rafts. People would need to exit the river, walk along the riverbank around the channel-spanning logs, and re-enter the river on the down-river side of the blockage. These bumper logs would push the floating logs away from the structure, back into the fast moving water in the center of the river. The apex jams should capture a variety of size classes of material and retain it in the jam.

How would the proposed activity directly alter upland conditions?

The proposed action would slightly alter upland conditions near the constructed structures. The structures would be visible from the river. By following the design criteria, the constructed structures would appear as natural logjams. Riverside vegetation would be removed or crushed in isolated spots during construction, but it would re-grow to the existing condition within approximately 2 to 3 years.

Five of the constructed structures would be located near established developed or dispersed campsites. Two of those campsites would be used as staging areas during construction. The sites would be closed during construction, making them unavailable for 4 – 6 weeks/year. There are ample established dispersed campsites along the river, so it is unlikely that anyone wanting to use those sites would not be able to find an additional site. The site would be restored after construction, so there would be no lasting modification of the campsite. The proximity of the constructed feature to a campsite would change the view from the site, but as stated earlier, the design criteria would help the constructed feature appear natural, protecting the view. There would be a risk of campers or river-users trying to climb on the structure, which could be hazardous.

Time scale over which steps are likely to occur.

The constructed structures would be designed to last for decades, so their potential effects on river-users and scenery would be long-term. The potential for the structures to capture and hold channel-spanning logs could increase slightly over time if the size of the structures increases because of captured logs. The likelihood of this is low however, because of the bumper-log design. Given the small number of people boating or rafting the river, the overall effect to recreation would be slight. The impacts to the dispersed campsites would be of short duration, with the sites closed during construction, and then fully recovering within 2 to 3 years. Impacts to scenery along the river would likely diminish over time as the structures weather and collect small debris such as branches, small logs, and leaves. This would make them look more natural over time.

Project analysis and management goals.

This project would be consistent with the management goals, and standards and guidelines from the Okanogan Forest Plan. Considering the potential effect of the condition to the "Outstandingly Remarkable Values" of the Chewuch at the time it was determined eligible for potential designation (1989), the project would not create impoundments. Shorelines and the immediate environment would not show substantial evidence of human activity. The design criteria would minimize potential impacts to scenery and the structures would appear natural. The structures would not be concentrated with about 6.7 new structures/mile, along approximately 4½ miles (R.M. 15.5 - 20). New access routes to reach construction sites would be revegetate within 2 to 3 years, and would not become permanent roads.

Determination

Based on the documented analysis, this project would not have a direct and adverse impact on the Chewuch River for classification as an eligible potential Scenic River under the Wild and Scenic River Act. The free-flowing river conditions and water quality would not be changed. The "Outstandingly Remarkable Values" would be, for the most part, protected or improved. Changes in the scenic quality would be minor, and likely not noticeable to most people. Access to and availability of recreation would be affected, in the short term, at several dispersed recreation sites. River-users could see longer-term impacts if channel-spanning logs become lodged in the structures. Given the low number of river-users, and the design of the structures to minimize the potential of floating log capture, impacts to recreation would be slight.

Forest Service Handbook

This project would comply with Forest Service Handbook 1909.12, 82.5.

1. The free-flowing character of the river would not be modified by the construction or development of stream impoundments, diversions, or other water resources projects;

2. Outstandingly remarkable values of the identified river area would be protected; and

3. Construction of structures to protect and enhance fish habitat would harmonize with the area's largely undeveloped character and fully protect identified river values.

Land and Resource Management Plan

The project would comply with all applicable Forest Plan standards and guidelines, as described below.

S&G 9-3 The potential scenic classification attributes within a one-fourth mile wild corridor on each side of the {Chewuch River} shall be protected pending congressional action on river designation.

Overall, the project would meet a High scenic integrity objective, and Retention visual quality objective. Impacts from temporary access routes should lessen over time when vegetation regrows, in approximately 3-5 years after construction. The structures would meet the High scenic integrity objective and Retention visual quality objective since the vegetation would blend the structure into the surrounding landscape.

MA5-8A The visual quality objective is retention (the proposed action would occur within the foreground of the Chewuch River).

Alternative 2 would meet the visual quality objective of retention overall. As described above, temporary access routes would have a short-term scenic integrity objective of Low, and a visual quality objective of Modification. When vegetation regrows, in approximately 3-5 years after construction, the structures would meet the High scenic integrity objective and Retention visual quality objective since the vegetation would blend the structures into the surrounding landscape.

Appendix G of the Okanogan LRMP discusses Wild and Scenic River management, beginning on page G-2. Under the Scenic category, it states: "[t]hose rivers of segments of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines undeveloped, but accessible in places by roads."

It goes on to list the follow interpretation of the criteria (refer to Appendix G for full text):

River areas shall be free of impoundments.

No impoundments would be constructed.

River area shorelines and the immediate environment should not show substantial evidence of human activity.

Overall, there would be no substantial evidence of human activity along the shoreline. Structures would appear natural because of size, placement, and shape. These structures would be subordinate to the surrounding landscape in the immediate vicinity.

Structures or concentration of structures must be limited to relatively short reaches of the total river area.

Structures would be spread along approximately 4½ miles of river. The highest concentration would be at R.M. 16 where four structures plus the channel enhancement wood is clustered together. Other structures are spread out over the miles with limited concentrations.

Roads may reach the river area and occasionally bridge the river.

No roads, only access trails, or bridges would be constructed.

Required Monitoring

Restoration of campsites near structures would be monitored to ensure compliance with restoration tasks. Monitoring would be completed during active restoration, or immediately after completion, by the recreation staff.

3.4.5 Summary

Alternative 2 would protect and maintain the "Outstandingly Remarkable Values" of scenery and recreation for R.M. 15.5 - 20. The river would continue to appear undeveloped and conditions should improve over time as vegetation regrows on temporary roads and natural material builds on structures. Recreation opportunities would not be affected, except for short-term closures of the dispersed campsites near structures J, M, and U. These sites would be closed during construction, but would be restored once construction is complete. Risk to boaters would be minimized by incorporation of bumper logs to help deflect boaters away from the structures.

Degree to Which the Alternatives Address the Issues

Figure 50: Summary comparison of how the alternatives address the key issues

Issue	Indicator/Measure	Alt 1	Alt 2
Structures could degrade visual quality and increase development along river	Scenic integrity objective and Visual Quality Objective	High Scenic integrity objective, and Retention Visual Quality Objective	Overall, High Scenic integrity objective, and Retention Visual Quality Objective.
Structures could affect recreation by changing the overall recreation opportunities.	Overall changes to recreation opportunities.	No changes in overall recreation opportunities.	No changes to most recreation activities along the river. Outstanding recreation opportunities would still dominate, and the popularity of the area would not decrease.
Structure could change the landscape character as seen from the dispersed camp site near structure J.	Changes in landscape setting of dispersed camp site by structure J	No changes in surrounding landscape character.	No apparent change in setting. Structure would appear natural, and not interfere with usefulness of site. There would be a short–term impact to the use of the site, which would be closed during construction. Site restoration mitigation measures would return site to the original condition, with no long-term impact on popularity or use.
Structure could change the landscape character as seen from the dispersed camp site near structure M.	Changes in landscape setting of dispersed camp site by structure M	No changes in surrounding landscape character.	There would be a short–term impact to the use of the site, which would be closed during construction. Site restoration mitigation measures would return the site to the original condition, with no long-term impact on popularity or use.
Structure could change the landscape character as seen from the dispersed camp site near structure U	Changes in landscape setting of dispersed camp site by structure U	No changes in surrounding landscape character.	There would be a short–term impact to the use of the site, which would be closed during construction. Site restoration mitigation measures would return the site to the original condition, with no long-term impact on popularity or use. The structure may limit or alter access to the river.
Structures could pose a safety hazard to boaters if the boaters became caught on or pulled under the structures.	Boater Safety	No increase in risk to boaters.	All structures designed to minimize risk to boaters

3.5 Wildlife

3.5.1 Affected Environment

Wildlife Considered But Not Analyzed In Detail

Figure 51: Resources Considered But Not Analyzed in Detail

Resource	Rationale for Dismissing from Further Analysis
American marten, pileated woodpecker, three-toed woodpecker, northern spotted owl and the barred owl (MIS)	These are management indicator species for mature and old growth mixed conifer forest. The proposed action would not result in the conversion of forest stand types. It would have no effect on mature and old-growth forest and would not affect the size or health of marten, pileated woodpecker, three-toed woodpecker, and barred owl populations
Lewis's, pileated, three-toed, black-backed, downy, hairy, and white-headed woodpeckers; red-naped and Williamson's sapsuckers; and Northern flicker (MIS)	These are management indicator species for dead and defective tree habitat. Snag habitat does exist within the project area; however, snag removal is not part of the proposed action. The proposed action would have no effect on dead and defective tree habitat. It would not affect the size or health of primary cavity excavator populations.
Ruffed Grouse (MIS)	The ruffed grouse is the management indicator species of deciduous and riparian habitats. The proposed action would result in a temporary, small decrease in riparian habitat followed by a long-term increase in riparian habitat. In the long-term, it would have a positive effect on ruffed grouse habitat and ruffed grouse populations.
Mule Deer (MIS)	Mule deer are the management indicator species for winter range. The proposed enhancements to aquatic habitat along the Chewuch River would not result in any reduction in quantity or quality of winter range habitat. The project would have no effect on winter range habitat. It would not affect the size or health of mule deer populations.
Landbirds	Pertinent species of landbirds are addressed below in resource indicators.
Lynx (MIS and T)	Lynx habitat on the Okanogan National Forest has been mapped into 43 Lynx Analysis Units (LAUs). The proposed action is not within an LAU. It is not in suitable lynx habitat. The proposed action would have "no effect" on the lynx.
Lynx Critical Habitat	The proposed action is not within a critical habitat unit for lynx. The proposed action would have "no effect" on lynx critical habitat.
Northern Spotted Owl (T)	There is no suitable nesting/roosting/foraging habitat within ½ mile of the proposed action. The proposed action would have no effect on mature or old growth habitats. It would have "no effect" on the northern spotted owl.
Northern Spotted Owl Critical Habitat	The proposed action is not within a critical habitat unit for the northern spotted owl. The proposed action would have "no effect" on northern spotted owl critical habitat.
California bighorn sheep (S)	The proposed action is not within or adjacent to suitable habitat for the California bighorn sheep. The proposed action would have "no impact" on the California bighorn sheep.
Cascade red fox (S)	The proposed action would have no effect on Cascade red fox habitat. It would have "no impact" on the Cascade red fox.
Common Loon (S)	The proposed action is not within or adjacent to suitable habitat for the common loon. The proposed action would have "no impact" on the common loon.
Fisher (S)	The proposed action would have no effect on fisher habitat. It would have "no impact" on the fisher.
Gray Flycatcher (S)	The proposed action is not within or adjacent to suitable habitat for the gray flycatcher. The proposed action would have "no impact" on the gray flycatcher.
Great Gray Owl (S)	The proposed action would have no effect on great gray owl habitat. It would have "no impact" on the great gray owl.
Lewis' Woodpecker (S)	The proposed action would have no effect on Lewis' woodpecker habitat. It would have "no impact" on the Lewis' woodpecker.

Little brown myotis (S)	The proposed action would have no effect on bat habitat. It would have "no impact" on the Little brown myotis.
Mountain Goat (S)	The proposed action is not within or adjacent to suitable habitat for the mountain goat. The proposed action would have "no impact" on the mountain goat.
Northern goshawk (S)	The proposed action would have no effect on northern goshawk habitat. It would have "no impact" on the northern goshawk.
Peregrine Falcon (S)	The proposed action would have no effect on peregrine falcon habitat. It would have "no impact" on the peregrine falcon.
Sandhill Crane (S)	The proposed action is not within or adjacent to suitable habitat for the sandhill crane. The proposed action would have "no impact" on the sandhill crane.
Sharp-tailed Grouse (S)	The proposed action is not within or adjacent to suitable habitat for the sharp-tailed grouse. The proposed action would have "no impact" on the sharp-tailed grouse.
Townsend's Big-eared Bat (S)	The proposed action would have no effect on bat habitat. It would have "no impact" on the Townsend's big-eared bat.
Western Gray Squirrel (S)	The proposed action would have no effect on western gray squirrel habitat. It would have "no impact" on the western gray squirrel.
White-headed Woodpecker (S)	The proposed action would have no effect on snag habitat. It would have "no impact" on the white-headed woodpecker.
Wolverine (S)	The proposed action would have no effect on wolverine habitat. It would have "no impact" on the wolverine.
Invertebrate Species (S)	Due to the slight increase in riparian habitat the proposed action would have a slightly beneficial effect on butterfly and dragonfly habitats. It would have a "beneficial impact" on listed invertebrate species.

Resource Indicators and Measures

Resource indicators and the measures used for assessing project effects to wildlife are described below. Reference information is contained in the full specialist report in the analysis file.

Figure 52: Resource Indicators and Measures for Assessing Effects

Resource Element	Resource Indicator	Measure	Used to address: P/N, or key issue?	Source (LRMP S/G; law or policy, BMPs, etc.)?
Wildlife (Harlequin Duck)	Disturbance during critical periods.	Yes/No & if yes, to what degree	No	Okanogan NF LRMP S&G 6-8 and 6-19.
Active Raptor Nests (Bald Eagle and Osprey)	Disturbance during the nesting season.	Yes/No & if yes, to what degree	No	Okanogan NF LRMP S&G 6-10.
Grizzly bear and gray wolf	Disturbance to federally listed species.	Yes/No & if yes, to what degree	No	Okanogan NF LRMP S&G 6-17 and FSM 2672.4.
Unique nesting habitat	Loss of large diameter cottonwood and cedar trees.	Number of large diameter cottonwood or cedar trees felled.	Yes	Executive Order 13186
Wild and Scenic River Eligibility	Outstandingly remarkable wildlife value	Is the value for wildlife diminished (Yes/No)	Yes	Okanogan NF LRMP S&G 9-3.

Methodology

Resource Indicator: Disturbance to wildlife during critical periods

The harlequin duck is a R6 Sensitive species that is known to nest along the Chewuch River. The female is extremely sensitive and can be very intolerant to disturbance while incubating. The basis of effects analysis would be the seasonal timing of the implementation (disturbance) of this project and whether it overlaps with the timing of critical nesting period of the harlequin duck. The nesting season of the harlequin duck would be determined by a scientific literature review and local observations of the species on the Chewuch River.

Resource Indicator: Disturbance to active raptor nests during the nesting season

The riverine habitat in the project area provides suitable nesting habitat for bald eagles and ospreys. The basis of effects analysis would be whether active raptor nests are present and, if so, whether project implementation would take place during the nesting season and in proximity to the nest. The project area would be surveyed annually for active nests and scientific literature would be reviewed to determine the nesting season dates.

Resource Indicator: Disturbance to grizzly bear and gray wolf

The project area provides habitat for the federally listed grizzly bear and gray wolf. The proposed construction activity would include the use of heavy machinery and the increase in noise and human use would likely disturb any grizzly bears or gray wolves at the site, resulting in a temporary negative effect. The basis of effects analysis would be the season and length of the disturbance (project implementation), and whether adjacent undisturbed areas are available.

Resource Indicator: Loss of unique nesting habitat-large cottonwood and cedar trees

Black cottonwood and western red cedar are 2 species of trees that are relatively rare on the Methow Valley Ranger District in that their occurrence is limited to riparian areas. Construction activities associated with the proposed action would require the felling of some trees at the project sites and access trails to the project sites. The method of analysis for this indicator would be the number of large diameter cottonwood and cedar trees, >16", that are proposed to be felled during project implementation. This number would be based on field inspections of each of the individual restoration sites and associated access trails.

Resource Indicator: Wild and scenic river eligibility

The Okanogan National Forest Land and Resource Management Plan (1989) determined the Chewuch River to be eligible for Wild and Scenic River designation partly due to wildlife values. The method of analysis would be any direct and adverse effect that would diminish the value of the area for wildlife. The basis for direct and adverse effects would be tied to the previous 4 wildlife resource indicators and professional judgement.

Affected Environment

The Chewuch River is a major riparian corridor that provides habitat components not found in the surrounding matrix of mixed conifer forests. The river itself is large enough to provide habitat for aquatic wildlife species such as beaver, muskrat, waterfowl, and amphibians. The Chewuch River also supports populations of several fish species therefore providing a food source for fish-eating wildlife like blue herons, ospreys, and garter snakes. The relatively flat terrain adjacent to the river allows for the growth of large diameter trees of a variety of species, including those that require a riparian environment, like black

cottonwood and western red cedar. These large diameter trees provide a variety of foraging and nesting structures for a variety of bird and mammal species.

The Okanogan National Forest Land and Resource Management Plan (1989) determined the Chewuch River, from the Thirtymile Trailhead to the Forest Boundary, is within an eligible river segment for potential scenic classification under the Wild and Scenic River Act based partly on its outstandingly remarkable value for wildlife.

The entire Chewuch River watershed is part of the North Cascades Grizzly Bear Recovery Zone and the riparian habitat it supports could be important spring and fall habitat for grizzly bears. The Chewuch River is in the part of Washington where the gray wolf is federally listed as an endangered species. There are no known wolf den sites in the Chewuch River area, but it is likely that a small number of wolves currently inhabit the area, at least seasonally or intermittently.

Figure 53: Resource Indicators and Measures for the Existing Condition

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Existing Condition (Alternative 1)
Wildlife (Harlequin Duck)	Disturbance during critical periods.	Yes/No & if yes, to what degree	No. Disturbance limited to recreational users.
Active Raptor Nests (Bald Eagle and Osprey)	Disturbance during the nesting season.	Yes/No & if yes, to what degree	No. Disturbance limited to recreational users.
Grizzly bear and gray wolf	Disturbance to federally listed species.	Yes/No & if yes, to what degree	No. Disturbance limited to recreational users.
Unique nesting habitat	Loss of large diameter cottonwood and cedar trees.	Number of large diameter cottonwood or cedar trees removed.	0 No trees removed for restoration project.
Wild and Scenic River Eligibility	Outstandingly remarkable wildlife value	Any direct and adverse effect that would diminish the value for wildlife	No direct and adverse effects. Outstandingly Remarkable

Resource Indicator: Disturbance to wildlife during critical periods

The Chewuch River riparian area provides nesting and birthing habitat for a number of species including amphibians, spotted sandpipers, some waterfowl species, and mule and white-tailed deer. The harlequin duck is a R6 Sensitive species that is known to nest along the Chewuch River. The female is extremely sensitive and can be very intolerant to disturbance while incubating (ISSSP 2009). Incubation of eggs usually begins in mid to late May and eggs hatch in 28-30 days (ISSSP 2009). The newborn ducklings are precocial and can leave the nest soon after hatching to join their mother on the water (ISSSP 2009). The mother and brood can be on the breeding areas into September (ISSSP 2009). Project construction activities during the incubation period could result in the abandonment and failure of nests. Harlequin ducks have been documented on the Chewuch River from the junction with the Methow River to up above

Camp Four, which includes the proposed action area. Though they are known to nest on the Chewuch River, there are no mapped nesting sites. The stretch of Chewuch River in the proposed action area was surveyed for harlequin ducks in 2011, 2013, 2014, and 2016 with negative results for nesting.

Resource Indicator: Disturbance to active raptor nests during the nesting season

The riverine habitat in the project area provides suitable nesting habitat for bald eagles and ospreys. There are no known active nest sites in or adjacent to the project area (Chewuch R.M. 15.5 - 20). There are no records of bald eagles nesting or roosting on the Chewuch River; the nearest known nest site is 16 miles south near the town of Winthrop. There is one record of an osprey nest on the Chewuch River near R.M. 14. The nest tree was overhanging the river and fell over and was swept away several years ago. There are no records of ospreys building any new nests in the project area since then. Project construction activities during the incubation period could result in the abandonment and failure of nests.

Resource Indicator: Disturbance to grizzly bear and gray wolf

The project area provides habitat for the federally listed grizzly bear and gray wolf. The Chewuch River Project area may be inhabited by grizzly bears at certain times of the year. The project area is dry forest and forested riparian habitat type and could be important spring and fall habitat for grizzly bears. The project area is not adjacent to any areas that are lush with berry shrubs, but there are scattered service berry, elderberry, thimbleberry, chokecherry and other shrubs in the general area. The Chewuch River Project area may be inhabited by wolves during spring, summer, and fall when mule deer are present in the area. If moose winter in the area, it is possible that wolves would also. The proposed construction activity would include the use of heavy machinery and the increase in noise and human use would likely disturb ungulates and other wildlife that were utilizing the area. If wolves or bears were hunting or foraging in the area, this activity would likely disturb them.

Resource Indicator: Loss of unique nesting habitat-large cottonwood and cedar trees

Black cottonwood and western red cedar are 2 species of trees that are relatively rare on the Methow Valley Ranger District in that their occurrence is limited to riparian areas. Large diameter individuals provide a unique habitat for wildlife in that these 2 species are prone to large trunk cavities, which commonly result from heart rot in stands nearing maturity (Parks et al. 1997). The rotten trunks of these 2 species provide an opportunity for the excavation of large cavities and hollow trees/logs, an important wildlife habitat component that is otherwise scarce. There are several small stands of large diameter black cottonwood trees within the project area and a few individual cedar trees and small clumps of cedar trees.

Resource Indicator: Wild and scenic river eligibility

The Okanogan National Forest Land and Resource Management Plan (1989) determined the Chewuch River, from the Thirtymile Trailhead to the Forest Boundary, is within an eligible river segment for potential scenic classification under the Wild and Scenic River Act. The Outstandingly Remarkable Values of the Chewuch River, identified in the Okanogan Forest Plan, are scenic, wildlife, fish, and recreation. Section 7 of the Wild and Scenic Rivers Act states, in part, that projects that have a "direct and adverse effect on the values for which" the river was found eligible shall not be authorized.

3.5.2 Environmental Consequences

Alternative 1 – No Action

There would be no additional disturbance to riparian wildlife during critical periods. There would be no additional disturbance to active raptor nests during the nesting periods. There would be no additional

disturbance to grizzly bears or gray wolves utilizing the area. Disturbance would be limited to recreational users. There would be no loss of large diameter cottonwood or cedar trees. All the existing ones would remain standing until natural conditions caused them to fall.

Alternative 2 – Proposed Action

Figure 54: Resource Indicators and Measures for Alternative 2

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 2
Wildlife (Harlequin Duck)	Disturbance during critical periods.	Yes/No & if yes, to what degree	No. Disturbance would occur outside of critical periods.
Active Raptor Nests (Bald Eagle and Osprey)	Disturbance during the nesting season.	Yes/No & if yes, to what degree	No. Disturbance would occur outside of nesting season.
Grizzly bear and gray wolf	Disturbance to federally listed species.	Yes/No & if yes, to what degree.	Yes. Disturbance limited to short duration in middle of summer.
Unique nesting habitat	Loss of large diameter cottonwood and cedar trees.	Number of large diameter cottonwood or cedar trees removed.	No large diameter cottonwood to be removed, no large diameter cedar to be removed.
Wild and Scenic River Eligibility	Outstandingly remarkable wildlife value	Any direct and adverse effect that would diminish the value for wildlife	Direct and adverse effects limited in time and space. Outstandingly remarkable value for wildlife would not be diminished

Resource Indicator: Disturbance to wildlife during critical periods

Harlequin ducks were observed on the Chewuch River within the project area during surveys in June 2016 and in previous years' surveys. Potential impacts of the proposed action to harlequin ducks would be disturbance or destruction of active nest sites during project implementation. The proposed action would be implemented during the month of July, which is after harlequin duck eggs have hatched and ducklings are on the water. With this timing of implementation, the proposed action would have "no impact" on harlequin ducks. In the long term, the improvement and expansion of riparian habitat resulting from the project would be beneficial for the species.

Resource Indicator: Disturbance to active raptor nests during the nesting season

No raptor nests were observed within ½ mile of the project area during surveys in June thru September 2016. It is possible that a new nest(s) would be constructed and used in spring and summer 2017. If design feature #8 is implemented, and nest surveys are conducted again in spring 2017, and no active nests are found, the proposed action would have no impact on bald eagles and no effect on ospreys.

If a new active raptor nest is discovered in spring 2017 (or following years if implementation is delayed) then implementation within 450 meters of the nest would have to be delayed until after August 15 (Steidl and Anthony 2000).

Resource Indicator: Disturbance to grizzly bear and gray wolf

The construction activity that would occur during implementation would likely disturb any grizzly bears or gray wolves that were utilizing the area. Bears and wolves would be able to use the area without human disturbance from construction at night. Wildlife disturbed by construction activity would be able to move to adjacent undisturbed areas. This temporary human disturbance of a forested riparian site would occur outside the denning period for these large predators, and would not result in any reductions to grizzly bears or any of their forage items, nor to gray wolves or any of their prey. Alternative 2 would have a slight adverse disturbance effect on grizzly bear and gray wolf. With the limited time and spatial scale of this project the potential for disturbance would be minimal. The proposed action "may effect, but would not likely adversely affect" the grizzly bear and gray wolf.

Resource Indicator: Loss of unique nesting habitat-large cottonwood and cedar trees

Alternative 2 would not result in the loss of any large diameter, > 16", cottonwood or cedar trees. Alternative 2 would have no effect on unique nesting habitat.

Resource Indicator: Wild and scenic river eligibility

Alternative 2 would not diminish the outstandingly remarkable wildlife values of the Chewuch River. The only direct and adverse effect would be from the potential for slight temporary disturbance to grizzly bears and gray wolves. In the long term, the improvement and expansion of riparian habitat resulting from the project would be beneficial for harlequin ducks as well as many of the other aquatic and riparian dependent species that add to the river's value for wildlife.

3.5.3 Cumulative Effects

Spatial and Temporal Context for Effects Analysis

The spatial boundaries for analyzing the cumulative effects of disturbance to wildlife during critical periods are the same as the project area because the effect of disturbance to harlequin duck nest sites is limited to the immediate vicinity of the nest site. The temporal boundaries are one year because disturbance to a nesting site in one year would not likely affect the use of the site in the following years.

The spatial boundaries for analyzing the cumulative effects of disturbance to active raptor nest sites during the nesting season are the project area plus a 450 meter buffer because the effect of disturbance to bald eagle nest sites is limited to within 450 meters of the nest site (Steidl and Anthony 2000). The temporal boundaries are one year because disturbance to a nesting site in one year would not likely affect the use of the site in the following years.

The spatial boundaries for analyzing the cumulative effects of disturbance to grizzly bears and gray wolves are the Lower Chewuch Bear Management Unit (BMU) because effects to grizzly bears are analyzed at the BMU scale (Puchlerz and Servheen 1998). The temporal boundaries are one year because temporary disturbance to individuals at a site in one year would not likely affect the use of the site in the following years.

The spatial boundaries for analyzing the cumulative effects of removal of unique nesting habitat are the same as the project area because the effects of removal of habitat components is limited to the immediate vicinity. The temporal boundaries are 80 years because that is the approximate amount of time it takes to grow a new large diameter cottonwood or cedar tree.

Past, Present, and Reasonably Foreseeable Activities Relevant to Cumulative Effects Analysis

Since Alternative 2 had no direct or indirect effects to harlequin ducks and bald eagles and ospreys there would be no cumulative effects.

Resource Indicator: Disturbance to grizzly bear and gray wolf

Figure 55: Disturbance to Grizzly Bear and Gray Wolf Cumulative Effects

Project	Overlap In Time	Space	Measurable Cumulative Effect?	Extent, Detectable?
Forest Service Vegetation Treatment Activities (Pre-commercial treatments and fuel reduction treatments from the Flatmoon and Buck projects.)	Yes	Yes	No	There may be an overlap in timing of these projects with Chewuch Restoration Project. All recent past and future projects have been and would be designed to minimize disturbance to grizzly bear and gray wolf. The cumulative effect of disturbance to grizzly bear and gray wolf would be minor and within the interim direction for management within the North Cascades Grizzly Bear Recovery Zone.
Ongoing Recreation Activities	Yes	Yes	No	There may be an overlap in timing of these projects with Chewuch Restoration Project. All recent past and future projects have been and would be designed to minimize disturbance to grizzly bear and gray wolf. The cumulative effect of disturbance to grizzly bear and gray wolf would be minor and within the interim direction for management within the North Cascades Grizzly Bear Recovery Zone.

Resource Indicator: Loss of Unique Nesting Habitat

Since Alternative 2 had no direct or indirect effects to unique nesting habitat there would be no cumulative effects.

3.5.4 Other Relevant Mandatory Disclosures

Alternative 2 would be compliant with the Okanogan Forest Plan management indicator species (MIS) direction because it has no effect on any of the MIS and therefore does not reduce population viability for any of them. Alternative 2 would be compliant with the Migratory Bird Treaty Act and Executive Order 13186 direction because it has no effect on landbirds. Alternative 2 would be compliant with FSM 2670 and the Endangered Species Act direction because it either has no effect on threatened and endangered species (lynx and northern spotted owl), or it has a may affect, not likely to adversely affect (grizzly bear and gray wolf) and that determination has been consulted on and concurred with by the U.S. Fish & Wildlife Service. Alternative 2 would be compliant with FSM 2670 direction for sensitive species because it has no impact on any of the sensitive species listed for Region 6. Alternative 2 would not degrade the wildlife outstandingly remarkable value for making the Chewuch River eligible as a Wild and Scenic River.

Degree to Which the Alternatives Address the Issues

Figure 56: Summary comparison of how the alternatives address the key issues

Issue	Indicator/Measure	Alt 1	Alt 2
Disturbance from access and construction during critical periods, including nesting season, may impact nesting birds or federally listed wildlife species.	Disturbance during critical periods; Disturbance during nesting season; Disturbance to federally listed species.	No disturbance from river restoration project.	Disturbance would occur outside of critical nesting period. Disturbance to federally listed species would be limited to short duration during the middle of summer.
Removal of large diameter cedar and cottonwood during access and construction would impact unique riparian habitat.	Number of large diameter cedar or cottonwood trees felled.	0	0

3.5.5 Summary

Alternative 1 would have no effect to any wildlife species or habitats in the project area. Alternative 2 has the potential to disturb and negatively impact harlequin duck nest sites but the timing of implementation removes this potential and results in no impact. Alternative 2 has the potential to disturb and negatively impact bald eagle and osprey nests, but annual surveys to ensure there are no active nests prior to implementation removes this potential and results in no impact. Alternative 2 would result in a slight disturbance to grizzly bears and gray wolves during project implementation that results in a "may affect, not likely to adversely affect" determination for those two species. Alternative 2 has the potential to remove unique nesting habitat in the form of large diameter cottonwood and cedar trees. If implemented, it would result in the loss of no large diameter cottonwood and cedar trees, resulting in no effect to unique nesting habitat in the project area. Alternative 2 would not diminish the project area's "outstandingly remarkable wildlife value" referred to in the Wild and Scenic River Act.

3.6 Soil Resources

The proposed in-stream wood placement and riparian plantings would have an adverse, short-term minor impact to the soil resource. There would be localized soil disturbance to tie the logs into the stream bank (Figure 57) and walking the equipment to the site. Project BMPs would ensure that there is limited impact to existing soil conditions, and riparian plantings would help stabilize and enhance the soil long-term.

Figure 57: Example of previous in-stream wood placement along the Chewuch River. The bare soil was seeded and the riparian planting were on the other side of the mesh fencing. Rock armoring along the stream bank would help reduce erosion.

Figure 58. Example of riparian planting that would be done with this project. This adds soil stability, biodiversity, and long-term soil health and productivity.

3.7 Cultural Resources

The following section summarizes the existing condition of cultural resources in the Chewuch River Habitat Restoration project area between River Miles 15.5 - 20, along with the direct, indirect, and cumulative effects of the proposed action alternatives as analyzed in the Cultural Resources Specialist Report (R2014060804005). Reference information is contained in the cultural resource report in the analysis file.

Tribal Consultation

Many laws, regulations, and directives instruct the Forest Service to consult with American Indian tribes, the State, and other interested parties on the cultural resource management process. Consultation with tribes on the Chewuch River Restoration project proposed actions has been conducted in accordance with NHPA, NEPA, and Executive Order 13175 "Consultation and Coordination with Indian Tribal Governments". Government-to-Government consultation letters were sent to the Confederated Tribes of the Colville Reservation and the Yakama Nation on September 2, 2016. No comments or concerns have been received to date from either party except as related to the boundary of the Area of Potential Effects (APE). Documentation of compliance with the NHPA was prepared in accordance with the 1997 Programmatic Agreement (PA). Consultation with the Washington SHPO was completed on October 3, 2016.

3.7.1 Affected Environment and Environmental Consequences

Cultural resources are fragile, non-renewable resources that chronicle the history of people traversing and utilizing the natural landscape. Cultural resource identification efforts in the Chewuch River planning area focused on three primary types of resources: prehistoric archaeological sites, historic archaeological sites, and Traditional Cultural Properties, which are valued places to contemporary Indian and non-Indian communities. Cultural resource identification efforts have included pedestrian field surveys, literature reviews, GIS analysis, and consultation with the Yakama Nation and Confederated Tribes of the Colville Indian Reservation that are historically associated with the area.

The Okanogan Forest Plan defines a cultural resource site as a locus of purposeful and interpretable human activity containing physical manifestations of that activity (e.g. one or more features with or without artifacts; one or more formal tools found in association with other cultural materials; diverse cultural materials in densities beyond the level of one or a few lost artifacts; or physical manifestations of human activity that in the professional opinion of an archaeologist are indicative of purposeful human activity). These resources are typically at least 50 years old and are considered valuable if they have yielded or could yield scientific or scholarly information important in prehistory or history.

In order to meet the requirements set forth in Section 106 of the NHPA, as amended, and the Forest's 1997 Programmatic Agreement with SHPO, an intensive cultural resource inventory of the project area of potential effect (APE) began in 2016. A 100% on-the-ground survey of affected areas was completed since the entire project area was determined to be within high site location probability (generally terrain less than 15% slopes within 500' of water or major ridge systems). This survey led to the discovery and recordation of one cultural resource site, a bridge abutment, which was determined "Not Eligible" since the site lacks physical and functional integrity and thorough documentation has exhausted its research potential. SHPO concurred with that determination on October 3, 2016. This project would have no direct, indirect, or cumulative effect on known cultural resources. Cultural resources found during implementation would be protected by Design Criteria and Mitigation Measure 12: "if avoidance were not possible, mitigation would be developed".

3.8. Other Environmental Consequences and Required Disclosures

This section addresses those effects for which disclosure is required by NEPA regulations, Forest Service policy or regulation, Executive Order, or other laws and direction covering environmental analysis and documentation. In some cases, the information found here is also located elsewhere in the document.

3.8.1 Conflicts with other Plans, Policies, or Other Jurisdictions

This project would not conflict with any plans or policies of other jurisdictions, including Tribes and neighboring public and private landowners. This project would not conflict with other policies, regulations, or laws, including the Clean Water Act, Endangered Species Act, National Historic Preservation Act, Magnuson-Stevenson Fishery Conservation and Management Act, and Clean Air Act. Other potential conflicts with plans, policies, or other jurisdictions are discussed below.

3.8.2 Environmental Justice

Executive Order 12898 (February 11, 1994) directs federal agencies to focus attention on the human health and environmental condition in minority and low-income communities. The purpose of the Executive Order is to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects on minority and low-income populations.

The project would not have disproportionately high or adverse human health or environmental effect on minority and low-income populations.

3.8.3 Treaty Resources and Reserved Indian Rights

No impacts on American Indian social, economic, or subsistence rights are anticipated. No impacts are anticipated related to the American Indian Religious Freedom Act. Tribal contacts regarding this Proposed Action are described on page 9.

3.8.4 Wetlands and Floodplains

Project design measures to protect streams, wetlands, floodplain, and water quality were built into treatment activities. Therefore, there may be some short-term effects during the 1-month construction season, but no-long-term effect on wetlands and floodplains.

3.8.5 Unique Characteristics of the Area

There are no parklands, farmlands, rangelands, wildernesses, inventoried roadless areas (IRAs), unroaded areas, research natural areas, or ecologically critical areas within the project area. Therefore, none of these features would be affected by the proposed action. Maps and descriptions the project location are on pages 1 - 3, 13 – 15, and elsewhere in the document.

The project area includes a section of the Chewuch River that is within an eligible river segment for potential scenic classification under the Wild and Scenic River Act. The project would protect and maintain the outstandingly remarkable values that make this river segment eligible for Scenic designation.

3.8.6 Air Quality

Adding large wood to the Chewuch River would not affect air quality. Therefore, this project would comply with the Clean Air Act. No on-site burning of debris is proposed in this project.

3.8.7 Irreversible and Irretrievable Commitments of Resources

There are no Irreversible or Irretrievable commitments of resources anticipated as part of implementing the proposed action.

3.8.8 Agencies, Tribes, and other Entities Consulted

As described on pages 9 & 10, the Forest Service and BPA invited Federal, State, County and Ttribal entities to engage in informal or formal comment, discussion, and/or consultation on this Environmental Assessment. In compliance with 36 CFR 800.3(f), initiation of the National Historic Preservation Act Section 106 process included notification to two federally-recognized tribes, including the Confederated Tribes of the Colville Indian Reservation and the Yakama Nation.

Consultation with the U.S. Fish and Wildlife Service and National Marine Fisheries Service was completed using the U.S. Forest Service, U.S Bureau of Land Management, and Bureau of Indian Affairs' Biological Assessment for USDA Forest Service (Pacific Northwest Region), USDI Bureau of Land Management (Oregon State Office) and the Bureau of Indian Affairs. The project meets the design criteria for the above Biological Assessment and therefore is consistent and covered under the Programmatic Biological Opinion for Aquatic Restoration Activities in the States of Oregon, Washington and portions of California, Idaho and Nevada (USDI-FWS – 01EOFW00-2013-F-0090) (USDC-NOAA NWP-2013-9664).

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