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Forest Service

Chewuch River Restoration River Miles 13-15.5 Environmental Assessment

Methow Valley Ranger District, Okanogan-Wenatchee National Forest, Okanogan County, Washington
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Photo of the Chewuch River by Barbara Jackson, Landscape Architect, USDA Forest Service

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Introduction

The Methow Valley Ranger District, in partnership with the Yakama Nation, propose to re-establish, enhance and improve the diversity of aquatic habitat for Endangered Species Act listed fish in the 13-15.5 mile reach of the Chewuch River. These actions are proposed to be implemented on the Methow Valley Ranger District of the Okanogan-Wenatchee National Forest.

This environmental assessment (EA) was prepared to determine the effects of increasing large wood quantities, pool frequency and quality and re-establishing side- and off-channel habitat in the 13-15.5 mile reach of the Chewuch River and whether it significantly affects the quality of the human environment and thereby require the preparation of an environmental impact statement. Preparing this EA fulfills agency policy and direction to comply with the National Environmental Policy Act (NEPA). Details of the proposed action are in the Proposed Action and Alternatives section of this document beginning on page 11.

On March 27, 2013, a final rule revising 36 CFR Part 218 was published in the Federal Register Volume 78, No. 59. The new rule replaces the previous appeal rules defined in 36 CFR 215, and expands the use of the pre-decisional objection process. The new rule provides the public an opportunity to comment and express concerns on projects before decisions are made, rather than after. This project is subject to the new pre-decisional objection regulations.

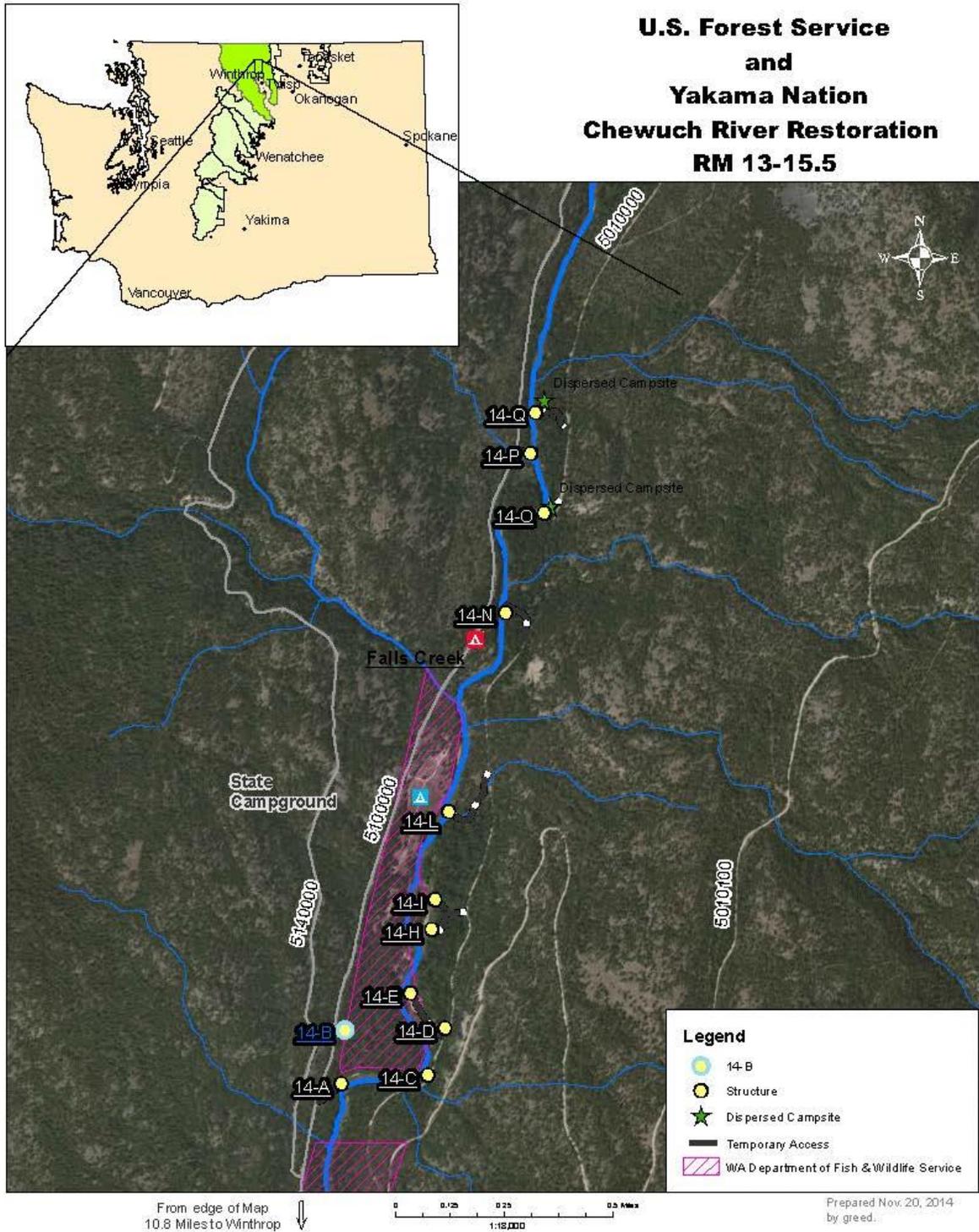
Proposed Project Location

As shown in Figure 1, the project is north of Winthrop, Washington at Chewuch River miles 13 to 15.5. It includes construction of features at 12 sites on National Forest Land along the River (Sites 14A, 14B, 14C, 14D, 14E, 14H, 14I, 14L, 14N, 14O, 14P and 14Q). The proposed project is not within an inventoried roadless area, wilderness or other congressionally designated area, nor is it within potential wilderness.

Site 14B begins on National Forest lands but is mostly situated on Washington State Department of Fish and Wildlife (WDFW) managed lands. While the design for site 14B (on WDFW managed lands) is not finalized, the project is considered a connected action for purposes of this analysis.

Effects of implementing the entire project, including the connected actions on WDFW lands, are analyzed in this document. The U.S. Forest Service would only make a decision on the portion within Agency jurisdiction. Implementation of site 14B is dependent upon a decision from each agency.

Map 1 Project & Vicinity Map



Background

The Chewuch River, eligible as a Wild and Scenic River, is a key watershed and an important fishery for the delisting of the upper Columbia listed species. The Chewuch historically produced large numbers of salmon, steelhead and bull trout. However, it has been slow to recover from the removal of wood in the early half of the 1900's. Many of the forest stands along the project area provide low rates of natural wood recruitment due to low tree densities along the river corridor. In addition, channel and streambank alterations have reduced the ability of stream channels to meander and effectively retain wood once it has been recruited. 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)

Processes affecting large wood availability, recruitment, and retention have all been altered to varying degrees and are unlikely to fully recover on their own. Furthermore, natural restoration of the underlying processes will 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 provides shelter, hydraulic refuge, and wood 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 are 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, 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 listed fish in the Methow sub-basin (USDA-FS 1994a), (UCSRB 2007), (USDA-FS 2010).

Need for the Proposal

The Methow Valley Ranger District of the Okanogan-Wenatchee National Forest, in partnership with the Yakama Nation, propose 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 13-15.5 mile reach of the Chewuch River. Lack of habitat diversity in the Chewuch River has been identified as limiting fish productivity for anadromous fish listed under the Endangered Species Act.

Specifically, 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(USDA-FS 1994a), (UCSRB 2007), (USDA-FS 2010)

As described in *Chewuch River Large Wood, Pool, and Off-channel Habitat* (Shull and Butler 2014), wood density in the 13-15.5 mile reach of the Chewuch River is currently below the desired condition, pool habitat is in the range of 50-80 percent of the desired condition and off-channel habitat is lacking. Backwater habitat features exist but lack adequate cover to protect juvenile fish against predators.

1. Increase Large Wood Complexity

The need for large wood is established by the Okanogan National Forest Plan (USDA-FS 1989b) and the 1995 PACFISH documents (PACFISH 1995) and detailed *Chewuch River Large Wood, Pool, and Off-channel Habitat* (Shull and Butler 2014). Quantities of large wood in river miles 13-15.5 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 13-15.5 mile reach of the Chewuch River to start moving the reach toward the desired condition.

2. Enhance Pool Habitat

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 and 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 as well as increasing the percent of the area with pools in the 13 -15.5 mile reach of the Chewuch River.

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

Side channel habitat in miles 13-15.5 of the Chewuch River are present, but lack the structure, stability, and cover associated with ideal over-wintering habitats. Many areas are losing, or lack, river connectivity. There are some side channels filling in with fine sediment and lacking complex cover for protecting juvenile fish.

To move the 13-15.5 mile channel of the Chewuch River 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.

Public Involvement and Tribal Consultation

This project has been listed on the Okanogan-Wenatchee National Forest Schedule of Proposed Actions (SOPA) since April of 2014. On March 7, 2014, government-to-government consultation letters were sent to the Yakama Nation and Confederated Tribes of the Colville Indian Reservation per Executive Order 13175. No concerns regarding the project were expressed by either Tribal government.

On March 20, 2014, 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 March 28, 2014. The letter sent to individuals on the Methow Valley Ranger District's project mailing list resulted in two responses. Comments from those individuals were used in the development of the proposed action. Public scoping also included discussing project details with local conservation groups and restoration practitioners and several adjacent landowners. No unresolved issues remain.

Resource specialists from USDA Forest Service and WDFW met on site and are coordinating on the proposed construction at Sites 14A and B, including the proposed adjacent work on WDFW lands.

The project was discussed, reviewed, and modified internally by an interdisciplinary team of resource specialists. Additional correspondence and review was conducted with WDFW and necessary permits will be obtained by the Yakama Nation from the Army Corps of Engineers and Washington Department of Ecology.

Relevant Issues

Issues for analysis were identified during interdisciplinary discussions. Those issues and the indicators for measuring effects are listed below and discussed in the appropriate resource section under Environmental Impacts beginning on page 17 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 impact the recreation outstandingly remarkable value by changing the landscape character as seen from developed, dispersed or State 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 found at sites 14B, H and I.

- Proposed access to Sites 14H & I is through a continuous *Sanicula* population (about 200 plants).
- Construction activities being discussed at Site 14B (on WDFW land) could remove that *Sanicula* population.

Indicators: Acres of Habitat, Numbers of population, Numbers 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 impact 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 and cottonwood during access and construction could impact unique riparian habitat.

Indicators: Loss of large diameter cottonwood and cedar trees

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

Indicators: Establishment of new infestation

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

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 an occurrence is considered unlikely and it is not reasonably foreseeable. As described in the Chewuch RM 13-15.5 Concept Design Report (Inter-Fluve 2013), the features are designed to remain stable during 100-year flood events and high water.
2. The proposed route to access Site N is a cultural site; an abandoned road that accessed a bridge. Using the road may disturb the cultural site and decommissioning the road would adversely impact the cultural site.
 - The stock driveway (site 06080400093) was determined to be “not eligible” for listing on the National Register of Historic Places. No improvements will be needed to use the road.

Proposed Action and Alternatives

Alternative Formulation

Because no unresolved conflicts emerged during scoping, an alternative to the Proposed Action was not developed. This EA addresses one action alternative, the Proposed Action, including design criteria and required mitigations to prevent unacceptable resource damage and ensure Forest Plan compliance.

During the preliminary effects analysis process one proposed site was dropped from further consideration. An interdisciplinary discussion showed conflicts between aquatic and fish resources and scenic, recreation and Wild and Scenic River eligibility. Those sites are described below under Alternatives Considered but Dismissed from Detailed Analysis.

Alternatives Considered but Dismissed from Detailed Analysis

The following alternatives were considered, but for the reasons described below were not moved forward for detailed analysis.

- Change design of Site 14Q, which is within a long, straight segment of river channel, by making it smaller to better meet visual objectives.
 - Changing structure would render it ineffective for meeting its objective of providing adult and juvenile rearing habitat and therefore would not meet the stated purpose and need for

the project. The No Action alternative addresses visual concerns by not constructing a structure at this site.

- Construct site M, as described in the Chewuch RM 13-15.5 Concept Design Report (Inter-Fluve 2013).
 - Site M was proposed as a logjam habitat project.
 - This site was dropped because it was immediately across the river and in full view of the Falls Creek campground. It was removed from further consideration due to potential impacts on visual resources and recreation experiences.
- Fully restore large wood, cover and habitat to historic levels to achieve the fish habitat objective.
 - The intent of the project is not to move all indicators to desired conditions at once but to make improvements over existing conditions; allowing more time for natural large wood recruitment and geomorphological processes to bring the river in balance with large wood.

No Action Alternative

The “No Action” alternative provides a baseline for the analysis of environmental effects.

This Alternative would not propose an active program to restore wood in the 13-15.5 mile reach of the Chewuch River nor any other river restoration activities. The wood needed for increasing large wood complexity would have to be recruited through natural processes.

Recovery of pool habitat and restoring the quantity and quality of off-channel rearing habitat in the river would also be left to natural processes. Without wood recruitment and retention, those processes are hindered.

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 will 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).

Proposed Action

The U.S. Forest Service, Methow Valley Ranger District, and the Yakama Nation are currently proposing restoration actions on the Chewuch River from river mile 13 to 15.5. This is the third in a series of Chewuch River restoration projects. Additional project proposals are anticipated in future years, but information about site locations or designs has not been provided. Therefore, the future proposals are not considered reasonably foreseeable actions for the purpose of this analysis. Plans for restoration are designed to enhance fish habitat and to improve fish habitat diversity by:

- increasing habitat complexity by introduction of large wood,
- increasing pool habitat, and
- restoring historic off-channel habitat.

The proposed action is based on projects described in the Chewuch RM 13-15.5 Concept Design Report (Inter-Fluve 2013) and includes the following activities. Locations for each of the sites and associated access routes are shown on Figure 1, the Project & Vicinity Map.

Construction of a Backwater Alcove Channel: A backwater channel is an abandoned historic channel segment connected to the main river only at their downstream end. These channels provide rearing habitat for juvenile fish and hydraulic refuge during spring runoff.

Site 14D would provide rearing habitat for juvenile fish and a high-flow velocity refuge for multiple life stages of fish. If the backwater channel receives cold groundwater from upslope, then a temperature refuge may also be created during the summer. It would include the use of about 36 trees with rootwads, along with any trees removed during access and construction. It would involve excavating the channel to create a low flow connection to the Chewuch River. The left bank of the channel would be 10-15 feet from the toe of the East Chewuch road in order to maintain a riparian buffer.

Site 14B would create immediate rearing habitat for juvenile fish and a high-flow velocity refuge for multiple life stages of fish. The first 100 feet of the channel would be on lands managed by USDA Forest Service, with the remainder of the channel, 300 feet, on WDFW lands. The project would involve excavating an old channel scar to form a low flow connection to ground water and the Chewuch River.

Access to the site would occur from the West Chewuch Road, Forest Road 5100000.

Construction of Standalone Engineered Log Jams: Each of these structures would provide cover and rearing habitat for salmonids. Log structures would be buried or closely associated with the bank and could extend out into the channel depending on site conditions. River velocities interacting with the wood structures would cause localized scour and pool development.

Site 14A would provide immediate adult and juvenile cover and rearing habitat. It is a buried bank logjam that would extend out into an existing pool about 10-15 feet along approximately 40 feet of riverbank. Eight trees, between 10 and 18 inches diameter at breast height (DBH) would need to be removed to access the site and during construction. Any trees removed would be used in the logjam along with an estimated 13 trees with rootwads intact.

An existing non-system native surface road would be used for site access. A fence would be cut and some improvement would be required at the West Chewuch Road shoulder to access the non-system route.

Site 14H would provide immediate adult holding and juvenile rearing habitat. It is a buried bank jam extending about 10-15 into the channel along approximately 40 feet of riverbank. Five trees between 7 and 19 inches diameter at breast height (dbh) would need to be removed to access the site and during construction. Any trees removed would be used in the logjam along with an estimated 34 trees with rootwads.

A temporary access route would be needed for site construction. Brush and small trees adjacent to the road shoulder would be removed to develop the access and would be used in the logjam. The access route would be shared with Site 14I.

Site 14I would provide immediate adult holding and juvenile rearing habitat. It is a buried bank jam that would extend about 10-15 feet into the channel along approximately 65 feet of bank. Nine trees between 6 and 25 inches dbh may need to be removed to access the site and during construction.

Any trees removed would be used in the logjam along with an estimated 43 trees, both with and without rootwads. Four additional trees that have fallen within the jam site would also be used in the project.

A temporary access route, off the East Chewuch Road (Forest Road 5010000), would be needed for site construction. The temporary access route would be shared with Site 14H.

Site 14N would provide immediate adult holding and juvenile rearing habitat. It is a small, buried bank jam downstream of an abutment from a bridge that washed out in 1948. The jam would extend about 10-15 feet into a pool formed by the abutment along approximately 30 feet of riverbank. Nine trees between 5 and 27 inches dbh would need to be removed to access the site and during construction. Any trees removed would be used in the logjam along with an estimated 18 trees with rootwads.

Site 14N would be accessed via a non-system road that is an historic stock driveway.

Site 14P would provide immediate adult holding and juvenile rearing habitat. It is a buried bank jam that would extend out into the channel about 10-15 feet along approximately 45 feet of riverbank. Seven trees between 2 and 10 inches dbh would need to be removed to access the site and during construction. Any trees removed would be used in the logjam along with an estimated 29 trees with rootwads.

Site P would be accessed through an existing WDFW campground area.

Site 14Q would provide immediate adult and juvenile rearing habitat. It is a buried bank jam that would extend out into the channel about 15-20 feet along approximately 50 feet of riverbank. Some trees may need to be removed to access the site and during construction. Any trees removed would be used along with an estimated 37 trees with and without rootwads.

Access for site 14Q would be via a non-system native surface road that goes through an existing dispersed campsite.

Construction of a bar apex jam: Engineered logjams placed on mid-channel bars and areas riverward of the stream bank provide cover habitat, and in certain locations, promote natural river migration processes and naturally created habitat. The interaction between the wood and flowing water can form deep pools that provide excellent fish habitat adjacent to mid-river logjams.

Site 14E includes the use of about 36 trees with and without root wads. Access to site 14E would be on USDA Forest Service managed lands while the site of the constructed bar apex log jam would be on lands managed by WDFW. The apex jam is designed to enhance the existing natural processes by adding to a mid-channel bar wood deposit.

Construction of pool enhancement with large wood cover habitat: Enhance existing pools by excavating small and large boulders from the pool and installing large wood cover habitat. The boulders currently prevent the pool from developing. Removing the large rock and installing the large wood habitat promotes localized scour. The overhanging and submerged wood provide cover habitat for returning adults and juvenile fish within the scoured pool. Deeping the pools provides over winter habitat for aquatic species.

Site 14C would include the use of about 17 trees with root wads to create cover habitat within an existing side channel pool. Adult salmon and steelhead may use the site for staging and it would likely be

used by juvenile Chinook and steelhead. The existing pool was formed and is maintained by the Chewuch River but has no cover habitat.

Site 14L is a surface large wood cover habitat project designed to provide rearing habitat for juvenile salmonids. Adult salmon and steelhead may use the site for staging and it is likely to be used by juvenile Chinook and steelhead. It would include the use of two large whole trees from a nearby stand of pine trees. The site is expected to use an estimated six trees with rootwads plus any tree salvaged for the project.

Access to the site would be along a non-system, native surface road.

Site 14O would provide adult holding and juvenile rearing habitat; enhancing an existing pool by excavating small and large boulders then providing large wood boulder ballasted cover in the pool. It involves the use of about six trees with rootwads.

Access would be through a dispersed campground site.

Table 1: Design Features for all sites in the Proposed Action

Number	Design Feature
1	All access routes and existing road templates encountered within the project area will be rehabilitated and restored to promote vegetation recruitment, soil productivity and hydrologic function. The road prism will be ripped at a minimum and/or fully recontoured to reduce soil compaction, increase infiltration capacity and prevent unauthorized motorized access.
2	Best Management Practices (BMPs) will be utilized which include: invasive weed management, scattering slash, replanting with native vegetation approved by the Forest Service and erosion mitigation.
3	Do not fall trees within 100 feet of <i>Sanicula</i> populations
4	Design access routes to avoid <i>Sanicula</i> populations or individuals.
5	All soil displaced from <i>Sanicula</i> populations shall be replaced back to its origin.
6	Prior to ground-disturbing activities in areas containing <i>Sanicula</i> , a FS Botanist must identify and mark all plants in the zone of disturbance for transplanting.
7	The documented cadastral markers, corners, and the boundary fencing will be avoided during project implementation.
8	All project undertakings will avoid National Register eligible cultural resources per Section 106 of the NHPA.
9	The two existing infestations of invasive plant species will be treated annually by the FS prior to and after project implementation
10	All heavy equipment must be cleaned prior to entering National Forest System lands.
11	Native plant materials are the first choice in revegetation where timely natural regeneration of the native plant community is not likely to occur.
12	Straw or mulch used for restoration of disturbed soil must be weed-free.
13	This project would use design criteria described under the Conservation Measures for Fish Passage Culvert and Bridge Projects described in the 2014 FWS and NMFS Washington State Fish Passage and Habitat Enhancement Restoration Programmatic Consultation Biological Opinions (FWS No.: 13410-2008-FWS # F-0209 & NMFS Tracking No.: 2008/03598).
14	Vertical members needed for structural stability should vary in height.
15	Implementation timing of July 1 – July 30
16	Bald eagle and osprey nest surveys must be completed each spring until project is implemented.

Number	Design Feature
17	Design restoration sites to minimize need to fell large diameter (>18" dbh) cottonwood and cedar trees.

Table 2: Design Features applicable to specific sites in the Proposed Action

Number	Design Feature
18	Forest Service will identify shared access route to be used for sites 14I and 14H
19	Forest Service will mark trees at the following sites for removal and use in the construction of log jams: <ul style="list-style-type: none"> • Site 14H, one large live spruce tree • Site 14L, two large (24-30" dbh by 60-70') trees for use at site 14L and two large trees for use at site 14Q
20	A FS Botanist will be present when the access route to site 14L is finalized.
21	All equipment shall be washed immediately prior to entering Sensitive plant sites. This applies to sites 14H, 14I, and 14L.
22	Use trees with limbs attached when possible, and integrate brush or small trees with limbs attached into structures 14A, 14E, 14H, 14I, 14N, 14P, and 14Q
23	Install bumper logs on structures 14A, 14I, and 14Q

Table 3: Mitigation Measures for Alternative 2

Number	Mitigation
1	Transplant <i>Sanicula</i> individuals located within zones of disturbance. Reintroduce individuals back to their original habitat post-disturbance. All transplant work will be done with FS Botanist oversight.
2	If avoidance of a cultural resource is not possible, mitigation will 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.
3	For three years, all disturbed soil areas would be annually inspected for invasive plants
4	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; remove, chip, or burn all slash, re-grade the camping area or access area, reconstruct fire rings, vegetate site by seeding or transplanting, maintain open road access, protect or reconstruct fences, and reconstruct trails.

Comparison of Alternatives

Degree to Which the Purpose and Need for Action is Met

For alternative 2, the long-term effects of the project to fishery habitat would be an increase in total pool and deep, complex pool habitat, logjams per mile, and off-channel habitat, which would successfully meet the need within the proposed reach. Aquatic habitat diversity within the project area would move toward meeting the desired condition, as defined by (Shull and Butler 2014) The number of log jams per mile would increase to within about half of the desired level. Total pools and deep, complex pools per mile would be adjusted to within about 60 and 90 percent of what the desired number is for the Chewuch River. Off-channel habitat would double in size.

Table 4: 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	0.9	Increase of~5
	Pools	Pools/mi	6.7 - 9	Increase of ~4.5
		Deep, Complex Pools/mi	5.8 - 9	Increase of~5
	Off-Channel Habitat	Number of off-channel habitat areas	2	4
Maintain Water Quality	Sediment	NTU	No-effect	Small temporary increase during construction
Wild & Scenic River Outstandingly 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

Degree to Which the Alternatives Address the Issues

Table 5: Summary comparison of how the alternatives address the key issues

Issue	Indicator/Measure	Alt 1	Alt 2
<p>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.</p>	<p>Scenic Quality: Scenic integrity objective and Visual Quality Objective</p>	<p>High Scenic integrity objective, and Retention Visual Quality Objective</p>	<p>Overall, High Scenic integrity objective, and Retention Visual Quality Objective, however sites 14N and 14Q would not meet this level</p>
	<p>Scenic Quality: Development along the river</p>	<p>The shoreline is largely undeveloped</p>	<p>Two structures would be noticeable, and increase the developed look in the vicinity of the structures. Overall, the undeveloped character would be retained.</p>
<p>2. The constructed structures could impact the recreation outstandingly remarkable value by changing the landscape character as seen from developed campgrounds, dispersed campsites, or the State Campground.</p>	<p>Recreation Experience: Overall changes to recreation opportunities.</p>	<p>No changes in overall recreation opportunities.</p>	<p>No changes to most recreation activities along the river. Outstanding recreation opportunities would still dominate, and popularity of the area would not decrease.</p>
	<p>Recreation Experience: Degree of changes to aspects of developed campgrounds and dispersed campsites that are valued by the public</p>	<p>No changes in surrounding landscape character.</p>	<p>One structure would moderately alter view of the riverbank across from Falls Creek Campground. Would not change the popularity of the campground.</p>
			<p>No apparent change in setting of dispersed campsite near structure 14O. Structure would appear natural, and not interfere with usefulness of site. Short –term impact to the use of the site, which would be closed during construction. Site restoration mitigation measures would return site to original condition, with no long-term impact on popularity or use</p>
<p>Structure 14Q would be a dominant feature in downriver view from the campsite. It would also be an obstacle to avoid for boaters launching from the site. Short –term impact the use of the site, which would be closed during construction. Site restoration mitigation measures would return site to original condition, with no long-term impact on popularity or use.</p>			

Issue	Indicator/Measure	Alt 1	Alt 2
			One structure would be across the river from the State Campground, but would blend with the surrounding riverbank and not change the popularity of the campground.
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 <i>Sanicula</i> populations, a Region 6 Sensitive plant Species found at sites B, H and I	Acres of occupied <i>Sanicula</i> Habitat;	6.97	6.97 (Temporary loss of .025. Ultimately no loss)
	Number of individual <i>Sanicula</i>	534	524
	Number of <i>Sanicula</i> populations	2	2
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
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 short duration during middle of summer.
6. 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	1
7. Site access and construction will include soil disturbance and will 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. Clean equipment and materials required.
8. Existing populations of invasive plants in the project area could be spread by project	Amount of soil disturbance	0	12 restoration sites with temporary access routes totaling approximately two miles

Issue	Indicator/Measure	Alt 1	Alt 2
activities such as site access and construction.	Activity within existing site. Yes/No	No activity within two known sites in project area; recreational activities occur within sites	Yes. Design criteria and mitigation measures minimize potential for spread.

Environmental Impacts of the Proposed Action and Alternatives

This section summarizes the potential impacts of the proposed action and alternatives for each impacted resource. Resources that were not impacted and therefore not further analyzed include: fire, fuels, range, and silviculture.

Botany

Regulatory Framework

Land and Resource Management Plan

The Okanogan National Forest Land and Resource Management Plan (LRMP) does not provide additional standards and guidelines (S&G) for Threatened, Endangered, or Survey and Manage plant species. Northwest Forest Plan direction, which applies to all portions of the project west of the Chewuch River, is described below under Survey and Manage. The following Forestwide guideline addresses Sensitive species:

S&G 6-19 - addresses Sensitive species, stating, “Sensitive plants and animals should be protected.”

Federal Law

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.

Survey and Manage

On December 2009, the District Court for the Western District of Washington issued an order on partial summary judgment in favor of the Plaintiffs finding inadequacies in the NEPA analysis supporting the *Record of Decision to Remove the Survey and Manage Mitigation Measure Standards and Guidelines from Bureau of Land Management Resource Management Plans Within the Range of the Northern Spotted Owl* (FS et al. 2007)(2007 ROD). The District Court did not issue a remedy or injunction at that time.

Plaintiffs and Defendants entered into settlement negotiations that resulted in the 2011 Survey and Manage Consent Decree, adopted by the District Court on July 6, 2011.

The Defendant-Intervenor subsequently appealed the 2011 Consent Decree to the Ninth Circuit Court of Appeals. The April 25, 2013 ruling in favor of Defendant-Intervener remanded the case back to the District Court.

On February 18, 2014, the District Court vacated the 2007 RODs, thereby returning the Forest Service to the 2001 Record of Decision.

The District Court and all parties agreed that projects begun in reliance on the Settlement Agreement should not be halted. Under District Court order, the Forest Service and BLM develop and implement

projects that meet the 2011 Settlement Agreement exemptions or species list, for three categories of projects. This project is consistent with category 1:

Projects in which any Survey and Manage pre-disturbance survey(s) has been initiated (defined as at least one occurrence of actual in-the-field surveying undertaken according to applicable protocol) in reliance upon the Settlement Agreement on or before April 25, 2013;

Surveys for this project were conducted in 2011 (see the project file for field notes dated in 2011).

There are four categories of projects exempt from the Survey and Manage standards and guidelines as stipulated by Judge Pechman (October 11, 2006, “Pechman exemptions”). The Category “C” exemption was used in the portions of the project occurring within the Northwest Forest Plan (all sites on the west side of the Chewuch River):

Riparian and stream improvement projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning; and where the stream improvement work is the placement of large wood, channel and floodplain reconstruction, or removal of channel diversions;

Watershed Analysis

The Chewuch River Watershed Analysis (1994) includes 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.

Other Guidance or Recommendations

A full description of the Forest Service Manual direction and policies for threatened and endangered species, sensitive species and species viability applicable to the Chewuch River Restoration project is available in the Botany Resource Report in the project record.

Sensitive Species are defined as those plants and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers or density and habitat capability that would reduce a species’ existing distribution (FSM 2670.5).

Affected Environment and Environmental Consequences

Considered but Not Analyzed In Detail

Table 6: Resources Considered But Not Analyzed in Detail

Resource	Rationale for Dismissing from Further Analysis
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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 (<i>Hackelia venusta</i>) and Wenatchee Mt. checker-mallow (<i>Sidalcea oregana var. calva</i>). 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 known to occur on the Okanogan-Wenatchee National Forest; water howellia (<i>Howellia aquatalis</i>) and Ute ladies'-tresses (<i>Spiranthes diluvialis</i>). 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.

Table 7: 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.)?
<i>Sanicula marilandica</i>	Occupied habitat.	Acres of occupied habitat lost.	Yes	Forest Plan S/G 6-19, FSM 2620, FSM 2670
	Individuals.	Number of individuals lost.	Yes	Forest Plan S/G 6-19, FSM 2620, FSM 2670
	Populations.	Populations lost.	Yes	Forest Plan S/G 6-19, FSM 2620, FSM 2670

Methodology

Effects are analyzed by determining where disturbance will overlap with *Sanicula* populations, determining the nature and level of disturbance, and assessing the plant’s vulnerability to the disturbance.

All populations of *Sanicula* documented in the project area were delineated and mapped. When populations were small enough, exact counts of individuals were taken. For larger populations, the number of individuals was estimated based on smaller subsets of data. Acreage of each population was determined using GIS software.

Resource Indicator: Occupied Habitat

Occupied habitat is suitable habitat occurring within delineated population boundaries established during pre-disturbance field work. 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 *Sanicula* 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 *Sanicula* populations. Access routes were assumed to have a footprint 20 ft. wide.

Resource Indicator: Individuals

For each population within the project area, a total count of *Sanicula* individuals is known or estimated. Because *Sanicula* 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 to 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 number of individuals occurring in the proposed disturbance.

Resource Indicator: Populations

For this analysis, 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.

Affected Environment

Surveys located three Sensitive plant sites in the project area. All three sites are populations of *Sanicula* black snakeroot. One of the three populations is located entirely on WDFW land, and is not subject to Forest Service regulations. Seven total populations of *Sanicula* are known to occur on Methow Valley Ranger District lands, and all occur within the Chewuch River watershed. *Sanicula* is considered a Sensitive species according to the Region 6 Interagency Special Status & Sensitive Species Program (ISSSP) 2011 list. It is considered secure globally and nationally, but imperiled in the state of Washington (Washington Natural Heritage Program (WNHP)). The seven populations of *Sanicula* occurring in this watershed (one of which occurs on state land) are the only known occurrences of this species in the planning unit (Okanogan-Wenatchee National Forest). The only other known occurrences in Washington State are on the Colville National Forest, with one exception on Washington State Department of Natural Resources Land near Loomis, WA.

Sanicula grows in moist, low areas, such as meadows, riparian flood plains, moist woods, and marsh edges. Some of the Washington occurrences are on calcareous substrates (Ahrensleger and Cabral 2007). Elevation at which it occurs ranges from 1500 to 2900 feet in Washington State. In the planning area, associated species variously include *Picea engelmannii*, *Pseudotsuga menziesii*, *Thuja plicata*, *Populus trichocarpa*, *Populus tremuloides*, *Betula occidentalis*, *Symphoricarpos albus*, *Rubus parviflora*, *Cornus stolonifera*, *Cornus canadensis*, *Ribes lacustre*, *Linnaea borealis*, *Equisetum arvense*, and *Galium aparine*.

Sanicula is a perennial andromonoecious (flowers can contain either both male and female reproductive organs, or just male reproductive organs) herb that blooms in late spring or early summer, and sets fruit by mid-summer. Flowers are most likely pollinated by flying nectar-sucking insects such as halictid bees, masked bees, and syrphid flies. Seeds are likely distributed by mammals, becoming entangled in their fur and later dropped. Seeds might also be distributed by seasonal water flow. While little to no data exists for seed germination of this species, similar species have been shown to be capable of establishing seed-banks with a delayed germination of up to six years (Hawkins and others 2007). *S. europaea*, with similar life-history traits to *Sanicula*, has been shown to have reduced reproductive success in small populations, likely due to Allee-effect (Kolb and Lindhorst December 2005). *Sanicula* occasionally reproduces

rhizomatously. This information is all important when considering the viability and definition of populations.

Table 8: Resource Indicators and Measures for the Existing Condition

Resource Element	Resource Indicator	Measure	Existing Condition (Alternative 1)
<i>Sanicula marilandica</i>	Occupied habitat.	Acres	6.97 (0.35 WDFW)
	Individuals	Est. of Individuals	534 (50 WDFW)
	Populations.	Number of populations	2 (1 WDFW)

Resource Indicator: Occupied Habitat

The three populations located in the project area occupy a total of 7.31 acres of habitat. One of those populations (0.35 acres) is on state WDFW land.

Table 9: Acres of Occupied *Sanicula* Habitat by Site

Site	Project Group	Acres of Occupied Habitat
WDFW (FS site # 06080400232)	Falls Creek	0.35
Site 06080400229	Falls Creek	6.30
Site 06080400233	Spring Creek	0.66

Resource Indicator: Individuals

Table 10: Count of Individual *Sanicula* Plants by Site

<i>Sanicula</i> Site	Project Group	Number of Individuals
WDFW (FS site # 06080400232)	Falls Creek	50 (est.)
Site 06080400229	Falls Creek	500 (est.)
Site 06080400233	Spring Creek	34

Resource Indicator: Populations

There are two known populations of *Sanicula* in the project area on National Forest land. There is also a population of *Sanicula* on adjacent land, managed by WDFW, where that agency is considering a project.

Environmental Consequences

Alternative 1 – No Action

Under a no-action alternative, plant habitat conditions and trends in the project area would remain unaltered. Existing populations of *Sanicula* 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. The response of *Sanicula* to wildfires is unknown. Natural fluctuations in hydrology and associated land-features such as river side-channels could potentially alter habitat conditions at sensitive plant sites.

Alternative 2 – Proposed Action

Project Design Features and Mitigation Measures

Table 11: Design Features

Number	Design Feature	Why Necessary	Efficacy	Consequence of Not Applying
3	Do not fall trees within 100 feet of <i>Sanicula</i> populations	Prevent mechanical damage to and loss of individuals and/or degradation of habitat.	High	Loss of individuals and/or occupied habitat.
4	Design access routes to avoid <i>Sanicula</i> populations or individuals	Limit the loss of individuals and degradation of habitat.	High	Loss of individuals and/or occupied habitat.
5	All soil displaced from <i>Sanicula</i> populations shall be replaced back to its origin.	Local topsoil contains a <i>Sanicula</i> seedbank that will aid in the recovery of the disturbed portion of the site.	High	Loss of seedbank.
6	Prior to ground-disturbing activities in areas containing <i>Sanicula</i> , a FS Botanist must identify and mark all plants in the zone of disturbance for transplanting.	Prevent accidental loss of individuals.	High	Potential loss of individuals.
20	A FS Botanist will be present when the access route to site 14L is finalized.	Limit the loss of individuals and degradation of habitat.	High	Loss of individuals and/or occupied habitat
21	All equipment shall be washed immediately prior to entering Sensitive plant sites. This applies to sites 14H, 14I, and 14L.	Prevent spread of invasive plant species within Sensitive plant populations.	High	Loss of habitat, potential loss of individuals.

Table 12: Mitigation Measures

Number	Mitigation	Why	Efficacy	Consequences	Monitoring Required
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Number	Mitigation	Why	Efficacy	Consequences	Monitoring Required
1	Transplant <i>Sanicula</i> individuals located within zones of disturbance. Reintroduce individuals back to their original habitat post-disturbance. All transplant work will be done with FS Botanist oversight.	Prevent loss of individuals	Fair. A trial transplant resulted in 77% survival.	Loss of some individuals, but a greater loss is mitigated.	2 years post-reintroduction.

Effects

Table 13: Resource Indicators and Measures for Alternative 2 (WDFW population not analyzed – information displayed is for Forest Service land only)

Resource Element	Resource Indicator	Measure	Alternative 2
<i>Sanicula marilandica</i>	Occupied habitat.	Acres	6.97 (Initial loss of 0.025. Ultimately no loss)
	Individuals	Est. of Individuals	524 (Potential loss of 10. Likely loss of 3).
	Populations	Number of populations	2

Resource Indicator: Occupied Habitat

Occupied *Sanicula* habitat would be initially reduced by approximately 0.025 acres during access and construction. Mitigation measures would re-populate this habitat with native vegetation and *Sanicula* individuals salvaged from the area of disturbance. With the application of mitigation measures, no change in the amount of occupied habitat would be expected.

As it is currently proposed, the connected project (site 14B) on WDFW land would result in losses to occupied habitat. The population occurs in the side channel that is currently proposed to be excavated. WDFW specialists are working to revise the proposal with the intent of lessening impacts on *Sanicula*.

Resource Indicator: Individuals

Within the area of disturbance, ten *Sanicula* individuals are expected to be transplanted. Based on transplant trials with the species, a 77% survival rate is expected. Thus, a loss of three individuals is expected. Out of an estimated 500 individuals in the population, this would be a 0.6% loss of individuals.

As it is currently proposed, the connected project (site 14B) on WDFW land would lead to indirect effects to individuals outside the zone of ground-disturbance resulting from changes in shade-regime, groundwater, species assemblage, microclimate, and loss of suitable habitat. WDFW specialists are working to revise that proposal with the intent of lessening impacts on *Sanicula*.

Resource Indicator: Populations

While the loss of a population would be deemed unacceptable, no loss of populations is expected on Forest Service land.

As it is currently proposed, the connected project (site 14B) on WDFW land would lead to direct effects to the population resulting from excavation, tree-falling, and work-related traffic. WDFW specialists are working to revise that proposal with the intent of lessening impacts on *Sanicula*.

Cumulative Effects

Spatial and Temporal Context for Effects Analysis

The spatial boundaries for analyzing cumulative effects to *Sanicula* populations encompass all known populations in the Chewuch Watershed because they occur within such 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 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 10 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. As discussed in the Affected Environment portion of this document, 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.

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

As discussed previously, a concurrent river restoration project is planned on WDFW lands adjacent to the Forest Service lands addressed in this analysis. As it is currently designed, the WDFW proposal for site 14B includes excavation of a river side channel for fish rearing habitat and construction of logjam features along the riverbank. WDFW specialists are working to revise the proposal with the intent of lessening impacts on *Sanicula*.

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

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.

Table 14: Resource Indicators and Measures for Cumulative Effects

Resource Element	Resource Indicator	Measure	Alternative 2	Past, Present, and Future Actions	Cumulative Impacts
<i>Sanicula marilandica</i>	Occupied habitat	Acres	43.5	43.475	43.475
	Individuals	Est. of Individuals	>3500	loss of up to 50	loss of up to 50

Resource Element	Resource Indicator	Measure	Alternative 2	Past, Present, and Future Actions	Cumulative Impacts
	Populations	Number of populations	7	6 (potential loss of 1 population from connected action on WDFW land)	6 (potential loss of 1 population from connected action on WDFW land)

Resource Indicator: Occupied Habitat

Table 15: Occupied Habitat Cumulative Effects

Project	Overlap In Time Space		Measurable Cumulative Effect	Extent, Detectable
	Yes	No		
Forest Service Grazing	Yes	Yes	No	Grazing is expected to continue indefinitely. One <i>Sanicula</i> 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 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 occupied habitat would be expected.

Resource Indicator: Individuals

Table 16: Individual Cumulative Effects

Project	Overlap In Time Space		Measurable Cumulative Effect	Extent, Detectable
	Yes	No		

Project	Overlap In Time Space		Measurable Cumulative Effect	Extent, Detectable
	Yes	No		
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 would be expected.
Washington Department of Fish and Wildlife River Restoration Project	Yes	Yes	Yes	This project would be concurrent with the Proposed Action for site 14B. Effects to individuals on WDFW land would be directly measurable. As proposed, it would likely decrease the number of individuals within its project area by half, or more.

Resource Indicator: Populations

Table 17: Population Cumulative Effects

Project	Overlap In Time Space		Measurable Cumulative Effect	Extent, Detectable
	Yes	No		
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 and occupied habitat. 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 populations as a whole would be expected.

Project	Overlap In Time Space		Measurable Cumulative Effect	Extent, Detectable
Washington Department of Fish and Wildlife River Restoration Project	Yes	Yes	Yes	This project would be concurrent with the Proposed Action at site 14B. Effects to the populations would be directly measurable. As proposed, it would likely decrease the number of individuals and occupied habitat within its project area by half, or more, and greatly diminish the viability of the population. As currently proposed, the project on WDFW land has the potential to cause or contribute to the total loss of the single <i>Sanicula</i> population that occurs within its project boundaries.

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

Oka-Wen 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 will be in compliance with 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 of Sensitive plant species, and does not contribute to or trend these species toward being listed as Threatened or Endangered.

This project complies 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

Summary

Some disturbance to *Sanicula* individuals and habitat is expected under Alternative 2. However, the effects of the disturbance will be mitigated by salvaging affected individuals, holding them at a nursery until work is finished, then transplanting them back to where they were collected. Furthermore, re-vegetation will take place in the disturbed portions of the project area, restoring habitat. The proposed action, properly mitigated, may impact *Sanicula* individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.

A concurrent restoration project on WDFW land may impact *Sanicula* individuals or habitat.

Cultural Resources

The following section summarizes the existing condition of cultural resources in the Chewuch River Habitat Restoration project area between river miles 13.0 to 15.5, along with the direct, indirect and cumulative effects of the proposed action alternatives as analyzed in Cultural Resources Specialist Report (R2014060804005). Reference information is contained in the full specialist report in the analysis file.

Regulatory Framework

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 Forest Service lands. It also establishes the process that the SHPO utilizes to review Forest Service undertakings for NHPA compliance.

The *National Environmental Policy Act* (NEPA) of 1970 is also a cultural resource management directive as it calls for agencies to analyze the effects of their actions on sociocultural elements of the environment. Laws such as the National Forest Management Act (NFMA) of 1976, the Archaeological Resources Protection Act (ARPA) of 1979, the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990, and Executive Order 13007 (Indian Sacred Sites) also guide Forest Service decision-making as it relates to cultural resource management.

The Okanogan and Wenatchee National Forest (OWNF) Land and Resource Management Plans (1989, 1990) tier to the previously mentioned laws and corresponding Forest Service Handbook and Forest Service Manual direction as it sets forth resource management goals, objectives, and standards. Forest-wide management standards that are pertinent for this cultural resource effects analysis include:

- Conduct a professionally supervised cultural resource survey on National Forest lands to identify cultural resource properties. Use sound survey strategies and the OWNF Cultural Resource Inventory Survey Design and site location predicative model.
- Evaluate the significance of sites by applying the criteria for eligibility to the National Register of Historic Places (Parker and King, 1998).
- Consider the effects of all Forest Service undertakings on cultural resources. Coordinate the formulation and evaluation of alternatives with State and Federal agencies, and with leaders and the Tribal Historic Preservation Officer (THPO) of American Indian tribes with historic ties to the project planning area.

Tribal Consultation

Many of the previously described 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 March 7, 2014. No comments or concerns have been received to date from either party. Documentation of compliance with the NHPA was prepared in accordance with the 1997 PA. Consultation with the Washington SHPO was completed prior to the publication of the Chewuch River Habitat Restoration project area between river miles 13.0 to 15.5 Environmental Assessment (EA).

Affected Environment and Environmental Consequences

Affected Environment

Methodology

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 have focused on three primary types of resources: prehistoric archaeological sites, historic archaeological sites, and TCPs, which are valued places to contemporary Indian and non-Indian communities. Cultural resource identification efforts have included pedestrian field surveys, literature reviews, Geographic Information Systems (GIS) analysis, and consultation with American Indian tribes that are historically associated with the area.

Eight (8) previous cultural resource surveys and Forest Service inventory projects along with eight (8) rock art (pictograph) overviews have taken place within or adjacent to the project area. These surveys amounted to the discovery of two (2) cultural resource sites. The OWNF 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 PA with SHPO, an intensive cultural resource inventory of the project area of potential effect (APE) began in 2011. The OWNF site location probability model was used to identify areas for survey. The model uses a variety of environmental variables such as slope, distance to water, and landform type along with oral and recorded history to predict the likelihood that an area will contain material evidence of past human activity. Sample strategy standards require that intensive, systematic pedestrian survey be applied to no less than 100% of high site location probability areas, 35% of moderate probability areas, and 5% of low probability areas. The entire project area was determined to be within high site location probability which required 100% pedestrian survey coverage. This survey led to the discovery and recordation of two (2) new cultural resource sites and a new feature associated with a previously recorded livestock driveway. Of the four cultural resource sites located in the project planning area, three sites date to the late 19th and early 20th centuries. One site, the West Chewuch/Falls Creek Pictograph site (FS Site 06080400178/45OK392), may date to the prehistoric (Pre A.D. 1750) or proto-historic (A.D. 1750-1811) period.

Prehistoric and Historic Overview of the Project Area

Lands administered by the Okanogan-Wenatchee National Forest have attracted human use and occupation for more than 13,000 years as represented by prehistoric and historic sites and artifacts scattered across the Forest. The first people in the area likely migrated through the Chewuch River corridor sometime after the glaciers receded at the end of the last glacial period (110,000 to 10,000 years BP). These people developed seasonal camps and hunting and gathering areas. Early camps were small (<11 square meters) and consisted of stone circle features with external hearths (Ames and others 1998). Early sites, dated to this period through faunal remains, include Marmes Rockshelter, Chief Joseph Reservoir, Kettle Falls, Lind Coulee, and sites in the Wells Reservoir area. As populations grew over time, settlements increased in size. Subsistence strategies changed toward a more efficient use of salmon

and root crops. Intensive exploitation of riverine environments led to increased sedentism and seasonal reoccupation of sites (Sarah K. Campbell and others 1985) (Chatters 1986) (Galm and Masten 1985). The Chewuch River was likely used seasonally and then over longer periods of time as populations grew accustomed to a sedentary lifestyle.

A pictograph site is located within the project planning area. This site is considered a Forest Priority Heritage Asset (PHA) and is eligible for the National Register per SHPO determination and concurrence. The site is outside the project APE and will not be affected by project activities.

Three historic cultural resource sites associated with late 19th and early 20th century homesteading and livestock are also located within the project planning area. These sites consist of homestead entry survey (HES 74) markers and associated features, a water crossing associated with a livestock driveway, and a bridge associated with a historic road. Following the establishment of tribal reservations and the removal of tribes from the region, the area was opened to public settlement. Miners looking for gold, lead and silver ores and homesteaders hoping for viable land flocked to the region after 1886. Homesteading and living stock rearing along river valleys, including the Chewuch flourished. Homestead Parcel 74 (FS Site 06080400409) was settled in 1906 by Abert Boesel. The homestead entry was surveyed and mapped in 1913. Most of the homestead is now located on Washington Department of Fish and Wildlife (WDFW) land. However, survey markers and boundary fencing associated with the homestead occur on Forest land. A buried boulder, used to mark Corner 1, is no longer in place and was possibly washed away or buried in the 1948 flood. Corner 2 was blazed on a tree, along with two bearing trees. These trees are now stumps, but the blazing is still visible. The site remains “unevaluated” for the National Register and features will be avoided during project activities.

As the Euro-American population increased in the area, so did livestock production and the need for grazing lands. A segment of the Brewster-Pasayten Stock Driveway (FS Site 06080400093) occurs within the project planning area. The Falls Creek Sheep Bridge is an historic bridge associated with the driveway. The bridge was constructed between 1917 and 1918, and washed out in the 1948 flood. The only features remaining to mark its location are the bridge abutments and a short segment of the road or possible driveway that leads up to an abutment on the eastern side of the river. The area was a popular camping spot used by stock herders. This segment of the Brewster-Pasayten Stock Driveway and bridge feature have been determined “not eligible” for the National Register per SHPO concurrence. The driveway, which is an existing dirt road, will be used during project implementation (see Direct Effects section). The Falls Creek Water Crossing (FS Site 06080400410) at the mouth of Falls Creek may have been the site of a single-log span bridge crossing. Some vague references in historic grazing records mention the use of single log spans to cross the Chewuch River near the mouth of Falls Creek. Additional features at the site include blazed trees and historic debris along both banks of the river. The site has been determined “not eligible” for the National Register per SHPO concurrence.

National Register of Historic Places Evaluation

Cultural resources are evaluated for their eligibility to be listed on the National Register of Historic Places (NRHP) under the Criteria of Significance (36 CFR 60.4). The determination of eligibility is documented by a cultural resource specialist and concurred upon by the SHPO. Once the determination of eligibility has been finalized, measures must be taken to avoid or mitigate potential damage to the qualities that make a cultural resource significant. Otherwise, the project has the potential to adversely affect the site. Under 36 CFR 60.4, there are four criteria for evaluating a cultural resource. The quality of significance of a cultural resource is evaluated based on the integrity of location, design, setting, materials, workmanship, feeling, and association, and,

- A. the association with events that have made a significant contribution to the broad patterns of our history; or
- B. the association with the lives of persons significant in our past; or
- C. the embodiment of the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- D. The ability to yield or potentially yield additional information important in prehistory or history.

A cultural resource that fits one of these four criteria and retains quality of significance is considered “eligible” for listing on the National Register. If the cultural resource does not fit any of the National Register criteria or quality of significance, it is determined “not eligible”. Sites that cannot be determined “eligible” or “not eligible” are considered “unevaluated”. Unevaluated sites retain the same protection measures and considerations of effect afforded to “eligible” sites. Of the four (4) cultural resources located within or adjacent to the project area, the West Chewuch Pictograph site (FS Site 06080400178/45OK392) is eligible, the Brewster-Pasayten Stock Driveway (FS site 06080400093) Falls Creek Sheep Bridge and the Falls Creek Water Crossing site (FS Site 06080400410) are not eligible, and the Homestead Parcel 74 site (FS Site 06080400409) remains unevaluated. State of Washington archaeological site forms were completed for the Falls Creek Bridge, the homestead parcel and the Falls Creek water crossing only; the pictograph site form remains unchanged.

Traditional Cultural Properties

The NHPA, NEPA and other authorities require that federal agencies consider the impact of their actions on cultural uses of the natural environment such as those practiced by present-day communities of American Indians. Resources of contemporary tribal interest may include TCPs, areas important for the practice of Indian religion, Indian sacred sites on federal lands, and areas that support cultural uses of the natural environment (i.e. subsistence use of plants or animals). The project area encompasses the traditional lands used by the Northern Okanogan, Methow, Chelan, Nespelem and Skagit peoples. The Methow people historically lived in the area, but exact boundaries of their original territory remain unknown (Teit 1928). Seven winter villages were recorded in 1938 (Walters 1938). At least 16 village sites are reported along the Methow, Chewuch, and Twisp River systems during a historic overview presented in an Indian Claims Commission proceeding in 1956. What is known about the Methow culture comes largely from the journals of early explorers, fur trappers, naturalists, and missionaries. At the time of Euro-American exploration, the Methow were located largely along riverine systems, living in semi-sedentary pit house villages and subsisting on salmon, ungulates and seasonally available wild root crops (Sarah K Campbell 1989).

The Methow Tribe is now part of the Confederated Tribes of the Colville Reservation. Through Executive Order, these tribes have guaranteed rights to customary uses in the Methow Valley. The Yakama Indian Nation also has treaty rights that influence the Methow Valley. Since the Chewuch River flows into the Methow, and eventually into the Columbia, all project activities along the Methow and in the Methow Valley in general could potentially affect fish habitat that are of interest to both tribal governments. Bibliographic resources pertaining to the region were reviewed for information regarding cultural landscape, traditional world views, traditional religious views and practices, subsistence practices and rituals, the occupancy of land, and the use of resources. To date, neither the Confederated Tribes of the Colville Reservation or the Yakama Nation have identified TCPs or traditional gathering or use areas within the project area.

Environmental Consequences

Complete site avoidance during project implementation is the preferred method of management for cultural resources that have characteristics qualifying them for inclusion on the NRHP. If the integrity of the cultural resource and/or surrounding areas is altered by project activities, that project is considered to have direct and/or indirect effects on the site. Two alternative actions have been proposed by the Forest as a result of the Chewuch River Restoration River Miles 13 to 15.5 project analysis. These actions may potentially have direct, indirect and cumulative effects on the four cultural resource sites identified within the APE.

Effects

The criteria for determining a project’s effect on cultural resources is found in 36 CFR 800.5. A determination of an “adverse effect” is reached when a project has the potential to “alter directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property’s location, design, setting, materials, workmanship, feeling, or association.” Typical riparian restoration activities, such as channel dredging, sediment or rock removal, vegetation removal and/or enhancement, and woody debris placement, can cause surface impacts that may adversely affect the integrity of cultural resources. Impacts can be direct (e.g. the dredging of channels within a National Register eligible site), indirect (e.g. visual changes to the landscape around a site) or cumulative (e.g. future undertakings within a site boundary).

Alternative 1 – No Action

Under the No Action alternative, river restoration treatments, road work or other ground-disturbing activities would not take place along river miles 13 to 15.5 of the Chewuch River. Ongoing and future activities, such as routine resource maintenance, recreation use, grazing, and noxious weed control would occur under current LRMP standards. This alternative would have little direct and indirect effects on cultural resources. Alternative 1 would virtually eliminate the likelihood of ground disturbing activities to damage cultural resources in the project area. Routine resource and infrastructure management would continue under the LRMP, which tiers to cultural resource protection and avoidance.

Alternative 2 – Proposed Action

Project Design Features and Mitigation Measures

Table 18: Design Features

Number	Design Feature	Why Necessary	Efficacy	Consequence of Not Applying
7	The documented cadastral markers, corners, and the boundary fencing will be avoided during project implementation.	Prevent accidental damage to historical features	High	Damage of cultural heritage historical resources

Number	Design Feature	Why Necessary	Efficacy	Consequence of Not Applying
8	All project undertakings will avoid National Register eligible cultural resources per Section 106 of the NHPA.	Law requires this per Section 106 of the NHPA.	High	Violation of law. Damage to cultural heritage resources.

Table 19: Mitigation Measures

Number	Mitigation	Why	Efficacy	Consequences	Monitoring Required
2	If avoidance of a cultural resource is not possible, mitigation will 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.	This is required by law and Forest Service policy	High	Damage to cultural resources	A CRT or Archaeologist would be required to be present during activities likely to disturb cultural resources.

The proposed project involves restoration activities that will benefit salmon recovery by restoring stream habitat and riparian areas. These activities will include the placement of large wood and engineered logjams (ELJs) in the Chewuch River and river channel enhancements at 12 locations. These activities have the potential to directly affect cultural resources during implementation, in particular cultural resources located in areas subjected to flooding and/or erosion or cultural resources located below the surface. Sites 06080400178 (eligible) and -410 (not eligible) will be avoided during project implementation but one work location and an access route to another work location overlap cultural resource sites 06080400093 (not eligible) and -409 (unevaluated) respectively.

Work location Site 14N would be accessed via an existing non-system dirt road that was once the corridor for stock driveway site 06080400093. This segment was recently documented as part of the Falls Creek bridge abutment feature and was determined “not eligible”. This is an existing road and no improvements will be needed to use the road. Work location 14A is located within the boundary of homestead site 06080400409, which remains “unevaluated”. No features of the site were located at the proposed work location. The documented cadastral markers, corners, and the boundary fencing are located well away from the river and will be avoided during project implementation. All project undertakings identified under Alternative 2 will avoid National Register eligible cultural resources per Section 106 of the NHPA.

As such, the determination of no adverse effect, in accordance with 36 CFR 800, is recommended for the project. In addition, because site probability is high in the APE and the potential for buried cultural resources exists, monitoring by a cultural resource specialist is recommended during the use of heavy

equipment in the project area, including the installation of ELJs and placement of LWD, and the excavation along river banks and in former river channels. A separate monitoring report will be prepared to document the result of project monitoring.

Cumulative Effects

Spatial and Temporal Context for Effects Analysis

The project area of potential effect includes all National Forest System lands administered by the Methow Valley Ranger District that are within the designated boundary established for this project. The cultural resources effects analysis, including cumulative effects, focuses on cultural resources identified within the project planning area boundary.

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

Past and future forest management projects have the potential to cumulatively impact cultural resources within the project area. Typical resource management activities can cause surface disturbance that may affect the integrity of cultural resources. Ongoing and future monitoring and inspections of known or newly identified cultural resources in the project area would trigger adjustments in management practices (as appropriate) to ensure that cultural resources are considered and managed to standard within the Chewuch River corridor. Any potential impacts to cultural resources that might incur from future actions within the project APE would be mitigated per the 1997 PA with the Washington State SHPO.

Other Relevant Mandatory Disclosures

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

Heritage and Tribal interests are regulated by federal laws that direct and guide the Forest Service in identifying, evaluating and protecting cultural resources. All of the alternatives would comply with federal laws. The Okanogan-Wenatchee National Forest Plan tiers to these laws, therefore the proposed action alternatives meet Forest Plan Standards. With the completion of the cultural resources inventory per Section 106 of the NHPA and under the terms of the 1997 PA with Washington SHPO and by providing the interdisciplinary team with appropriate input as per NEPA, all relevant laws and regulations have been met.

Required Monitoring

Monitoring by a cultural resource specialist is recommended during the use of heavy equipment in the project area, including the installation of ELJs and placement of LWD, and the excavation along riverbanks and in former river channels.

A separate monitoring report will be prepared to document the result of project monitoring

Invasives

Regulatory Framework

Land and Resource Management Plan

This analysis conforms to the requirements of *Pacific Northwest Invasive Plant Program Final Environmental Impact Statement, Record of Decision* (USDA-FS November 2005), hereafter referred to as the 2005 PNW ROD. This project is intended to comply with *the Okanogan and Wenatchee National Forests 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).

The Okanogan National Forest Plan standards and guidelines for noxious weeds are:

S&G12-1 - Control noxious weeds to the extent practical.

S&G12-2 - New infestations of noxious weeds should be the first priority for eradication.

S&G12-3 - Emphasis on noxious weed control shall be the prevention of infestations, especially into un-roaded areas and wilderness.

Other Guidance or Recommendations

The current strategy for invasive species management has four elements (USDA-FS October 2004):

1. Prevention – Stop invasive plants before they arrive.
2. Early detection and rapid response – Find new infestations and eliminate them before they become established.
3. Control and management – Contain and reduce existing infestations.
4. Rehabilitation and restoration – Reclaim native habitats and ecosystems.

Relative to noxious weeds, the prevention strategy is always preferred and employed as the initial strategy. However, due to the nature of noxious weeds, the prevention strategy is often not adequate to ensure complete exclusion of noxious weeds.

Affected Environment and Environmental Consequences

Resource Indicators and Measures

Resource indicators and the measures used for assessing project effects to invasives are described below.

Table 20: 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.)
Invasive Plant Prevention	Establishment of new infestations	Use of clean equipment and materials Yes/No, and amount of soil disturbance	Yes	ONF LRMP S&G 12-3 USDA FS (2004) Element 1
Invasive Plant Control	Spread of existing infestations	Activity within existing sites, Yes/No	Yes	ONF LRMP S&G 12-1 USDA FS (2004) Element 3

Methodology

Resource Indicator: Invasive plant prevention

The prevention of new invasive plant infestations includes the use of clean equipment and materials to prevent seed dispersal, the limit of soil disturbance, and the restoration of disturbed sites with native vegetation. The use of clean equipment and materials and the restoration of the sites is part of the proposed action. The basis for effects analysis will be the amount of new soil disturbance.

Resource Indicator: Invasive plant control

The control of existing invasive plant infestations includes containment and reduction or eradication of the infestations through treatment. Containment of an infestation includes the prevention of heavy equipment use within the infested site. The basis for effects analysis will be whether project implementation includes activities within existing infestations.

Affected Environment

The project area is relatively low elevation (2200-2300 ft.) riparian forest. It is 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, and 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.

Table 21: Resource Indicators and Measures for the Existing Condition

Resource Element	Resource Indicator	Measure	Existing Condition (Alternative 1)
Invasive Plant Prevention	Establishment of new infestations	Use of clean equipment and materials, Yes/No Amount of soil disturbance	No equipment or materials used. Soil disturbance from dispersed recreational activities
Invasive Plant Control	Spread of existing infestations	Activity within existing sites, Yes/No	Recreational activities within and adjacent to 2 known sites in project area

Resource Indicator: Invasive Plant Prevention

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.

Resource Indicator: Invasive Plant Control

Two infestations of species classified as new invaders are known to exist within the project area. A small population of whitetop was first documented in 2005 and has been treated four years since. It has been reduced in size and number of plants but not yet eradicated. A population of common tansy was first

documented in 2006 and has been treated numerous times since. Inspections in 2013 and 2014 found no plants. This infestation may have been eradicated but will require additional monitoring.

Environmental Consequences

Alternative 1 – No Action

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

Alternative 2 – Proposed Action

Project Design Features and Mitigation Measures

Table 22: Design Features

Number	Design Feature	Why Necessary	Efficacy	Consequence of Not Applying
9	The 2 existing infestations of invasive plant species will be treated annually by the FS prior to and after project implementation	To help prevent spread of existing invasive plants	Good. The annual treatment of known infestations would prevent the production of new seeds that could easily be dispersed by project activities.	Higher potential for project activities to move seeds or other plant parts to different areas.
10	All heavy equipment must be cleaned prior to entering National Forest System lands.	To help prevent establishment of new infestations	Good. The cleaning of equipment would prevent the introduction of new weed seeds to the project area.	Higher potential for dirty equipment to introduce weeds seeds from outside the project area.
11	Native plant materials are the first choice in revegetation where timely natural regeneration of the native plant community is not likely to occur.	To help prevent the establishment of new infestations and the spread of existing infestations.	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.	Higher potential for disturbed soil areas to be infested with invasive plants.
12	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 weeds seeds from outside the project area.

Table 23: Mitigation Measures

Number	Mitigation	Why	Efficacy	Consequences	Monitoring Required
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Number	Mitigation	Why	Efficacy	Consequences	Monitoring Required
3	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.	Early detection of new infestations	Yes, monitor annually for three years

Effects

Table 24: Resource Indicators and Measures for Alternative 2

Resource Element	Resource Indicator	Measure	Alternative 2
Invasive Plant Prevention	Establishment of new infestations	Use of clean equipment and materials, Yes/No Amount of soil disturbance	Yes. Clean equipment and materials required; 12 restoration sites with temporary access trails totaling approximately 2 miles
Invasive Plant Control	Spread of existing infestations	Activity within existing sites, Yes/No	Yes

Resource Indicator: Invasive Plant Prevention

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 12 restoration sites. Eight of the sites would require temporary access trails/roads that would total approximately 2 miles in length. 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.

Resource Indicator: Invasive Plant Control

Both known invasive plant sites would be inspected and treated annually by the Forest Service prior to and after the implementation of this project. Proposed activities would occur adjacent to these known populations. 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.

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.

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 of two known sites that are being controlled and monitored. 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.

Table 25: Resource Indicators and Measures for Cumulative Effects

Resource Element	Resource Indicator	Measure	Alternative 2 (Units)	Past, Present, and Future Actions (Units)	Cumulative Impacts (Units)
Invasive Plant Prevention	Establishment of new infestations	Use of clean equipment and materials, Yes/No Amount of soil disturbance	Yes. Clean equipment and materials required; 12 restoration sites with temporary access trails totaling approximately 2 miles	Yes and No. Not all past actions used clean equipment. Future dispersed recreationists will likely not use clean equipment. Past and present soil disturbance at 5 dispersed recreation sites.	12 restoration sites with temporary access trails totaling approximately 2 miles and existing dispersed recreation use at 5 sites.
Invasive Plant Control	Spread of existing infestations	Activity within existing sites, Yes/No	Yes	Yes, from past and present dispersed recreation.	Minimized and mitigated

Resource Indicator: Invasive Plant Prevention

Table 26: 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 prevention of new populations.

Resource Indicator: Invasive Plant Control

Table 27: 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.

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

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

Required Monitoring

All disturbed soil areas would be inspected annually for three years for invasive plants.

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, the design criteria and mitigation measures incorporated into the proposed activities will minimize this potential.

Water Resources

Regulatory Framework

Land and Resource Management Plan

The Okanogan National Forest Plan provides direction for the management of aquatic and riparian habitat in the Chewuch River Restoration Project area (USDA-FS 1989a) (Elliott 1986). Currently, the Chewuch River is the boundary between two different land management areas. To the west, the Northwest Forest Plan (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-FS and USDI-BLM 1994)) amended the LRMP. To the east, 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 1995) amended the LRMP in 1995.

The proposed action, which includes the design criteria and mitigation measures described in Chapter 2, was designed to be consistent with standards and guidelines from the LRMP as amended. The following regulatory framework discussion is separated into three different management plans and they are the LRMP, the Northwest Forest Plan, and PACFISH.

Okanogan National Forest Plan

The LRMP’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 (USDA-FS 1989a). Fish 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 under the LRMP 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 will be managed to promote bank and channel stability and riparian areas will be managed to provide a continuing supply of large wood for fish habitat (USDA-FS 1989a).

The LRMP contains a number of Forest-wide standards and guidelines that pertain to fisheries. A full description of the LRMP standards and guidelines applicable to the Chewuch River Restoration project is available in the Water Resource Report in the project record.

Northwest Forest Plan

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 of National Forest System lands 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 a priority for habitat restoration. Standards and guidelines in the NWFP for Riparian Reserves of particular relevance to this habitat restoration project include:

Activity Type – Key Watersheds (page C-7)

Key Watersheds are highest priority for watershed restoration.

Activity Type - Watershed and Habitat Restoration (page C-18)

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.

Activity Type - Fish and Wildlife Management (page C-18)

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

PACFISH

The PACFISH amended the Okanogan National 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 of National Forest System lands at the watershed scale that focus on maintaining and/or improving conditions and processes associated with streams and adjacent riparian. The Lower Chewuch River watershed is a designated Key Watershed and is priority for habitat restoration. The two applicable RMOs include Pool Frequency and Large Woody Debris. The RMO suggested pool frequency is around 23 pools per mile. Suggested large wood levels is more than 20 pieces per mile that are greater than 12 inches diameter and 35 feet long.

Standards and guidelines in PACFISH for RHCAs of particular relevance to the project include:

Activity Type - Watershed and Habitat Restoration (page C-18)

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.

Activity Type – Fish and Wildlife Restoration (page C-18)

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.

Federal Law

- Endangered Species Act
- The Magnuson-Stevens fishery Conservation and Management Act
- Clean Water Act

State and Local Law

- Regional Water Quality Control Board Requirements

Watershed Analysis

The Chewuch Watershed Analysis (USDA-FS 1994a) 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 habitat and 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 of 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.

Affected Environment and Environmental Consequences

The proposed project is located on the Chewuch River, around Falls Creek. 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 (Table 1). There are no Region 6 Sensitive Species within the project area.

Table 28: 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 federally threatened under the ESA, use this area on the Chewuch for migration, rearing, and over-wintering habitat. Additionally, the project area provides habitat for MIS and EFH listed above. National Marine Fisheries Service and US Fish and Wildlife Service have designated the Chewuch River as critical habitat for Chinook, 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 Table 2.

Table 29: Resources Considered But Not Analyzed in Detail

Resource Indicator	Rationale for Dismissing from Further Analysis
Chemical contaminants	Use of equipment or fueling of equipment in proximity to stream can add toxins to waterways. This indicator is mitigated to negligible levels due to implementation of design criteria that keep chemical contaminants outside areas where they could be delivered to streams in measurable volumes or 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 will not impact water yield in any measurable way from vegetation cover removal or increase/decrease in the drainage network (roads).
Water Quality (temperature)	This project will 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 hyporheic 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 will not decrease shading or increase temperature.
Soil Resources	This project will have a short-term impact on soil resources (porosity and areas of bare soil). The impacts will be minimal, short-lived and mitigated by BMPs and rehabilitation. The project will improve porosity, productivity, nutrient cycling and vegetation establishment with the decommissioning of access routes and site restoration.
Essential Fish Habitat	This project would cause short-term, negligible impacts to the river. Impacts would be short-term in duration (few weeks) and the project would improve habitat conditions once complete. 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	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 LRMP and thus continued viability of the MIS is expected on the Okanogan National Forest.

Resource Indicators and Measures

Resource indicators and the measures used for assessing project effects to water resources are described below.

Table 30: 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*	Yes	(Shull and Butler 2014) (USDA-FS 2008) (PACFISH 1995) (USDA-FS 1989a) (USDA and others 2004)

* These determinations are based on the condition of the existing large wood, pool habitat, and off-channel pool habitat as compared to desired conditions defined in the Shull and Bulter (2014) report (tables19-22)

Methodology

Resource Indicator: Wood Density

Large wood is important for reducing river energy, forming pools, and adding overall habitat complexity. To identify the existing conditions within the project reach for large wood quantities, we relied upon the most recent detailed habitat inventory done in 2008 (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 was then 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 log jams) 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 log jams per mile that would occur under properly functioning wood conditions. This allowed the project hydrologist and fish biologist to determine where existing wood levels are compared to desired conditions.

The proposed wood treatment is to construct engineered logjams that will function as 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 will influence river process as an individual logjam, the unit of measure for assessing the changes to habitat diversity will be the number of logjams per mile.

Resource Indicator: Pools

Pool habitat is important for salmon and trout as rearing habitat for juveniles and deep pools are important for cool water holding areas for adults. The pool indicator is split into the number of total pools per mile and the number of deep, complex pools per mile, which are pools deeper than 3 feet with cover from woody debris. To establish baseline conditions we used both total pool frequencies (total pools per mile) and deep, complex pool frequencies inventoried in the Chewuch River during the 2008 habitat inventory (USDA-FS 2008). The 2008 pool frequencies were then compared to the 2014 Desired Condition Report (Shull and Butler 2014), which summarizes the range of desirable pool frequencies based on local natural

river reaches, new scientific research, and federal land management direction. This allowed the project hydrologist and fish biologist to determine where existing pool frequencies are compared to desired conditions. The units of measure for assessing existing conditions and the changes to habitat diversity will be the number of total pools and deep, complex pools per mile.

Resource Indicator: Off-Channel Habitat

Off-channel areas provide important rearing habitats for juvenile salmonids during spring runoff periods and throughout the year. Existing off-channel habitat conditions, which includes number of habitat features (pools, cover, large wood, etc.) and their accessibility, was identified using the 2008 stream survey data (USDA-FS 2008). There are no numerical standards or desired number of off-channel features available. Rather, desired conditions are described as this type of habitat existing at a frequency and condition at or close to what occurs naturally (USDA and others 2004). Alluvial fans are a key geomorphic feature in the river and the area just above these are where off-channel habitat exists. The project hydrologist and fish biologist compared existing off-channel habitat to where it would be expected to occur in areas above alluvial fans. This allowed for determining how close the project reach is to having a desirable level of off-channel habitat.

Resource Indicator: Sediment

Fish species in the Lower Chewuch Watershed are sensitive to accumulations of sediment in spawning substrates. Excessive fine sediments reduce pool habitat, spawning habitat quality, and the availability of off-channel rearing habitat for juveniles during spring peak flows, which results in reduced fish survival rates. To assess fine sediment levels in the Chewuch River and streams across the watershed, the fish biologists collect sediment data using the McNeil Core Sediment surveys (USDA-FS 2013). Sediment data was compared to the LRMP sediment standard of fines (<1mm) in spawning areas. Anticipated sediment effects would be an increase in suspended sediment (turbidity), which is typically measured using a Nephelometric Turbidity Units (NTU) meter. The project hydrologist will assess 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 include: 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. Of these habitat attributes, large wood levels, deep pool habitat, and off-channel habitat are applicable for this project.

Fish habitat in the lower Chewuch River, below Lake Creek, is identified as a Priority 2 designation for salmon and steelhead recovery ((RTT) 2013; UCSRB 2007) Priority 2 areas are defined as water bodies that support important aquatic resources such as federally endangered and threatened fish species, but have a higher level of at-risk habitat indicators than more pristine areas, resulting from habitat disturbance or loss.

The habitat indicator conditions described above were identified from the most recent stream surveys and sediment surveys (USDA-FS 2008), (USDA-FS 2013). These conditions were compared to the LRMP standards, PACFISH RMOs, the Desired Condition Report, and the Habitat Indicators Table (HIT) from the 2004 Analytical Process for Developing Biological Assessments for Federal Actions Affecting Fish within the Northwest Forest Plan Area (USDA-FS 1989a), (PACFISH 1995), (Shull and Butler 2014) and (USDA and others 2004) to assess whether the fishery resource value and habitat for ESA fish is non-functioning, functioning at risk, or properly functioning. The above documents define habitat conditions

that meet the habitat requirements for salmon and trout species (properly functioning) and the HIT further defines habitat conditions that are non-functioning or functioning at risk.

Integrating the above habitat indicator conditions with the biological requirements of project area fish species allowed the project fish biologist to determine the existing overall functionality of the project area fishery value. To assess the effects to this indicator, the project fish biologist will compare the changes in habitat diversity with desired conditions for fishery habitat described above.

This project will result in some unintended short-term negative effects to ESA listed fish species and their critical habitats. Therefore, the project fish biologist must make an ESA project effects determination to the fish species and their designated critical habitat in order comply with NEPA regulation. ESA effects determination to listed fish and their habitat will be determined by integrating project effects during construction with anticipated impacts to and biological needs of the fish species present. The project fish biologist will assess short-term effects based on the various fish life states present during the work and from effect determinations from those discussed in regional biological opinions from the National Marine Fisheries Service (NMFS) and US Fish and Wildlife Service (FWS).

Affected Environment

Table 31: Resource Indicators and Measures for the Existing Condition

Resource Element	Resource Indicator	Measure	Existing Condition
Channel Morphology/Fish Habitat	Wood Density	Log Jams/mi	0.9
	Pools	Pools/mi	6.7 - 9
		Deep, Complex Pools/mi	5.8 - 9
	Off-Channel Habitat	Quantity of Habitat	Two off-channel habitat features present
Water Quality	Sediment	Nephelometric Turbidity Units (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 important roles in aquatic ecosystems, especially in the Cascade Mountain hydrophysiographic province. Instream wood influences stream channel shape and form that leads to channel diversity and favorable fish habitat conditions. Since European settlement, the amount and size of large wood in stream systems has decreased as a result of human activities. A reduction in wood quantities has resulted in adjustments to channel maintenance processes, a loss of complex pool habitats, and a loss of high quality spawning areas. This general trend is evident in the Chewuch River.

Actions that have reduced wood numbers include direct interventions, such as LW removal for safety or flood conveyance, as well as more indirect impacts, like riparian roads and past riparian logging, to the

processes that are necessary for the supply and retention of instream wood. Impaired processes include the following:

- 1) impaired riparian conditions including past clearing and development of riparian and floodplain areas that has resulted in fewer trees, younger trees, and shifts in the species composition of trees that are available to be recruited to the stream channel;
- 2) reduced LW recruitment due to channel alterations such as stream channelization, bank armoring, roadways, and protection of property, which have reduced the ability of stream channels to erode and recruit LW from riparian areas and floodplains; and
- 3) reduced in-channel retention as a result of channel and streambank alterations that have simplified stream channels and have reduced the ability of stream channels to effectively retain wood once it has been recruited.

The lack of available large “key pieces” necessary to capture other LW pieces has also resulted in less in-channel retention.

Existing Conditions

Large wood was measured in the following categories as part of the habitat surveys: 1) small, > 6” diam and >20’ long; 2) medium, >12” diam and >35’ long; and 3) large, >20” diam and >35’ long. In the 2008 survey, total wood numbers ranged from 15.3 to 48.1, depending on the reach, with medium and large pieces ranging from 4.4 to 19.7. Large pieces greater than 20 inches diameter were scarce at only 1.8 to 2.2 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 9.75-10.5m³. However, log volumes were not specifically measured during the Chewuch stream surveys.

Logjams were inventoried over a 2.3-mile reach from RM 11.75 to Falls Creek at RM 14.1 with only two jams observed. Logjam density was 0.9 jams per mile (Table 31).

Table 32: Existing and Desired wood densities for the Chewuch River project reach.

Existing LW/mi (>12” dia)	Desired LW/mi (>12” dia)	Existing LW/mi (> 20” dia)	Desired LW/mi (> 20” dia)	Existing Log Jams /mi	Desired Log Jams /mi
4.4 – 19.7	105 – 172	1.8 – 2.2	≥ 33	0.9 (RM 11.75-14.1)	10 – 19

Natural wood accumulation has occurred and some active wood recruitment is happening currently, which is increasing the habitat diversity, but in general, wood quantities are low. 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). LW 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 to 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 lower Chewuch. In the interim, wood additions are necessary to accelerate pool formation in the mainstem lower Chewuch.

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. Pool tails provide optimal spawning areas for salmonids due to hydraulic gravel sorting and intergravel flow characteristics (USDA-FS 1994b). (Baigun and others 2000) observed adult steelhead to 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.

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 per mile from the 2008 habitat survey ranged from 6.7 to 9 depending on the reach, and deep pools ranged from 5.8 to 9 pools per mile. The percent pool habitat ranged from 35.1% to 45.8%. These data are displayed in Table 32.

The Desired Condition Report (Shull and Butler 2014) identified desired pool frequencies for total pools and deep, complex pools (Table 32). From the inventoried pool habitat observed, the desired percent pool habitat by reach is in the range of 50 to 80 percent.

Table 33: Existing and Desired pool condition for the Chewuch River project reach.

Existing Pools/Mile	Desired Pools/Mile	Existing Deep, Complex Pool/Mile	Desired Deep, Complex Pool/Mile	Existing % Pool Habitat	Desired % Pool Habitat
6.7 – 9	19 - 31	5.8 – 9	12 - 15	35.1 – 45.8%	50-80%

Existing pool habitat is generally below desired condition metrics. 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.

Resource Indicator: Off-Channel Habitat

Background

Off-channel areas provide important rearing habitats for juvenile salmonids in the Upper Columbia. 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. Typically, 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 segment of the project reach is functioning at risk due to apparent infilling from excess fine sediment. Additionally, the river is believed to have down cut over the years, somewhat disconnecting the main channel from accessing the floodplain. This has led to juvenile fish access being cut off from important off-channel that provides refuge from high flows.

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 in the areas, 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. Much of the habitat has become disconnected, likely due to infilling with fine sediments during the 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. Additionally, 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.

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 (Shull and Butler 2014), 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.

Resource Indicator: Sediment

Background

Weathered granitic soil is common throughout the upper two-thirds of the watershed that is conducive to high erosion rates. Subsequently, the Chewuch watershed naturally has moderate to high erosion potential on about two thirds of the drainage area (USDA-FS 1994a). 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.

In the past, the naturally high levels of erosion and sediment delivery to the Chewuch River likely peaked following major disturbances such as fire and flood. This material was also 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 higher chronic or constant delivery component. This chronic component is delivered from roads in tributary drainages and bank erosion from channel downcutting 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, thereby reducing the frequencies and availability.

Existing Conditions

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

The percent fine sediments in spawning gravels in the Chewuch River in the past five years have decreased from years 2005 to 2007, and are at about the same level as years 2000 to 2004. The decreases in percent of fines in spawning gravels in 2008 to 2012 could be attributed to the end of a pulse of sediment that went through the system following a sediment delivery event in 2004. 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. The table and graph below shows the progression of sediment in the Chewuch; from before the landslide events (2000 to 2004), to the years affected by the event (2005 to 2007), to years 2008 to 2012, where the % fines in spawning gravels return to levels before the event.

All four reaches sampled for sediment in the Chewuch River were well below the 20% guideline in the LRMP. Data collected in 2012 is displayed in Table 33, 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).

Table 34: Summary of 2012 Chewuch McNeil Core data: Percent Fine Sediment Less than 1 mm

Reach	River Mile	Mean % fines <1 mm	Std dev <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

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

Surface fines in transport reaches are below the LRMP 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 spawning, rearing, and adult holding. Historically, the Chewuch River was considered an excellent producing area for Chinook salmon and steelhead because it is extremely well suited for the production of early running varieties of Chinook salmon and steelhead trout 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, lack of large wood, and pool habitat. Because of these various activities, salmon, steelhead and other fish species have decreased in numbers compared to historical abundance in the upper Columbia River system.

Existing Conditions

A high percentage of the spring Chinook salmon that return to the Methow Sub-basin spawn and rear in the Chewuch River and a small proportion (~12%) of the steelhead spawn and rear in the Chewuch. 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. In systems like the Chewuch River, large wood plays a major role in the formation of pools. 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 sediment that otherwise would not occur. However, many habitat elements within the Chewuch River are functioning on National Forest lands. Connectivity and access between the varieties of habitats required by migratory fishes is good, and riparian habitat in the watershed is generally in good condition.

Some challenges remain such as 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.

Overall, total pool frequencies, deep and complex pool frequencies, and instream large wood are lacking in the river and within the project reach. Data suggest that quality and access to off-channel habitat may be reduced due to reduced LWD levels, reduced wood recruitment, and natural sedimentation. Therefore, the “outstandingly remarkable fishery values” for the river and the project reach are below desired condition and considered functioning at risk. Similarly, the habitat conditions for ESA fish species is considered functioning at risk.

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 the fishery values that would be associated with a Wild and Scenic River. See the Desired Condition Report for details on the desired ranges for wood loading, pool habitat, and off-channel habitat.

Environmental Consequences

Alternative 1 – No Action

If the no action alternative is chosen, the 13-15.5 mile reach of the Chewuch River will 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 within the project reach is 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. Furthermore, natural restoration of the underlying processes will 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 generally below desired condition metrics. 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. 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 per 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

Table 35: Design Features

Number	Design Feature	Why Necessary	Efficacy	Consequence of Not Applying
13	<p>This project would use design criteria described under the Conservation Measures for Fish Passage Culvert and Bridge Projects described in the 2014 FWS and NMFS Washington State Fish Passage and Habitat Enhancement Restoration Programmatic Consultation Biological Opinions (FWS No.: 13410-2008-FWS # F-0209 & NMFS Tracking No.: 2008/03598).</p>	<p>In order to comply with applicable ESA and Clean Water Act laws, this project would follow a suite of design criteria aimed at minimizing impacts to aquatic and riparian resources.</p>	<p>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 this document for detailed descriptions for all criteria.</p>	<p>Not applying these would result in unwanted and unnecessary impacts to fish, the river channel, riparian vegetation, and the river’s floodplain. Examples: Not defishing the worksite would result in excess mortality of threatened and endangered fish. Not dewatering the worksites would result in excessive sedimentation to the river channel, thereby degrading fish habitat. Disturbance of riparian vegetation and the floodplain without replanting native vegetation and putting surface erosion mitigation would leave worksites in a disturbed, vulnerable condition. Reestablishment of native vegetation could take years and invasive weeds could easily get established. Each worksite would likely not comply with provisions in the Clean Water Act.</p>

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.

Effects

Table 36: Resource Indicators and Measures for Alternative 2

Resource Element	Resource Indicator	Measure	Alt 2
Channel Morphology/Fish Habitat	Large Wood	Log Jams/mi	~5
	Pools	Pools/mi	~4.5 pools of various sizes created from LW additions
		Deep, Complex Pools/mi	~5 pools, with adding wood to existing pool
	Off-Channel Habitat	Quality/Quantity of Habitat	Four off-channel habitat features present, high complexity
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

In this alternative, 12 structures with wood (8 standalone logjams, 2 backwater alcoves, 1 apex jam and 1 pool enhancement with LW cover habitat) would be constructed. About 240 logs of various sizes (~95 per/mile) instream would be added to the stream. An additional ~120 logs would be added to the backwater alcove and LW cover enhancement pools. The addition of 1 apex jam and 9 standalone jams would be ~ 5 jams per mile, which is below desired conditions (10 -19 jams/mile), but a large beneficial improvement. The intent of the project is to not move all indicators to desired conditions at once but to form a temporary adjustment over existing conditions to allow more time for natural LW recruitment and geomorphological processes to bring the river in a balance with LW.

Resource Indicator: Pools

Nine of the constructed logjams will be located in areas that do not have pool habitat. After a couple of years, these jams will scour out deep pools that will provide diverse rearing habitat for juveniles and holding areas for adult fish. At one existing pool, a wood jam will be placed to provide cover for fish. Combined, these will add nine new pools and make one more simple pool into a complex pool with the added wood. This will increase the range of total pool frequency from 6.7-9 per mile to 11.2 – 13.5 per mile, an increase of 55 to 67 percent. Similarly, deep complex pools frequency would go from 5.8-9 per mile to 10.8-14 per mile, an increase of 55-86 percent. Total pool area would increase as well. Additional pool habitat that has wood cover will almost double the amount of quality juvenile rearing and adult holding habitat within this reach. Survival of juveniles and adults using this reach is expected to improve.

Resource Indicator: Off-Channel Habitat

The creation of two complex backwater alcove and off-channel pool enhancement features with cover will improve off-channel habitat. There is no numeric target cited in literature for the amount of off-channel habitat that is considered healthy, but this habitat indicator would double in number 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. This project will benefit this 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. Subsequently, flows would not be at their lowest and turbidity downstream is expected. Following applicable design criteria and Best Management Practices (BMP), the turbidity downstream of the site is expected to be measurable for up to 100 feet downstream and for a period of no more than one hour following construction. Furthermore, 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 at more than 100 feet downriver of the sites. Therefore, the effects to the current stream sediment levels would be negligible and the existing sediment levels would remain.

Resource Indicator: Outstandingly Remarkable Fishery Values/ESA fish species

There is potential for some direct effects to ESA and other fish at the project site during the construction phase. 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 will 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 of the project to fishery habitat will be an increase in total pool and deep, complex pool frequency by 55 to 86 over current levels. Installing the logjams would increase the frequency from 0.9 jams per mile to 5.9 jams per mile. The number of off-channel habitat features would double in size and they would be constructed in naturally occurring areas in the floodplain. The high quality fine sediment levels would have a short-term, immeasurable increase and would remain principally the same. (Table 36).

Habitat qualities for endangered Chinook and threatened steelhead would improve substantially within the Chewuch River would move closer 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.

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 will overlap with grazing impacts, the road network and recreation.

The outstanding remarkable value for fisheries will be cumulatively impacted by past LW projects in the Chewuch River.

The temporal boundaries for the analysis of cumulative effects are similar to the spatial boundaries. The indicators of large wood, pools and off-channel habitat will not overlap in time with any other planned activity. The indicator for sediment will overlap in time with grazing, recreation and the transportation network. The outstanding remarkable value for fisheries will be cumulatively impacted by past LW projects in the Chewuch River.

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

Table 37: Resource Indicators and Measures for Cumulative Effects

Resource Element	Resource Indicator	Measure	Alt 2	Past, Present, Future Actions	Cumulative Impacts
Channel Morphology/Fish Habitat	Large Wood	Log Jams/mi	~5	0	~5
	Pools	Pools/mi	~4.5		~4.5
		Deep, Complex Pools/mi	~5		~5
	Off-Channel Habitat	Quality/Quantity of Habitat	The quality/quantity of off-channel habitat will increase by 2 new channels	0	The quality/quantity of off-channel habitat will increase by 2 new channels
Water Quality	Sediment	NTU	Small temporary increase, remain same	Negligible	None to slight
Scenic River Outstandingly Remarkable Values	Fishery Value	Degrade/Maintain /Improve	Improve	Improve	Improve

Resource Indicator: Wood Density

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

Resource Indicator: Pools

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

Resource Indicator: Off-Channel Habitat

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

Resource Indicator: Sediment

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

Table 38: 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 will still occur. These activities are all capable of producing sediment. There will be an overlap in timing of these activities with Chewuch LW additions. During implementation of the project, suspended sediment will be measurable during construction of the structures in the immediate vicinity of the project. The additional sediment production from the construction will be of a short duration, minimal and decrease to background upon cessation of the implementation work due to mitigation measures and design criteria. There will 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 LW projects in the Chewuch River would enhance fish habitat and have a beneficial impact on the outstandingly remarkable value for fisheries.

Table 39: Fishery Value Cumulative Effects

Project	Overlap In Time Space		Measurable Cumulative Effect	Extent, Detectable
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Project	Overlap In Time Space		Measurable Cumulative Effect	Extent, Detectable
Scenic River Outstandingly Remarkable Fishery Value/ESA Fisheries	Yes	Yes	Yes	Past projects have added LW and off-channel habitat to stream reaches below the project area on private, state, and USFS land. The Chewuch River is eligible for listing as a "Wild and Scenic" river and one of the ORVs making it eligible is its high fisheries value. The project will have a measurable cumulative impact upon fisheries and the impact will be primarily beneficial. There may also be additional LW projects in the future. All of these projects 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 LW projects will have a beneficial cumulative impact upon this ORV.

Other Relevant Mandatory Disclosures

Wild and Scenic River Outstandingly 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 "may affect, not likely to adversely affect" designated critical habitat for these species.

Consultation with the U.S. Fish and Wildlife Service and NOAA Fisheries was completed by the Yakama Nation and uses the U.S. Army Corp of Engineers' *Washington State Fish Passage and Habitat Enhancement Programmatic*. Concurrence with the effects determinations for federally listed species, described in the summary section below, was obtained from U.S. Fish and Wildlife Service and from NOAA Fisheries as part of the permitting process.

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

This project conforms to the Okanogan National Forest Plan, as amended by 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). The project site is located on the boundary of the Northwest Forest Plan and PACFISH management areas, which is the Chewuch River. On the east side of the river, the project is within a Key Watershed under the NWFP. On the west side of the river, the project is within a Key Watershed under the PACFISH. The project is consistent with standards and guidelines of these land management plans.

Okanogan National 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 LRMP contains a number of Forest-wide standards and guidelines that pertain to fisheries including fish habitat rehabilitation (page 4-31). Specific applicable S&Gs considered for plan conformance are listed below:

Activity Type – Fisheries (page 4-31 and 32)

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 will 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 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. Mitigation measures such as isolating the work sites will 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 a Key Watershed, which are identified as priority areas for restoration. Specific applicable standards and guidelines considered for Northwest Forest Plan conformance are listed below:

Activity Type – Key Watersheds (page C-7)

Key Watersheds are highest priority for watershed restoration.

The project is specifically intended to restore aquatic habitat complexity

Activity Type - Watershed and Habitat Restoration (page C-18)

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 complexity by increasing habitat complexity, pool habitat, cover habitat, and off-channel refuge habitat for all life stages of fish. This will 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.

Activity Type - Fish and Wildlife Management (page C-18)

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

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

PACIFSH

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

Activity Type - Watershed and Habitat Restoration (page C-18)

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 complexity by increasing habitat complexity, pool habitat, cover habitat, and off-channel refuge habitat for all life stages of fish. This will 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.

Activity Type – Fish and Wildlife Restoration (page C-18)

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

See above consistency statement for PACFISH WR-1.

Clean Water Act

This project uses design criteria minimizing the impacts to aquatic and riparian resources (See project design features and mitigation section). It is in compliance with the Clean Water Act.

Clean Air Act

Adding large wood to the Chewuch River would not affect air quality. Therefore, this project would comply with the Clean Air Act.

Summary

The project would increase large wood levels, 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 will minimize these effects to negligible levels. In the long-term, this effort will 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 fishery value. All applicable aquatic and riparian standards and guides would be met with the project design features.

Due to the presence of spring Chinook, steelhead, and possibly bull trout in the river while heavy equipment operations would be occurring, the project will affect these species temporarily and may result in “take” of the species. As a result, the project “may affect, likely to adversely affect” spring Chinook, steelhead, and bull trout for the short term. The project “may affect, not likely to adversely affect” designated critical habitat for these species. Overall, the project would result in long-term benefits to the species and their designated critical habitat within the project area.

Wild and Scenic Rivers (Recreation and Scenery)

Regulatory Framework

Federal Law

The Wild and Scenic Rivers Act

Congress created the National Wild and Scenic Rivers System 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. Under the Act, rivers are classified as wild, scenic, or recreational. Specific rivers across the country have been designated as part of the Wild and Scenic Rivers System. Once a river is designated, the values for which it was designated cannot be degraded.

The Okanogan National Forest Land and Resource Management Plan (USDA-FS 1989a) determined the Chewuch River, from the Thirtymile Trailhead to the Forest Boundary, is eligible for Wild and Scenic River designation in the scenic category. Scenic rivers are:

[t]hose rivers or sections of rivers that are free of impoundments, with shorelines or watershed still largely primitive and shorelines largely undeveloped, but accessible in places by roads.
(Wild and Scenic Rivers Act, 1968)

Section 7 of the Wild and Scenic Rivers Act directs federal agencies to protect the free-flowing condition and other values of designated rivers. Section 7(b) of the act applies to Agency-Identified, 5(d)(1), Study Rivers, such as the Chewuch, as well as Congressionally Authorized Study Rivers. This section provides a specific standard for review of developments below, above or on a stream tributary to a congressionally authorized study river. Such developments may occur as long as the project “will not invade the area or diminish the scenic, recreational, and fish and wildlife values present in the area on the date of designation...” Rivers found to be eligible for designation are not protected by the Act from proposed hydroelectric facilities or other federally assisted water resources projects that have the potential to affect the river’s free-flowing characteristics and other identified values. However, the managing agency should protect the values that make the river eligible or suitable (USFS, 2004). Section 7(b) 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.

The Act does not define terms; however, the codified regulations for Section 7 in 36 CFR 297 include definitions. The proposed Chewuch Restoration Project is considered a Water Resource Project. The definition of Water Resource Project includes “fisheries habitat and watershed restoration/enhancement”, as defined by the CFR and additional interpretation by the river-administering agencies (USDA-FS 2004).

The LRMP includes standards and guidelines (listed below) to ensure that management actions do not affect the eligibility of rivers to be considered by Congress for inclusion in the Wild and Scenic Rivers System.

Forest Service Handbook

Forest Service Handbook 1909.12, 82.5 gives direction for management of rivers, such as the Chewuch, that have been determined 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 all of 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.
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.

Land and Resource Management Plan

The Okanogan National Forest Land and Resource Management Plan provides standards and guidelines for projects along rivers found eligible for Wild and Scenic River designation. A full description of the LRMP standards and guidelines and management area guidance applicable to the Chewuch River Restoration project is available in the Wild and Scenic Rivers Resource Report in the project record.

Affected Environment and Environmental Consequences

Resource Indicators and Measures

Resource indicators and the measures used for assessing project effects to Wild and Scenic River eligibility are described below.

Wild and Scenic River Outstandingly Remarkable Values

The proposed action could impact the outstandingly remarkable values of the Chewuch River, identified in the Okanogan National Forest Plan as scenery, wildlife, fish and recreation.

Indicators and measures for assessing project effects to the fisheries outstandingly remarkable value are described in the Water Resources section beginning on page 40.

Indicators and measures for assessing project effects to the wildlife outstandingly remarkable value are described in the Wildlife section beginning on page 86.

The potential impact to the eligibility of the Chewuch River for Wild and Scenic River designation will be analyzed in this section by considering the effect on the scenic and recreation outstandingly remarkable values.

Scenic Outstandingly Remarkable Value: Determine whether constructed structures mimic natural features in terms of form, line, color, texture, and pattern, or if the number and appearance of the structures decrease the undeveloped nature of the riverbanks.

Recreation Outstandingly Remarkable Value: Determine whether the constructed structures degrade the scenic setting of the Falls Creek Campground or established dispersed campsites, or if they diminish the recreation value by posing an increased safety risk to boaters on the river.

Table 40: 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.)
Scenic Outstandingly Remarkable Value	Scenic Quality	Scenic Integrity Objective (SIO) and Visual Quality Objective (VQO) ratings	Yes	LRMP
		Number of structures not meeting High SIO and Retention VQO	Yes	Policy
Recreation Outstandingly Remarkable Value	Recreation Experience	Degree of changes to aspects of developed campgrounds and dispersed campsites that are valued by the public	Yes	LRMP
		Changes to Boater Safety	Yes	Agency Management Policy

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” (USDA-FS 1994b). The scenic and recreation outstandingly remarkable values are detailed in this report using the following analysis methods.

Resource Indicator: Changes in Scenic Quality

The scenic quality will be assessed by determining the Scenic Integrity Objective (high, medium, or low) and Visual Quality Objective (retention, partial retention, modification) of each structure based on the length of viewing time and deviations in the landscape character elements of form, line, color, texture, and pattern. Changes in the undeveloped character of the riverbanks will be determined by the number of structures not meeting a high SIO and retention VQO.

The Scenery Management System (SMS), as detailed in Agriculture Handbook Number 701, “Landscape Aesthetics, A Handbook for Scenery management” (USDA-FS 1995) established the method used in this analysis to evaluate the impacts of the proposed action on the scenic quality of the project area.

Table 41 shows the measurements used to evaluate the impact of a structure on the visual quality in terms of deviation in landscape character.

Table 41: Measurements of Deviations in Landscape Character

Deviations in Landscape Character	Measurement	Low Deviation	Moderate Deviation	High Deviation
Form: Most dominant element	Height of structure	At water surface more flush with ground, sand bars, islands	One to three stacked logs high, in scale with existing bank height.	Four stacked logs or higher, taller than existing bank height.
	Percentage of channel span	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 East and West Chewuch roads (5100000 and 5010000)	Amount of existing vegetation screening and placement along river corridor	Enhancement structure is screened by existing vegetation or islands and blends in Not noticeable	Enhancement structure is partially screened by existing vegetation is moderately noticeable	Enhancement structure is not screened by 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 but not a developed campsite.	Structure is visible from a developed campsite.

Form is defined as the structure, mass, or shape of an object. In the case of fish habitat improvement structures, this is evaluated by considering if the structure is in scale with naturally occurring log jams, and if the shape appears natural (random, without right angles). Measurements of scale include the height of the structure from the water surface and the

percentage of total channel width the structures spans. Form is also measured as the height and length of the structures in scale to the existing riverbank and/or islands/sand bars.

Line is defined as an intersection of two planes; a point that has been extended; a silhouette of form. In fish habitat improvement structures, this is evaluated by considering the extent of parallel logs and upright log piers. Measurements of line include the number of layers of parallel logs visible, the orientation of the logs in relation to the water flow, and the number and uniformity of the upright piers in a structure.

Color is defined as the hue of an object (red, green, blue, yellow, and so on), as contrasted with a value (black, white, or gray). In fish habitat improvement structures, this is evaluated by considering the contrast of the hue of the structure and naturally occurring colors surrounding it. Measurements include the color of the completed structure compared to naturally occurring logjams, and surrounding vegetation and soil.

Texture is defined as the visual interplay of light and shadow created by variations in the surface of an object. In fish habitat improvement structures, this is evaluated by considering the variations in the size and surface of the finished structure. Measurements include the incorporation of trees with limbs attached and use of brush or small trees, and increased variety with boulders of various sizes.

Pattern is defined as an arrangement of parts, elements, or details that suggests a design or somewhat orderly distribution. In fish habitat improvement structures, this is evaluated by considering if the shape appears natural (random, without right angles), and if the structures create a geometric, uniform pattern. Measurements include shape (random appearing, somewhat angular, strongly angular) and the amount and type of geometric pattern in the structure.

The analysis will 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 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: Changes to Recreation Experience

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

Analysis Area: The analysis will 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 view of the surrounding landscape.

Affected Environment

The LRMP determined the Chewuch River was eligible for designation under the Wild and Scenic Rivers Act. It is classified as “Scenic” 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. Wildlife and fish are discussed in those respective reports for this project, while scenery and recreation are addressed in more detail below.

Table 42: Resource Indicators and Measures for the Existing Condition

Resource Element	Resource Indicator	Measure	Existing Condition (Alternative 1)
Scenic Outstandingly Remarkable Value	Scenic Quality	Scenic Integrity Objective (SIO) and Visual Quality Objective (VQO) ratings	Current Scenic integrity objective is High, and Visual Quality Objective meets Retention overall.
		Number of structures not meeting High SIO and Retention VQO	No constructed log structures currently exist in this reach. Naturally occurring log jams and downed trees in the river provide variety
Recreation Outstandingly Remarkable Value	Recreation Experience	Degree of changes to aspects of developed campgrounds and dispersed campsites that are valued by the public	Falls Creek Campground is popular because of its proximity to the river, shallow water, beaches and large trees.
			Dispersed campsite near structure 14O is popular because of the proximity to river, flat ground, sandy swimming beach, and large trees.
			Dispersed campsite near structure 14Q is popular because of proximity to river, flat ground, isolated location, and good boat launch spot.
		Changes to Boater Safety	The State Campground*, within sight of structure 14L, is popular because of proximity to river, large open area easily accommodating groups of all sizes. People boat or raft along the river. Existing logjams are potential risks to boaters.

* A large, somewhat developed campground located on Washington Department of Fish and Wildlife land, referred to as the State Campground in this analysis

Resource Indicator: Scenic Quality

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 (USDA-FS 1995). 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

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 Wild and Scenic River eligibility determination. There are sections where roads are close to and visible from the river. The Eightmile Ranch¹, three developed campgrounds (Camp 4, Chewuch, and Falls Creek) and

¹ The Eightmile Ranch is a 50-acre ranch National Forest System land. The Methow Valley Ranger District pastures horses and mules on the ranch during the summer and fall.

some of the dispersed campsites can be seen from the river. River Mile 13 to 15.5 includes the Falls Creek Campground, a campground located on Washington State Department of Fish and Wildlife land (hereafter referred to as the State campground), a few 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.

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 logjams and downed trees in the river provide variety, along with rapids separated by deeper pools. The riverbanks vary in height from areas that are fairly 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.

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.”

Resource Indicator: Recreation Experience

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.

Camping

The Falls Creek Campground is within the project area. This seven-site campground sits on the bank of the Chewuch River. The campground is popular because each site fronts the river; the water in the river is shallow, with nice beaches. 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 14N is visible from the northern-most sites in the Falls Creek Campground, on the opposite 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. This dispersed camping is especially popular during general firearm season in October, and with large groups looking for a place where everyone can camp together throughout the camping season. Most of these campers stay in some sort of recreational vehicle, although some stay in tents.

Two of the proposed structures are near established dispersed campsites. Structure 14O is adjacent to a well-developed campsite popular throughout the summer. The campsite sits next to a sandy beach, and

has a fire ring and buck and pole fence to keep vehicles away from the river. It is popular because of its location on the river's edge, the sandy swimming beach, flat ground, and large trees providing shade.

Structure 14Q would be approximately 100 feet downstream from another popular campsite. This campsite has a fire ring, and post and pole fence defining its boundaries. It is popular because of its location right on the river bank, isolation from other campsites and people, flat ground, and large trees providing shade for camping, and also as a put-in spot for people boating or rafting down river to the Falls Creek Campground.

There is a large, somewhat developed campground located on WDFW land (hereafter called the State campground), just downstream from the Falls Creek Campground. It is a large, open area without designated camp spots. There are some fire rings, and an outhouse, and a post and rail fence to keep vehicles away from the riverbank. It is popular because of the proximity to the river and large, open area easily accommodating large and small groups of campers. Structure 14L would be located directly across the river from this campground, and visible to campers.

Boating

A relatively low number of people boat or raft down the Chewuch River each year. Logjams, whether naturally occurring or constructed, can be dangerous to boaters if the boaters become caught in or under a structure. There are naturally occurring logjams in the Chewuch, but they are infrequent and relatively small. Most are located along the riverbank, and do not extend out into the boater travelway of the river. The structures completed in the 2011 and 2013 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.

Chris Jonason, from a company called Wave Trek Rescue, conducted a Recreational Use Assessment in 2012 on Chewuch River Mile 9.56 to 13, downstream from the proposed project. The Whitewater Classifications for this reach include sections of Class I (easy), Class II (novice), and Class III (intermediate). Most of the river use occurs in the spring during high water run-off. The river can be dangerous during this time due to cold water temperatures and rapidly moving water. 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. 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 (Jonason 2012)

River use levels were very low during the 2012 study period. A total 10 people using small rafts were observed (Jonason 2012). The limited scope and time frame of this study prevent it from being used as a statistically valid estimate of use, however it does demonstrate that river use in this section of the Chewuch is low. Jonason concluded that the factors preventing more recreation use include:

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

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 campsite or a boat would remain largely undeveloped, with the existing exceptions of developed campgrounds and roads that can be seen from the river. The recreation outstandingly remarkable value would also be unchanged. There would be no new structures posing a potential danger to boaters, or altering the setting of dispersed campsites or developed campgrounds. The fish habitat value would continue to be compromised by a lack of structures providing hiding and rearing habitat, and a lack of pool habitat.

Alternative 2 – Proposed Action

Project Design Features and Mitigation Measures

Table 43: Design Features

Number	Design Feature	Why Necessary	Efficacy	Consequence of Not Applying
14	Vertical members needed for structural stability should vary in height.	To reduce deviations to landscape character.	Variance of upright pier height would decrease deviation to line and pattern by making structure appear more random and natural	Greater impact to scenic quality.
22	Use trees with limbs attached when possible, and integrate brush or small trees with limbs attached into structures 14A, 14E, 14H, 14I, 14N, 14P, and 14Q	To reduce deviation of the dominating form of the structure by adding texture of the landscape character.	Incorporation of limbs and slash improves natural appearance until debris collects and features weather over time.	Greater impact to scenic quality.
23	Install bumper logs on structures 14A, 14I, and 14Q	Reduce the risk of boaters being caught on or pulled under structure	The actual effectiveness of bumper logs has not been proven, but they were installed on previous structures. They could decrease the risk to boaters, but would not eliminate it.	Increased risk to boaters comparable to natural log features

Table 44: Mitigation Measures

Number	Mitigation	Why	Efficacy	Consequences	Monitoring Required
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Number	Mitigation	Why	Efficacy	Consequences	Monitoring Required
4	<p>Protect dispersed campsites, user-created trails, an access points to the river during construction, and restore them after the project is complete.</p> <p>Restoration measures include the following, as necessary; remove, chip, or burn all slash, re-grade the camping area or access area, reconstruct fire rings, vegetate site by seeding or transplanting, maintain open road access, protect or reconstruct fences, and reconstruct trails.</p>	<p>Avoid long-term impacts to dispersed campsites.</p>	<p>Highly effective at maintaining campsite quality post-project</p>	<p>Campsites near structures 14O and 14Q could become less desirable.</p>	<p>Check each site near the end of the construction to ensure restoration elements are completed.</p>

Effects

Table 45: Resource Indicators and Measures for Alternative 2

Resource Element	Resource Indicator	Measure	Alternative 2
Scenic Outstandingly Remarkable Value	Scenic Quality	Scenic Integrity Objective (SIO) and Visual Quality Objective (VQO) ratings of each structure	All structures except 14N and 14Q would meet High Scenic Integrity Objective, Retention Visual Quality Objective
		Number of structures not meeting High SIO and Retention VQO	Two - structures 14N would meet Moderate SIO and Partial Retention VQO. 14Q would meet Low SIO and Modification VQO
Recreation Outstandingly Remarkable Value	Recreation Experience	Degree of changes to aspects of developed campgrounds and dispersed campsites that are valued by the public	No changes to most recreation activities along the river. Outstanding opportunities would still dominate, and popularity of the area would not decrease.
			One structure would moderately alter view of the riverbank across from Falls Creek Campground. Would not change the popularity of the campground
			No apparent change in setting of the dispersed site near structure 14O. Structure would appear natural, and not interfere with usefulness of site. Short-term impact the use of the site, which would be closed during construction. Site restoration mitigation measures would return site to original condition, with no long-term impact on popularity or use.
			Structure 14Q would be a dominant feature in downriver view from the dispersed campsite. Would also be an obstacle to boaters launching from the site. Short-term impact the use of the site, which would be closed during construction. Site restoration mitigation measures would return site to original condition, with no long-term impact on popularity or use.
			No apparent change in setting of the State Campground. Structure across river and blends with surrounding
		Boater Safety	Bumper logs installed on structures 14A, 14I, and 14Q would reduce risk to boaters. The placement and size of the remaining structures would minimize risks to boaters.

Resource Indicator: Scenic Quality

Overall, Alternative 2 would meet the High scenic integrity objective, and Retention visual quality objective. Twelve structures would be constructed within the 2.5-mile stretch of the Chewuch River. The riverbanks would still appear undeveloped, although structures 14N and 14Q would be noticeable constructed features, deviating from the undeveloped landscape character. Table 46 details each structure, from where the structure would be viewed, deviations from landscape character, and scenic quality objective of each structure.

Table 46: Existing Condition and Deviations in Landscape Character and Viewing Location by Structure for Alternative 2

Type of Structure Site Location	Existing Condition	Viewing Location and Duration	Deviation in Landscape Character	Scenic Integrity Objective (SIO)
<p>Site 14A Engineered Log Jam in River Bank</p>		<p>Boaters passing by on the river would see structure. Not seen from East or West Chewuch Roads. No dispersed campsites or developed campgrounds within sight distance.</p>	<p>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 log would be visible and parallel to water flow. Color and Texture: Low Impact; color will blend with surrounding setting, root wads and tree limbs will add texture Pattern: Moderate Impact; structure would be somewhat angular, but geometric pattern would be limited due to limited size.</p>	<p>Meets High SIO, Retention VQO. Despite the moderate deviation from some components of landscape character, the structure would be viewed for short periods of time as boaters pass by, and would be in scale with the bank height.</p>

Type of Structure Site Location	Existing Condition	Viewing Location and Duration	Deviation in Landscape Character	Scenic Integrity Objective (SIO)
<p>Site 14B Backwater Enhancement</p>		<p>Channel opening and structure would be adjacent to 14A and would be potentially seen by boaters. Not seen from East or West Chewuch Roads. No dispersed campsites or developed campgrounds within site distance.</p>	<p>Form: Low Impact; logs would be on the ground and not protruding into the channel. Line: Low Impact; structure would be one to two logs high following newly opened channel. No upright piers. Color and Texture: Low Impact; structure would be partially covered by revegetation Pattern: Moderate Impact; pattern of logs could be somewhat angular but geometric pattern would be limited by the size of the structure</p>	<p>Meets High SIO, Retention VQO. Boaters passing the site could see the structure, although since it would be located on a bend in the river, the boater would need to be looking back at the right time to actually see the structure.</p>
<p>Site 14C Large wood and boulder cover habitat</p>		<p>Structure would be seen by boaters passing by on the river, however most boaters would follow main channel on other side of small island. This would be seen from East Chewuch Road. No dispersed campsites or developed campgrounds within sight distance.</p>	<p>Form: Low Impact; two stacked logs high, less than 10% channel span. Line: Low Impact; two to three horizontal parallel layers, no upright piers, anchored with boulders, most logs roughly parallel to water flow, nearly all root wads facing upstream. Color and Texture: Low Impact; color will blend with surrounding setting, root wads will add texture Pattern: Low Impact; pattern would be random-appearing with little to no visible geometric pattern</p>	<p>Meets High SIO, Retention VQO Low deviation in landscape character, and infrequent viewing from boaters. This would be seen from East Chewuch as an extension of site 14D, but is a low visual impact.</p>

Type of Structure Site Location	Existing Condition	Viewing Location and Duration	Deviation in Landscape Character	Scenic Integrity Objective (SIO)
<p>Site 14D Channel enhancement</p>		<p>Structure/channel would be clearly seen from East Chewuch Road, paralleling it for approximately 450 feet. Not seen from West Chewuch road, or any campsites. Entrance to channel would potentially be seen by boaters.</p>	<p>Form: Low Impact; logs would be on the ground and not protruding into the channel. Line: High Impact in short term; channel would be a linear clearing paralleling the road, approximately 50 feet wide. Color and Texture: High Impact in short term; color of exposed soil would stand out. Low Impact in the long term. As vegetation regrows, color and texture would match surrounding area. Pattern: Moderate Impact; pattern of logs could be somewhat angular but geometric pattern would be limited by the size of the structure</p>	<p>Meets Modification SIO and VQO for approximately 3 years after construction due to strong linear shape and proximity to East Chewuch Road. Meets High SIO and Retention VQO after approximately 3 years when site has revegetated.</p>
<p>Site 14E Large wood cover habitat</p>		<p>Boaters passing by on the river would see structure. Not seen from East or West Chewuch Roads. No dispersed campsites or developed campgrounds within sight distance.</p>	<p>Form: Low Impact; logs would be flush with the ground. Line: Moderate Impact; there would be only one layer of logs, logs would be parallel to water flow, and root wads would all face upstream, however 12 upright piers 5 to 8 feet tall would create an obvious deviation. Color and Texture: Low Impact; color will blend with surrounding setting, root wads and tree limbs will add texture Pattern: Low Impact; angular pattern would not be noticeable from the river, little to no visible geometric pattern</p>	<p>Meets High SIO, Retention VQO Despite the moderate deviation from line, the structure would be viewed for short periods of time as boaters pass by, and would be in scale with the bank height.</p>

Type of Structure Site Location	Existing Condition	Viewing Location and Duration	Deviation in Landscape Character	Scenic Integrity Objective (SIO)
<p>Site 14H Buried bank jam</p>		<p>Boaters passing by on the river would see the structure, although it would be located on a secondary channel. Not seen from East or West Chewuch Roads. No dispersed campsites or developed campgrounds within sight distance.</p>	<p>Form: Low Impact; two stacked logs high, less than 10% channel span.</p> <p>Line: High Impact; two to three horizontal parallel layers, 7 upright piers, roughly 2/3rds of the logs perpendicular to water flow, 2/3rds of the root wads perpendicular to flow.</p> <p>Color and Texture: Low Impact; color will blend with surrounding setting, root wads and tree limbs will add texture</p> <p>Pattern: Moderate Impact; pattern would be somewhat angular, amount of geometric pattern limited by small size of the structure.</p>	<p>Meets High SIO, Retention VQO</p> <p>Despite the high and moderate deviations from some components of landscape character, the structure would be infrequently viewed since most boaters stay in main channel, viewed for short periods of time if boaters pass by, and would be in scale with the bank height.</p>
<p>Site 14I Engineered Log Jam in River Bank</p>		<p>Boaters passing by on the river would see the structure, although it would be located on a secondary channel. Not seen from East or West Chewuch Roads. No dispersed campsites or developed campgrounds within sight distance.</p>	<p>Form: Low Impact; 2 to 3 stacked logs high, less than 10% channel span.</p> <p>Line: Low Impact; two to three horizontal parallel layers, no upright piers, anchored with boulders, most logs roughly parallel to water flow, nearly all root wads facing upstream.</p> <p>Color and Texture: Low Impact; color will blend with surrounding setting, root wads and tree limbs will add texture</p> <p>Pattern: Low Impact; pattern would be random-appearing with little to no visible geometric pattern</p>	<p>Meets High SIO, Retention VQO</p> <p>Low deviation in landscape character, and infrequent viewing from boaters.</p>

Type of Structure Site Location	Existing Condition	Viewing Location and Duration	Deviation in Landscape Character	Scenic Integrity Objective (SIO)
<p>Site 14L Large wood cover habitat</p>		<p>Structure would be located directly across from the State campground, and be seen by boaters passing by on the river. Not seen from East or West Chewuch Roads. No dispersed campsites within sight distance.</p>	<p>Form: Low Impact; two stacked logs high, less than 10% channel span. Line: Low Impact; no parallel layers, no upright piers, anchored with boulders, most logs roughly parallel to water flow, nearly all root wads facing upstream. Color and Texture: Low Impact; color will blend with surrounding setting, root wads will add texture Pattern: Low Impact; pattern would be random-appearing with little to no visible geometric pattern</p>	<p>Meets High SIO, Retention VQO. Low deviation from landscape character. Brush regrowth would help cover part of the structure so it would blend with surrounding bank and vegetation when viewed from State campground.</p>
<p>Site 14N Engineered Log Jam in River Bank</p>		<p>Structure would be located across from the northern end of the Falls Creek Campground, on the opposite side of the river. Not seen from East or West Chewuch Roads. No dispersed campsites within sight distance.</p>	<p>Form: Moderate Impact; 3 to 4 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, most root wads face perpendicular to water flow. Color and Texture: Low Impact; color will blend with surrounding setting, root wads and tree limbs will add texture Pattern: Moderate Impact; structure would be somewhat angular, but geometric pattern would be limited due to limited size.</p>	<p>Meets Moderate SIO, Partial Retention VQO. Would be directly viewed from 2 campsites in Falls Creek Campground. Moderate deviations from landscape character would appear slightly altered, but visually subordinate to surrounding riverbank.</p>

Type of Structure Site Location	Existing Condition	Viewing Location and Duration	Deviation in Landscape Character	Scenic Integrity Objective (SIO)
<p>Site 14O Pool enhancement</p>		<p>Structure would be located next to a popular dispersed campsite. Not seen from West Chewuch road, and shielded by trees from the East Chewuch road.</p>	<p>Form: Low Impact: at the water surface. Line: Low Impact; no parallel layers, no upright piers, anchored with boulders, most logs roughly parallel to water flow, nearly all root wads facing upstream. Color and Texture: Low Impact; color will blend with surrounding setting, root wads will add texture Pattern: Low Impact; pattern would be random-appearing with little to no visible geometric pattern</p>	<p>Meets High SIO, Retention VQO. Structure would appear naturally occurring, so even though it would be within the view from the campsite, it would not deviate from landscape character.</p>
<p>Site 14P Engineered Log Jam in River Bank</p>		<p>Boaters passing by on the river would see structure. Not seen from East or West Chewuch Roads. No dispersed campsites or developed campgrounds within sight distance.</p>	<p>Form: Moderate Impact; 3 to 4 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, most root wads face perpendicular to water flow. Color and Texture: Low Impact; color will blend with surrounding setting, root wads and tree limbs will add texture Pattern: Moderate Impact; structure would be somewhat angular, but geometric pattern would be limited due to limited size.</p>	<p>Meets High SIO, Retention VQO Despite the moderate deviation from landscape characters, the structure would be viewed for short periods of time as boaters pass by, and would be in scale with the bank height.</p>

Type of Structure Site Location	Existing Condition	Viewing Location and Duration	Deviation in Landscape Character	Scenic Integrity Objective (SIO)
<p>Site 14Q Engineered Log Jam in River Bank</p>		<p>Structure would be located next to a dispersed campsite popular for camping and as a put-in spot for boating/rafting. Not seen from West or East Chewuch roads.</p>	<p>Form: High Impact; 3 stacked logs high, approximately 8 feet above water level, spanning over 25% of river width. Line: Moderate Impact; 3 to 4 parallel layers, most visible logs parallel to water flow, roughly 50% of root wads perpendicular to water flow, nine upright piers. Color and Texture: Low Impact; color will blend with surrounding setting, root wads and tree limbs will add texture Pattern: Moderate Impact; structure would be somewhat angular, but geometric pattern would be more dominate due to overall size.</p>	<p>Meets Low SIO, Modification VQO. Would be directly viewed from dispersed campsite. Bumper log would reduce safety risk to boaters. High and Moderate deviations from landscape character would appear altered, so campsite setting would appear moderately altered from surrounding setting.</p>

Resource Indicator: Recreation

Camping

Alternative 2 would change a portion of the landscape viewed from the Falls Creek Campground, and one established campsite. Structure 14N would be located across the river from the northern-most campsites in the Falls Creek Campground. This would not change the elements of the setting of the campground 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 campground, 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.

Structure 14L would be located across the river from the State campground south of Falls Creek, but would blend into the surrounding riverbank because it would be only two logs tall, slightly extending into the river channel. Vegetation would recover within a few years after construction, further camouflaging the structure. It would likely not be noticeable to most people using the campground, which would continue to be popular because of the proximity to the river and large, open area easily accommodating large and small groups of campers.

Structure 14O would be located directly adjacent to a popular dispersed campsite, but would be appear natural to most people. The site would still be very popular due to its location on the river's edge, sandy swimming beach, flat ground, and large trees providing shade. The site would be closed during construction, however, so there would be a short-term loss of the site. The site would be cleaned-up and restored after construction, so there would be no long-term loss of the site.

Structure 14Q would be directly downstream from the established dispersed campsite, extending far enough into the river channel to dominate the down-river view from the campsite. It would be an obviously constructed structure because of its height off the water level (approximately eight feet), angular shape, and row of root wads facing upstream towards the campsite. Views in other directions would not be changed. It is unlikely to diminish the popularity of the site, however, since the elements that make it popular – location right on the river bank, isolation from other campsites and people, flat ground, good boat launch spot, and large trees providing shade, would not change from the existing condition. The site would be closed during construction, however, so there would be a short-term loss of the site. The site would be cleaned-up and restored after construction, so there would be no long-term loss of the site.

Boating

All structures would be designed and constructed to reduce risk to boaters, with bumper logs installed on structures 14A, 14I, and 14Q, to reduce the chance of people becoming caught in or under the structures. Bumper logs have been installed on the previously constructed structures, but there is no proof that they are effective in all situations. They would reduce the risk that boaters would be caught on, or pulled under the structures. In theory, boaters would bounce off the bumper logs and be pushed away from the structure, back into the faster-moving water, and float past the structure. If boats do not bounce off the bumper log, they could slide along the log for the length of the structure, and would move back into the faster-moving water once past the structure. The bumper log would also present a barrier to a boater being pulled under the structure.

The structure at site 14Q would present an obstacle to navigate around for boaters who launch from the campsite, or reach the structure from upstream launch locations. A bumper log running along the upriver side of the structure would minimize any chance of boaters becoming caught in or under the structure.

The size and placement of the remaining structures would minimize risk to boaters. The following table details how boater safety was addressed in each structure design.

Table 47: Structure Design to Minimize Risk to Boaters

Structure	Bumper Log Included	Rational
14A	yes	Structure located on a bend in the river where boaters could be pulled to the structure. Bumper log would help deflect boaters.
14B	no	Structure would be an excavated side channel, and would not be used by boaters
14C	no	Structure not located in main channel where boating is likely to occur.
14D	no	Structure would be an excavated side channel, and would not be used by boaters
14E	no	Structure would be located with approximately 450 feet of line-of-sight for approaching boaters. Structure would be above water line during low flow. Adequate line-of-sight distance would allow boaters to avoid the structure,
14H	no	Structure would be built tight to the bank, and not located in main channel where boating is likely to occur. Boaters would have approximately 400 feet of line-of-sight, which would be adequate distance to avoid the structure.
14I	yes	Structure located on a side channel, near the intersection with the main channel. Bumper log would help deflect boaters.
14L	no	Structure located off the main channel, sitting off a bar point during high/low flow. Boater would not come into contact with structure.
14N	no	Structure would be built tight to the bank, just downstream of an old bridge abutment. Boater would have a line-of-sight of approximately 900 feet before reaching the structure. The bridge abutment would help deflect boaters away from the structure.
14O	no	Structure would be located near a dispersed campsite, but would be small and tight to the bank, so would not pose a risk to boaters.
14P	no	Structure would be tight to the bank, and located with approximately 1,000 feet of line-of-sight distance up-stream, giving boaters opportunity to avoid structure. It would not be in the vicinity of any dispersed campsites.
14Q	yes	Structure would be located just downstream from a dispersed campsite used as a boat launching spot.

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 was found eligible for Wild and Scenic River designation under the Scenic classification.

The temporal boundary is from the time of implementation of this project until sometime in the future when these constructed features are no longer evident.

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

The Forest Service and Yakama Nation have implemented two 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. A map and details about the previous structures and their impacts on the scenic outstandingly remarkable value of the Chewuch River are in the Wild and Scenic Resource Report in the project record.

Table 48: Resource Indicators and Measures for Cumulative Effects

Resource Element	Resource Indicator	Measure	Alternative 2 (Units)	Past, Present, and Future Actions (Units)	Cumulative Impacts (Units)
Wild and Scenic River Eligibility	Scenery	Scenic Integrity Objective, Visual Quality Objective	High Scenic Integrity Objective, Retention Visual Quality Objective overall. 2 structures would not meet visual quality objectives. Shoreline would appear more developed in the vicinity of these structures; however, they would be spaced far enough apart to minimize visual impact.	2 structures do not meet visual quality objectives.	Some degradation of scenic quality, with 4 structures between river miles 9.5 and 15.5 that would not meet visual quality objective. Shoreline would appear more developed in this stretch, but would not have a direct and adverse impact on 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 Falls Creek Campground	One structure would moderately alter view of the riverbank across from Falls Creek Campground. Would not change the popularity of the campground.	No effect.	No cumulative effect.

Resource Element	Resource Indicator	Measure	Alternative 2 (Units)	Past, Present, and Future Actions (Units)	Cumulative Impacts (Units)
		Changes in landscape setting of dispersed campsite by structure 14O	No apparent change in setting. Structure would appear natural, and not interfere with usefulness of site. Short-term, impact the use of the site, which would be closed during construction. Site restoration mitigation measures would return site to original condition, with no long-term impact on popularity or use.	No effect.	No cumulative effect.
		Changes in landscape setting of dispersed campsite by structure 14Q	Structure would be a dominant feature in downriver view from the campsite. Would also be an obstacle to boaters launching from the site. Short-term impact the use of the site, which would be closed during construction. Site restoration mitigation measures would return site to original condition, with no long-term impact on popularity or use.	No effect.	No cumulative effect.
		Changes in landscape setting of State campground	No apparent change in setting, structure across river and blends with surrounding	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 along this stretch of river would be increased over current condition, but structural components, namely bumper logs, would minimize risk.

Resource Indicator: Scenic Quality

Table 49: Scenic Quality Cumulative Effects

Project	Overlap In Time Space		Measurable Cumulative Effect	Extent, Detectable
	Yes	No		
Fish habitat structure construction in Chewuch River between river miles 9.5 and 13.	Yes	Yes	Yes	Some degradation of scenic quality, with 4 structures between river miles 9.5 and 15.5 that would not meet visual quality objective. Shoreline would appear more developed in this stretch, but would not have a direct and adverse impact on 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.

Resource Indicator: Recreation Experience

Table 50: Boater Safety Cumulative Effects

Project	Overlap In Time Space		Measurable Cumulative Effect	Extent, Detectable
	Yes	No		
Fish habitat structure construction in Chewuch River between river miles 9.5 and 13.	Yes	Yes	Yes	The risk to boaters along this stretch of river would be increased over current condition, but structural components, namely bumper logs, would reduce risk.

Other Relevant Mandatory Disclosures

Public Safety

Alternative 2 would increase 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 main structure.

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

Wild and Scenic Rivers Act

Based on Section 7 analysis documented in Appendix C of the Wild and Scenic Resource Report, this project would not have a direct and adverse impact on this section of the Chewuch River. 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 two dispersed campsites. 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 installation of bumper logs on the structures most likely to endanger boaters, 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.
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 LRMP standards and guidelines, as described below.

S&G9-3 - The potential scenic classification attributes within a one-fourth mile wide 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. Structure 14D, which would run parallel to the East Chewuch road for approximately 450 feet, would have a short-term scenic integrity objective of Low, and a visual quality objective of Modification. When vegetation regrows, in approximately 3 years after construction, the structure 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, structure 14D, which would run parallel to the East Chewuch road for approximately 450 feet, would have a short-term scenic integrity objective of Low, and a visual quality objective of Modification. When vegetation regrows, in approximately 3 years after construction, the structure would meet the High scenic integrity objective and Retention visual quality objective since the vegetation would blend the structure into the surrounding landscape.**

Appendix G of the LRMP discusses Wild and Scenic River management, beginning on page G-2. Determination of potential classification of eligible river segments is based on the existing conditions at the time of the assessment (USDA-FS 1989a). Under the Scenic category, it states:

“[t]hose rivers or 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 following interpretation of the criteria (refer to Appendix G for full text):

1. River area shall be free of impoundments. **No impoundments would be constructed.**
2. River area shorelines and immediate environment should not show substantial evidence of human activity. **Overall, there would be no substantial evidence of human activity along the shoreline. Ten of the structures would appear natural because of size, placement, and shape. The two structures that would be more obviously constructed features would be viewed for only short periods of time by boaters,**

however would be seen for long stretches of time by people camping in the Falls Creek Campground, or at the dispersed campsite near structure 14Q. These structures would be subordinate to the surrounding landscape in the immediate vicinity.

- 3. Structures or concentration of structures must be limited to relatively short reaches of the total river area. Twelve structures would be spread along approximately 2.5 miles of river. Two (14H and 14I) would be inter-visible, however would not be located on the main river channel, but rather on a side channel separated from the river by a small island. The other structures would be spaced far enough apart to not be inter-visible.**
- 4. Roads may reach the river area and occasionally bridge the river. No roads or bridges would be constructed.**

Required Monitoring

Restoration of dispersed campsites near structures 14O and 14Q would be monitored to ensure compliance with restoration tasks. The Methow Valley Ranger District Recreation and Wilderness Program Manager would conduct monitoring during the active restoration or immediately after completion.

Summary

Alternative 2 would protect and maintain the outstandingly remarkable values of scenery and recreation for river miles 13 to 15.5. The river would continue to appear undeveloped except in the vicinity of structures 14N and 14Q. Here, the structures would not appear natural, but would be subordinate to the surrounding landscape. Structure 14D would not comply with LRMP standards and guideline for visual quality in the short term, but would meet Retention objective when vegetation regrows around the structure approximately 3 years after construction. Recreation opportunities would not be affected, except for short-term closures of the dispersed campsites near structures 14O and 14Q. 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.

Wildlife

Regulatory Framework

Land and Resource Management Plan

The Okanogan National Forest Plan identifies management indicator species for mature and old growth forest habitat, dead and defective tree habitat, deciduous and riparian habitat, lodgepole pine forest habitat, and winter range habitat ((USDA-FS 1989a), page III-77). Details on habitat use, ecology, and amount of each habitat on the Forest for these species are in Wildlife MIS Status Report (USDA-FS 2011). The Forest-wide viability determination for each species is also included in this report.

The LRMP provides wildlife standards and guidelines applicable for river restoration projects.

A full description of the LRMP standards and guidelines, federal laws, executive orders, regulations and management guidance applicable to the Chewuch River Restoration project is available in the Wildlife Resource Report in the project record.

Affected Environment and Environmental Consequences

Wildlife Considered But Not Analyzed In Detail

Table 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 project 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 project 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 project 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 project is not within an LAU. It is not in suitable lynx habitat. The proposed project would have "no effect" on the lynx.
Lynx Critical Habitat	The proposed project is not within a critical habitat unit for lynx. The proposed project 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 project. The proposed project 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 project is not within a critical habitat unit for the northern spotted owl. The proposed project would have "no effect" on northern spotted owl critical habitat.
Common Loon (S)	The proposed project is not within or adjacent to suitable habitat for the common loon. The proposed project would have "no impact" on the common loon.
Fisher (S)	The proposed project would have no effect on fisher habitat. It would have "no impact" on the fisher.
Gray Flycatcher (S)	The proposed project is not within or adjacent to suitable habitat for the gray flycatcher. The proposed project would have "no impact" on the gray flycatcher.

Resource	Rationale for Dismissing from Further Analysis
Great Gray Owl (S)	The proposed project would have no effect on great gray owl habitat. It would have “no impact” on the great gray owl.
Lewis’ Woodpecker (S)	The proposed project would have no effect on Lewis’ woodpecker habitat. It would have “no impact” on the Lewis’ woodpecker.
Moose (S)	The proposed project would have a slightly beneficial effect on moose habitat. It would have “beneficial impact” on the moose.
Mountain Goat (S)	The proposed project is not within or adjacent to suitable habitat for the mountain goat. The proposed project would have “no impact” on the mountain goat.
Pallid Bat (S)	The proposed project is not within or adjacent to suitable habitat for the pallid bat. The proposed project would have “no impact” on the pallid bat.
Peregrine Falcon (S)	The proposed project would have no effect on peregrine falcon habitat. It would have “no impact” on the peregrine falcon.
Sandhill Crane (S)	The proposed project is not within or adjacent to suitable habitat for the sandhill crane. The proposed project would have “no impact” on the sandhill crane.
Sharp-tailed Grouse (S)	The proposed project is not within or adjacent to suitable habitat for the sharp-tailed grouse. The proposed project would have “no impact” on the sharp-tailed grouse.
Townsend’s Big-eared Bat (S)	The proposed project 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 project 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 project would have no effect on snag habitat. It would have “no impact” on the white-headed woodpecker.
Wolverine (S)	The proposed project would have no effect on wolverine habitat. It would have “no impact” on the wolverine.
12 Invertebrate Species (S)	Due to the slight increase in riparian habitat, the proposed project would have a slightly beneficial effect on butterfly and dragonfly habitats. It would have “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.

Table 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.
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.

Resource Element	Resource Indicator	Measure	Used to address P/N, or key issue?	Source (LRMP S/G; law or policy, BMPs, etc.)
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 will 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 will 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 will 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 will be surveyed for active nests and scientific literature will 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 sight, resulting in a temporary negative effect. The basis of effects analysis will 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 two 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 project would require the felling of some trees at the project sites. The method of analysis for this indicator will be the number of large diameter cottonwood and cedar trees that are proposed to be felled during project implementation. This number will be based on field inspections of each of the individual restoration sights.

Resource Indicator: Wild and Scenic river eligibility

The Okanogan National Forest Land and Resource Management Plan determined the Chewuch River to be eligible for Wild and Scenic River designation partly due to wildlife values. The method of analysis will be any direct and adverse effect that would diminish the value of the area

for wildlife. The basis for direct and adverse effects will be tied to the previous four wildlife resource indicators and professional judgment.

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, ducks, 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 determined the Chewuch River, from the Thirtymile Trailhead to the Forest Boundary, is eligible for Wild and Scenic River designation in the scenic category 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.

Table 53: Resource Indicators and Measures for the Existing Condition

Resource Element	Resource Indicator	Measure	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.

Resource Element	Resource Indicator	Measure	Existing Condition (Alternative 1)
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 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 (USDI-BLM USDA-FS 2009). Incubation of eggs usually begins in mid to late May and eggs hatch in 28-30 days (USDI-BLM USDA-FS 2009). The newborn ducklings are precocial and can leave the nest soon after hatching to join their mother on the water (USDI-BLM USDA-FS 2009). The mother and brood can be on the breeding areas in to September (USDI-BLM USDA-FS 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 project 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 project area was surveyed for harlequin ducks in 2011, 2013, and 2014.

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 River mile 13.0- 15.5). There are no records of bald eagles nesting or roosting on the Chewuch River; the nearest known nest site is 13 miles south near the town of Winthrop. There is one record of an osprey nest on the Chewuch River near river mile 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. Grizzly bears may inhabit the Chewuch River Project area 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, chokecherry and other shrubs in the general area. Wolves may inhabit the Chewuch River Project area 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 two 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 most stands nearing maturity (Parks and others 1997). The rotten trunks of these two 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 stands of large diameter black cottonwood trees within the project area and a few individual cedar trees.

Resource Indicator: Wild and Scenic river eligibility

The LRMP determined the Chewuch River, from the Thirtymile Trailhead to the Forest Boundary, is eligible for Wild and Scenic River designation in the scenic category. The outstandingly remarkable values of the Chewuch River, identified in the LRMP, 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.

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

Project Design Features and Mitigation Measures

Table 54: Design Features

Number	Design Feature	Why Necessary	Efficacy	Consequence of Not Applying
15	Implementation timing of July 1 – July 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 negative impact to R6 Sensitive species
16	Bald eagle and osprey nest surveys must be completed each spring until 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 negative impact to R6 Sensitive Species

Number	Design Feature	Why Necessary	Efficacy	Consequence of Not Applying
17	Design restoration sites to avoid need to fell large diameter cottonwood and cedar trees.	Prevent/minimize loss of unique riparian habitat features	Avoiding large diameter cottonwood and cedar trees while designing would be extremely effective at maintaining them	Potential for negative impact to migratory birds

Effects

Table 55: Resource Indicators and Measures for Alternative 2

Resource Element	Resource Indicator	Measure	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.	1 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 May 2014. Potential impacts of the proposed project to harlequin ducks would be disturbance or destruction of active nest sites during project implementation. The proposed project 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 project 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 May 2014. It is possible that a new nest(s) would be constructed and used in spring and summer 2015. If design feature #16 is implemented and nest surveys are conducted again in spring 2015 and no active nests are found, the proposed project would have no impact on bald eagles and no effect on ospreys.

If a new active raptor nest is discovered in spring 2015 (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 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 project “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 result in the loss of one large diameter cottonwood tree at Site 14D. It would result in no loss of large diameter cedar trees. The one cottonwood to be removed from Site 14D would have a minimal impact on the availability of this unique habitat. There are 5 other very large diameter cottonwood trees at Site 14D that would not be felled, as well as several small to medium ones that will eventually grow into large diameter trees capable of developing large trunk cavities and hollow trunks. Alternative 2 would have a very minimal negative 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 loss of one large diameter cottonwood tree and 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.

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 are 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

Table 56: 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 will 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.

Project	Overlap In Time Space		Measurable Cumulative Effect	Extent, Detectable
	Yes	No		
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 will 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

Table 57: Loss of Unique Nesting Habitat Cumulative Effects

Project	Overlap In Time Space		Measurable Cumulative Effect	Extent, Detectable
	Yes	No		
Forest Service Vegetation Treatment Activities (Pre-commercial treatments and fuel reduction treatments from the Flatmoon and Buck projects.)	Yes	No	No	There may be an overlap in timing of these projects with Chewuch Restoration Project; however, they would not occur within the same spatial boundaries designated for this indicator.
Ongoing Recreation Activities	Yes	Yes	No	Ongoing recreational activities would not lead to a loss of large diameter cottonwood or cedar trees. The cumulative effect of loss of unique nesting habitat would be minor.

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

Alternative 2 would be compliant with Federal, State or local laws or requirements imposed for the protection of the environment as follows:

- Compliant with LRMP 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.
- Compliant with the Migratory Bird Treaty Act and Executive Order 13186 direction because it has no effect on landbirds.
- Compliant with FSM 2670 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.
- 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.

Summary

Alternative 1 would have no effect to any wildlife species or habitats in the project area. Alternative 2 had 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 had 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 had 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 one large diameter cottonwood tree, resulting in a very minimal 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.

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.

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.

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.

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 5.

Wetlands and Floodplains

Project design measures to protect streams, wetlands, and water quality were built into treatment activities. Therefore, there will be no effect on wetlands and floodplains.

Unique Characteristics of the Area

There are no parklands, farmlands, rangelands, wildernesses, potential wildernesses (PWAs), 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. A map and description the project location is on pages 2-3.

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

Air Quality

Adding large wood to the Chewuch River would not affect air quality. Therefore, this project would comply with the Clean Air Act.

Potential or Unusual Expenditures of Energy

The no-action alternative would not require any expenditure of fuel or energy. The Proposed Action would require expenditures of fuel for workers to access the project area and use power equipment. Overall, the proposed action would not result in any unusual expenditure of fuel.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that are forever lost and cannot be reversed. Irretrievable commitments of resources are considered to be those that are lost for a period of time, and in time, can be replaced.

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

Agencies, Tribes, and other Entities Consulted

As described beginning on page 5, the Forest Service invited Federal, State, County and tribal entities to engage in informal or formal comment, discussion, and/or consultation on this EA. 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**.

Per regulations on interagency cooperation pursuant to Section 7 of the Endangered Species Act (1973), as amended, the Yakama Nation initiated consultation with **US Fish and Wildlife Service** on March 9, 2015 for the proposed action. US Fish and Wildlife Service agreed that the project is consistent with the restoration actions and conservation measures described in the Programmatic agreement and therefore may be tiered to the Service's July 8, 2008 Biological Opinion and June 30, 2008 Letter of Concurrence with the Programmatic. US Fish and Wildlife Service agreed with the determination that the project may affect, likely to adversely affect for the bull trout and may affect but is not likely to adversely affect bull trout critical habitat. Effects to other listed species and their habitats are not anticipated to occur.

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