Lead Agency:

United States Department of Agriculture, Forest Service

March 2014

Cooperating Agencies:

Nez Perce Tribe

U.S. Department of Energy, Bonneville Power Administration

U.S. Army Corps of Engineers

Draft Environmental Impact Statement

Crooked River Valley Rehabilitation

Red River Ranger District, Nez Perce – Clearwater National Forests
Idaho County, Idaho

Non-Discrimination Policy

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers, employees, and applicants for employments on the basis of race, color, national origin, age, disability, sex, gender identity, religion, reprisal, and where applicable political beliefs, marital status, familial status, or parental status, sexual orientation, or all or part of an individual's income is derived from any public assistance program or protected genetic information in employment or in any program or activity conducted or funded by the Department. (Not all prohibited bases will apply to all programs and/or employment activities.)

To File an Employment Complaint

If you wish to file an employment complaint, you must contact your agency's EEO Counselor (click the hyperlink list of EEO Counselors) within 45 days of the date of the alleged discriminatory act, event or in the case of a personnel action. Additional information can be found online at http://www.ascr.usda.gov/complaint_filing_cust.html.

To File a Program Compliant

If you wish to file a Civil Rights program complaint of discrimination, complete the USDA Program Discrimination Complaint Form, found online at http://www.ascr.usda.gov/complaint_filing_cust.html, or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed complaint form or letter to us by mail at U.S. Department of Agriculture, Director, Office of Adjudication, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410, by fax (202) 690-7442 or email at: program.intake@usda.gov.

Persons with Disabilities

Individuals who are deaf, hard of hearing or have speech disabilities and you with to file either an EEO or program complaint please contact USDA through the Federal Relay Service at (800) 877-8339 or (800) 845-6136 (in Spanish).

Persons with disabilities, who wish to file a program complaint, please see information above on how to contact us by mail directly or by email. If you require alternative means for communication of program information (e.g. Braille, large print, audiotape, etc.) please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

USDA is an equal opportunity provider and employer.

Crooked River Valley Rehabilitation
Draft Environmental Impact Statement
March 2014

Red River Ranger District
Nez Perce-Clearwater National Forests
Idaho County, Idaho

Lead Agency: **USDA Forest Service**

Cooperating Agencies: **Nez Perce Tribe**

U.S. Department of Energy, Bonneville Power Administration

U.S. Army Corps of Engineers

Responsible Official: **Rick Brazell, Forest Supervisor**
104 Airport Road
Grangeville, Idaho 83530
(208) 983-1950

For Information Contact: **Jennie Fischer, NEPA Team Leader**
104 Airport Road
Grangeville, Idaho 83530
(208) 983-4048

Abstract: This Draft Environmental Impact Statement documents the analysis of two alternatives, including the "no action" alternative, that were developed for the Crooked River Valley Rehabilitation project. The Notice of Intent to prepare this document was published in the Federal Register on December 12, 2012. The Crooked River Valley Rehabilitation project proposes to improve fish habitat by restoring stream and floodplain functions, restoring instream fish habitat complexity, and improving water quality along approximately 2 miles of the Crooked River in the Crooked River Valley Rehabilitation project area.

A Final Environmental Impact Statement may be released following public review and comments on this Draft. Comments received in response to this solicitation, including names and addresses of those who comment, will be part of the public record for the proposed action. Comments submitted anonymously will be accepted and considered; however, anonymous comments will not provide the respondent with standing to participate in subsequent administrative reviews of the Final Environmental Impact Statement and decision under 36 Code of Federal Regulations (CFR) 218.

Send written comments to: Rick Brazell, Forest Supervisor
104 Airport Road
Grangeville, Idaho 83530

Submit electronic comments to: comments-northern-nezperce-red-river@fs.fed.us

Submit comments by May 12, 2014, and please include **CRVR Project** in the subject line.

See project webpage at: http://www.fs.fed.us/nepa/nepa_project_exp.php?project=40648

This page was intentionally left blank.

OVERVIEW

Document Structure

The Crooked River Valley Rehabilitation Draft Environmental Impact Statement (DEIS) is organized into five chapters and six appendices:

- Chapter 1 (Purpose and Need for Action). Chapter 1 describes the purpose and need of the proposed project, the history of the affected area, and the Forest Service and Nez Perce Tribe's proposal to achieve the purpose and fulfill the need. This chapter also describes how the Forest Service, Nez Perce Tribe, U.S. Department of Energy Bonneville Power Administration (BPA), and U.S. Army Corps of Engineers (USACE) informed the public of the proposal and how the public responded.
- Chapter 2 (Alternatives, Including the Preferred Alternative). Chapter 2 provides a more detailed description of the Forest Service and Nez Perce Tribe's proposed action and the alternatives for achieving the stated need. These alternatives were developed with consideration of significant issues raised by the public and other agencies. This chapter also describes the mitigation measures to be implemented for the action alternative and provides a summary table of the environmental consequences associated with each alternative.
- Chapter 3 (Affected Environment and Environmental Consequences). Chapter 3 describes the existing conditions of various resources and discusses environmental effects of implementing the alternatives, including the preferred alternative. It is organized by resource topic (e.g., fish habitat and species, watershed, soils, and cultural resources).
- Chapter 4 (Preparers, Consultation, Coordination, Laws, and Regulations). Chapter 4 provides a list of preparers and the agencies consulted during the development of this DEIS and a summary of laws and regulations that guided the development of this document.
- Chapter 5 (Acronyms and Glossary). Chapter 5 provides a glossary of terms and acronyms used in the DEIS.
- Appendices. The appendices consist of supporting information for the DEIS and include the following: Appendix A – conceptual drawings of the proposed stream restoration actions, Appendix B – Clean Water Act 404(b)(1) analysis, Appendix C – cumulative effects, Appendix D – proposed Forest Plan amendments, Appendix E – best management practices for mercury collection from restoration actions in Crooked River, and Appendix F – references used in preparing the DEIS.
- Index.

Additional documentation, including more-detailed analyses of project-area resources, may be found in the project record located at the Nez Perce – Clearwater National Forests office in Grangeville, Idaho.

SUMMARY

The U.S. Department of Agriculture, Forest Service, in cooperation with the Nez Perce Tribe, BPA, and USACE, has prepared this Draft Environmental Impact Statement (DEIS) to disclose the potential effects of the proposed Crooked River Valley Rehabilitation project, in compliance with the National Environmental Policy Act (NEPA) (42 United States Code [U.S.C.] 4321 et seq.) and other relevant federal and state laws and regulations. This DEIS discloses direct, indirect, and cumulative environmental consequences and irreversible or irretrievable commitments of resources and alternatives, including the preferred alternative.

The proposed Crooked River Valley Rehabilitation project consists of restoring and improving 2.0 miles of Crooked River, known as the Meanders. The project area is located in the Crooked River watershed, within the Red River Ranger District in the Nez Perce – Clearwater National Forests in north-central Idaho, approximately 5 miles west of Elk City, Idaho. The project boundary extends from 0.1 mile upstream from the mouth of Crooked River (at the Idaho Department of Fish and Game intake weir) to approximately 2.0 miles upstream.

The project would help restore Crooked River and its floodplain that have been significantly degraded by past land management activities, most importantly mining and road construction. These activities have substantially affected the sediment regimes (various physical processes that affect sediment) in many parts of the watershed, as well as instream, riparian and floodplain functions in the main stem of Crooked River. Fire suppression, mining, road construction, and timber harvest have caused a shift in many of the natural hydrologic and geomorphic processes in the watershed. Over the long term, this shift has led to changes in streamflows and a reduction in the amount of large pieces of wood and rock in the stream. The area surrounding Crooked River was mined for mineral resources from the early 1900s through the 1950s. Mining waste (also referred to as mine tailings) is concentrated in the valley bottom, altering the physical condition of the stream system, restricting the natural migration pattern of the stream and other changes in channel morphology (channel size, form, and function), and impairing the recolonization of riparian vegetation and its function as a natural buffer. These alterations have resulted in a significant reduction of productive aquatic habitat for Endangered Species Act (ESA)-listed Snake River Basin steelhead (steelhead), spring/summer Chinook salmon, and bull trout.

Purpose and Need for Action

Historic mining activities have altered the Crooked River valley and have led to degraded fish habitat, causing inadequate densities of fish in Crooked River (a lower density than the stream historically supported). The Forest Service needs to restore the Crooked River valley to improve fish habitat and water quality in Crooked River. The proposed action would achieve goals and objectives in the Forest Plan, improve habitat for ESA-listed and sensitive fish species, and respond to objectives of the Nez Perce Tribe. To meet the purpose and need, the proposed action is to restore channel and floodplain functions, restore instream fish habitat complexity, and improve water quality in the Crooked River valley.

The Crooked River watershed contains important aquatic resources and has high aquatic potential. Crooked River provides habitat for steelhead and bull trout, which are listed as threatened species under the ESA, and is designated as critical habitat for both species. It also provides habitat for westslope cutthroat trout, resident rainbow trout (redband), and spring/summer Chinook salmon, all considered by the Forest Service to be sensitive fish species in the Nez Perce National Forest (USDA Forest Service 1987a; USDA Forest Service 2011b). Crooked River also supports whitefish and nongame species such as sculpin. Pacific lamprey have not been found in the project area in recent years. The restoration of Crooked River could provide appropriate sand beds for lamprey spawning and rearing habitat.

The proposed action responds to the goals and objectives outlined in the *Nez Perce National Forest Land and Resource Management Plan* (also referred to as the Nez Perce Forest Plan, and as Forest Plan in this document [USDA Forest Service 1987a]), as amended, and would improve conditions in the project area and move the area toward the desired future conditions. The Forest Plan provides direction for the management of the Crooked River project area and defines the habitat conditions necessary for salmonid spawning and rearing. In addition, the proposed action responds to the objectives of the Nez Perce Tribe by protecting, restoring, and enhancing watersheds within proximity of their ceded territory. The existing conditions were determined using field data collected by River Design Group, Inc. (RDG), for the *Design Criteria Report: Crooked River Valley Rehabilitation and Design* (RDG et al. 2012), the *Final Design Report* (RDG et al. 2013a), the *Crooked River Valley Rehabilitation Project Wetland Delineation Report* (Geum Environmental Consulting 2012), and the *South Fork Clearwater River Landscape Assessment* (USDA Forest Service 1998). The reports that resulted from these studies are not decision documents; therefore, the recommendations provided in the reports were considered as recommendations only, rather than direction.

Public Involvement

The Notice of Intent for the project was published in the *Federal Register* (Volume 77, No. 239, Page 73976) on December 12, 2012, with a 45-day comment period. In addition, as part of the public involvement process, the Forest Service mailed the scoping letter with a description of the proposed action to 395 potentially interested parties on November 30, 2012. To solicit input on the proposed action the Forest Service held two public meetings: January 17, 2013, in Grangeville, Idaho; and January 28, 2013, in Elk City, Idaho. Issues raised by interested parties are summarized below.

The Notice of Availability of the Draft EIS was published in the *Federal Register* and in the *Lewiston Morning Tribune*.

Issues

The December 2012 Notice of Intent and scoping letter presented to the public two project components as the proposed action: the Crooked River Meanders and the Crooked River Narrows Road. Comments on these proposed actions are summarized here to provide information to the public on their comments. Below is a display of alternatives presented in the Notice of Intent and this Draft EIS.

Crooked River	Notice of Intent & Scoping Letter	Draft EIS
Meanders	Alternative 1 – No Action	Alternative 1 – No Action
	Alternatives 2 – Proposed Action	Alternative 2 – Proposed Action
Narrows Road	Alternative A – No Action	Considered as a future foreseeable action in cumulative effects. The Narrows Road Improvement Project (Alternative B) would reconstruct Road 233 in place, above the 50-year flood flow elevation.
	Alternative B – Proposed Action – Reconstruct Road 233 in place, above the 100-year flood flow elevation.	
	Alternative C – Deadwood Re-route, including decommissioning a portion of Road 233.	
	Alternative – Relocate Road 233, upslope above the 100-year flood flow elevation.	

During the public involvement process, various issues were identified. The public raised several issues that drove the development of alternatives, added design or mitigation measures, or affected analysis of consequences. Other issues raised were considered to be not relevant or outside of the scope of this project.

Some comments were used to add design or mitigation measures to reduce effects, including: effects to water quality and fish habitat, soil resources, cultural resources, mineral claims and public access during implementation, and control of invasive species. Concerns about effects to natural resources or the public were grouped into the following categories: aquatic resources, water resources, cultural resources (including historic sites), soil resources, wildlife resources, rare plants, invasive plants, recreation (including fishing access), air quality, mineral resources, transportation (including access, maintenance, safety, and costs), social and economic resources, and cumulative effects. Most commenters were supportive of the Meanders valley and stream restoration; however, one commenter thought that the valley should be left alone. Alternative 1 (No Action) addresses this concern.

Concerns were raised about preserving moose and elk habitat and about effects to natural resources. The effects analysis in this document addresses this concern.

Some comments were in support of moving the Narrows Road (Road 233) out of the valley bottom, but most were in support of leaving the road in its current location and improving the road condition. Alternative B (see Appendix C and the project record) addresses this concern. Concerns were expressed about the potential relocation of a portion of Road 233.

One comment was that the proposed action for the Narrows Road (Alternative B as described in Appendix C and the project record) would not provide enough benefit and that the Narrows area of Road 233 should be decommissioned or converted to a foot trail. Alternative C (see Appendix C) was developed to address this concern.

During analysis, the Narrows Road component of the project was considered but eliminated from detailed study in this EIS. The Narrows Road component of the project may be implemented in the future (5 years or more) and the potential effects from implementing this project are included in the cumulative effects sections in Chapter 3 and Appendix C.

The following alternatives were developed to address these issues.

Alternatives, including the Proposed Action

The action proposed by the Forest Service and the Nez Perce Tribe is to improve fish habitat in Crooked River by implementing the Crooked River Valley Rehabilitation project. The Crooked River Valley Rehabilitation project includes two alternatives: No Action and Proposed Action. Detailed description of alternatives, comparison of alternatives, and a summary of the effects are provided in Chapter 2. The Narrows Road component of the Crooked River Valley Rehabilitation project was removed from detailed study in this EIS by the deciding official in December 2013. See Chapter 2 for more details.

No Action (Alternative 1)

This alternative provides a baseline for comparing the environmental consequences of other alternatives as required by NEPA. Under the No Action alternative, no project actions, including funding from BPA, any construction actions by USFS and the Nez Perce Tribe, or permitting decision(s) by the USACE would be implemented.

Proposed Action (Alternative 2)

This alternative was developed in response to the purpose and need for action identified from existing conditions to improve fish habitat and water quality, which have been altered as a result of past mining and other activities. It was presented for public scoping in December 2012. Alternative 2 would move the project area towards habitat considered optimal for salmonid spawning and rearing, the desired future condition as identified in the Forest Plan.

Alternative 2 proposes to rehabilitate the lower 2.0 miles of Crooked River, known as the Meanders. The project area, approximately 115 acres, extends from 0.1 mile upstream from the mouth of Crooked River (at the Idaho Department of Fish and Game weir) to approximately 2.0 miles upstream. The valley width includes Road 233 on the east side of the valley to the base of the hillslope on the west side of the valley. This alternative would rehabilitate up to 115 acres of floodplain by moving dredge tailings, reconstructing approximately 7,400 feet of stream channel, installing woody bank structures, constructing more than 2,700 feet of side channels, creating conditions for 64 acres of wetlands, and replanting the valley bottom with native plant communities. The project would be implemented over approximately 6 years (2015–2021).

Major Conclusions

Major conclusions related to potential consequences from proposed activities include:

- Proposed activities would move the Lower Crooked River watershed towards the Forest Plan Fishery/Water quality objectives identified in the Forest Plan. Proposed activities would provide improvement to fish habitat conditions by improving pool quality, increasing large woody debris recruitment, and increasing spawning habitat and higher-quality rearing habitat. These changes would improve overall fish habitat complexity in Crooked River from the existing condition.
- Proposed activities would have a short-term potential to adversely affect ESA-listed threatened fish species (steelhead and bull trout), and may impact five sensitive fish species (westslope cutthroat trout, interior redband trout, Pacific lamprey, western pearlshell mussel, and spring Chinook salmon). Endangered Species Act, Section 7, consultation with federal agencies would be completed prior to signing the decision.
- Proposed activities would have a short- and long-term effect on the geomorphology of the lower 2 miles of Crooked River. Channel morphology and sediment transport/bed mobility would be improved.
- Floodplain function would be improved by increasing the floodplain area, with the bankfull floodplain area increasing and upland floodplain decreasing. Interaction between the stream channel and floodplain would be restored with floodplain inundation occurring more frequently at flows greater than the 1.1-year recurrence interval, and sustainable floodplain morphology would be established that is capable of supporting aquatic habitat and desired vegetation communities, which would provide more ecological functions than currently exist. All required permits would be obtained prior to implementation.
- Proposed activities would have a short- and long-term effect on wetlands. The proposed activities would adversely impact 31 of 52 total acres of wetland during construction, and create 42 acres of wetlands. The result would be an overall increase from 52 acres to 64 acres of wetlands in the long term. Wetlands are expected to increase in both area and diversity with the proposed action. The Forest would apply for a Joint 404 Permit and Stream Channel Alteration Permit, from Idaho Department of Water Resources and USACE.
- Proposed activities would have a short- and long-term effect on water quality. Multiple mitigation measures have been developed to manage instream turbidity levels during

construction. Water temperature in Crooked River currently exceeds state standards. The proposed activities to restore channel and floodplain functions and re-establish vegetation would move toward meeting requirements in the South Fork Clearwater River Total Maximum Daily Load in Crooked River to reduce water temperatures in the long term (IDEQ et al. 2004).

- Proposed activities would have both short- and long-term effects on one National Historic Register site. Measures meant to recover significant values of the site have been identified. All cultural properties in the project area have been evaluated for their National Register eligibility. Consultation with Idaho State Preservation Office would be completed prior to signing the decision. A project-specific Forest Plan amendment is proposed.
- Proposed activities would change the conditions of the Meanders area to have desired plant communities that would improve soil conditions over time. Both the alder and mixed shrub communities (riparian) would increase substantially compared to the existing conifer/tall forb communities (upland/ tailing piles). Proposed activities would lay the foundation to rebuild soil functions, including chemical and biological properties adjacent to Crooked River.
- Proposed activities would change the amount of detrimental soil disturbance from a level that currently exceeds the Forest Plan standards. By implementing proposed activities the amount of detrimental soil disturbance would decrease from 65 to 4 percent, over the next 20 years. A project-specific Forest Plan amendment is proposed.
- Proposed activities would have no effect on one threatened wildlife species (lynx) and is not likely to jeopardize the continued existence of one proposed species (wolverine). The proposal may impact four sensitive wildlife species (western toad, gray wolf, harlequin duck, and fisher). Western toads are present in the project area and direct effect to habitat would occur. A loss of potential breeding habitat and mortality during construction could occur. Non-breeding habitat would increase and overall habitat conditions would improve as the floodplain functions are restored.
- Proposed activities would displace Forest Plan management indicator species (elk, moose, pine marten), and other species in the short term. A long-term reduction in ponded foraging moose habitat would occur with channel and floodplain restoration; however, foraging habitat in the floodplain would improve over time. No change to elk habitat effectiveness level would occur in any elk units.
- The proposal may impact one sensitive plant species (Idaho barren strawberry) following the restoration of the floodplain, which would make the habitat too wet for the species.
- Proposed activities would have a short-term effect on two developed and 18 dispersed recreation sites in the project area, for up to 6 years during implementation. In the long term, the same number of existing dispersed and developed sites would be available for use. Fishing access would be limited during construction because of the area closure, but

in the long term the public would have walking access to fishing in the restored Crooked River stream channel. No changes to the recreation opportunity spectrum would occur, and visual quality objectives would be met.

- Proposed activities would have negligible impacts to air quality.
- Proposed activities would have the potential to have a short-term effect on access to some mineral claims and an increase to placer claim reclamation bonds in the future. There would be no effect on actual mineral resources.
- Invasive plant species are present and the extent of weed spread following implementation would depend on the implementation and effectiveness of design and mitigation measures.
- Proposed activities would have short-term effects to the public during construction in the form of traffic delays and a Forest Supervisor area closure for up to 6 years.
- Proposed activities would have potential beneficial short-term effects for employment and long-term recreation-based economic benefits. The cost of the project is estimated at $2.5 million and would potentially be funded through the BPA Fish and Wildlife Program.

Cooperating Agencies

Cooperating agencies identified in preparing this DEIS are: the Nez Perce Tribe, BPA, and USACE.

Decision Framework

Based on the effects of the alternatives, the responsible Forest Service official would decide the following:

- Should the lower Crooked River valley be rehabilitated or not, and if so, to what extent?
- What design and mitigation measures would be included?
- What, if any, monitoring would be included?
- Whether the decision requires any Forest Plan amendments, and if so, what elements of the Forest Plan are to be amended for this project?

Following the Forest Service decision:

- BPA would decide whether or not to fund the proposed project.
- USACE would decide whether or not to provide permits for the project.

Table of Contents

Tables

Figures

This page was intentionally left blank.

CHAPTER 1. PURPOSE AND NEED FOR ACTION

Purpose and Need

Historic mining activities have altered the Crooked River valley and have led to degraded fish habitat, causing inadequate densities of fish in Crooked River (a lower density than the stream historically supported). The Forest Service needs to restore the Crooked River valley to improve fish habitat and water quality in Crooked River. The proposed action would achieve goals and objectives in the Forest Plan, improve habitat for Endangered Species Act (ESA)-listed and sensitive fish species, and respond to objectives of the Nez Perce Tribe. To meet the purpose and need, the proposed action is to restore channel and floodplain functions, restore instream fish habitat complexity, and improve water quality in the Crooked River valley.

The activities proposed by the Forest Service and the Nez Perce Tribe consist of restoring and improving 2.0 miles of Crooked River, known as the Meanders. The project area is located in the Crooked River watershed, within the Red River Ranger District in the Nez Perce – Clearwater National Forests in north-central Idaho, approximately 5 miles west of Elk City, Idaho. The project area, approximately 115 acres, extends from 0.1 miles upstream from the mouth of Crooked River (at the Idaho Department of Fish and Game weir) to approximately 2.0 miles upstream. The valley width includes Road 233 on the east side of the valley to the base of the hillslope on the west side of the valley. The location is Township 29 North, Range 7 East, Sections 25 and 36; and Township 28 North, Range 7 East, Section 1. A vicinity map depicting the location of the proposed activities is shown in Figure 1-1.

Existing Condition

During the 1930s through 1950s the entire main stem of Crooked River was heavily impacted by dredge mining, which left large tailings piles and deep ponds throughout the valley bottom. Physical changes to the valley bottom have altered stream and riparian processes, and have affected aquatic and terrestrial habitat conditions that resulted in degraded ecosystem conditions relative to historic conditions. The lower 2.0 miles have been altered so drastically that hydrologic and geomorphic condition resemble that of a spring-fed creek instead of a snow-melt dominated system, instream complexity is low, the majority of the streambed is armored, and the recolonization of native riparian vegetation has been impaired.

Desired Condition

Desired aquatic habitat in the project area is a rehabilitated stream corridor capable of supporting natural aquatic processes and sustaining the habitat requirements of the focal aquatic species for a range of life stages and seasonal behavior patterns. This would include an accessible and functioning floodplain, natural stream meanders, complex fish habitat, healthy riparian vegetation, and improved water quality (USDA Forest Service 1987a).

Proposed Action

The proposed action is to reconstruct 2.0 valley miles of Crooked River. Restoration of the valley bottom and stream channel would provide habitat for ESA-listed fish. This would be achieved by grading the majority of the tailings piles and reconstructing the river and its floodplain to create natural stream sinuosity and morphology; restoring floodplain and hydrologic functions; constructing instream channel structures to provide spawning and rearing habitat for steelhead, spring/summer Chinook salmon, bull trout, and cutthroat trout; improving water quality; and restoring riparian areas.

In addition, the proposed action would maintain campsites in the project area and preserve heritage resource areas as identified by the Forest Service Archeologist through consultation with the State Historic Preservation Office.

Primary elements of the proposed action would include:

- Salvaging existing material onsite (trees, brush, rocks, etc.) to use in the reconstructed channel and floodplain.
- Constructing a temporary bypass channel to provide fish passage during construction.
- Constructing a temporary access route for the movement of heavy equipment through the project area.
- Creating stream morphology features, including stream slope, meanders, and pool/riffle ratios, that would provide quality habitat for fish and allow for a more natural hydrologic function to maintain these features in the future.
- Balancing earthwork quantities to maximize bankfull floodplain area by filling in tailings ponds and developing a sloped valley bottom along the east edge of the project area without removing material from the project area.
- Stabilizing re-constructed streambanks using woody material and brush.
- Creating areas that would support wetland development over time.
- Re-vegetating the floodplain with native vegetation and maintain for several years after project completion through replanting and protection from browse.

Details of the current condition and proposed action (e.g., stream channel dimensions) are provided in Chapter 3, Appendix A, and the project record.

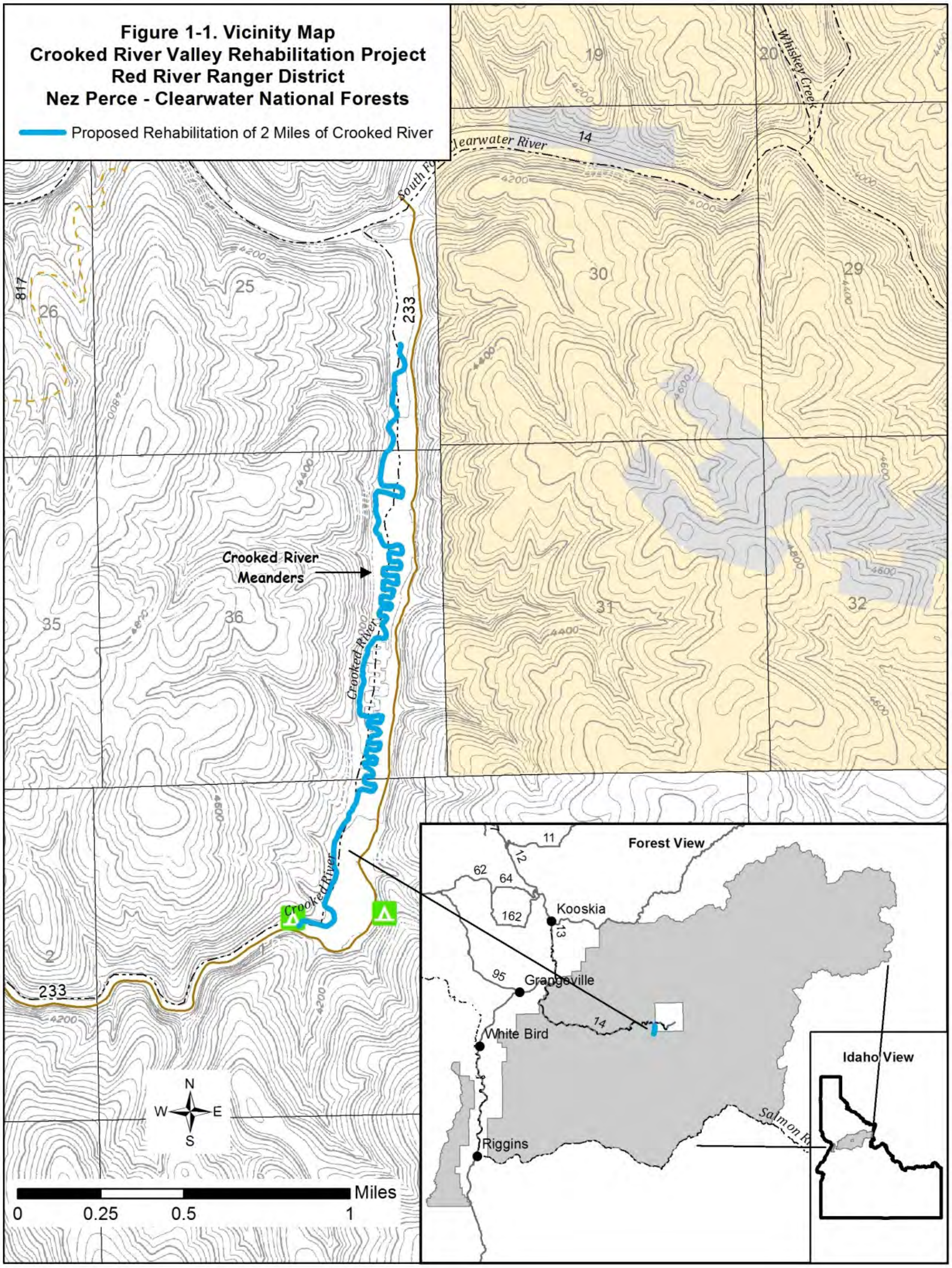


Figure 1-1. Vicinity map for Crooked River Valley Rehabilitation.

Scope of Analysis

The scope of this proposal is limited to activities related to the purpose and need as well as measures necessary to mitigate the effects these activities may have on the environment. Direct, indirect, and cumulative environmental effects of past, present, and reasonably foreseeable future actions are analyzed in Chapter 3 for all of these activities. Cumulative effects are also discussed in Appendix C.

Decision Framework

Based on the effects of the alternatives, the responsible Forest Service official would decide the following:

- Should the lower Crooked River valley be rehabilitated or not, and if so, to what extent?
- What design and mitigation measures would be included?
- What, if any, monitoring and evaluation would be included?
- Whether the decision requires any Forest Plan amendments, and if so, what elements of the Forest Plan are to be amended for this project?

Following the Forest Service decision:

- BPA would decide whether or not to fund the proposed project.
- USACE would decide whether or not to provide permits for the project.

Project Background

The Crooked River valley bottom was dredge mined with a bucket dredge from the 1930s through the 1950s, which left large tailings piles and ponds. Mining waste (also referred to as tailings piles) is concentrated around the stream corridor, altering the physical, hydrologic, and geomorphic conditions of the stream system; restricting the natural pattern of stream migration and other changes in channel morphology (channel size, form, and function); and inhibiting the recolonization of native riparian vegetation.

In the Crooked River watershed, past land management activities, most importantly mining and road construction, have substantially affected the sediment regimes (various physical processes that affect sediment transport) in many parts of the watershed, as well as instream, riparian and floodplain function in the main stem of Crooked River. Fire suppression, road construction, and timber harvest have caused a shift in many of the natural processes in the watershed. For example, disturbances shift from less frequent events of mixed severity to chronic events (such as mass erosion). Over the long term, this shift has led to changes in streamflows, greater deposition of sediment in streams, and a reduction in the amount of large pieces of wood and rock in streams. These alterations have included degraded channel morphology and reduced quantity of productive aquatic habitat.

Several documents have been published that assess the existing environmental conditions of the South Fork Clearwater River Subbasin, the Crooked River Watershed, and surrounding watersheds and habitat areas. These documents are incorporated by reference and are located in the project record. Most of the documents include management recommendations for supporting critical aquatic habitats and much of the preliminary background information needed for a study of this nature. These studies and the resulting reports are summarized below:

- *Nez Perce National Forest Land and Resource Management Plan* (USDA Forest Service 1987a), also referred to as the Nez Perce Forest Plan (or Forest Plan), and *Nez Perce National Forest Land and Resource Management Plan Final Environmental Impact Statement and Record of Decision* (USDA Forest Service 1987b)
- *Environmental Assessment for the Implementation of Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California* (also referred to as PACFISH) (USDA Forest Service and USDI Bureau of Land Management 1995)
- *South Fork Clearwater River Landscape Assessment* (USDA Forest Service 1998)
- *Clearwater Subbasin Management Plan* (Northwest Power and Conservation Council 2005)
- *South Fork Clearwater River Subbasin Assessment and Total Maximum Daily Loads* (IDEQ et al. 2004)
- *American and Crooked River Project Environmental Impact Statement and Record of Decision* (USDA Forest Service 2005a)
- *Crooked River Valley Rehabilitation Project Wetland Delineation Report* (Geum Environmental Consulting 2012)
- *Design Criteria Report: Crooked River Valley Rehabilitation Design* (River Design Group et al. 2012)
- *Crooked River Archaeological Survey* (Desert West Environmental 2013a)
- *Native Materials Inventory: Crooked River Valley Rehabilitation Design* (River Design Group and Geum Environmental Consulting 2012).

The Nez Perce Forest Plan guides all activities related to the management of natural resources and establishes management standards for lands administered by the Nez Perce National Forest (USDA Forest Service 1987a). The Nez Perce Forest Plan describes resource management practices, levels of resource production and management, and the availability and suitability of lands for resource management.

On February 24, 1995, the Forest Service and the Bureau of Land Management signed a decision adopting an interim strategy for managing anadromous-fish-producing watersheds on lands administered by the Forest Service and the Bureau of Land Management in eastern Oregon and Washington, Idaho, and portions of California, commonly referred to as PACFISH (USDA Forest Service and USDI BLM 1995). This decision amends regional guides and forest land and resource management plans that guide the management of lands in the National Forest System. Where compatible, the decision also provides management direction that is consistent with Bureau of Land Management land-use plans and, thereby, establishes interim goals, objectives, and standards and guidelines for these anadromous-fish-producing watersheds. The intended effect of the decision is to provide additional protective management of the watersheds in the affected areas to avoid limiting the choice of reasonable alternatives that may be developed in geographically specific environmental analyses of long-term management strategies.

The *South Fork Clearwater River Landscape Assessment* (USDA Forest Service 1998) characterized the ecological and social conditions in the South Fork Clearwater River Subbasin and provided the context for subsequent ecosystem analyses, including Crooked River. Within the Crooked River Ecological Reporting Unit, the integrated area theme for lower Crooked River was identified as Restore Aquatic Processes (Map 48). Review of the existing conditions in lower Crooked River identified the primary departure from historic disturbance regimes in Crooked River as being associated with the riparian and instream processes of the mainstem channel. A very high priority rating was identified with the aquatic theme for lower Crooked River for the restoration of stream/riparian processes and the sediment regime in the main channel of Crooked River. Restoration in the lower watershed was recommended to focus primarily on restoring, to the extent possible, the hydrologic and riparian processes of the mainstem channel, with aquatic habitat creation being the end result. This type of restoration would provide increased habitat potential for steelhead and spring Chinook, along with subadult/adult rearing habitat for bull trout and westslope cutthroat in the upper subbasin. Restoration of this channel would greatly improve the connectivity to the rest of the subbasin of the existing good habitat and populations in the upper watershed.

The *Clearwater Subbasin Management Plan* (NPCC 2005) was the first of approximately 60 subbasin plans intended to provide an up-to-date biological assessment of fish and wildlife populations, a synthesis of past and ongoing fish and wildlife management activities, the identification of factors currently limiting fish and wildlife production, a description of strategies to address the limiting factors, and a prioritization framework for future fish and wildlife activities in the face of limited resources for each subbasin. The document was intended to guide future fish and wildlife projects in the Clearwater River Subbasin.

The *South Fork Clearwater River Subbasin Assessment and Total Maximum Daily Loads* (IDEQ et al. 2004) addresses the water bodies in the South Fork Clearwater River Subbasin that have been placed on the Clean Water Act, Section 303(d) list, including Crooked River. Crooked River has a TMDL for sediment and water temperature.

The *American and Crooked River Project Environmental Impact Statement and Record of Decision* (USDA Forest Service 2005a) analyzed the environmental consequences of reducing forest fuels through various timber harvest methods and implementing watershed improvements in the Crooked River watershed. Most of the projects addressed by that EIS have been completed.

The *Design Criteria Report: Crooked River Valley Rehabilitation Design* (RDG et al. 2012), *Crooked River Valley Rehabilitation Project Wetland Delineation Report* (Geum Environmental Consulting 2012), and *Final Design Report: Crooked River Valley Rehabilitation Design* (RDG et al. 2013a) summarize an investigation and evaluation of the lower 2 miles of Crooked River that are being considered for restoration. The study was commissioned to document the existing conditions within the stream system, provide a design and the appropriate criteria for restoring the stream, riparian corridor, and floodplain, and evaluate the ability to mitigate the environmental disturbance of past mining within the watershed.

The *Crooked River Archaeological Survey* (Desert West Environmental 2013a) describes the heritage resources in the project area. The Gnome Townsite above the project area was fully surveyed and documented as mitigation for the proposed action and is covered in this survey.

The *Native Materials Inventory: Crooked River Valley Rehabilitation Design* (RDG and Geum Environmental Consulting 2012) describes the inventory of existing native materials, such as soil, trees, rocks, and instream habitat structures in the project area. The purpose of the inventory was to estimate the quantity of native material available for use in proposed rehabilitation efforts.

Cooperating Agencies

Nez Perce Tribe

The Nez Perce Tribe is responsible for reviewing and providing comments on the EIS. The Nez Perce – Clearwater National Forests and the Nez Perce Tribe would be responsible for implementing the decision, including mitigation and monitoring.

Bonneville Power Administration

BPA is responsible for reviewing and providing comments on the EIS and determining whether to provide funding for the project following the decision.

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

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

U.S. Army Corps of Engineers

The United States Army Corps of Engineers (USACE) is a federal agency in the U.S. Department of Defense. The USACE administers and enforces Section 404 of the Clean Water Act. Under Section 404, a Department of Army permit is required for the discharge of dredge/fill material into waters of the United States, including wetlands. The USACE has jurisdiction under Section 404 of the Clean Water Act with respect to the Crooked Valley Rehabilitation Project EIS over project alternatives that would involve the discharge of dredged or fill materials into wetlands and open waters in the Crooked River floodplain, including man-made remnant gold dredge ponds.

The USACE role in the Crooked Valley Rehabilitation Project EIS is to assist the Forest Service and other partners in reviewing information for the preparation of the environmental analysis in regards to the permit review process under Section 404 of the Clean Water Act. This entails reviewing portions of the EIS or supporting documents, and advising the Forest Service with respect to project compliance under Section 404 of the Clean Water Act.

Public Involvement

The Notice of Intent for the project was published in the *Federal Register* (Volume 77, No. 239, Page 73976) on December 12, 2012, with a 45-day comment period. In addition, as part of the public involvement process, the Forest Service mailed the proposed action letter to 395 potentially interested parties on November 30, 2012. To solicit input on the proposed actions the Forest Service held two public meetings: January 17, 2013, in Grangeville, Idaho; and January 28, 2013, in Elk City, Idaho. Issues raised by interested parties are summarized below.

The Notice of Availability of the Draft EIS was published in the *Federal Register* and *Lewiston Morning Tribune*.

Issues

Public comments on the proposed action were received in response to the mailing in December 2012, and public meetings in January 2013. The Notice of Intent and scoping letter presented to the public two project components as the proposed action: the Crooked River Meanders and the

Crooked River Narrows Road. Comments on these proposed actions are summarized here to provide information to the public on their comments. Below is a display of alternatives presented in the Notice of Intent and this Draft EIS. For the Crooked River Meanders, the public commented on two alternatives, including No Action. For the Crooked River Narrows Road, the public commented on four alternatives, including No Action. See Chapter 2 for a description of the alternatives considered in detail and alternatives considered but eliminated from detailed study.

Crooked River	Notice of Intent & Scoping Letter	Draft EIS
Meanders	Alternative 1 – No Action	Alternative 1 – No Action
	Alternatives 2 – Proposed Action	Alternative 2 – Proposed Action
Narrows Road	Alternative A – No Action	Considered as a future foreseeable action in cumulative effects. The Narrows Road Improvement Project (Alternative B) would reconstruct Road 233 in place, above the 50-year flood flow elevation.
	Alternative B – Proposed Action – Reconstruct Road 233 in place, above the 100-year flood flow elevation.	
	Alternative C – Deadwood Re-route, including decommissioning a portion of Road 233.	
	Alternative – Relocate Road 233, upslope above the 100-year flood flow elevation.	

The Forest Service and the Nez Perce Tribe reviewed and identified issues raised during the scoping period. Issues are actual or perceived effects, risk and hazards identified by the public, other agencies or by the interdisciplinary team. Issues were categorized as follows: (1) issues decided by law or policy, (2) issues addressed through design criteria or mitigation, (3) issues to be addressed in effects analysis, (4) issues used to develop alternatives to the proposed action, (5) issues not affected by the proposed action, or (6) issues outside the scope of the project, including conjectural and not supported by scientific or factual evidence. The public raised several issues that drove the development of alternatives, added design or mitigation measures, or affected analysis of the proposed project.

In Section 1501.7(a)(3), the Council on Environmental Quality (CEQ) NEPA regulations direct the lead agency to "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…" A full description of issues and reasons why they are not evaluated further in this EIS are briefly discussed below. Additional information on issues may be found in the project record at the Nez Perce – Clearwater National Forests office in Grangeville, Idaho. The following issues were identified and addressed as indicated below:

- Comments were expressed about the potential effects to the environment. These comments were addressed by adding design and mitigation measures related to:

effects on water quality and fish habitat, soil resources, cultural resources, mineral claims and public access during implementation, and control of invasive species. See Chapter 2.

- Comments were expressed about the potential effects to natural resources or the public. These comments were grouped into the following categories, and the potential effects are presented in Chapter 3: aquatic resources, water resources, cultural resources (including historic sites), soil resources, wildlife resources, rare plants, invasive plants, recreation (including fishing access), mineral resources, transportation (including access, maintenance, safety, and costs), social and economic resources, and cumulative effects.
- Comments were expressed about the loss of moose and elk habitat and re-vegetation in the Crooked River Meanders. See the analysis completed in the Wildlife section in Chapter 3.
- Comments were expressed about the cumulative effects of mining operations in the Crooked River watershed and the potential of future mining operations on the proposed project. See the analysis completed in the Mineral Resources section in Chapter 3.
- Concerns were expressed about preserving the recreational and mining opportunities in the watershed. See the Mineral Resources and Recreation Resources sections in Chapter 3 for the comparison of current and proposed access in the watershed, by alternative.
- Comments were expressed about the consequences of the proposed project on water quality in the project area. See the analysis in the Water Resources and Aquatic Resources sections in Chapter 3.
- Comments were expressed about preserving access to historic roads, trails, and rights-of-way, and that the tailings piles are historic and should not be altered. See the analysis in the Cultural Resources section in Chapter 3.
- Comments were expressed about the safety, seasonal access, and maintenance of Alternative C for the Crooked River Narrows Road (Deadwood Road Re-route). This alternative was developed and considered by the deciding official, but eliminated from detailed study (Chapter 2). See the analysis in the Transportation report in the project record.
- Comments were expressed that the proposed action for the Crooked River Narrows Road (Alternative B) would not provide enough benefit and that the road needs to be decommissioned or converted to a foot trail, and Alternative C needs to be fully analyzed. Alternative C was developed and considered by the deciding official, but eliminated from detailed study (Chapter 2). See the analysis in the Water Resources report in the project record.

Regulatory Framework

As part of the analysis for this project, the Interdisciplinary Team evaluated various alternatives under the laws, regulations, and requirements relating to federal natural resource management. Several of the design features presented in Chapter 2 were developed and incorporated to ensure that these requirements would be met. Additional details can be found in Chapters 2 and 3 (by resource area), Chapter 4, and the project record.

Forest Plan Direction

Although the Clearwater and Nez Perce National Forests were administratively combined in February 2013, management of the lands formerly within the boundary of the Nez Perce National Forest will continue to be guided by direction found in the Nez Perce Forest Plan until the plan is revised. The Nez Perce Forest Plan (USDA Forest Service 1987a, as amended) includes goals, objectives, standards, and guidelines that direct management of forest resources. Forest Plan direction is established at two scales: (1) Forest-wide direction is applicable throughout the Forest, and (2) management area direction ties specific goals, objectives, and standards to the unique capabilities of given parcels of land.

Nez Perce Forest Plan standards apply to National Forest System (NFS) lands within the Nez Perce National Forest boundary. The standards are intended to supplement, not replace, national and regional policies, standards, and guidelines found in Forest Service manuals and handbooks and the Northern Regional Guide (USDA Forest Service 1999a).

The development and analysis of the Crooked River Valley Rehabilitation project was guided by the goals, objectives, standards, guidelines, and management area direction within the Nez Perce Forest Plan. The Forest Plan provides direction for the management of the Crooked River Valley Rehabilitation Project area and defines the desired future conditions. The proposed action responds to the goals and objectives outlined in the Forest Plan. This project would improve conditions in the project area to bring them more in line with the desired future conditions described in the plan. In addition, the proposed project responds to the objectives of protecting, restoring, and enhancing watersheds within proximity of the ceded territory of the Nez Perce Tribe. The need for this project was identified by comparing the existing conditions in the Crooked River Valley Rehabilitation Project area with the habitat objectives considered optimal for salmonid spawning and rearing. This project would help move the Forest toward desired conditions as described in the Forest Plan and other relevant planning direction.

Forest-wide management direction in the Nez Perce National Forest Plan that relate to this project include Goals 2, 3, 4, 11, 12, 18, 20, 21, and 22 (USDA Forest Service 1987a, pages II-1 and II-2):

2. Provide and maintain a diversity and quality of habitat that ensures a harvestable surplus of resident and anadromous game fish species.

3. Provide and maintain a diversity and quality of habitat to support viable populations of native and desirable non-native wildlife species.
4. Provide habitat to contribute to the recovery of Threatened and Endangered plant and animal species in accordance with approved recovery plans. Provide habitat to ensure the viability of those species identified as sensitive.
11. Locate, protect, and interpret significant prehistoric, historic, and cultural resources.
12. Provide a stable and cost-efficient transportation system through construction, reconstruction, maintenance, or transportation system management.
18. Maintain soil productivity and minimize any irreversible impacts to the soil resource.
20. Maintain or enhance stream channel stability and favorable conditions for water flow.
21. Provide water of sufficient quality to meet or exceed Idaho State Water Quality Standards and local and downstream beneficial uses.
22. Protect or enhance riparian-dependent resources.

The Nez Perce Forest Plan provides direction for wildlife and fish with the following Forestwide standards that apply to this project (USDA Forest Service 1987a, p. II-19):

1. Maintain viable populations of existing native and desirable non-native vertebrate wildlife species.
2. In compliance with sub-section 7(a)(2) of the Endangered Species Act, a biological evaluation will be prepared (as described in FSM 2672.42) for all proposed management activities.
4. Recognize fishing and hunting rights guaranteed to the Nez Perce Tribe through fish and game habitat management.
19. Restore presently degraded fish habitat to meet the fish/water quality objectives established in this Forest Plan (see Appendix A of the Forest Plan).
20. Use the "Guide for Predicting Salmonid Response to Sediment Yields in the Idaho Batholith Watersheds" to evaluate the attainment of fish habitat objectives.
21. Meet established fishery/water quality objectives for all prescription watersheds as shown in Appendix A.
22. Schedule fishery habitat and watershed improvements in those streams where the existing fishery habitat potential is below the stated objective.

Forest Plan, Management Areas 3, 7, and 10, provides direction, including standards, that would apply to this project (USDA Forest Service 1987a, as amended):

- Management Area 3 – Cultural resources (pages III-9 and III-10)
- Management Area 7 – Administrative sites, including campgrounds (pages III-15 and III-16)
- Management Area 10 – Riparian Areas (pages III-30 to III-33).

Forest Plan Amendment 20 standards that apply to this project are as follows (PACFISH – USDA Forest Service and USDI Bureau of Land Management 1995):

- FW-1. Design and implement fish and wildlife habitat restoration and enhancement that contributes to Riparian Management Objectives (RMOs).
- FW-2. Design, construct, and operate fish and wildlife interpretive and other user-enhancement facilities in a manner that does not retard or prevent attaining the RMOs.
- FW-3. Cooperate with Federal, Tribal, and State wildlife management agencies and eliminate wild ungulate impacts that prevent attainment of RMOs or adversely affect listed anadromous fish.
- 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 RMOs.
- WR-3. Do not use planned restoration as a substitute for preventing habitat degradation (i.e., use planned restoration only to mitigate existing problems, not to mitigate the effects of proposed activities).

Other Management Guidance

The Crooked River Valley Rehabilitation project analysis and documentation of effects in this EIS are consistent with direction found in the following laws and regulations that guide federal actions: the National Forest Management Act (NFMA) and implementing regulations in 36 CFR 219; the National Environmental Policy Act of 1969 and CEQ implementing regulations under 40 CFR 1500–1508; the National Historic Preservation Act (NHPA) and implementing regulations under 36 CFR 800; the Clean Water Act (Federal Water Pollution Control Act) together with implementing regulations under 40 CFR 130; the Endangered Species Act of 1973, as amended (16 United States Code (USC) 1531 *et seq*) (ESA), and implementing regulations pursuant to 50 CFR 402.06 and 40 CFR 1502.25; and the Clean Air Act and implementing regulations in 40 CFR 50.

This project has been developed to be consistent with: Executive Orders 11988 (Floodplain Management), 11990 (Protection of Wetlands), 12898 (Environmental Justice), and 13112 (Invasive Species); Idaho Forest Practices Act; Idaho State Water Quality Standards; Idaho Stream Channel Protection Act; Travel Management Rule (36 CFR 212, 251, 261, 295); Watershed and Fisheries Regulatory Framework; and the Northern Region Soil Quality standards.

More details are in Chapter 3, by resource area, in the Consistency with Forest Plan and Environmental Laws sections, Chapter 4, Appendix D, and the project record.

Tribal Treaty Rights

American Indian tribes are afforded special rights under various federal statutes: National Historic Preservation Act (NHPA) (36 CFR 800), National Forest Management Act (NFMA), Archaeological Resources Protection Act of 1979 (43 CFR 7), Native American Graves Protection and Repatriation Act of 1990 (NAGPRA [43 CFR 10]), Religious Freedom Restoration Act of 1993 (P.L. 103141), and American Indian Religious Freedom Act of 1978 (42 U.S.C. 1996, 1996a) (AIRFA). Some of these statutes and federal guidelines direct federal agencies to consult with tribal representatives who may have concerns about federal actions that may affect religious practices, other traditional cultural uses, or cultural resource sites and remains associated with tribal ancestors. Any tribe whose aboriginal territory occurs within a project area is afforded the opportunity to voice concerns for issues governed by NHPA, NAGPRA, or AIRFA.

Federal responsibilities to consult with tribes are enumerated in the NFMA; Interior Secretarial Order 3175 of 1993; and EOs 12875, 13007, 12866, and 13084. EO 12875 (Enhancing the Intergovernmental Partnership) calls for regular consultation with tribal governments. EO 13007 (Indian Sacred Sites) requires consultation with tribes and religious representatives on the access, use, and protection of sacred sites by land management agencies. EO 12866 (Regulatory Planning and Review) requires that federal agencies seek views of tribal officials before imposing regulatory requirements that might affect them. EO 13084 (Consultation and Coordination with Indian Tribal Governments) provides direction regarding consultation and coordination with tribes relative to fee waivers. EO 12898 (Environmental Justice) directs federal agencies to focus on the human health and environmental conditions in minority and low-income communities, especially in instances where decisions may adversely impact these populations. NEPA regulations (40 CFR 1500–1508) invite tribes to participate in forest management projects and activities that may affect them. The Crooked River watershed is a part of the more than 13 million acres in central Idaho, northeastern Oregon, and southeastern Washington included in the pre-treaty area of use by the Nez Perce Tribe. Prior to the treaty of 1855, the Nez Perce used Crooked River and the South Fork Clearwater River Subbasin for hunting, fishing, gathering food, horse pasturing, and other cultural uses.

In 1855, the United States negotiated a treaty with the Nez Perce Tribe: Treaty of June 9, 1855, 12 Stat. 957. In Article 3 of this treaty, the Nez Perce Tribe explicitly reserved for itself certain rights, including the exclusive right to take fish in streams running through or bordering the Reservation and "the right to fish at all usual and accustomed places in common with the citizens of the Territory." These rights include the right to fish, hunt, and gather within the Nez Perce – Clearwater National Forests, including Crooked River watershed. Crooked River lies entirely within the ceded territory of the Nez Perce Tribe.

Federal courts have recognized that "it is undisputed that Indian tribes have legally protected interests within their aboriginal Territory" (*Idaho v. Forest Service,* No. CV 99-611-N-EJL, slip op. at 3 [D. Idaho Sept. 8, 2000]). By virtue of its treaty and trust obligations to the Nez Perce Tribe, the United States and its agencies, including the Forest Service, have substantive duties to consult with the Nez Perce Tribe and to implement measures necessary to protect and enhance tribal resources (*Klamath Tribes v. U.S.*, 24 Ind. Law Rep. 3017, 3020 [D. Or. 1996]).

Treaty tribes, such as the Nez Perce, have been recognized as managers of their treaty-reserved resources (*U.S. v. Washington*, 384 F. Supp. 312, 339-40, 403 [W.D. Wash. 1974]). As a manager, the Nez Perce Tribe has devoted substantial time, effort, and resources to the recovery and co-management of treaty-reserved resources within its ceded territory. To guide these efforts, the Nez Perce Tribe, through its own fisheries programs and the Columbia River Inter-Tribal Fish Commission (CRITFC), has developed and implemented a comprehensive salmon recovery plan (CRITFC 1996).

The national forests, including the Nez Perce – Clearwater National Forests, within the Nez Perce Tribe's ceded territory are central to both tribal and federal efforts to recover imperiled species. The Nez Perce Tribe believes that projects in national forests, such as the Crooked River Valley Rehabilitation, are needed to enhance efforts to recover and restore anadromous fish species and their habitat.

The Crooked River Valley Rehabilitation project has been presented to the Nez Perce Tribe at quarterly staff-to-staff meetings since January 2013.

Project Record

This EIS incorporates by reference, pursuant to 40 CFR 1502.21, the Crooked River Valley Rehabilitation Project Record, which contains specialist reports and other technical documentation used to support the analysis and conclusions in this EIS.

Relying on specialist reports and the project record helps implement the CEQ regulations' direction to reduce NEPA paperwork (40 CFR 1500.4). This EIS also incorporates documented analyses by summary and reference where appropriate. The intent is to furnish enough site-specific information to demonstrate a reasoned consideration of the environmental consequences of the alternatives and how these consequences can be mitigated, without repeating detailed analysis and background information available elsewhere. The project record is available for review at the Nez Perce – Clearwater National Forests office, in Grangeville, Idaho.

This page was intentionally left blank.

CHAPTER 2. ALTERNATIVES, INCLUDING THE PREFERRED ALTERNATIVE

Introduction

This chapter compares the alternatives being considered for the Crooked River Valley Rehabilitation project. It defines the differences between the alternatives and provides a clear basis for the deciding official and the public choosing between them. The choice will be based on the design of the action alternative, as well as the environmental, social, and economic effects of implementing each alternative.

Alternatives Considered in Detail

In response to issues raised by the public, the Forest Service has developed two alternatives to be considered in detail: no action and proposed action. The decision to proceed with the proposed action could include the entire proposed action or less than what has been proposed in the proposed action alternative.

NEPA requires the inclusion of a no-action alternative when federal agencies enter into the decision-making process to consider the environmental, historical, and cultural consequences of a proposed action. Alternative 1, no action, provides a mechanism for evaluating the potential effectiveness of the existing management policy as well as considering the implications of a hands-off approach. Alternative 1 does not necessarily preclude further action or plausible changes in management policy; instead, it represents the continuation of the existing management strategy.

Alternative 1 – No Action

Under Alternative 1, no stream rehabilitation would occur. BPA would not provide funding toward the Crooked River Valley Rehabilitation Project; the Corps would not grant appropriate permits; and the Forest Service and NPT would not construct the project. This alternative provides a baseline for comparison of environmental consequences of the proposed action to the existing condition, and is a management option that could be selected by the Responsible Official. The results of taking no action would be the current condition as it changes over time due to natural forces. Current management plans, such as the Forest Plan, and ongoing activities would continue to guide the management of the project area (see Appendix C for more details). No rehabilitation of Crooked River Valley would occur.

Following the Forest Service decision, BPA would not provide funding toward the Crooked River Valley Rehabilitation Project and USACE would not issue a 404 permit.

Alternative 2 – Proposed Action (Preferred Alternative)

Under Alternative 2, the lower 2 miles of the Crooked River valley and Crooked River would be reconstructed to improve fisheries habitat (Figure 2-1 and Appendix A). This alternative would follow the specific design and mitigation measures identified in the Design and Mitigation Measures section in the Draft EIS below. Additional measures may be identified during consultation or from public comments and may be included in the Final EIS or decision.

This proposed action alternative is based on designs and design criteria provided in the *Final Design Report: Crooked River Valley Rehabilitation Design* (RDG et al. 2013a) and the *Design Criteria Report: Crooked River Valley Rehabilitation Design* (RDG et al. 2012). The stream restoration is proposed to address areas of impact in the lower 2 miles of Crooked River. For engineering design details on the proposed action, see Appendix A.

Alternative 2 project area spans from the Idaho Department of Fish and Game weir intake structure, which is approximately 0.1 mile upstream of the confluence with the South Fork Clearwater River, to about 2.0 miles upstream where the valley narrows. The valley rehabilitation/reconstruction is proposed to address the areas that have been adversely impacted by historic dredge mining.

Alternative 2 proposes to re-grade approximately 115 acres of floodplain by moving dredge tailings. No dredge material would be removed from the project area. Approximately 10,960 feet of current channel would be filled in and approximately 7,400 feet of new stream channel would be reconstructed. The new stream channel would have woody bank treatments to provide stability. Large woody debris would be added to the stream channel along approximately 9,400 feet. More than 2,700 feet of side channels would be constructed. The stream channel would be constructed so as not to interfere with Road 233 in the lower 2 miles. An illustration of the proposed floodplain features, including the side channels and vegetation communities, is provided in Figure 2-2.

The floodplain would be re-graded so that about 50 acres would seasonally flood every 1.5 years, which would create conditions for the formation of approximately 64 acres of wetlands, including 14 acres of open water. Appendix B provides the Clean Water Act 404(b)(1) analysis that describes the Least Environmentally Damaging Practicable Alternative for the alteration of wetlands. The valley bottom would be replanted with native plant communities, including alder and spruce, to facilitate the continuous and natural recruitment of wood and instream substrate material. Large wood, from re-grading the floodplain or from other approved sources, would be placed on the newly constructed floodplain to increase upland, riparian, and future instream habitat complexity. The remaining valley bottom would be constructed to seasonally flood every 10 years. Figure 2-3 shows a cross section of distribution of floodplain vegetation communities.

Alternative 2 proposes a temporary river bypass channel to reduce the direct impacts of construction to water quality, fish, and aquatic organisms in Crooked River. The bypass channel would be constructed prior to any instream or floodplain work, and remain in use until completion of the new floodplain and stream channel (2–3 years). Cofferdams and/or headgates would be constructed on the mainstem channel. This temporary river bypass channel (about 6,000 feet) would be constructed along the east side of the valley using existing mining ponds to pass water, fish and aquatic organisms during construction of the project. The bypass channel would be constructed to contain a 10-year flow event of Crooked River. Fish and aquatic organism salvage would occur in the main channel, ponds, and bypass channel before de-watering actions. Following construction, Crooked River would be slowly re-watered during low flow, cofferdams removed, and the bypass channel would be reshaped into the floodplain.

Alternative 2 proposes a temporary haul/access route in the project area to reduce the impact to Road 233 and the public traveling on Road 233 during river rehabilitation. Approximately 23,200 cubic yards of material would be excavated for the bypass channel and the material would be used in construction of the temporary access route. There are three existing access roads into the project areas: these areas would be used to access the valley bottom from Road 233. Stream crossing structures would be installed on these existing access routes in three locations over the temporary bypass channel (see Appendix A). Following construction of the channel, the temporary haul/access road structures would be removed and the road decommissioned. Existing access roads would be retained for recreational use.

Materials such as large woody debris, rock, wood chips, and soil would be stockpiled in the dispersed campsites near Campground 4, which would require the closure of four dispersed sites (about 1.5 acres) prior to beginning construction. These dispersed campsites would be closed for the duration of the project. Campgrounds 3 and 4 may also be closed year-round for the duration of the project to store materials and ensure public safety. Much of the material would come from within the project area, but some would be imported. Large woody debris and wood chips would be imported from the Crooked River watershed through the Orogrande Community Protection project (USDA Forest Service 2013a draft) or other projects evaluated through a NEPA process. See Appendix C for more details. Large woody debris would be added to the stream channel for habitat complexity, and to the floodplain to provide microsites and roughness. Wood chips would also be added to the floodplain to increase water retention in the substrate in order to improve plant survival.

To provide nutrients and a food source for fish, cobble substrate and large woody debris may be added to the newly created channel from the temporary bypass channel. Salmon carcasses may be used to provide additional nutrients to the new channel.

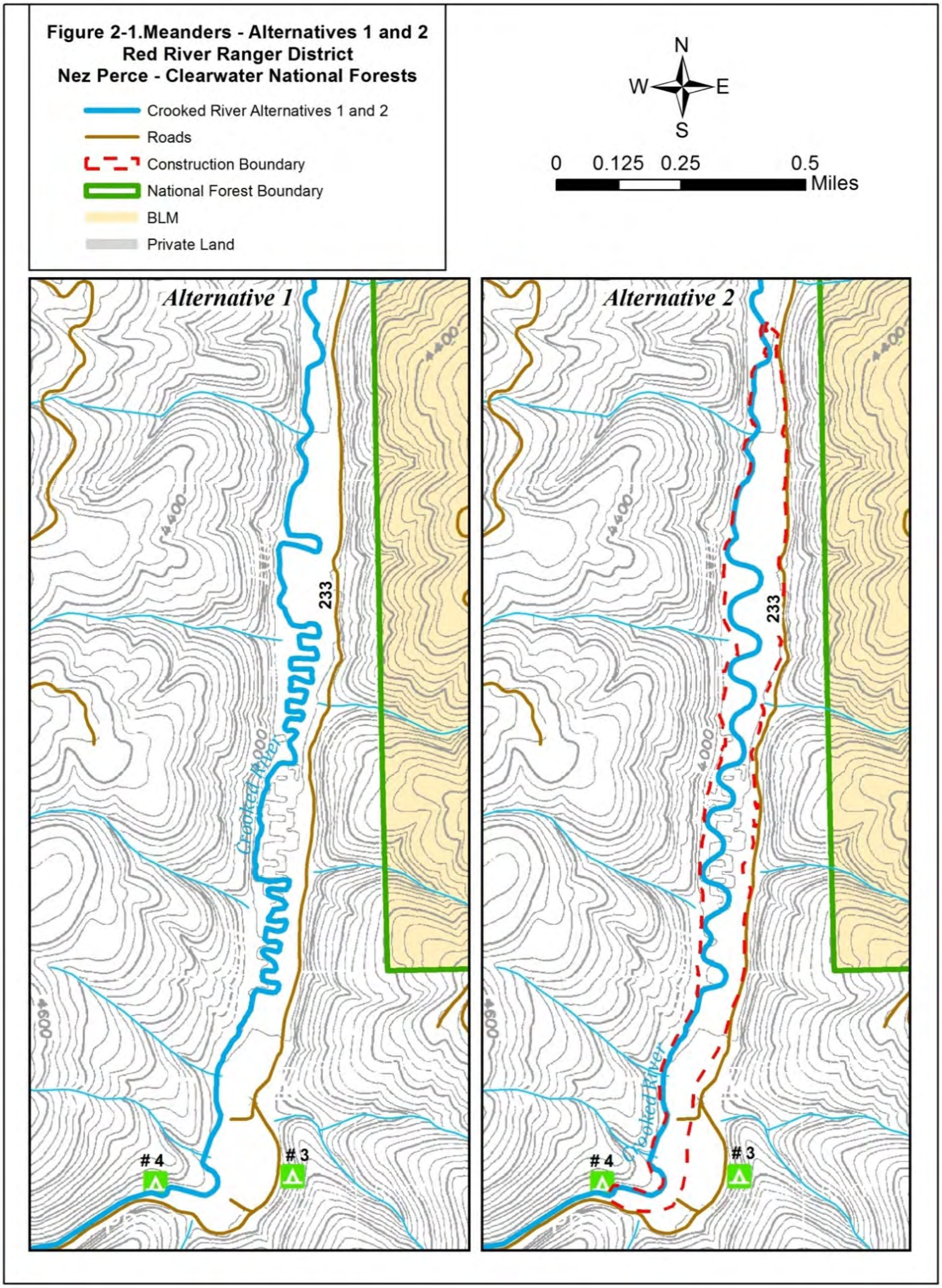


Figure 2-1. Project area for Crooked River Meanders.

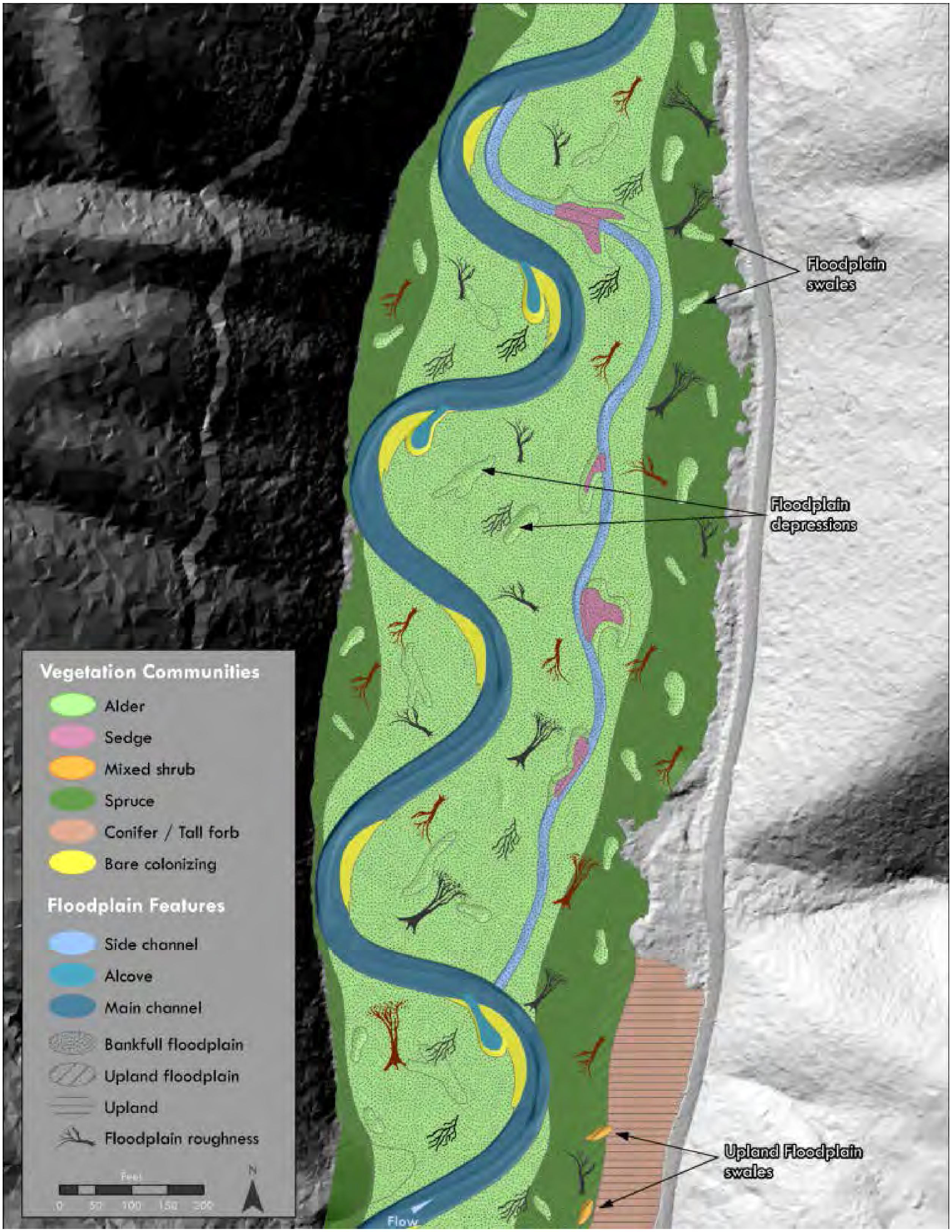


Figure 2-2. Proposed floodplain features (RDG et al. 2013a).

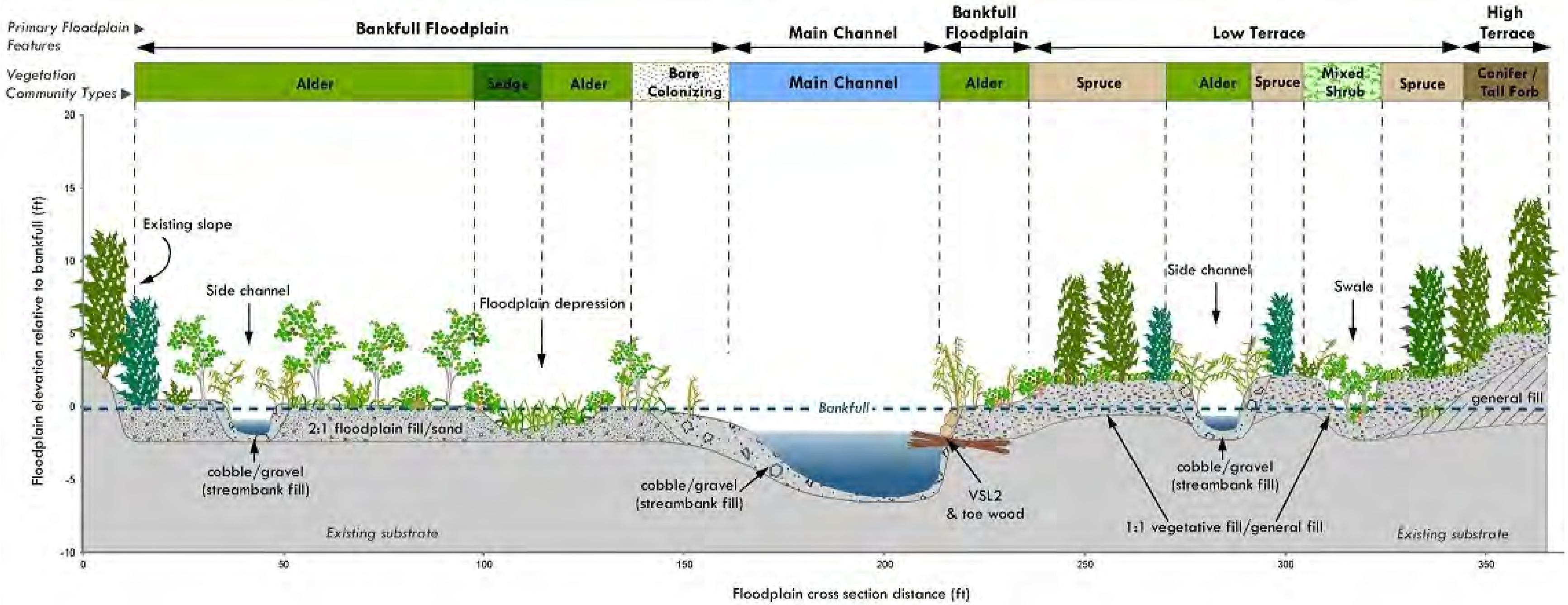


Figure 2-3. Cross section of distribution of floodplain vegetation communities. The illustration shows the potential development over a 10- to 20-year period (RDG et al. 2013a).

Construction Phasing

The project would split implementation into multiple construction phases that could be accomplished within annual budget allocations. The phasing sequence is summarized in Table 2-1 below, and depicted in Appendix A in Figures A-1a and A-1b (RDG et al. 2013a).

Phasing considerations include:

- Water management (bypass channel) requirements
- Temporary stabilization measures of unconsolidated material required to transition from each phase to prevent flood damage to newly constructed features
- Earthwork volumes (balancing cut and fill)
- Environmental compliance considerations (fish passage).

The project would be constructed in phases over several years. The construction phasing approach involves: (1) stockpiling large woody debris in designated upland areas, (2) constructing bypass channel and removing vegetation from floodplain, (3) new floodplain grading and new channel grading, (4) new channel bank treatments, woody debris placement, and new channel activation, (5) bypass channel reclamation and upland floodplain grading, and (6) replanting with native plant communities and long-term maintenance of vegetation.

Table 2-1. Construction phasing approach for the Crooked River Valley Rehabilitation project (RDG et al. 2013a).

Phase	Year	Scope
Phase 1	2015	Bypass channel construction between bypass channel stations 0+00 and 40+00. New channel construction and floodplain grading between channel stations 31+00 and 74+00, including grading of secondary floodplain features (swales, depressions, wetlands, and side channels).
Phase 2	2016	Bypass channel construction between bypass channel stations 40+00 and 60+00. New channel construction and floodplain grading between channel stations 74+00 and 106+00, including grading of secondary floodplain features (swales, depressions, wetlands, and side channels).
Phase 3	2017	Bank treatments and floodplain roughness between channel stations 31+00 and 106+00. New channel activation.
Phase 4	2018	Bypass channel reclamation, floodplain roughness, and upland floodplain grading, including grading of secondary floodplain features (swales, depressions, wetlands, and side channels) between channel stations 31+00 and 106+00.
Option 1	Any year 2015 to 2018	Floodplain grading and habitat structures between channel stations 0+00 and 31+00.
Option 2	Any year 2015 to 2018	Floodplain grading and habitat structures between stations 106+00 and 129+00.

Following the Forest Service decision, BPA would decide whether to provide funding toward the Crooked River Valley Rehabilitation Project and USACE would decide whether to issue permits.

Design and Mitigation Measures by Resource Area

The following project design and mitigation measures have been developed to eliminate or reduce to acceptable levels the effects of proposed activities. Their potential effectiveness is described in italics, in Chapter 3, and in more detail in the project record.

Soils, Water Quality, and Fish Habitat

1. Complete ground-disturbing activities during low-flow conditions. Adjust instream work dates site-specifically through coordination with the Central Idaho Level 1 Team (USDI Fish and Wildlife Service, NOAA-National Marine Fisheries Service, USDA Forest Service, and USDI Bureau of Land Management) and other agencies. (Effectiveness: *High, based on experience*)
2. Thoroughly wash and inspect all equipment used in stream restoration activities before it enters the Nez Perce – Clearwater National Forests to help prevent the introduction of chemicals to the site. Keep all equipment in a well-maintained condition to minimize the likelihood of a fluid leak. (Effectiveness: *High, based on experience*)
3. Stage all construction equipment in a location and manner to minimize air, soil, and water pollution. (Effectiveness: *High, based on experience*)
4. Require a Spill Prevention and Control Plan that is approved by the Forest Service contracting officer representative for handling and storage of petroleum products. Keep any storage of petroleum products in excess of 200 gallons within constructed containment structures that have an impervious liner with a capacity equal to or larger than the storage container. Locate the containment structure at least 150 feet from live water. Before being used within 300 feet of the stream reconstruction site, inspect all heavy equipment or other machinery for hydraulic leaks or other leaks. Do not use leaking or faulty equipment. Clean equipment that has accumulations of oil, grease, or other toxic materials prior to use in these areas. Do not permit disposal of petroleum products on national forest land. (Effectiveness: *High, based on experience*)
5. Fuel and lubricate at least 150 feet from all waterbodies. Service and refuel in a manner that avoids spills and overfills. (Effectiveness: *High, based on experience*)
6. Require a pollution and erosion control plan, approved by the Forest Service contracting officer representative, prior to commencing construction activities. Ensure that erosion control measures are in place before construction or staging of erodible materials begins. (Effectiveness: *Moderate to High, based on experience*)
7. Divert or pump stream around work site. Place screens on pump intakes. (Effectiveness: *Moderate to High, based on experience*)
8. Install silt fences, straw bales, and/or sand bag windrows as needed before excavation occurs to separate the disturbed areas from the live water and prevent eroded soil from entering the stream channel. (Effectiveness: *High, based on experience* [Clarkin et al. 2003])

9. Stabilize any road cuts, fills, and treads with a cover of annual rye and/or mulch where roads would remain for more than 1 year. (Effectiveness: *Moderate, based on experience*)
10. Grade and shape all disturbed sites to allow drainage. Seed disturbed sites as needed immediately upon completion of work in that area with certified weed-seed-free seed. Replant any small trees excavated from the work sites on the rehabilitated disturbed areas to help stabilize the soils. (Effectiveness: *Moderate to High, based on experience*)
11. For fish and aquatic organism salvage operations, drive or remove fish, amphibians, and mussels (referred to as fish salvage) from area. Removal would be done so as to result in minimal injury or disturbance to behavior. Ensure that a fisheries biologist is present onsite during dewatering and all salvage operations. Reduce water volume using pumping or diversion. Set up block nets to isolate areas to ensure that all species are moved. Conduct electroshocking only when a biologist with at least 100 hours of electrofishing experience is onsite to conduct or direct all activities associated with capture attempts in accordance with *Guidelines for Electrofishing Waters Containing Salmonids Listed under the Endangered Species Act* (NMFS 2000) and *Best Management Practices for Pacific Lamprey* (USFWS 2010). (Effectiveness: *Moderate to High, based on experience*)
12. Deleted. Applied only to Narrows Road.
13. Apply the State of Idaho Best Management Practices and Forest Service Soil and Water Conservation Practices and incorporated in this document by reference (IDL 2013; USDA Forest Service 1988b and 2012). (Effectiveness: *High, based on experience*)
14. Contact appropriate utility companies prior to ground-disturbing activities to locate and move or avoid underground power lines. Restore all utility lines upon completion of the project so that no loss of power occurs. (Effectiveness: *High, based on experience*)
15. Stage sanitary facilities such as chemical toilets at least 150 feet from waterbodies to prevent contamination of surface or subsurface water. (Effectiveness: *High, based on experience*)
16. Obtain and comply with all appropriate permits prior to ground-disturbing activities (such as Joint Application for Stream Alteration Permit [Clean Water Act Section 404], 401 Water Quality Certification, National Pollutant Discharge Elimination System or Storm Water Discharge Permit). Adjust any mitigation or monitoring through coordination with regulatory agencies. (Effectiveness: *High, based on experience*)
17. Within productive riparian areas, build soil and plant substrate suitable for restoring expected vegetation types. (Effectiveness: *High, based on experience*)
18. Conserve plants and active soil materials for re-use in valley and roadside reclamation and upland restoration activities. (Effectiveness: *High, based on experience and Final Design Report* [RDG et al. 2013a])
19. Secure side-slopes after construction activities using onsite materials where available, including natural mulch from residual vegetation slash, chipping/masticated material,

and/or transplanted trees and shrubs. (Effectiveness: *Moderate to High, based on experience*)

20. Implement procedures outlined in the Best Management Practices for Mercury Collection from Restoration Activities in Crooked River (Appendix E) if mercury is found during project work. (Effectiveness: *Moderate, based on experience*)

Transportation

21. Deleted. Applied only to Narrows Road.
22. Water road surfaces, including the temporary haul road to reduce airborne dust.
23. Provide maintenance on Road 233 commensurate with construction-induced effects. (*Effectiveness: High, based on experience*)

Noxious Weeds/Sensitive Plants and Wildlife

24. Implement appropriate protection measures, under the direction of the forest native plant coordinator, if previously unknown Forest Service sensitive plant species are observed and activities would impact individuals or populations during implementation. Appropriate measures would vary depending upon the ecology of the species involved and nature of the activity. (Effectiveness: *High, based on monitoring and experience*)
25. Revegetate the project area using native and non-native species, as approved by the forest native plant coordinator, immediately upon completion of the project. (Effectiveness: *Moderate, based on experience*)
26. Apply only certified weed-seed-free mulching material and seed. Seed inspection testing is to be completed by a certified seed laboratory against the state noxious weed lists and documentation of the test provided to the contracting officer representative or designated inspector. Mulch material would be state certified weed free. (Effectiveness: *Moderate, based on experience*)
27. Soil, gravel, rock, and any material hauled to the project area must come from sources determined to be weed free. Sources would be approved by a contracting officer representative or designated inspector as weed free. (Effectiveness: *High, based on experience*).
28. Following implementation, monitor to detect invasive and noxious weeds. Treat identified weed infestations following the Nez Perce National Forest Noxious Weed EA (USDA Forest Service 1988a), Biological Assessments (USDA Forest Service 2013b draft), and Biological Opinions for Herbicide Treatment of Invasive and Noxious Weeds on the Nez Perce National Forest (2013–2022) (NMFS and USFWS 2013 draft) when applying herbicides within 50 feet of sensitive plants to reduce potential for incidental contact of spray compounds with non-target species of concern and to avoid potential harmful exposure. Adjust treatment through coordination with the Central Idaho Level 1 Team. (Effectiveness: *Moderate, based on experience*)
29. Prior to weed treatment, provide personnel with map locations and species identification of all known sensitive amphibians and plant habitats to reduce potential

harmful exposure and direct contact. (Effectiveness: *Moderate to High, based on practical experience*).

30. Avoid directly spraying chemicals on any terrestrial or aquatic organism other than invasive plants (to reduce potential for incidental contact of spray compounds with non-target species of concern and avoid potential harmful exposure). (Effectiveness: *Moderate to High, based on practical experience*).
31. Thoroughly wash and inspect all off-road equipment associated with the project for mud, soil, and plant parts prior to entering the Nez Perce – Clearwater National Forests. Cleaning must occur off national forest lands. (Effectiveness: *High, based on experience*)

Minerals

32. Protect or re-establish corners of existing lode mining claims. (Effectiveness: *High, based on experience and Final Design Report* [RDG et al. 2013a])

Recreation

33. During construction, place into effect a temporary area closure that would be in effect yearlong for the duration of the construction for the valley bottom, including Campgrounds 3 and 4. Keep Road 233 open. Notify public 1 year in advance of closure and have information available on the Forest Service website. (Effectiveness: *High, based on experience*)
34. Deleted. Applied only to Narrows Road.
35. Retain three dispersed recreation sites in the Crooked River valley. (Effectiveness: *High, based on experience*)
36. Retain and protect Campgrounds 3 and 4. (Effectiveness: *High, based on Final Design Report* [RDG et al. 2013a])

Heritage Resources

37. If human remains or materials subject to cultural patrimony (as defined in the Native American Graves and Repatriation Act) are encountered, the contractor would contact the Nez Perce – Clearwater National Forests. (Effectiveness: *Moderate, based on recognition of resource and contact with Heritage personnel*)
38. If any American Indian–related cultural resource materials, sites, or artifacts are discovered during project implementation, stop work and notify the Forest Service archeologist (36 CFR 800.13b). (Effectiveness: *Moderate, based on recognition of resource)*
39. Retain a representative sample of dredge piles for public interpretation. (Effectiveness: *High, based on Final Design Report* [RDG et al. 2013a])
40. Construct a three-panel educational kiosk in the Meanders to inform the public of the history of the Crooked River Valley. (Effectiveness: *High, based on experience*)

41. Follow guidance and conduct any monitoring, documentation, or other measures directed by Idaho State Historical Preservation Office or the National Office of Historic Preservation. (Effectiveness: *High, based on experience and consultation*)
42. Thoroughly photograph, document, and map historic dredge piles that are proposed for removal. (*Effectiveness*: *High, based on experience* [Desert West Environmental 2013a])
43. Record the historic Gnome village. (Effectiveness: *High, based on experience* [Desert West Environmental 2013a])
44. Perform a social business history related to the economic contribution historic dredge mining operations made to the local central Idaho economy. (Effectiveness: *High, based on experience* [Desert West Environmental 2013a])

Other Specific Design and Mitigation Measures

45. The temporary bypass channel construction and fish and aquatic organism salvage operations from the mainstem channel would occur after July 1 when steelhead and Chinook salmon have emerged from redds and bull trout would not be migrating in the project area. These dates may be adjusted for the particular site through coordination with the Central Idaho Level 1 Team and other agencies. Fish passage would be provided at all times for salmon, steelhead, bull trout, westslope cutthroat trout, and redband/resident rainbow trout. (Effectiveness: *Moderate, based on experience and Final Design Report* [RDG et al. 2013a])
46. During dewatering, floodplain grading, or temporary bypass channel or new channel construction, if "quick" conditions occur, halt activity until condition stops or other sufficient mitigations occur. (Effectiveness: *Moderate to High, based on experience)*
47. Keep natural soils in place onsite or stockpile them for future use. (Effectiveness: *High, based on experience*)
48. Operate dewatering within the construction area continuously until project construction has been completed to minimize turbidity and sedimentation. Turbid water may be pumped to the floodplain or settling ponds to keep areas dry during construction and reduce sediment input. (Effectiveness: *Moderate to High, based on experience*)
49. Construct a temporary haul/access road through the project area to reduce potential degradation to Road 233 and impacts to the public. Install crossing structures for the bypass channel in 2 to 3 locations prior to watering the bypass channel. Decommission haul/access road following use, but retain existing access roads for recreation. (Effectiveness: *High, based on Final Design Report* [RDG et al. 2013a])
50. Ensure that Road 233 remains clear of debris and equipment during construction. (Effectiveness: *High, based on Final Design Report* [RDG et al. 2013a])
51. Store mulch piles to reduce combustion hazard. (Effectiveness: *Moderate, based on experience*)
52. Construct temporary bypass channel of Crooked River to pass water, fish, and aquatic organisms during construction. Construct bypass channel prior to any instream or

floodplain work, and use until completion of the new floodplain and stream channel (2–3 years). Install cofferdams and/or headgates on the mainstem channel to contain a 10-year flow event. Water bypass channel during high flows (estimated April to June), but not fully use until the low-flow work window (July 1, or as agreed to during consultation). The bypass channel would be evaluated for stability through cross section and longitudinal analysis prior to watering. Slowly re-water the newly constructed channel during low flow. Remove cofferdams and reshape the bypass channel into the new floodplain. (Effectiveness: *High, based on experience* [i.e. observations and work in Red River Narrows and Mill Creek])

Monitoring

The Forest Service and Nez Perce Tribe would inspect the projects during implementation for implementation and compliance to ensure that they are completed per contract specifications and to ensure that best management practices are followed. The project would also be monitored for effectiveness to ensure that mitigation activities are meeting or working towards the desired condition.

A fish biologist and/or other qualified personnel (stream restoration specialist, hydrologist, etc.) from the Nez Perce – Clearwater National Forests or Nez Perce Tribe would ensure that the mitigation measures and best management practices are being adequately implemented. The Forest Service Contracting Officer Representative would be present most days during construction, and a designated inspector would be onsite. Any last-minute changes made to accommodate site-specific conditions must be within the range of effects analyzed in the EIS or biological assessment, or authorized by permits to be prepared for this project. A fish biologist or other qualified personnel would conduct compliance monitoring that tiers to regulatory documents, including biological opinions, Section 404 Clean Water Act permits, and Section 401 water quality certification.

In addition, monitoring for vegetation survival and invasive plants would occur in the longer term. Vegetation would be monitored in years 1, 3, and 5, 10 post-project for survival. Areas would be replanted if success rates are less than 80%. Invasive weeds would be monitored and treated at years 1, 3, 5, 7, and 10 if new infestations are found. Photos, at established points, would be taken of the floodplain prior to and post construction to document changes. The Nez Perce Tribe may contract aerial photography prior to construction and post construction to document the overall changes in the valley bottom. Additional monitoring such as large woody debris counts, measuring entrenchment ratios, cobble embeddedness, and temperature may be conducted over the long term to document changes in the project area from the proposed project.

Alternatives Considered but Eliminated from Detailed Study

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the solicitation of comments on the proposed actions in December 2012 and January 2013 suggested additional alternatives for achieving the project purpose and fulfilling the need for the project. Some of these alternatives were outside the scope of the project or duplicated the components of the alternatives considered in detail. These alternatives were considered but dismissed from detailed consideration, for reasons summarized below:

Meanders

- **Reconnect ponds to the river; no floodplain grading**. This alternative was dropped from further analysis because it did not meet the purpose and need of the project. Past restoration activities in the Crooked River Meanders section included connecting the river to the ponds. The ponds act as sediment sinks that impair overall fish habitat and the gradient of the river channel is currently too low to adequately sort necessary substrate for spawning and rearing habitat. This alternative would also continue to limit the re-establishment of riparian vegetation that is necessary for shading, large woody debris inputs, and food sources for aquatic organisms.
- **Reconstruct 11,000 feet of stream channel and 115 acres of floodplain; maintain 1-year bypass channel**. This alternative would include reconstructing the stream channel in the lower and upper ends of the project area along with the proposed stream channel construction. This alternative would also regrade the floodplain such that material would be terraced along the road side of the valley so that flooding would occur only during a 500-year event. A bypass channel would be constructed and decommissioned each year to pass water and fish. Under this alternative, there would be fewer areas of wetlands being created than filled, there would be a high risk of adversely affecting the Idaho Department of Fish and Game weir downstream, and the phasing of the project and the regraded material could not be redistributed within the constraints of the construction season (June through September). Constructing a 1-year bypass channel would mean conducting fish-salvage operations twice each year for each phase of construction, which would likely increase the amount of take of ESA-listed fish. This alternative was dropped from further analysis because it was un-constructible within the construction window, posed high risks of damaging structures downstream, and potentially increasing impacts to ESA-listed fish.
- **Remove mine tailings from valley and use for road material; maintain river channel and ponds**. This alternative would entail using large equipment to remove tailings piles from the valley bottom and build up a road base for Road 233 through the Narrows.

This alternative was dropped from further analysis because the material in the tailings piles is unsuitable as road base material, the cost of hauling the material would be prohibitive (>$6 million), and maintaining the current pond features would impair substrate distribution, would impair hydrologic functions, and would not improve stream temperatures of the river; thus, this alternative would not meet the purpose and need of the project.

- **Phase the project with four reaches and complete all aspects of an entire reach during one construction season**. This alternative would entail completing all aspects of an entire reach during one construction season, including constructing a temporary bypass channel, regrading the floodplain, reconstructing the new channel and bank stabilization structures, installing large woody debris, rewatering the new channel, and decommissioning the bypass channel. Temporary stabilization measures would be required for the first three phases in the newly constructed stream channel and floodplain to prevent downcutting of the new channel during high spring flows. Temporary stabilization measures would include grade control structures to step down the new channel 3 feet into the existing channel and address the risk of head-cutting back upstream into the new channel. Similarly, temporary stabilization measures would be required to transition the new floodplain to existing ground and prevent floodplain erosion. These structures would prevent fish passage through the project area between construction phases. Constructing a 1-year bypass channel would mean conducting fish-salvage operations twice each year for each phase of construction, which would likely increase the amount of take of ESA-listed fish. This alternative was eliminated due to channel in-stability between construction seasons (i.e., high flow) and the risk of increased impacts to ESA-listed fish.
- **Various small fixes to the stream channel to improve fish habitat**. Alternatives such as adding large woody debris to the current channel and cutting off Meander bends to increase the stream gradient, as well as reconnecting some of the ponds to the main channel, were considered but dropped from further analysis. These types of projects have been implemented over the last 35 years in the Crooked River watershed and the South Fork Clearwater tributaries. Periodic monitoring of these efforts indicate that small, piecemeal restoration projects have failed to substantially restore the fisheries; therefore, it was determined that these types of actions would not meet the purpose and need of the project. A long-term improvement to instream habitat and the overall fisheries in the watershed requires restoring the hydrologic functions of the watershed. This requires stream channel-floodplain interactions, which cannot be achieved without floodplain regrading.
- **Regrade 115 acres of floodplain and reconstruct up to 7,400 feet of stream channel in other configurations**. Some commenters requested analysis of the same concept of floodplain regrading and channel reconstruction, but with various alternatives to the

proposed layout of the stream channel. The stream channel was developed to exhibit a meandering pattern and a range of riverbed elevations to support development of variable flow condition, which would in turn maintain instream habitat features (riffles and pools) for aquatic habitat. The stream channel could have been designed to meander on one side of the valley or the other. There are an infinite number of configurations for the new channel. All of these would have met the purpose and need of the project; however, designing each of these configurations would be cost prohibitive and the overall benefits to resources from the small changes in channel location would be similar in their effects. Therefore, the alternative involving various stream channel configurations has been dropped from further analysis.

Narrows Road

The Narrows Road component of the Crooked River Valley Rehabilitation project was removed from detailed study in this EIS by the deciding official in December 2013. The reasons for removing the Narrows Road component include the priority to directly improve habitat in the Meanders area. The Narrows Road design plan is also currently at 25 percent so more information and planning is necessary to analyze impacts and complete the required environmental analysis for NEPA, Endangered Species Act consultation and Clean Water Act Section 404 permitting efforts in a timely manner. Moreover, the Narrows Road project is a separate action from the Meanders and not dependent or connected to the Meanders proposed actions so the NEPA analysis for the Narrow Road component, referred to as the *Crooked River Narrows Road Improvement Project*, could be completed in the future (Appendix C).

Because the Narrows Road component was removed from this EIS, the alternatives listed in this section were eliminated from detailed analysis. The following is a summary of the alternatives considered for the Narrows Road.

- **No Action (Alternative A)**. This alternative was eliminated because it is not needed for this analysis.
- **Proposed Action (Alternative B)**. Leave the 3 miles of Road 233 in the valley bottom through the narrow canyon, but re-aligning sections to be out of the 2- and 50-year floodplain. All material excavated to move the road would be used in the construction of the new road base. This alternative is considered as a future foreseeable action once more planning and design is completed and is considered in the cumulative effects analysis in sections of this EIS and Appendix C.
- **Re-route Access Using Deadwood (Alternative C)**. Re-routing access from Road 233 and using Roads 1803 and 522 (Deadwood Road) as the main access route. This alternative would decommission 3 miles of Road 233 into a non-motorized trail.
- **Decommission all roads in the watershed**. Some commenters advocated decommissioning more or all of the roads in the Crooked River watershed. Some access

to the watershed needs to be maintained for private property, recreation, fire suppression, and other future management activities. This alternative was not considered in detail because it would not meet the purpose and need of the project and management objectives of the Forest Plan and is of larger scope than this project. This alternative would also be cost prohibitive.

- **Relocate road out of the 100-year floodplain.** The Forest Service reviewed an alternative for moving Road 233 out of the 100-year floodplain, but maintaining it in the valley bottom. This would require disturbing more than 30 acres and removing more than 650,000 cubic yards of material, and cost prohibitive (> $6 million). This alternative was eliminated due to the excessive impact on the environment and prohibitive cost.
- **Relocate road onto the near (east) hillside, constructing 4.8 miles of road.** The Forest Service reviewed an option for moving Road 233 onto the near (east) hillside. This would disturb more than 30 acres and remove more than 395,000 cubic yards of material and have road grades greater than 12%. This alternative was eliminated due to the excessive impact on the environment and cost prohibitive (> $5 million).
- **Relocate road onto the near (east) hillside, constructing 5.6 miles of road.** The Forest Service reviewed an alternative for moving Road 233 onto the near (east) hillside. This would disturb more than 30 acres and remove approximately 470,000 cubic yards of material, and have greater than 12% road grades. This option was eliminated due to the excessive impact on the environment and prohibitive cost.
- **Relocate road onto hillside across the river.** The Forest Service reviewed an alternative for relocating the road across the river onto the far hillside. This would have the same environmental and economic consequences as relocating the road out of the 100-year floodplain, as well as the impacts and cost of constructing two additional bridges across Crooked River; thus, the option was eliminated.

Meanders and Narrows Road

- **Administratively withdraw mineral activities in the project area**. Some commenters advocated the withdrawal of mining claims and actions within the project area. This alternative was not considered in detail because it is more appropriately considered in the current Forest Plan revision effort than at a project level and is, therefore, outside the scope of the project and this EIS.

Proposed Forest Plan Amendments

See Appendix D for details of the project-specific proposed Forest Plan Amendments.

Soils

Past mining activities have altered soil conditions in the Crooked River Valley Rehabilitation project area. The current Forest Plan standards and the Forest Service Region 1 soil quality guidelines provide direction to maintain soil productivity. A proposed project-specific amendment would exempt this project from Forest Plan Standard #2, allowing for activities to occur on areas with greater than 20% soil detrimental disturbance, as long as soil improvement activities are implemented.

Based on current soil conditions, a project-specific Forest Plan amendment is needed for Alternative 2 to allow the Meanders stream restoration of the Crooked River Valley Rehabilitation project.

Heritage

Past mining activities along the Crooked River have created cultural properties and historic sites. The current cultural resource Forest Plan standards provide direction to: identify sites and protect on a site-by-site basis (Standard #2), and to protect and preserve National Register and National Register–eligible cultural resources (Standard #4). In addition, Management Area 3 – Standard #4 directs the forest to protect National Register and National Register–eligible sites from deterioration or destruction. The proposed action would not protect the large majority of identified cultural properties in the project area and would have adverse effects on these properties.

A proposed project-specific amendment would exempt this project from Cultural Resource Forest Plan Standards #2 and #4, or Management Area 3 – Cultural Resource Standard #4, allowing for activities to impact or destroy National Register and National Register–eligible cultural resources. To mitigate effects on cultural resources, as part of the proposed action several representative areas of historic dredge mining would be preserved and interpretation materials would be installed. Consultation with the State Historic Preservation Office would also occur.

Based on current heritage conditions, a project-specific Forest Plan amendment is needed for the preferred alternative to allow the Meanders stream restoration of the Crooked River Valley Rehabilitation project.

Comparison of Alternatives

Table 2-3 compares the Meanders alternatives in terms of indicators related to the project's purpose and need.

Table 2-2. Comparison of response of alternatives to project's purpose and need.

Indicator	Alternative 1 (No Action)	Alternative 2 (Proposed Action)
Need: Restoring stream and floodplain functions, restoring instream fish habitat complexity, and improving water quality in Crooked River.		
Stream reconstruction	No construction for stream rehabilitation.	Reconstruct areas of impact in the lower 2 miles of Crooked River.
		Fill in 10,560 feet of current channel and construct about 7,400 feet of new stream channel.
		Construct about 2,700 feet of side channels.
Floodplain restoration	No floodplain regrading.	Regrade about 115 acres of floodplain by moving dredge tailings.
	No floodplain roughening or addition of woody debris.	Roughen floodplain and add woody debris to surface.
Fish habitat complexity	No change to existing pool quality, pool quantity, and habitat features.	Reconstruct channel and floodplain to provide more spawning habitat, and higher quality rearing habitat. Replant valley bottom with native plant communities to input large woody debris overtime.
Water quality	No change to existing water quality conditions.	Reduced water temperature overtime.

Summary of Environmental Consequences, By Alternative

Table 2-3 summarizes the environmental consequences of implementation, by alternative, in relation to the issues identified in Chapter 1 and the resource effects analyses completed in Chapter 3.

Table 2-3. Comparison of effects of alternatives.

Indicator	Alternative 1 (No Action)	Alternative 2 (Proposed Action)
Aquatic Resources		
Summary of Effects on Fish – Determinations[a]		
Threatened or Endangered Fish Species and Critical Habitat 1 Species Not Present – fall Chinook salmon 2 Species Present or Potential – steelhead and bull trout	Not Present – 1 No Effect – 2	No Effect –1 LAA – 2 (steelhead and bull trout)
Sensitive Fish Species 4 Species Present or Potential	No Effect – 4	MI – 4 (Westslope cutthroat trout, Pacific lamprey, western pearlshell mussel, and spring/summer Chinook salmon)
Pool Quality and Quantity		
- Pool:riffle ratio	63:37	40:60
- Floodplain connectivity	Disconnected floodplain	Connected floodplain
- Large Woody Debris (LWD) input	LWD input limited	LWD input improved
- Entrenchment (range of averages) Ratio	1.7–2.5	3–10
Habitat Features		
- Large woody debris	2–5 pieces/100 m	100+ pieces/100 m
- Spawning habitat	<2 acres	3.5 acres
- Rearing habitat	2.45 acres (poor quality)	1.94 acres (high quality)
Temperature		
- Solar radiation	Up to 93% solar radiation (75% average)	Long-term decrease in solar radiation
- Groundwater connection to Crooked River	Disconnected due to ponds and altered channel and floodplain	Reconnected after action

[a] Effects Determinations:

Threatened & Endangered Species: LAA – Likely to Adversely Affect; NLAA – Not Likely to Adversely Affect.

Proposed species: NI – No Impact; NLJCE – Not Likely to Jeopardize the Continued Existence of the species; LJ – Likely to Jeopardize the continued existence of the species.

Sensitive Species: BI – Beneficial Impact; MI – May Impact individuals or habitat but not likely to cause trend toward federal listing or reduce viability for the population or species; or NI – No Impact.

Indicator	Alternative 1 (No Action)	Alternative 2 (Proposed Action)
Water Resources (Hydrology)		
Floodplain (type/acres)		
- Bankfull floodplain	15.6	43.1
- Upland floodplain	7.1	13.2
Channel Geomorphology		
- Channel entrenchment ratio (full range)	1.6–2.9	10.0–12.5
- Channel entrenchment	Moderate	Slight
- Channel width-to-depth ratio	17.0–31.0	25.0–32.0
- Channel sinuosity (ft/ft)	2.2–2.7	1.2–1.6
- Sediment transport/bed mobility	Maintain current mobility	Increased mobility of gravel and cobble particle sizes
Wetlands (acres)		
- Palustrine aquatic bed	9.7	1.8
- Palustrine emergent	28.1	13.9
- Palustrine scrub shrub	1.7	34.3
- Palustrine forested	0.5	0.5
- Riverine	12.5	13.6
Total wetlands	52.5	64.1
Water Quality		
- Turbidity	Meeting standard	Short term – Exceed state standard during construction.
- Mercury	Equivalent to background levels or below detection limits.	Same as Alternative 1. If detected during construction, follow measures identified in Appendix E.
- Effective shade (Related to TMDL)	Minimum of 16% effective shade. 32% average effective shade.	Short-term decrease in effective shade. Long-term increase to average of 83% effective shade.

Indicator	Alternative 1 (No Action)	Alternative 2 (Proposed Action)
Cultural Resources		
National Register Sites present?	Yes. 1 Site (SHC-32).	Yes. 1 Site (SHC-32).
Irretrievable effects to any National Register sites that meets the definition of a historic property?	No	Yes, and mitigation measures have been identified to ameliorate the adverse effects.
Forest Plan Amendment required?	No	Yes. The exemption would allow the restoration activities to impact an historic site, through the application of mitigation measures. All cultural properties have been evaluated for their National Register of Historic Places eligibility. All landforms having a high probability for historic property locations have been surveyed for the presence of cultural resources and have their conditions documented. Measures meant to recover significant values of site SHC-32 have been identified.

<table>
<tr><th>Indicator</th><th>Alternative 1
(No Action)</th><th>Alternative 2
(Proposed Action)</th></tr>
<tr><td colspan="3">Soil Resources</td></tr>
<tr><td colspan="3">Comparison of desired plant community composition using percent Meanders project area, by alternative</td></tr>
<tr><td colspan="3">Desired plant communities</td></tr>
<tr><td>Bare – colonizing</td><td>1.1</td><td>1.0</td></tr>
<tr><td>Alder</td><td>1.8</td><td>51</td></tr>
<tr><td>Sedge</td><td>8.5</td><td>0.5</td></tr>
<tr><td>Mixed Shrub</td><td>0</td><td>0.5</td></tr>
<tr><td>Spruce</td><td>18</td><td>25</td></tr>
<tr><td>Conifer/Tall forb</td><td>41.1</td><td>22</td></tr>
<tr><td colspan="3">Undesired plant communities</td></tr>
<tr><td>Dredge herbaceous</td><td>4.6</td><td>0</td></tr>
<tr><td>Mesic forb meadow</td><td>8.2</td><td>0</td></tr>
<tr><td>Reed canary grass/Cattail</td><td>16.7</td><td>0</td></tr>
<tr><td colspan="3">Restoration trajectory for plant groups and associated geomorphic forms and percent detrimental soil disturbance (DSD)</td></tr>
<tr><td>Channel, primary floodplain</td><td rowspan="5">Year 0 to 20
65% DSD</td><td>Year 1 – 48% DSD</td></tr>
<tr><td>Alder and sedge where perennial water, seasonal flooding; initial conifer/tall forb and spruce</td><td>Year 3 – 40% DSD</td></tr>
<tr><td>Mixed scrub, more alder; continued spruce and conifer/tall forb</td><td>Year 5 – 32% DSD</td></tr>
<tr><td>Alder established, spruce continues</td><td>Year 10 – 13% DSD</td></tr>
<tr><td>Spruce established</td><td>Year 20 – 4% DSD</td></tr>
<tr><td colspan="3">Forest Plan Amendment</td></tr>
<tr><td>Forest Plan Amendment required?</td><td>No</td><td>Yes. The exemption of Standard #2 would allow for the restoration activities to improve soil productivity from 65% DSD currently to 48% in the first year after implementation and 4% in 20 years.</td></tr>
</table>

Indicator	Alternative 1 (No Action)	Alternative 2 (Proposed Action)
Wildlife Resources		
Summary of Effect to Wildlife – Determinations[a]		
Threatened or Endangered, Proposed Wildlife Species 2 Species Present or Potential: lynx, wolverine	No Effect – 2	No Effect – 1 (lynx) NLJCE – 1 (wolverine)
Sensitive Wildlife Species 21 Species Present or Potential	Not present – 17 No Impact – 4	No Impact – 17 MI-1 – 4 (western toad, gray wolf, harlequin duck, fisher)
Sensitive Wildlife Species		
Western Toad Habitat	Existing Habitat (acres)	Habitat Potentially Retained (acres)
Non-breeding	14.7	48.4
Breeding	37.8	15.7
Total	52.5	64.1
Gray Wolf	No effects to wolves or their habitat	Short-term displacement
Harlequin Duck	No effects to harlequin ducks or their habitat	Short-term displacement and long-term improvement of potential habitat
Fisher	No effects to fisher or their habitat	Short-term displacement
Management Indicator Species		
Elk	No effects to elk or their habitat. Elk Unit below Forest Plan objective of 50%.	Short-term disturbance/ displacement. No change to elk habitat effectiveness.
Moose	No effects to moose or their habitat	Short-term disturbance and adverse impacts to moose habitat Long-term reduction in ponded foraging habitat; however, approximately 3 ponds would be retained. Improved foraging habitat in the restored floodplain.
Pine Marten	No effects to marten or their habitat	Short-term displacement
Other Goshawk, Pileated woodpecker	Not present – 2 species	No effects – 2 species
Neotropical Migratory Birds	No effects. Less-than-desirable breeding habitat.	Short-term disturbance. Long-term improved habitat for riparian-associated bird species.

[a] Effects Determinations:

T & E Species: Proposed species: NLJCE – Not Likely to Jeopardize the Continued Existence of the species;
Sensitive Species: MI – May Impact individuals or habitat but not likely to cause trend toward federal listing or reduce viability for the population or species

Indicator	Alternative 1 (No Action)	Alternative 2 (Proposed Action)
Rare Plants		
Summary of Effect to Rare Plants – Determinations[a]		
Threatened or Endangered Plant Species 3 Species Present or Potential	Not Present – 3 No Effect – 3	No Effect – 3
Sensitive Plant Species 31 Species Present or Potential	Not Present – 30 No Impact – 1	No Impact – 30 MI –1 (Idaho barren strawberry)

[a] Effects Determinations:

Sensitive Species: MI – May Impact individuals or habitat but not likely to cause trend toward federal listing or reduce viability for the population or species

Indicator	Alternative 1 (No Action)	Alternative 2 (Proposed Action)
Invasive Plants		
Invasive Species Present?	Yes, and weed spread is likely.	Yes, and weed spread is likely. The extent of weed spread would be dependent on implementation and effectiveness of existing weed treatments, design criteria, and mitigation items. Reed canary grass would decrease over time with greater shade/competition from shrubs and conifers, and less disturbance from a restored stream channel.
Habitat Susceptibility to Invasive Plants		
None	3 acres	Maintain
Low	105 acres	Short-term increase
Moderate	54 acres	Short-term increase
High	1 acre	Maintain
Weed Expansion Risk		
Weed Expansion Risk	No change	Weed expansion risk is not expected to increase from the proposed activities because of the highly disturbed nature of the river system, and long-term risk is already mostly moderate or lower in the project area.
None	3 acres	Maintain
Low	140 acres	Short-term increase
Moderate	21 acres	Short-term increase
High	0 acres	Maintain

Indicator	Alternative 1 (No Action)	Alternative 2 (Proposed Action)
Recreation Resources		
Impact on developed recreation sites Gold Rush Loop Tour Crooked River Campground 3 Crooked River Campground 4	No effects – 3 sites	No effects – 1 site Short-term effects – 2 sites Area closure for up to 6 years
		Long term – no effects – 2 sites
Impact on dispersed recreation sites	No effects – 18 sites	Short-term effects – 2 sites Area closure for up to 6 years
		Long term – no effects – 2 sites
Fishing access to Crooked River	Access to 18 sites and walking access to Crooked River	Short term – Access to bypass channel (up to 6 years) Area closure for up to 6 years.
		Long term – Access to 18 sites and walking access to Crooked River
Recreation opportunity spectrum	Roaded Natural	Roaded Natural
Forest Plan – Visual Quality Objectives Partial Retention Modification Maximum Modification	Meets	Meets
Air Quality		
Impact on air quality	No effect	Short-term effect from dust and vehicle emissions. Not expected to exceed state air quality standards. No long-term effects.
Mineral Resources		
Number of mining claims that could be impacted	3 Placer 24 Lode	3 Placer 24 Lode
Access to mining claims	Maintained	Area closure in place. Short-term restrictions for up to 6 years.
Effect to placer mining claim material	No effect	Short- and long-term effects. Material moved to within a quarter section.
Effect to lode mining claim material	No effect	No effect
Claim corners protected or re-established	No	Yes
Future cost of placer claim reclamation bond	No change	Increased. Must return to improved condition.
Future cost of lode claim reclamation bond	No change	No change

Indicator	Alternative 1 (No Action)	Alternative 2 (Proposed Action)
Transportation		
Traffic delays	No delays. Maintain current access.	Short term delays for transport of equipment and supplies during construction. Temporary haul/access road would reduce delays and maintain access on Road 233 during implementation.
Social and Economic Resources		
Employment	No impact to economic or social status of the area. No short-term jobs would be created.	Short-term increase in job opportunities. Long term, unlikely to result in a measurable effect on poverty, unemployment, or income rates in the subbasin.
Recreation-based economics	Maintain the current recreation opportunities.	Recreation opportunities may be displaced from the Crooked River watershed during construction. Long term, improvement in recreational fishing opportunities through improved fish habitat. Other benefits remain the same.
Cost of improvements		
Cost	$0	$2,500,000
Funding source	Not applicable	Bonneville Power Administration Fish and Wildlife Program
Project schedule	Not applicable	Construct project in phases over several years.

Summary of Short-term Impacts

The short-term adverse effects that could be caused by the proposed project include:

- Increased turbidity in Crooked River due to instream restoration work and culvert replacement/removal
- Potential increased water temperature due to removal of existing riparian vegetation for channel reconstruction and temporary bypass construction
- Reduction in shading due to removal of existing larger trees in the Crooked River riparian area
- Disturbance of individual fish and macroinvertebrates
- Disturbance of existing wetlands
- Modification of wildlife species habitat and distributions of sensitive and management indicator wildlife species
- Adverse effects due to direct mortality or displacement of individuals, and loss of habitat (western toad)
- Changes in habitat conditions and distributions of sensitive plant species
- Increased dust and vehicle emissions
- Temporary travel restrictions due to road reconstruction and improvement activities
- Burying of existing rock, soil, and vegetation by regrading of mining dredge tailings and blasted rock
- Exposure of locatable minerals.

Summary of Long-term Benefits

The long-term benefits to be gained through the implementation of the proposed project include the following:

- Improved fish habitat in Crooked River by restoring stream and floodplain function, restoring instream fish habitat complexity, and improving water quality
- Recovery of natural processes in the Crooked River floodplain, which would improve habitat conditions (cover and forage) for many of the wildlife species using this area
- Decreased soil compaction and surface/substratum erosion problems in the watershed
- Improved fish habitat due to reduction in sediment yield, increased pool habitat quality, and improved health of the riparian plant community
- Reduced water temperatures in Crooked River with potential attainment of water temperature criteria and removal from the §305(b) list for temperature impairment.

Summary of Unavoidable Adverse Effects

Under Alternative 2, there would be impacts on fish within the project area and downstream to the South Fork Clearwater River. Efforts would be made to work within the in-water work fish “window” as designated by the USFWS and NMFS, and to reduce sediment and turbidity during construction. Fish would be provided migratory passage for the duration of the project. Under

Alternative 2, there would be direct mortality to adult western toads, egg masses, tadpoles, and juveniles during construction of the temporary bypass channel and dewatering/rechanneling of existing open water ponded environments; construction of the temporary bypass road; dewatering of the main Crooked River channel; dewatering of the temporary bypass channel; regrading/reshaping of the valley bottom, stream channel, and tailing piles; and equipment traffic. The alternatives are consistent with Forest Plan direction to the extent that proposed management actions would not adversely affect viability of existing sensitive wildlife populations.

Irreversible and Irretrievable Commitments of Resources

Alternative 2 would result in the irreversible and irretrievable commitment of heritage resources. Mining waste and associated artifacts are not only physical representations of history, they—even when newly created—give a visual sense of history. Section 106 of the National Historic Preservation Act makes reference to this visual sense of history when allowing that historic properties may still be eligible for listing even when they have been newly modified, as long as they maintain their visual sense of place. Nowhere is this more applicable than to historic mining areas, known as historic vernacular landscapes. The mining waste and associated artifacts are irretrievable. Once removed from their contextual resting places, artifacts lose their archaeological value as information resources, and if restoration were to take place, the inability to recreate the tailings piles exactly as they were would be irreversible.

Cutting of live and dead trees from the project area for channel construction and floodplain development would be an irreversible commitment of that resource. Areas stripped of trees would be replanted or allowed to regenerate.

Human resources would be used for the construction and maintenance of the project. Economic commitments are also an irretrievable investment. The estimated approximate cost of the preferred alternative is $2.5 million. Funds have already been committed or spent for planning, design, environmental studies, and drafting the environmental impact statement.

Implementation of any action alternative would commit an undetermined amount of fossil fuels in order to transport material and implement other activities.

The project implementation would result in some loss of fish and wildlife habitat and displacement of fish and wildlife during construction. Stream habitat lost would be replaced by construction of a new channel. Wetland habitats and their associated functions and values lost as a result of the project would be replaced.

Proposed project activities would modify wildlife species habitat and would result in short-term changes in habitat conditions and distributions of sensitive and management indicator wildlife species. The project would result in some loss of wildlife habitat and displacement of wildlife species during implementation of project activities. There would be an irretrievable commitment of resources with the loss of potential breeding sites (ponds) for western toads.

Proposed project activities would modify sensitive plant species habitat and would result in short-term changes in habitat conditions and distributions of sensitive plant species. However, long-term habitat conditions would not be irretrievably or irreversibly lost.

The loss of native vegetation to new or expanding weed infestations would be a possible irretrievable effect if active restoration to native species is not pursued. Intensive invasive treatments and native plant restoration work would improve habitats and plant communities, which would minimize and avoid irreversible effects.

The commitment of resources is based on the belief that the condition of the natural environment in the watershed would be improved by the proposed project. The primary benefits would be improved fish habitat and water quality.

Preferred Alternative

The preferred alternative is Alternative 2.

This page was intentionally left blank.

CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Scope of Analysis

This chapter describes the existing conditions of the environment, in and adjacent to the Crooked River Valley Rehabilitation project area on the Nez Perce – Clearwater National Forests, that may affect or be affected by the alternatives presented in Chapter 2. This chapter also describes the potential environmental consequences of implementing each of the alternatives. Effects are quantified where possible, and/or are qualitatively discussed. The individual discussions are organized by issue and resource concern. Appendices A through F present additional drawings, plans, maps, and other information used in this analysis.

This chapter also discloses:

- Existing baseline or benchmark conditions and possible thresholds
- Potential changes to those environments, by alternative
- The scientific and analytical basis for comparison of alternatives
- Direct and indirect, short and long-term, irreversible and irretrievable, and cumulative effects
- Ways in which potential adverse effects would be reduced or mitigated
- How past decisions and directions were considered and relate to this project (e.g., Nez Perce Forest Plan FEIS, other past project EAs or EISs, project-specific resource reports, and other sources of information, as indicated).

Direct, Indirect, and Cumulative Effects

Environmental consequences form the scientific and analytical basis for comparison of alternatives, including the proposed action, through compliance with Forest Plan standards and a summary of monitoring required by the National Environmental Policy Act (NEPA) and the National Forest Management Act (NFMA). The discussion centers on direct, indirect, and cumulative effects along with applicable mitigation measures. Irreversible and irretrievable effects are also discussed. Effects of each action can be neutral, beneficial, and/or adverse. The terms are defined as follows:

- **Direct effects** are caused by the action and occur at the same time and place.
- **Indirect effects** are caused by the action and are later in time or further removed in distance, but are still reasonably foreseeable.
- **Cumulative effects** are those that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions.

- **Irreversible effects** are permanent or essentially permanent resource uses or losses; they cannot be restored or returned to their original condition. Examples of irreversible effects include minerals that have been extracted or soil productivity that has been lost.
- **Irretrievable effects** occur when a resource is removed or consumed.

Pursuant to CEQ's NEPA regulations (40 CFR 1500.1(b) and 1500.4), this document summarizes the completed analysis and forms the scientific and analytical basis for the comparison of alternatives at the end of Chapter 2. Unless specifically stated otherwise, additional supporting information, as well as analysis assumptions and methodologies, are contained in the project planning record (project file) located at the Nez Perce – Clearwater National Forests Supervisor's Office in Grangeville, Idaho. The project record also contains information resulting from public involvement efforts. The project record is available to review during regular business hours and information is available upon request.

Consideration of Past, Ongoing, and Reasonably Foreseeable Activities

The Council on Environmental Quality (CEQ) has provided guidance to federal agencies on the consideration of past actions in cumulative effects analysis (CEQ 2005).

Cumulative impact is defined in CEQ's NEPA regulations as the "impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions…" (40 CFR 1508.7). CEQ has interpreted this regulation as referring only to the cumulative impact of the direct and indirect effects of the proposed action and its alternatives when added to the aggregate effects of past, present, and reasonably foreseeable future actions (CEQ 2005).

As CEQ stated, "The environmental analysis required under NEPA is forward looking, in that it focuses on the potential impacts of the proposed alternatives that an agency is considering. Thus, review of past actions is required to the extent that the review informs agency decisionmakers regarding the proposed action." As the CEQ further stated, "Generally, agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historic details of individual past actions" (CEQ 2005).

In *Lands Council v. Powell*, the U.S. Court of Appeals for the 9th Circuit held that, under the circumstances presented in the case, proper cumulative impact analysis required some cataloging of past projects and their effect on the current project area. Furthermore, such cataloging should provide sufficient detail to allow for analysis of the differences between prior projects and proposed projects, which could provide the information necessary to consider alternatives that might have less impact on the environment.

While CEQ found that cataloging past actions and specific information about the direct and indirect effects of a past project's design and implementation could in some contexts be useful to predict the cumulative effects of the proposal, the regulations do not require the Forest Service to catalog or exhaustively list and analyze all individual past actions (CEQ 2005).

There is a marked difference between past and current Forest Service land management practices and policies. This evolution in land management practices (including those related to stream rehabilitation and road management projects) is the result of the application of scientific principles/research science and our ongoing monitoring actions.

During the analysis process and subsequent preparation of this DEIS, the Forest Service determined what information regarding past actions was useful and relevant to the analysis of cumulative effects. We have provided a discussion of known past activities and their general effects by each resource area, with more detail in Appendix C and the project record. The aggregate effects of past, ongoing, and future foreseeable actions are reflected in the description of existing resource conditions in this chapter and have been considered in the analysis of effects.

Aquatic Resources

Scope of Analysis

This section considers the effects of the Crooked River Valley Rehabilitation project alternatives on aquatic resources, including aquatic species that are listed as threatened and endangered under the Endangered Species Act (ESA) and Forest Service sensitive species and management indicator species (MIS).

The geographic scope of the analysis for aquatic resources focuses primarily on the Crooked River watershed, but also includes Deadwood Creek sub-watershed, a tributary to Red River. Crooked River drains north into the South Fork Clearwater River, approximately 57 miles upstream of Kooskia, Idaho.

Project Area

The proposed project and direct and indirect effects analysis area consists of 2 miles of stream restoration. The project boundary extends from 0.1 mile upstream from the mouth of Crooked River and includes the entire valley bottom. The project area, approximately 115 acres, extends from 0.1 mile upstream from the mouth of Crooked River (at the Idaho Department of Fish and Game weir) to approximately 2.0 miles upstream. Indirect effects are considered throughout the entire Crooked River watershed as bull trout and steelhead, along with numerous sensitive species, inhabit and migrate throughout the Crooked River watershed (Figure 3-1).

Cumulative Effects Area

For aquatic resources, the cumulative effects area includes the project area, the Crooked River watershed, as well as the South Fork Clearwater River from the mouth of Crooked River downstream to the Forest Service boundary at Mount Idaho Grade bridge. See Appendix C, Figures C-1 and C-2, for a display of watersheds used in this analysis.

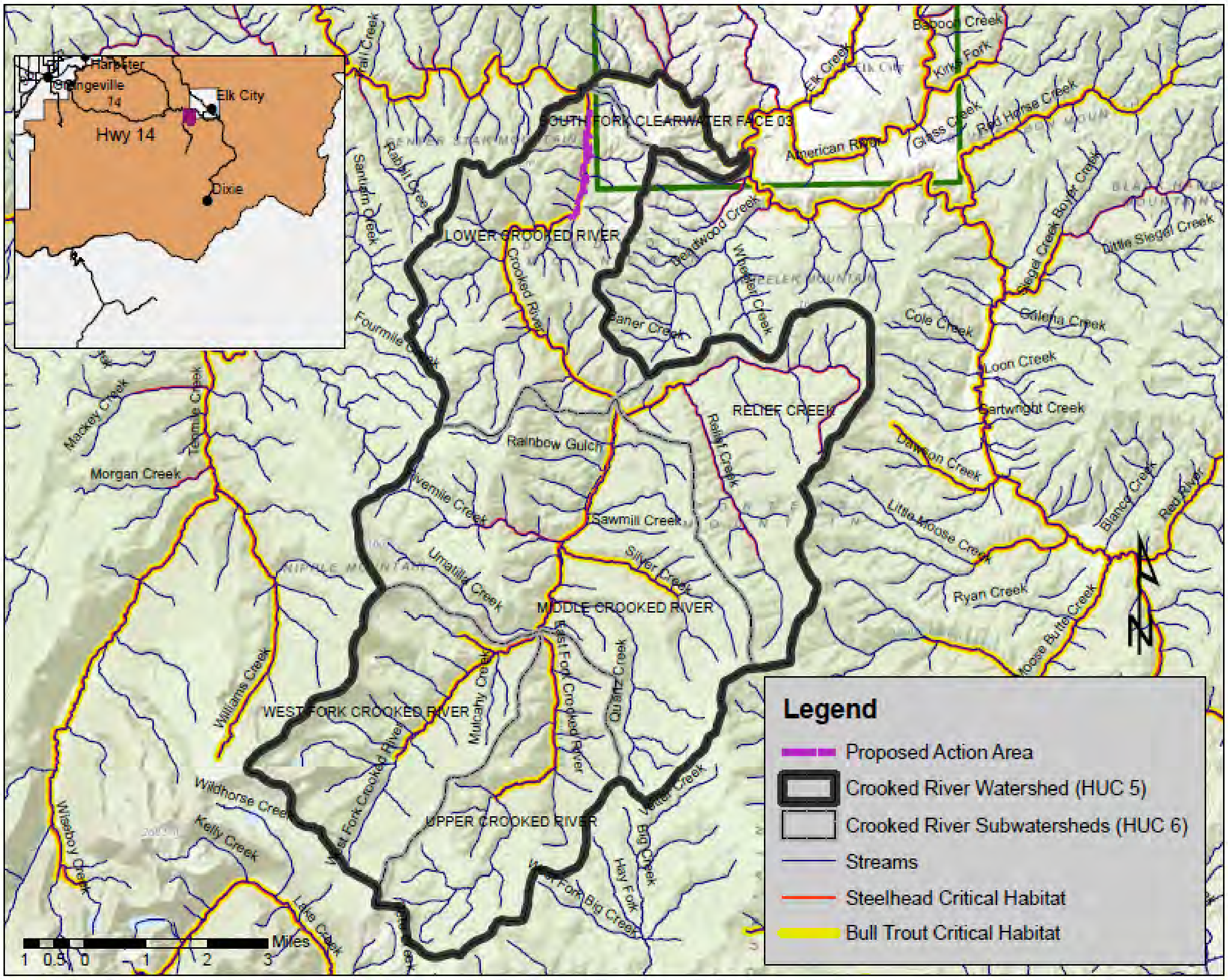


Figure 3-1. Proposed project area with steelhead and bull trout critical habitat identified.

Analysis Methods and Indicators

Information for this analysis has been gathered from a variety of sources. The Nez Perce – Clearwater National Forests and Nez Perce Tribe have conducted site-specific inventories of fish habitat conditions and population status throughout the watershed. Several studies that directly relate to Crooked River and its aquatic resources were completed, including the *Design Criteria Report: Crooked River Valley Rehabilitation Design* (RDG et al. 2012), *Crooked River Wetland Delineation Report* (Geum 2012), and *Final Design Report: Crooked River Valley Rehabilitation Design* (RDG et al. 2013a). The *Design Criteria Report* summarizes an investigation and evaluation of approximately 2 miles and 115 acres of lower Crooked River valley being considered for restoration. Additional temperature data were collected through the summer of 2013 by the Nez Perce Tribe. In addition, peer-reviewed scientific literature has been used as the primary source of information regarding the life histories and habitat requirements of the aquatic organisms of Crooked River and the effect of natural and human-caused disturbance upon those organisms.

Indicators

The analysis compares the effects of the alternatives using the following indicators:

- *Pool Quality/Quantity*
    - The ratio of pools to riffles (pool:riffle ratio) is an indicator of habitat quantity, and complexity, both of which are important elements for salmonid fishes in streams. In addition, the quality of pools is an important consideration. Pool quality is generally indicated by pool volume and pool depth. However, in this project area, indicators of habitat quality or complexity are pool-forming processes such as large woody debris input, lateral migration of channel potential (entrenchment), and flow acceleration from riffle-pool morphology.
- *Habitat features (large woody debris, spawning and rearing habitat, fish passage, floodplain connectivity)*
    - Large woody debris provides habitat complexity and cover, and assists in pool creation and maintenance in stream systems, as well as macro-invertebrate habitat.
    - Spawning and rearing habitat are analyzed through flow velocities, depth, cover, substrate quality and quantity, and off-channel refuges.
    - Ability for all life-stages of fish to move, unimpeded, to spawning, rearing, and overwintering habitat, is critical for the survival and continuance of migrating species.
    - Fish passage was analyzed through hydraulic modeling of maximum velocities and comparisons with literature review of fish swimming abilities.
    - Floodplain connectivity is important for sediment transport and deposition processes; riparian vegetation growth and recruitment; and juvenile fish refugia at high flows.
- *Temperature*
    - Water temperature, which controls the rate of biologic process, is of critical concern for fish populations and is a primary indicator of habitat conditions. The South Fork Clearwater River is included on the 1998 Idaho Department of Environmental Quality (IDEQ) Section 303(d) list (IDEQ 1998) of water-quality-limited water bodies because of temperature. Decreases in streamside shading in riparian habitat conservation areas result in increases in water temperature. Changes in shading can be due to a variety of factors, including vegetative succession (the replacement of one plant community with another over time), mortality, and/or project activities.
    - Potential increases or decreases in stream temperature were analyzed by assessing the conditions and the nature and extent of activities in riparian areas that may result in increased or decreased solar radiation to streams and connected wetland areas.
    - Groundwater maintains a near constant temperature, and interaction with the stream can influence and benefit nutrients and temperature in the channel. Connection of the stream with the ground- and hillslope water is imperative for decreases in water temperature.

Affected Environment and Environmental Consequences

This section includes a description of existing conditions in the Crooked River watershed and the direct and indirect effects on aquatic resources in Crooked River within the project area (Figure 2-1 in Chapter 2). This section also includes a discussion of species in the project area that are included on the list of threatened and endangered species established under the Endangered Species Act and species in the project area that have been designated by the Forest Service as sensitive species or MIS.

Pool Quality & Quantity

Pools offer important habitat functions for most life stages of the listed and sensitive fish species present in Crooked River. Juveniles utilize pools and pool margins for rearing and overwintering; adult anadromous fish use pools during migration as resting zones; and resident ESA-listed and sensitive fish overwinter in pools, as well as use pools for depth cover.

Riffles are dually important for salmonid species. Salmonids feed mainly on the macroinvertebrates that live in the riffle habitats. Most salmonids spawn at the tailout of pools (shallow crest at downstream end of pool) or in riffle-type habitats where the eggs will be sufficiently aerated and stay free of deposited sediments.

The ratio of pools to riffles (pool:riffle ratio) is an indicator of habitat quantity, and complexity, both of which are important elements for salmonid fishes in streams. In addition, the quality of pools is an important consideration. Pool quality is generally indicated by pool volume, depth, and cover. However, in this project area, indicators of habitat quality or complexity are pool forming processes such as, large woody debris (LWD) input, lateral migration of channel (entrenchment), and flow acceleration from riffle-pool morphology.

The quantity of pools in the 3.1-miles of Crooked River through the project area is fairly high (n>70). Many are the result of past rehabilitation efforts of connecting dredge ponds or are legacy from the dredging activity. These pool types can be deep, but due to the lack of functioning hydraulics, most act as sediment traps for fine sediments and will eventually fill in. Additionally, the pools lack cover or complexity preferred by focal fish species (e.g., steelhead and bull trout).

Snorkeling observations in September 2013 (conducted by NPT and Nez Perce – Clearwater National Forests) indicated very low numbers of all fish in the lower reaches of the project area. In Reach 4, five larger westslope cutthroat trout were observed in a pool formed by a small LWD jam. Reach 4 had 5 pools/100 meters with an average residual pool volume of about 2,000 ft^3 (RDG et al. 2012). In Reach 3, one large cutthroat was observed in a mid-channel scour pool, with a very small number of juvenile chinook and whitefish also in the lower portion of the pool. Reach 3 had 10 pools/100 meters with an average residual pool volume of about 9,500 ft^3. Reach 2 had the highest density of fish observed, with a much higher species and size class diversity. Two large bull trout, as well as juvenile bull trout were observed; all seemed to be associated with LWD complexes. In addition, a very large school of adult whitefish, schools (n>20) of juvenile chinook, two adult cutthroat, and a few adult brook trout were all observed within one meander wavelength (see Figure 3-2). Reach 2 had 9 pools/100 meters and an average residual pool volume of about 5,000 ft^3.

Pool-forming and maintenance processes are lacking through most of the project area. The current conditions include: a disconnected floodplain; diminished large woody debris recruitment potential; limited lateral migration, and the inherent lateral scour is restricted due to the tailing piles; and lack of stream bed complexity. Field observations indicate the hydraulics, due to the dredge activity, are forced into 90-degree corners in these large meanders. The stream channel has been so drastically altered standard pool-forming and maintenance processes are hardly present; water eddies on the outside corner and flows back upstream. This causes the majority of the flow to be pushed to the inside corner. This translates to fine sediment settling on the upstream side of the outside of the bend. Snorkeling surveys indicated very little fish use in the these large pools and eddy areas. Macroinvertebrate communities could shift from one associated with cobbles and gravels (which are highly available to fish due to drift) to one more unavailable such as burrowing insects. See Figure 3-2.

Large woody debris complexes and potential recruitment is very low. Conifers are the dominant overstory throughout the project area, but very few are within feet of the stream to provide effective shade or contribute terrestrial invertebrate prey to aquatic organisms. There is little interaction between the woody species and the stream, due to distance from the stream and a disconnected floodplain. In Figure 3-2, woody species and distance to stream can be seen. See more discussion about large woody debris in Habitat features section below.

Entrenchment can be a surrogate for lateral migration potential on a stream system. (Entrenchment quantifies the accessibility of the floodplain; it is the ratio of the floodplain width to the bankfull width—the lower the number, the greater the entrenchment.) Through the Crooked River project area, entrenchment varies from 1.7–2.5. The greatest entrenchment value (1.7) was measured within the severely meandered section with the very high dredge piles. This accounts for approximately one-third of the project area. In a functioning system similar to Crooked River, entrenchment values would be greater than 2.4 (Rosgen and Silvey 1996), indicating a low, wide floodplain.

A ratio of pools to riffles can begin to quantify habitat complexity. Overall in the project area, pools are the dominant habitat type with up to 63% of the morphology consisting of pools. With over 60% of the habitat in one habitat type, the current condition lacks complex bed form.

Figure 3-2. Google Earth image of a section of Reach 3 in the tortuous Meanders. Flow eddies at nearly every 90-degree corner. Fish densities, as observed during snorkeling, were very low in this reach. Also, note low potential for woody (evergreen) species interaction with the stream and lack of instream woody debris. Finally, from this picture (July 2012), note minimal shade occurring in and potential to occur on the stream.

Alternative 1 – No Action

Under Alternative 1, the Nez Perce – Clearwater National Forests would maintain the current management of the Meanders section of Crooked River in a manner that would minimize future disturbance or degradation of aquatic resources, but there would be no actions to improve aquatic habitat. Under this Alternative, BPA would not provide funding toward the Crooked River Valley Rehabilitation Project; the Corps would not grant appropriate permits; and the Forest Service and NPT would not be able to construct the project as described. The natural recovery processes would be the only mechanism for improvement to the channel or floodplain.

Pool habitat would remain in the highly altered condition that currently exists in Crooked River under Alternative 1. The pool:riffle ratio would remain at the existing conditions (63:37), maintaining many pools with low complexity. LWD input would remain limited. Entrenchment would remain at current conditions at 1.7–2.5.

The natural recovery process would result in a gradual adjustment to an equilibrium state (sediment inputs equal to sediment outputs), with a more natural ratio of pools and riffles throughout the project area; however, these processes would be extremely long term. Major flood events would slowly undercut the dredged materials, scouring and redistributing the piles of mining waste. The redistribution of these materials would result in the formation of a more naturally sinuous channel with pool habitat occurring on the corners, at large woody debris jams, or against bedrock outcrops. Through these natural processes, under Alternative 1, the area would eventually return to a more natural condition; however, in Crooked River, the expected rebound would be very slow. From hydraulic analysis, it is estimated that a 500-year flow event would be necessary to move the material in the tailings piles (RDG et al. 2012). A feasibility study conducted on Newsome Creek, a heavily mined tributary to the South Fork Clearwater about 10 miles downstream from the mouth of Crooked River, estimated that natural recovery within the project area would require between 1,000 and 5,000 years or more (Clear Creek Hydrology and North Wind 2004). Aquatic habitat would remain degraded and hamper fish recovery efforts in Crooked River during this recovery process.

Two events that were at or near 100-year return interval flows have occurred in the Crooked River watershed since the dredging ceased: one in the 1970s, and the most recent in 1996–97. Very little change was observed following these flows. Of note, a restoration project was completed in the upper end of the project area in the 1980s that removed the floodplain dredge materials but retained the tortuous meander pattern. Little to no change to the channel planform has been observed in this section in the past 20–25 years, even with two very large flow events. Figure 3-8 shows a comparison of intact dredge piles and stream channel (left) and the area of past dredge pile removal and stream channel (right). Because the high flows can access the floodplains, fine sediment can settle out in the channel. The channel is shallower, but no change has occurred to the planform of the channel, as it is still in a tortuous meander pattern. Also, few woody species have recolonized the floodplain. There is nearly 100% solar radiation on the stream channel where the dredge piles were removed and no planting occurred or was unsuccessful.

The natural recovery of stream morphology and riparian conditions would be very slow due to the extreme level of alteration across the entire valley bottom. The slow pace of recovery would do little in the short term to improve habitat complexity and aid in the recovery of sensitive, threatened, or endangered species within the project area. There would be no short-term direct or indirect effects such as those that are associated with Alternative 2.

Alternative 2 – Proposed Action

Alternative 2 activities would include building a bypass channel around the project area to pass fish and water while the floodplain and new channel were being constructed to minimize impacts to fish and water quality. The bypass channel would be constructed by connecting the ponds on the east side of the valley. This would create a fairly diverse habitat structure; however, spawning and rearing would not be expected nor planned for in the bypass channel design because it would be used short term (3-4 years). Channel design of the bypass channel was modeled to ensure fish passage and water holding capacity for flows up to the Q_{10} (about 1,000 cfs) (RDG et al. (2013a) used the HEC-RAS model to evaluate). Maximum velocities at this flow level would range from 1.6 to 11.3 ft/s with an average of 6.9 ft/s. Velocities along the margins would be much lower (0.1 to 2.5 ft/s). With lower flows ($\leq Q_2$), velocities would likely be considerably lower and could support juvenile rearing habitat. The current ponds are 2–6 feet deep, which would allow for potential rearing and rest for migrating adults. The bypass has been designed to not inhibit up- or down-stream anadromous and fluvial fish migration patterns. Additionally, there is little spawning in the majority of the project area by steelhead or Chinook (Kiefer and Lockhart 1997; Hall-Griswold and Petrosky 1998). Most Chinook redds are observed in the upper reach of the project area (Reaches 1), where wood could be added and floodplain dredge piles removed but which would not be dewatered or new channel built.

Under Alternative 2, a more natural sinuous channel would be constructed with floodplain connectivity, woody debris habitat features, channel spanning woody debris cover, and revegetation of native species. All of these elements would enhance pool habitat by increasing pool-forming processes, thermoregulation, and protective cover necessary for aquatic species.

The proposed design incorporates 30% pools, 40% riffles, 10% runs, and 20% glides (see Figure 3-3), creating a much more diverse habitat structure with much more spawning habitat for Chinook salmon and steelhead. In the South Fork Salmon River drainage the highest numbers of salmonids were associated with a pool:riffle ratio of about 30:70 (Platts 1974). Glides, or, in most cases, pool tailouts have the highest spawning site selection among Chinook salmon and steelhead (Sommer et al. 2001). Riffles are important macroinvertebrate producing habitat types, and are sometimes selected for spawning if not too shallow or fast (Platts et al. 1983).

Also, with a more natural meander wavelength and structure than in the current condition, the stream slope would be doubled, from the existing 0.003 to 0.006 (ft/ft) through the valley. By increasing the slope towards the natural slope of the valley, sediment transport processes would be regained in the system; proper slope for sediment transport processes is important to minimize aggradation (sediment deposition) or down-cutting in a stream system, as well as creating clean, unembedded spawning gravels. This design creates the opportunity for variable hydraulics to maintain the bedform and a highly complex habitat to increase spawning potential and higher-quality rearing sites.

Figure 3-3. Depiction of stream habitat classifications. Riffles are fast and shallow; runs are fast and deeper; pools are slow and deep; and glides are slow and shallow.

Recruitment of large woody debris would be expected to increase following floodplain and stream rehabilitation due to proximity of the riparian area proposed planting, and establishment of riparian vegetation. The proposed riparian community would be a spruce/alder-dominated system. Both of these species are hydrophilic (water-loving) and would thrive on the newly created floodplain. In roughly 30–50 years, trees would be large enough to begin to influence pool-forming and maintenance processes if they entered the stream course. Floodplain grading and channel reconstruction would increase the entrenchment value to 2.5–10 throughout the project area, thus decreasing entrenchment (Table 3-1). Figures 3-4 and 3-5 depict the difference in floodplain access between the current condition and the proposed design of Crooked River at a 2-year return interval stream flow (Q_2). Floodplain access has many benefits, including deposition of fines, decreased shear stress in channel/on banks, off-channel refugia for juvenile salmonids, high potential for allochthonous inputs into the stream system, and seed dispersal.

Table 3-1. Comparison of pool quantity and quality impacts, by alternative.

Pool Quality and Quantity	Alternative 1 (No Action)	Alternative 2 (Proposed Action)
- Pool:Riffle Ratio	63:37	40:60
- Floodplain connectivity	Disconnected floodplain.	Connected floodplain.
- LWD recruitment	LWD input limited or very low.	LWD input improved.
- Entrenchment	1.7–2.5	2.5 – 10.0

Habitat features (large woody debris, spawning and rearing habitat, fish passage, floodplain connectivity)

Large woody debris provides habitat complexity and cover, and assists in pool creation and maintenance in stream systems. It also has the added benefit of increasing diversity in the macro-invertebrate habitat and species (Hrodey et al. 2008). The extreme level of past disturbance in Crooked River has left the project area devoid of LWD and recruitment potential.

Stream surveys yielded 2–5 single pieces and 1–2 LWD aggregates per 100 meters of stream (Table 3-2).

Large woody debris increases the ability of stream habitat to support and produce salmonid species through pool creation and maintenance (Cederholm et al. 1997), added cover and hiding from predators (Fraser and Cerri 1982), refuge from high-velocity flows (Bustard and Narver 1975), and greater macro-invertebrate diversity (Hrodey et al. 2008; Rogers 2003).

The past dredge mining activities removed all of the woody debris and vegetation throughout the valley bottom. The highly disturbed valley and dredge tailing piles have naturally re-vegetated with lodgepole pine providing little shade or large wood recruitment (Geum 2012). Although conifers compose 30% of the project area, they are growing on top of the dredge piles and not recruiting wood or contributing shade to the stream. The three greenline surveys yielded seven mature trees (>10 years old) along the greenline of the stream, and in total only 18 conifers were counted in the greenline. No dead trees, considered near-future LWD recruitment, were counted in the surveys. Greenline surveys are conducted along the first perennial vegetation that forms a lineal grouping of community types on or near the water's edge (Winward 2000).

Spawning and rearing habitat were analyzed using five components: flow velocities, depth, cover, substrate quality and quantity, and off-channel refugia. Existing condition spawning habitat, as modeled by using substrate size class 50–75 mm, is less than 2 acres (Table 3-2; RDG et al. 2013a). This is less than the potential for the area based on the altered flow velocities and habitat complexity to transport and sort the necessary substrate sizes. It is also very limited to the upstream and downstream ends of the Meanders project area. The Meanders section has very little potential spawning gravels due to the altered flow velocities. Data obtained from 2004 suggests cobble embeddedness was 80%, which exceeds the 30% standard set for the Nez Perce Forest Plan (USDA Forest Service 2005a).

Rearing habitat, modeled with parameters of depth less than 1 foot and velocity less than 1 foot per second, was quantified at 2.45 acres (Figure 3-6) through the project area (Hillman et al. 1987). The modeled juvenile-rearing area does not take into account overhead cover, temperature, and substrate; therefore, this number is likely high. Most of the ponds in the project area, created by past mining, are not connected at low flow, which limits juvenile rearing to the main channel.

Upstream and downstream passage is critical to most fish species in the South Fork Clearwater drainage. Salmon, steelhead, bull trout, and lamprey depend on uninhibited upstream passage to the cold headwaters streams to spawn during the fall or spring and seek refuge during the hot summer months. Juvenile salmonids and other native fish species utilize Crooked River and its many tributaries for refuge during high spring flows on the South Fork Clearwater. Cutthroat trout move in and out of the tributaries, moving for desired temperature, increased feeding opportunities and spawning habitat (personal communication, M. Dobos, 2013).

Crooked River through the Meanders reach has highly altered hydraulics and runoff hydrology. Spring flows are attenuated through the unnatural morphology of the valley bottom, namely the highly porous and conductive tailings and ponds adjacent to the river. During base flow, there are areas of atypical flow patterns (Figure 3-2) where flow eddies in large pools, or large backwater areas in the main channel. Fish are currently passing through the area, but few have been observed staging in the project area, waiting for the right water conditions or cues to move up to spawning areas. Spawning and most rearing occurs upstream of the area that would be bypassed during project implementation (NPT surveys 2013, Kiefer and Lockhart 1997; Hall-Griswold and Petrosky 1998).

Alternative 1 – No Action

Under Alternative 1, habitat complexity and spawning and rearing areas in the Meanders project area would remain in the current condition, or decrease over time. New conifer growth potential in the riparian area is low due to the steep, nutrient-poor slopes of the dredge piles. Future LWD recruitment would remain very limited. Levels of LWD would remain about the same (2–5 single pieces and 1–2 LWD aggregates per 100 meters of stream) (see Table 3-2).

Spawning and rearing habitat, under Alternative 1, would remain in a similar condition and of a similar amount (less than 2 acres spawning and 2.45 acres juvenile-rearing habitats) or decrease over time (Table 3-2). There is potential in the very long term that recovery of the valley bottom could occur, but would take up to thousands of years. Cobble embeddedness in the riffles and pool tailouts is very high compared to areas that have not been altered by dredge mining, resulting in a reduction in quality spawning habitat Hydraulic complexity would remain low and, therefore, lead to increased sedimentation, thereby decreasing suitable salmon, steelhead, and bull trout spawning area. Overwinter rearing habitat would decrease at the same rate as sedimentation of the cobbles occurred. Off-channel rearing would remain low, and possibly decrease due to sedimentation over time.

Fish passage would remain in the current state through the Meanders reach. It is assumed, because there are no barriers, that fish pass up and down stream through the reach.

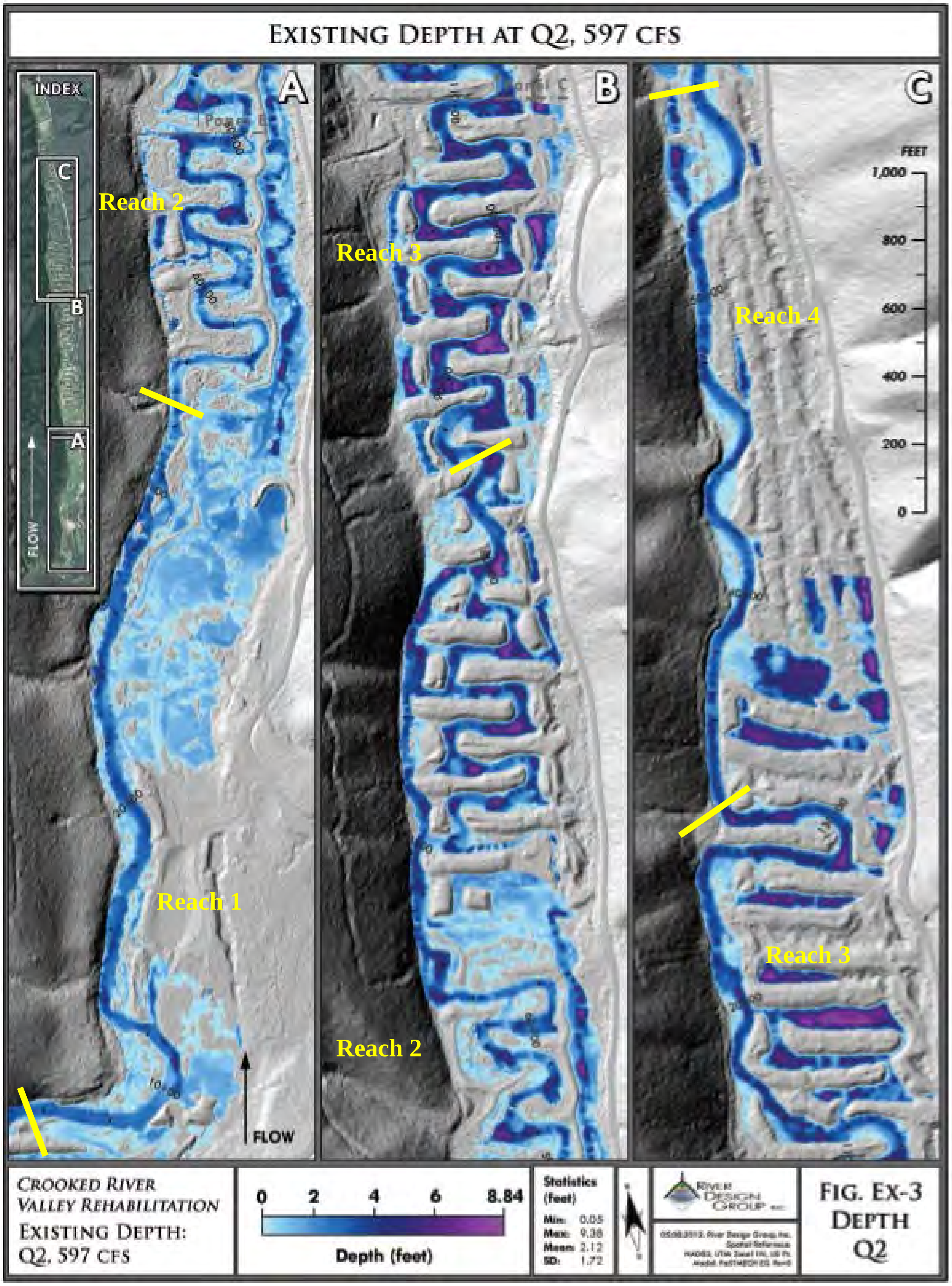


Figure 3-4. Alternative 1 – Crooked River current water depth at Q_2 flows; floodplain would be accessed at all flows over Q_2 (RDG et al. 2013a).

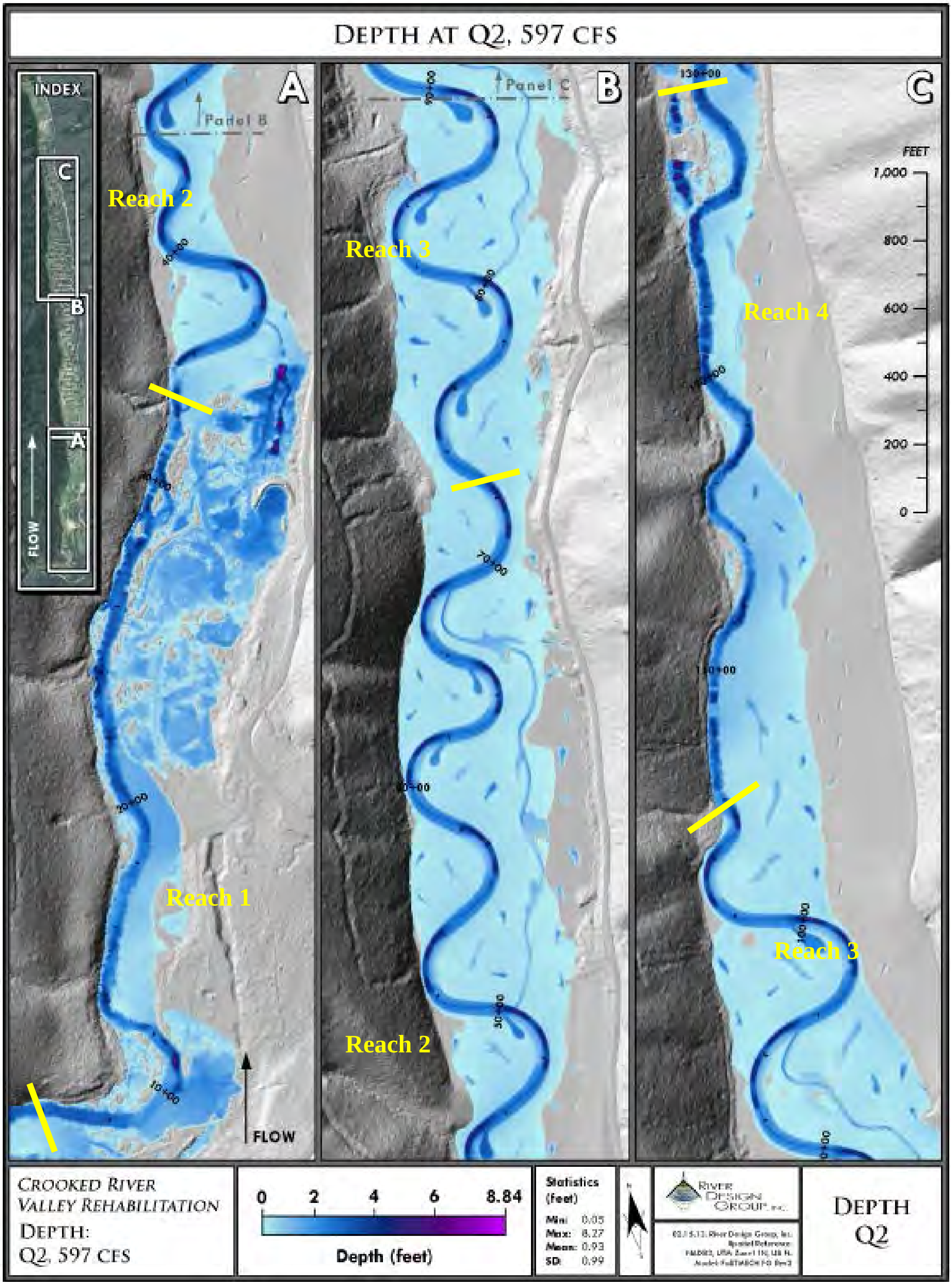


Figure 3-5. Alternative 2 – Proposed depth at Q_2 flows; floodplain would be accessed at all flows over Q_2 (RDG et al. 2013a).

Alternative 2 – Proposed Action

Activities proposed under Alternative 2 would have short and long term effects to fisheries in Crooked River. The bypass channel, as stated above, would not be designed or built for specific fish habitat needs. The bypass channel would potentially reduce the amount of spawning and rearing habitat; however, there is very little spawning occurring in the proposed instream impact area (IDFG redd surveys). Also, extremely low densities of juvenile steelhead were observed during a snorkeling survey in 2013 (two juvenile steelhead in three 300-foot snorkel lengths). Other fish densities were low as well, although there were large (n>20) schools of juvenile Chinook observed in Reach 2. The pools in the bypass channel could serve as surrogate rearing habitat for the short term (3–4 years) while floodplain and channel construction is occurring.

Under Alternative 2, habitat complexity would be immediately increased following proposed rehabilitation activities. Addition of large woody debris is proposed under this alternative, and it would be expected to increase through the project area up to and greater than 100 pieces per 100 meters (Table 3-2). The cover and habitat complexity created by addition of large woody debris would be expected to be beneficial because the project design would result in creation of debris jams similar to those that existed prior to the dredge mining, as indicated by large woody debris data from similar stream reaches in undisturbed watersheds, in which densities of juvenile fish are much higher (Cederholm et al. 1997).

Photographs from the 1980s show conifers just beginning to become established on the dredge piles and near the stream. From that evidence, the conifers planted would result in a shade-producing overstory, and provide a source of large woody debris in about 30 years. As shown in Figures 3-2 and 3-8, the 30- to 50-year-old vegetation is adding little shade to the stream channel through the project area. In 30–50 years following the project with a connected floodplain, natural meander pattern, and heavy woody revegetation efforts, the vegetation should be interacting with the stream for both shade and LWD recruitment.

The hydraulic complexity created through a more natural meandering pattern and the LWD component would increase spawning habitat from less than 2 acres to nearly 3.5 acres (RDG et al. 2013a) through the project area; juvenile-rearing habitat would be decreased from 2.45 acres of low- to marginal-quality habitat to 1.94 acres of better quality rearing habitat (Table 3-2; Figure 3-7). Off-channel alcoves and side channels would offer higher-quality rearing potential than the margins of the current condition of Crooked River.

Juvenile-rearing habitat was modeled using parameters of depth less than 1 foot and velocity less than 1 foot per second; Figure 3-7 shows that 1.94 acres would be developed (RDG et al. 2013a). These numbers do not include side channels that are connected or the connection of the existing ponds that would remain. The quality of rearing habitat would also be increased due to proper substrate sorting, overhanging riparian vegetation, reduced instream temperatures, and improved instream complexity from increases in large woody debris (Fraser and Cerri 1982, Bustard and Narver 1975). Additionally, 2,700 feet of side channels and about 10 off-channel alcoves would be constructed, both for the purpose of increasing beneficial juvenile rearing habitat and high flow refugia (Figure 3-7).

Under Alternative 2, fish passage could be altered temporarily if extreme high flows (>Q_{10}) occurred while water is routed in the bypass channel. The temporary bypass channel was modeled to design a stable channel capable of carrying a Q_{10} flow (1061 cfs) plus 1 foot of freeboard (distance from the water surface to the top of the levee; RDG et al. 2013a). The primary risks are lateral and vertical stability. The model results suggest that the presence of large cobble and larger material (150–300 mm) would result in fairly stable conditions. Recent observations of existing site conditions indicate that the 150–300mm material is common on site and reinforcement would not be needed for the entire channel. In addition, the bypass channel would flow through several existing ponds, which would serve as pools and areas of lower risk of instability.

Because of lateral constraints posed by the Crooked River Road and the project area, the bypass channel requires building up a berm along the west bank to prevent flow from entering the project area. The berm height would vary up to 4 feet above the design floodplain elevation. The proposed berm cross section would have a top width of 16 feet with side slopes of 2:1. The berm would serve multiple purposes, including use as a haul road during construction and use as a staging area for material that would eventually be used to fill the bypass channel after floodplain and channel construction is complete.

The temporary bypass channel should provide fish passage for a range of flows. The range of mid-channel velocities at a Q_{10} flow would be 1.6–11.3 feet per second (RDG et al. 2013a). The average mid-channel flow velocity of a Q_{10} flow would be about 7 feet per second. Margin velocities are much less (0.1-2.5 at Q_{10}). The bypass channel would be constructed with fish passage as a primary design criterion, mostly with large boulders as velocity breaks and grade control (>340 mm, maximum mobile particle size at Q_{10}; RDG et al. 2013a).

The existing ponds would provide areas of lower velocity and deeper water to facilitate movement up and down the bypass channel. The bypass channel would be inspected following large flows in order to assess channel changes that could affect fish passage and stability.

Table 3-2. Comparison of habitat feature impacts, by alternative.

Habitat Features	Alternative 1	Alternative 2
Large Woody Debris	2–5 pieces/100 meters	100+ pieces/100 meters
Spawning Habitat[1]	<2 acres	3.5 acres
Rearing Habitat	2.45 acres (poor quality)	1.94 acres (high quality)

1. Modeled using two-dimensional hydraulic modeling and habitat mapping for existing project area conditions and proposed after-project conditions (RDG et al. 2013a).

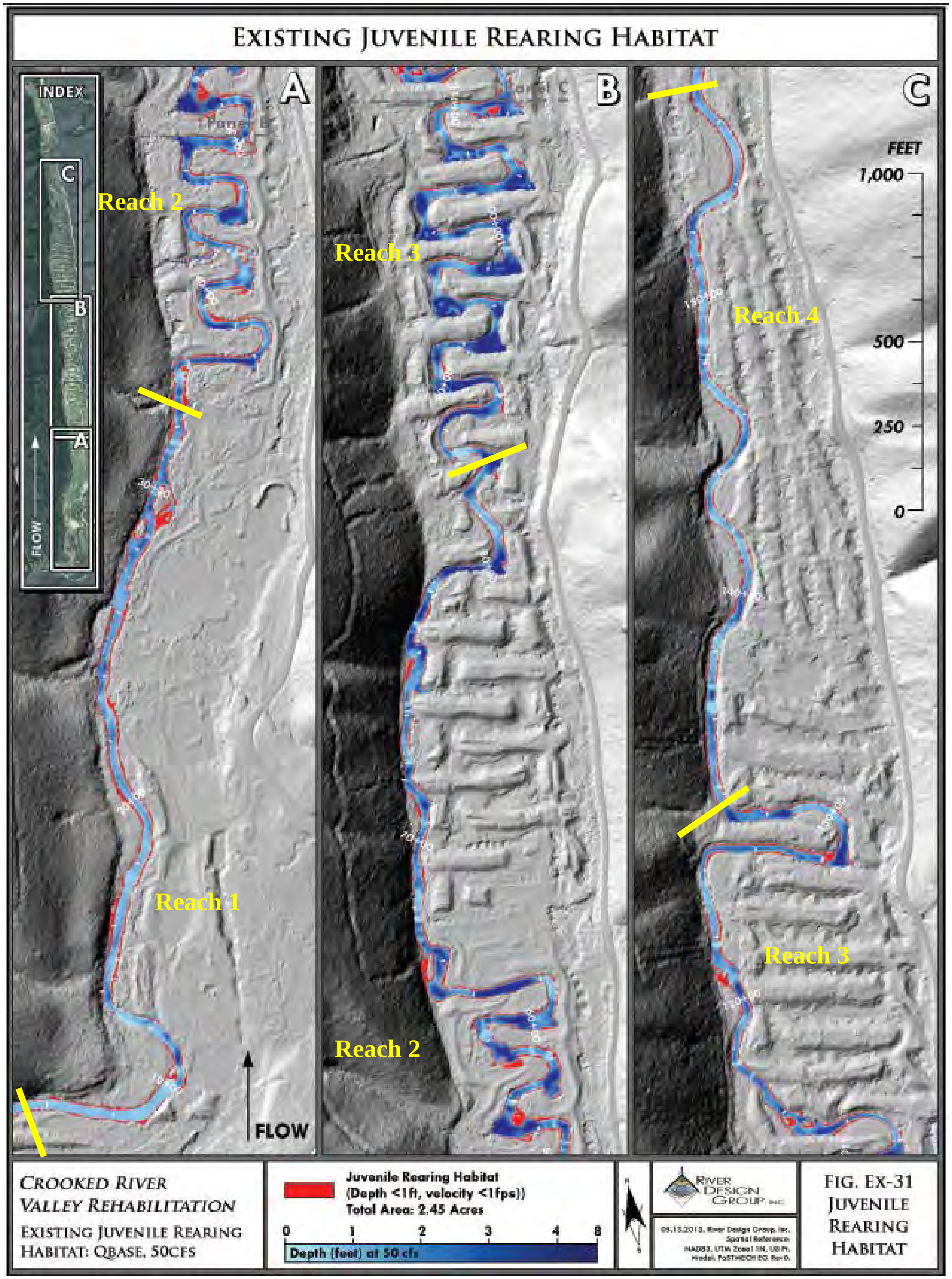


Figure 3-6. Alternative 1 – Modeled juvenile-rearing habitat for current conditions. Based on velocity and water depth (RDG et al. 2013a).

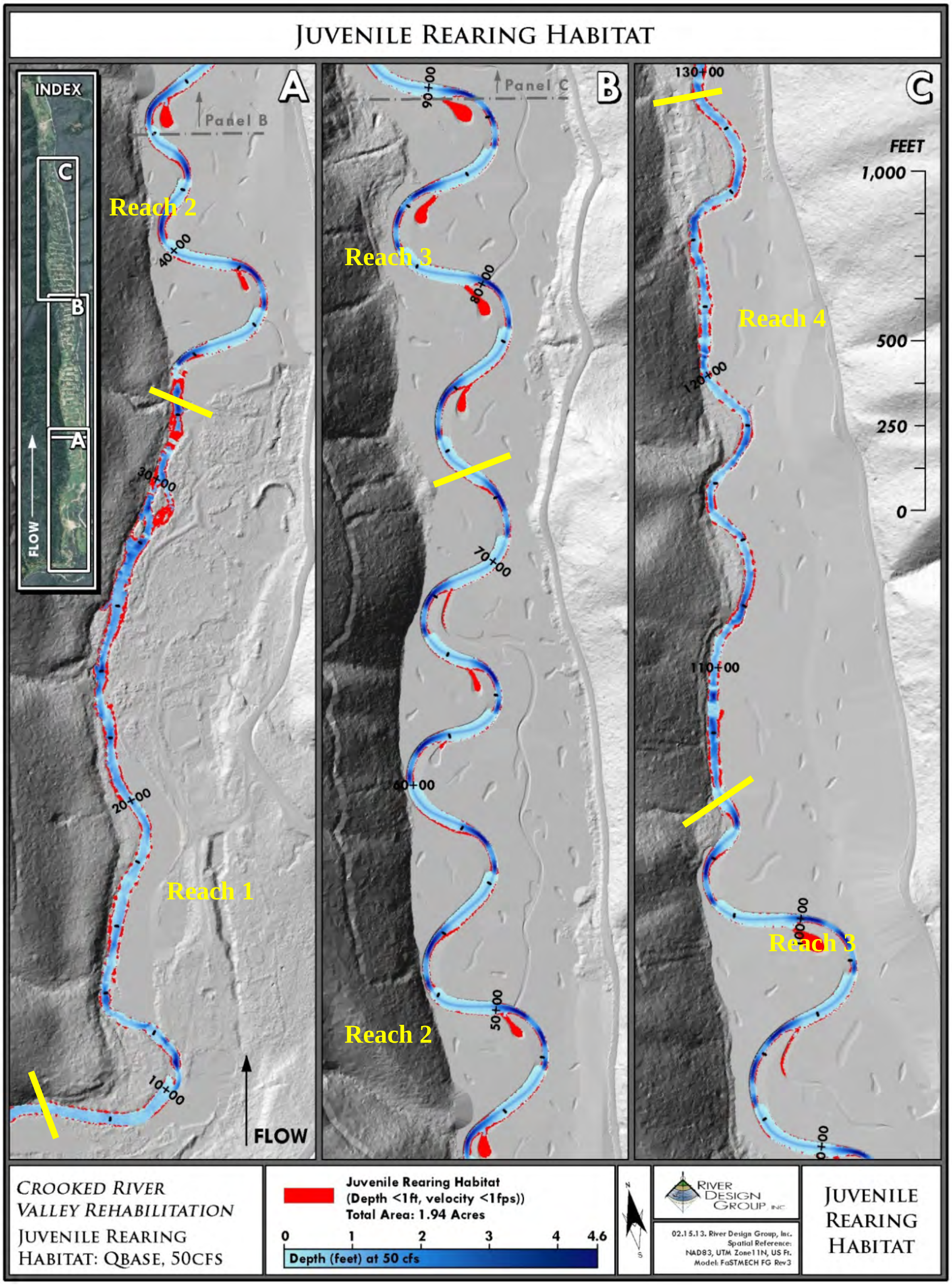


Figure 3-7. Alternative 2 – Proposed juvenile-rearing habitat (RDG et al. 2013a).

Temperature

Water temperature is a critical concern for cold water fish such as trout and salmon and is a primary indicator of habitat conditions in north central Idaho. The South Fork Clearwater River and Crooked River have a total maximum daily load (TMDL) for temperature that was established in the South Fork Clearwater River Subbasin Assessment and TMDL (IDEQ et al. 2004). Reduction in streamside shading can result in increases in water temperature. The TMDL and percent effective shade is discussed in the Water Quality section of the Water Resources report. Changes in shading can be due to a variety of factors, including vegetative succession (the replacement of one plant community with another over time), mortality, or project activities.

Late-summer temperatures in lower Crooked River exceeded 20 degrees Celsius (ºC) for numerous days when monitored in 2005, 2012, and 2013. The National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) developed a matrix of pathways and indicators of watershed condition for Chinook, steelhead, and bull trout (NMFS and USFWS 1998). The document provides appropriate temperature conditions for ESA-listed species adapted to the South Fork Clearwater River (Table 3-3). Temperatures in the Crooked River Meanders project area are well above temperature ranges considered optimal for steelhead and bull trout spawning, rearing, and migration (optimal temperatures shown below in Table 3-3). Monitoring also showed temperatures much greater than 13ºC through September, during critical times for Chinook spawning (13ºC is the upper optimum temperature limit for Chinook spawning). Bull trout are known to use the Crooked River Meanders reach for migration, juvenile rearing, and possibly overwinter habitat for the larger adults. However, the mean summer temperatures are higher than the cold water requirements for spawning and rearing.

Table 3-3. Temperature indicators for steelhead and bull trout (NMFS and USFWS 1998).

	Water Temperature and Habitat Condition Rating		
Fish Species	**High**	**Moderate**	**Low**
Steelhead (Spawning)	14°C	14–15.5°C	>16.5°C
Steelhead (Rearing and Migration)	14°C	14–17.8°C	>17.8°C
Bull Trout	7-day average maximum temperature in a reach during the following life history stages: incubation = 2–5°C; rearing = 4–12°C; spawning = 4–9°C; also, temperatures do not exceed 15°C in areas used by adults during migration (no thermal barriers).	7-day average maximum temperature in a reach during the following life history stages: incubation ≤2 or ≥6°C; rearing ≤4 or 13–15°C; spawning ≤4 or ≥10°C; also, temperatures in areas used by adults during migration sometimes exceeds 15°C.	7-day average maximum temperature in a reach during the following life history stages: incubation ≤1 or >6°C; rearing ≥15°C; spawning ≤4 or >10°C; also, temperatures in areas used by adults during migration regularly exceed 15°C (thermal barriers present).

The elevated temperatures in Crooked River are due to the severely altered riparian condition throughout the watershed from past activities (Appendix C). Within the project area, the stream is over-widened with little riparian shade or cover in the stream. Due to the high hydraulic conductivity through the dredge tailings in the valley, temperatures are slightly lower at the downstream end; this is potentially an effect of groundwater influxes, side drainage inputs, and most likely from the near-constant subsurface temperature. Diurnal fluctuations of 10 to 15ºC were common instream, as 5 to 8ºC fluxes were recorded in the ponds in 2012.

Although the ponds have lower temperatures and less diurnal flux than instream, their potential as rearing habitat for Chinook and steelhead is low due to access limited to only high flows. For the most part, ponds are not connected on an annual basis. Except for a few ponds that are connected year-round, fish could not escape if the temperatures were too warm or too cold; some ponds appear to freeze solid, as some are not very deep. During the winter, there is high likelihood that the conditions in the ponds, such as low dissolved oxygen due to vegetation decay and ice, are not conducive to fish survivability. Very few ponds have fish. Ponds that do support fish are usually connected at all or most flows.

Potential increases or decreases in stream temperature were analyzed by assessing the conditions and the nature and extent of activities in riparian areas that may result in increased or decreased solar radiation to streams and connected wetland areas.

Alternative 1 – No Action

Under Alternative 1, there would be no immediate changes to shade or other temperature-altering processes in the project area. The lack of vegetation and minimal shading would continue to impair stream temperatures in the project area. Dredge tailings would continue to restrict riparian growth in the project area. Leaving the tailings in place would allow the large trees currently growing among the piles to remain in place; however, these trees currently provide little shade to the stream.

Solar radiation is the radiant energy emitted by the sun, of which a portion is available for energy uptake on the earth in the form of light and heat. Solar pathfinder monitoring (instrument used to measure the amount of solar radiation available to the ground) in 2012 yielded an average of 74.7% solar radiation available for the summer months (May through September; Table 3-4; RDG et al. 2012). Readings in the heavily dredged areas with little to no vegetation increased up to 93.2%. Reed canary grass comprised the largest area of survey and ranged from 63.2 to 90.4% solar radiation availability. Herbaceous plant communities recorded the highest percentage of available solar radiation, and conifer-dominated communities recorded the lowest available solar radiation readings. However, only 3% of greenline vegetation communities are conifers. Under Alternative 1, conifers would continue to grow slowly in the nutrient-poor cobble tailing piles. Due to their steep slopes, the dredge tailings typically do not support conifers; therefore, trees are typically located a number of feet, both horizontally and vertically, from the edge of the channel, which provides little shade to the channel. See Figure 3-8.

Temperature data collected in 2012 (August to November) and 2013 (June to October) suggest groundwater influence and hillslope interception (RDG et al. 2013a). However, the stream temperature is fairly warm. Figure 3-9 shows the stream temperatures throughout the Crooked River watershed, from Orogrande to the mouth. As expected, the temperature gradient mostly moves from coldest upstream to warmest downstream. However, a thermograph placed in the middle of the Meanders project area showed a nearly constant temperature around 14°C. This is most likely due to a groundwater upwelling microsite from either valley or hillslope hyporheic (subsurface) flow.

Due to the extremely altered valley bottom, surface water and hyporheic flow are not as connected as in an unaltered state. The 2013 temperature data suggest that there are points of hyporheic expression within the stream channel through the project area; however, the valley bottom ponds are most likely intercepting the majority of the subsurface flow. Under Alternative 1, the valley bottom would likely remain in the current condition for up to 5,000 years (Clear Creek Hydrology and North Wind 2004); subsurface cool water would interact with the stream on a minimal scale, as compared to the stream intercepting the majority of the subsurface flow.

Alternative 2 – Proposed Action

Under Alternative 2, direct effects to water temperatures would be minimal. Reaches 2 and 3 have minimal shade availability currently so the increase in solar radiation would be negligible. Reaches 1 and 4 would not be realigned; therefore, mature vegetation would remain along the banks to continue to input shade to Crooked River. Figure 3-8 shows Reaches 2 and 3 in July 2013. The lack of shade inputs can be seen as well as solar radiation potential in the ponds. Long term, rehabilitation activities would be expected to slowly decrease temperatures through the project area via groundwater interaction in the stream and increased shading from planting overstory vegetation.

Temperature monitoring conducted in 2012 and 2013 suggests substantial subsurface flow through the valley bottom. By grading the floodplain and decreasing areas where subsurface water can come to the surface other than the stream channel, the subsurface flow should remain cooler and influence the instream temperatures via exchange. Grading the floodplain and creating a pathway for the hillslope water to enter the valley and Crooked River would increase the likelihood of those cold water springs or seeps influencing the subsurface and surface water.

Figure 3-9 illustrates temperatures in Crooked River from June to October 2013. Temperatures showed a warming trend from upstream to downstream, as is typical in most drainages. However, the two anomalies were the gauges in the middle of the project area and at the IDFG intake structure (the downstream extent of the project area). The gauge in the middle of the project area tracked with the other temperatures until Crooked River reached base flow. Then, it was a near-constant 14ºC with little diurnal fluctuation or response to rain events, suggesting that the gauge was located where groundwater is expressed in Crooked River. Temperatures in a pond surveyed in 2012 showed the same near-constant temperature through the warm months of the summer, again suggesting influence by groundwater or hillslope water into the pond.

Subsurface water temperature data collected in July 2013 showed 2–4ºC difference between subsurface water and surface water, with subsurface being cooler. Some of the subsurface temperatures were taken less than 5 feet from the edge of surface water and showed up to 4ºC difference. Grading the floodplain would potentially reestablish a more natural hyporheic/ surface water interaction. In only one of eight locations, the subsurface and surface water differed by less than 0.5ºC, suggesting high exchange between surface and hyporheic water (NPT unpublished data 2013).

The project area would be re-planted with 1- to 5-gallon alder, willow, dogwood, and spruce along with understory species. These plants would have access to groundwater due to re-grading the floodplain and there would be greater water holding capacity of the floodplain material due to the addition of woodchips and soil material in the floodplain. This would provide greater growth potential for these species. Vegetation planting would lead to shade over the stream channel as well as other surface water areas like the remaining and created wetlands. Solar radiation averaged at 75% throughout the project area. With increased vegetation growth and connection with Crooked River, the solar radiation availability should decrease over time, which could lead to decreases in stream temperature.

Under Alternative 2, instream water temperatures should decrease over time due to increased shade and groundwater connectivity. Amount of temperature change is very difficult to predict; however, Meadow Creek, a tributary to the South Fork Clearwater, had a 3ºC decrease over 10 years following extensive riparian planting on approximately 2 miles of streambank (NPT unpublished data). These types of decreases would be expected over the long term in Crooked River from the proposed project. Similar results would move the Habitat Condition Rating from low to moderate for juvenile steelhead rearing and migration.

Table 3-4. Comparison of temperature impacts, by alternative.

Temperature Indicators	Alternative 1	Alternative 2
Shade	Up to 93% solar radiation (75% average)	Short-term increase in solar radiation Long-term decrease in solar radiation
Groundwater connection to Crooked River	Disconnected due to ponds and altered channel and floodplain	Reconnected after action

Table 3-5. Comparison summary of aquatic impacts, by alternative.

Indicator	Alternative 1	Alternative 2
Pool Quality and Quantity		
- Pool:Riffle Ratio - Floodplain connectivity - LWD input - Entrenchment	63:37 Disconnected floodplain. LWD input limited. 1.7–2.5	40:60 Connected floodplain. LWD input improved. 3–10
Habitat Features		
- Large Woody Debris - Spawning Habitat - Rearing Habitat	2–5 pieces/100 m <2 acres 2.45 acres (poor quality)	100+pieces/100 m 3.5 acres 1.94 acres (high quality)
Temperature		
- Solar Radiation	Up to 93% solar radiation (75% average)	Long-term decrease in solar radiation
- Groundwater connection to Crooked River	Disconnected due to ponds and altered channel and floodplain	Reconnected after action

Figure 3-8. Reach 2 (left) and Reach 3 (right). Google Earth images from July 21, 2013, of Crooked River. Note shade on stream and potential shade from valley vegetation. Solar radiation averaged 74.7% throughout the project area.

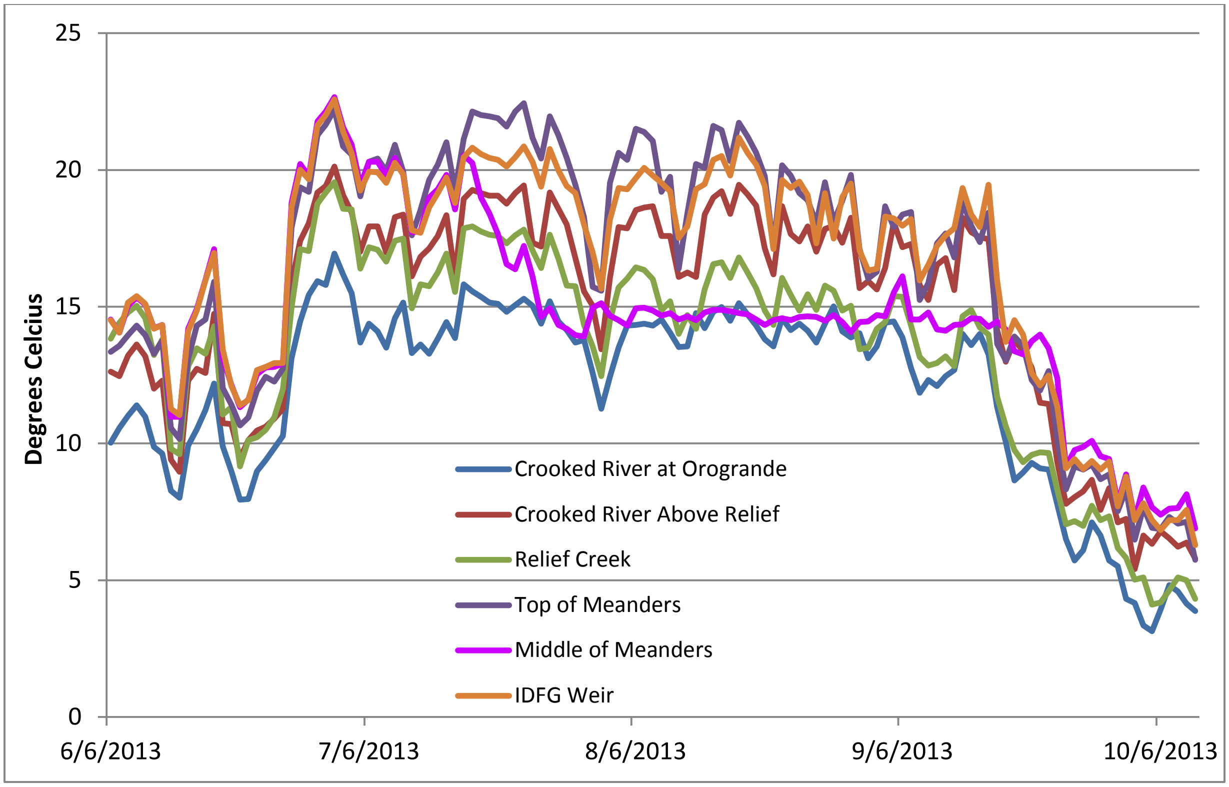


Figure 3-9. Temperature data collected in Crooked River watershed with HOBO Water Temp Pro v2 data loggers from June 6, 2013, to October 10, 2013 (NPT unpublished data 2013).

Threatened, Endangered, and Sensitive Species

Snake River Fall Chinook Salmon

Fall Chinook salmon (*Oncorhynchus tschawytscha*) are listed as Threatened under the Endangered Species Act in the Clearwater River subbasin (*Federal Register*, Vol. 57, page 14653 [57 FR 14653]). The listed evolutionarily significant unit (ESU) includes all natural populations of fall-run Chinook salmon in the mainstem Snake River and the following river basins: Tucannon River, Grande Ronde River, Imnaha River, Salmon River, and Clearwater River. Critical habitat for fall Chinook salmon has been designated in the Clearwater subbasin and includes the mainstem Clearwater River from Greer, Idaho, downstream to its confluence with the Snake River, including all river reaches currently and historically accessible. Fall Chinook salmon spawn and rear in the mainstem Clearwater River, as well as the lower reaches of the South Fork Clearwater River downstream of the project area.

Fall Chinook salmon have not been documented in Crooked River or in the South Fork Clearwater River within 30 miles. Because of the distance of the project area to the nearest occupied habitat, effects to spawning and rearing habitat for fall Chinook salmon are not expected.

Snake River Steelhead Trout/Interior Redband Trout

Steelhead trout (*Oncorhynchus mykiss gairdneri*) found in the Clearwater River and Salmon River subbasins, including Crooked River, are part of the Snake River ESU currently listed as threatened under the Endangered Species Act (62 FR 43937). Steelhead trout are an MIS in the Nez Perce Forest Plan. Interior redband trout, which are the resident form of *O. mykiss*, are designated as a Forest Service sensitive species in Region 1 but are not currently ESA-listed. In Crooked River, the *O. mykiss* population is largely anadromous, but there may be a small component that is resident, primarily at the headwaters of smaller tributaries upstream of the project area. Additional effects to resident *O. mykiss,* other than what is discussed below for anadromous steelhead, are therefore not expected.

The South Fork Clearwater River subbasin and all accessible tributaries were designated as critical habitat for steelhead (70 FR 52630), including Crooked River from its mouth to the headwaters. Steelhead trout use Crooked River for both spawning and rearing purposes and maintain a naturally reproducing population, which has been supplemented with hatchery fish. Steelhead supplementation by Idaho Department of Fish and Game in Crooked River occurred up to 2010 in most years (http://fishandgame.idaho.gov/public/fish/stocking/).

Adult steelhead trout generally arrive at the mouth of the Clearwater River from September through November, and migrate to tributary streams from January through May. Spawning occurs from mid-March through early June, typically on a rising hydrograph and prior to peak stream flows (Thurow 1987; Columbia River DART 2013). Fry emergence typically occurs during June in the upper South Fork tributaries, and juveniles will rear for 2 or 3 years in freshwater, typically out-migrating in the spring high flow (Mullan et al. 1992).

Crooked River was probably a historic stronghold for steelhead spawning and early rearing (USDA Forest Service 1998). Habitat degradation, including changes in aquatic habitat related to mining activity and road building, limit habitat potential for steelhead trout in lower Crooked River. Historic dredge mining activities have substantially reduced habitat potential (relative to historical conditions) in some areas of the watershed through changes in channel structure and function and substrate availability and distribution. Threats to steelhead include predation, competition, migration barriers, habitat degradation, and harvest (Ford 2011). Habitat degradation is probably the most substantial limiting factor to steelhead trout within the Crooked River watershed. Much of the accessible habitat area for steelhead has been altered by dredge mining, resulting in a loss of summer and winter rearing habitat. Alteration of riparian communities from mining and other disturbances resulted in less woody debris available to fall into the stream, lost floodplain function, and altered hydrologic regimes.

Idaho Department of Fish and Game (IDFG) parr monitoring data from 1985 to 2003 suggest variable mean densities across years, with a high of 12 fish/100 m^2 in 2002 and a low of 0 fish counted in 1987. Mean densities generally ranged between 5 fish/100 m^2 and 1 fish/100 m^2 (Kiefer and Lockhart 1997). Although these numbers are typical for many streams on the Nez

Perce National Forest, they are much less than densities observed in Gedney Creek, a tributary to the Selway River, Idaho, (Byrne 1994) and other wilderness and roadless streams, where densities are frequently 25 fish/m^2 and higher (Nez Perce National Forest unpublished data).

In addition, examination of fry data (undifferentiated salmonid fry other than salmon) suggests a highly variable but general decline in mean densities from the 1980s and early 1990s. Although data are inconclusive, they do suggest variable but low levels of recruitment in naturally produced steelhead (Kiefer and Lockhart 1997).

Redd count data are available for a limited number of years in the Crooked River watershed (South Fork Clearwater TMDL, IDEQ et al. 2004). 1990 surveys resulted in the highest number of redds counted (over 25), with 4 redds counted in 1991, 1 redd in 1992, and 2 redds in 1993, 1994, and 1995. It should be noted, however, that accurate counts of steelhead redds are difficult to obtain because detection may be comprised during high water conditions; also many steelhead spawn in smaller tributaries that are not routinely surveyed. Therefore, redd count data probably do not provide an accurate census of all redds in the watershed.

Adult steelhead trapping data are also available from 1990 to 2000 (South Fork Clearwater TMDL, IDEQ et. al 2004). Total number of returns each year reached about 50–55 adults from 1990 to 1993. Following 1993, number of returns precipitously declined to less than 15 from 1994 to 1999. In 2000, 17 were trapped. Seven adults were trapped in 2001, and 13 were trapped in 2002 and 2003. It is possible that there are greater returns of adults to Crooked River than indicated by these trapping data, if adults are migrating outside the trapping period. These data do not correspond well with increased adult counts at Lower Granite Dam in 2001, 2002, and 2003.

Alternative 1 would not result in direct or indirect effects to steelhead trout. The status quo regarding habitat in the Meanders section would be maintained, however, with limited potential for improvement over both the short and long term. Available information suggests that the existing condition of the habitat has reduced the capability of the Meanders section to support spawning and rearing habitat, as indicated by very low densities of observed juvenile steelhead trout in this section compared to reaches upstream. Alternative 1 would be expected to maintain this condition into the foreseeable future and not result in improvement or higher densities of juveniles.

Alternative 2 would result in direct and indirect effects to steelhead trout. Direct effects would occur during the project construction phase. Juvenile steelhead would likely be present when Crooked River is de-watered and would therefore be subjected to disturbance, handling, and potential mortality, although design criteria and salvage are expected to minimize mortality. In addition, recent snorkel surveys suggest densities of juvenile steelhead are very low, and if this is the case when the channel is de-watered, the number of fish affected is expected to be low as well.

The same could happen when the bypass channel is decommissioned at the end of the channel reconstruction phase. Individual fish immediately downstream of the bypass channel would also be temporarily affected by short-term increases in suspended sediment when it is initially watered, and then again when the new channel is watered following reconstruction and decommissioning of the bypass channel. In addition, adult and juvenile steelhead are expected to use the bypass channel for up- and down-stream migration for the duration of the channel construction phase as it is designed to do, so fish passage would continue to occur.

Indirect effects to steelhead would generally include long-term improved habitat conditions tied to the indicators previously discussed, such as cover, spawning and rearing areas, and potentially lower temperatures. Carrying capacity for steelhead is expected to increase long term from creation of high-quality pools and spawning habitat and improved stream temperatures during the summer. More juvenile steelhead would be expected to be present in the project area, and more adult steelhead would be expected to spawn, resulting in increased recruitment.

Although individual juvenile steelhead would be affected by the project in the short term during implementation, effects to staging or spawning adult steelhead and redds are not expected because of the timing of the de-watering events, lack of redds documented in the past 3 years, and design measures intended to reduce or eliminate the potential to affect adults and/or de-water redds.

Steelhead, as well as, spring/summer Chinook salmon and bull trout have the potential to be vulnerable to climate change in the Colombia River Basin. Modeled responses to climate change in the Columbia River Basin include a shift from a snow melt dominated system to a rain dominated system, diminished snow packs in all but the highest elevations, increased peak streamflow and increased stream temperature (ISAB 2007; ISAB 2011; Clark and Harris 2011). Changes in timing of peak flow are also likely to occur (Croizer et al. 2008), with spring runoff occurring earlier and summer base flows likely to be lower in the future. These hydrologic changes can have significant impacts on salmonids. Increased peak flows can scour redds, and change overall stream channel morphology (increased width to depth ratio). Changes in flow timing can alter smolt outmigration and lower base flows can lead to increased energy expenditure for migrating adults and reduce potential holding areas (Croizer et al. 2008). Warmer stream temperatures encourage adult Chinook salmon to return to freshwater earlier and warmer freshwater temperatures also delays spawning timing therefore adults are spending more time in freshwater, which increase pre-spawning mortality (Croizer et al. 2008).

Indirect and beneficial effects of the proposed project include increasing habitat diversity, restoring hydrologic and hydraulic processes towards a more natural state, and providing resilience capacity within the system to future stressors. As stated by the Independent Scientific Advisory Board (2011):

> It is important to consider the diversity, spatial array, and connectivity of habitats for conserving and restoring the diversity of movement patterns and life histories in this age of climate change. The suitability of different habitats will change due to increasing temperatures in both fresh water and the ocean (ISAB 2007), to changes in the timing and intensity of coastal upwelling, to rising sea levels and to increasing ocean acidity. This diversity is therefore a hedge against uncertainty and climate change that threaten the resilience and productivity of many populations.

The proposed project has several features that, when implemented, would serve to ameliorate the adverse effects that climate change could have on fish and their habitat. Floodplain restoration and riparian restoration have the obvious benefits of attenuating peak flows and providing stream shading. Providing streambank capacity of water storage can allow for a slow release of water during low summer base flows. Improving instream complexity by providing quality pools, overhead cover (large woody debris), and sinuosity will provide more holding areas for adult salmon prior to spawning and for juveniles during rearing. Improved sinuosity can also improve hyporheic flow and groundwater interaction to reduce stream temperatures.

Under Alternative 2, ESA consultation with National Marine Fisheries Service (NMFS) on the actions and potential effects would occur, a very detailed description of the direct and indirect effects to steelhead trout would be included in a biological assessment, and NMFS would issue an incidental take statement for direct effects to individual steelhead trout. This project is consistent with habitat restoration goals outlined in the draft Snake River recovery plan for salmon and steelhead (*draft* NMFS 2011).

Columbia River Bull Trout

Columbia River bull trout were listed as a threatened species under the Endangered Species Act in 1998 (*Federal Register,* Vol. 63, No. 31647). Bull trout (*Salvelinus confluentus*) are widely distributed throughout the South Fork Clearwater River, including Crooked River. Bull trout rear in headwater streams, and migrate to larger rivers or lakes at age two or three (Rieman and McIntyre 1993). In fall, adult bull trout migrate to smaller streams to spawn. Habitat requirements include complexity (large woody debris), deep pools, clean substrate, cold temperatures below 15°C, and stable channels. Threats to bull trout include harvest of adults, watershed disruption, introduced species (hybridization and competition with brook trout), and isolation/fragmentation of populations (USDI-FWS 2002).

The South Fork Clearwater River and many of its tributaries, including Crooked River, are designated critical habitat for bull trout (*Federal Register*, Vol. 75, No. 200). In Crooked River, critical habitat is designated from its mouth to the headwaters of East and West Fork Crooked River, as well as river reaches in the mainstem South Fork Clearwater downstream from Crooked River potentially affected by the project. The draft recovery plan for Columbia River bull trout identified a local population in Crooked River (USDI-FWS 2002). Available information suggests West Fork Crooked River (upstream of the project area) is a primary spawning and rearing area for fluvial bull trout in the South Fork Clearwater subbasin (USDA Forest Service 1998, USDA Forest Service 1999b).

IDFG surveys in 1993 resulted in observations of 24 bull trout, or 0.89 bull trout/100 m^2 (USDI-FWS 2002). It is likely that densities are higher in West Fork Crooked River. A total of 34 migratory bull trout were collected at the Crooked River trap in 1997. In 1998, bull trout captured at the weir were radio tagged and tracked over 25 miles as they migrated from the middle reaches of mainstem South Fork Clearwater River. All data strongly support high use of Crooked River by fluvial bull trout, perhaps the highest in the South Fork Clearwater subbasin.

Limited trend data exist for bull trout in Crooked River. These data are associated with capture of adults at the Crooked River weir and juveniles in the screw trap. In the early 1990s, the number of adult bull trout was very low, with 0 trapped in 1992 and 1994 and 2 in 1993. From 1994 to 2002, there appears to have been an increasing trend, with 15 trapped in 1995, 19 in 1996, 15 in 1997, 36 in 1998, and 19 in 2002. Increasing numbers are correlated with implementation of statewide no-harvest regulations on bull trout, which began in 1992. In 2003, however, only 2 adults were trapped.

Juvenile trapping data are variable but suggest a possible increasing trend (IDFG unpublished data, 2004). These data are downstream migrant data from scoop and screw traps located near the mouth of Crooked River. Data were as follows: 31 trapped in 1992, 2 in 1993, 13 in 1994, 33 in 1995, 3 in 1996 and 1997, 8 in 1998, 12 in 1999, 14 in 2000, 27 in 2002, and 52 in 2003.

Alternative 1 would not result in direct or indirect effects to bull trout. The status quo regarding habitat in the Meanders section would be maintained, however, with limited potential for improvement over both the short and long term. The existing condition of the habitat is probably limiting the habitat available for adult and juvenile bull trout in the Meanders section. Although most bull trout spawning occurs upstream in the East and West forks of Crooked River, the Meanders section does function as a migratory corridor for adults and could provide optimal late rearing habitat for juvenile bull trout, particularly if summer water temperatures were lower. Under Alternative 1, improvement in habitat condition for bull trout would not occur into the foreseeable future, and current conditions would be maintained.

Alternative 2 would result in direct and indirect effects to bull trout. Direct effects would occur during the project construction phase. It is possible that adult and juvenile bull trout could be present when Crooked River is de-watered and would therefore be subjected to disturbance, handling, and potential mortality, although design criteria and salvage are expected to minimize mortality. In addition, recent snorkel surveys suggest densities of bull trout are very low, and if this is the case when the channel is de-watered, the number of fish affected is expected to be low.

Indirect effects to bull trout would generally include long-term improved habitat conditions tied to the indicators previously discussed, particularly stream temperature. Improved pool quality and increases in habitat complexity from addition of large woody debris would be expected to create additional holding areas for migrating bull trout and rearing areas for juveniles. Higher densities of fish overall would be expected to benefit bull trout as available forage would be increased. Improvements in habitat conditions in this section of Crooked River would contribute to the quality of habitat overall in this stronghold watershed and contribute to recovery efforts for this species, particularly considering its importance in the South Fork Clearwater subbasin.

Under Alternative 2, ESA consultation with the U.S. Fish and Wildlife Service (USFWS) on the actions and potential effects would occur, a very detailed description of the direct and indirect effects to bull trout would be included in a biological assessment, and the USFWS would issue an incidental take statement for direct effects to individual bull trout. This project is consistent with habitat restoration goals outlined in the draft recovery plan for Columbia River bull trout (*draft* USDI-FWS 2002).

Spring Chinook Salmon

Spring Chinook salmon (*Oncorhynchus tshawytscha*) are not listed under the Endangered Species Act in the Clearwater subasin but are included as a sensitive species in Region 1 of the U.S. Forest Service. They are also identified as a species of special concern in the State of Idaho and are an MIS in the Nez Perce Forest Plan. Spring Chinook salmon are present in the South Fork Clearwater River and many of its tributaries. Indigenous Chinook salmon in the Clearwater subbasin were eliminated by Lewiston Dam in 1927, which functioned as a block to Chinook salmon migration until the early 1940s, but naturalized stocks exist in Crooked River and other areas of the subbasin as a result of reintroduction efforts (Matthews and Waples 1991).

Idaho Department of Fish and Game operates a weir and trapping facility for spring Chinook salmon near the mouth of Crooked River, downstream of the project area. Fish are moved to a holding facility until spawning in August and September. Juvenile salmon are reared and acclimated at a facility upstream from the project site and released into Crooked River the following spring. Idaho Department of Fish and Game parr monitoring indicates variable densities from the mid-1980s through 2003, with an overall decline from the late 1980s. Numbers are somewhat stable from 2000 to 2003, with relative stability attributable in part to hatchery supplementation. Redd count data and adult return data (taken at the collection weir near the mouth) suggest an increased number of adult returns after 2000, which are correlated with increased counts of spring Chinook at Lower Granite dam and likely reflect improved ocean conditions, increased survival of both juveniles and adults at dams in the Columbia and Snake rivers, and consistent hatchery supplementation supported by Idaho Department of Fish and Game's Crooked River's rearing and propagation facility. In 2004, 654 adult Chinook salmon were captured and counted at the Crooked River trap.

Adult Chinook salmon numbers returning to Crooked River range from around 350 fish to about 800 fish (IDFG 2010b, 2011, 2012). Of these, only about 30 fish are passed above the weir because of the Idaho Supplementation Study, which is a hatchery program for spring Chinook salmon, (IDFG 2010b, 2011, 2012); half of those were females or an undetermined sex.

Redd counts in the watershed ranged from 4 to 17 from 2007 to 2011, which corresponds to the number of females and unknown sexes that were passed above the weir.

Alternative 1 would not result in direct or indirect effects to spring Chinook salmon and would therefore not result in effects to the species viability. The status quo regarding habitat in the Meanders section would be maintained, however, with limited potential for improvement over both the short and long term. The existing condition of the habitat is probably adversely affecting spring Chinook salmon in the Meanders section because of reduced spawning habitat, low-quality spawning habitat, and high summer water temperatures.

Alternative 2 would result in direct and indirect effects to spring Chinook salmon. Direct effects would occur during the project construction phase. Juvenile salmon would likely be present when Crooked River is de-watered and would therefore be subjected to disturbance, handling, and potential mortality, although design criteria and salvage are expected to minimize mortality. The same could happen when the bypass channel is decommissioned at the end of the channel reconstruction phase. Individual fish immediately downstream of the bypass channel would also be temporarily affected by short-term increases in suspended sediment when it is initially watered, and then again when the new channel is watered following reconstruction and decommissioning of the bypass channel. In addition, adult and juvenile salmon are expected to use the bypass channel for up- and down-stream migration for the duration of the channel construction phase as it is designed to do, so fish passage would continue to occur.

Indirect effects to salmon would generally include long-term improved habitat conditions tied to the indicators previously discussed, such as cover, spawning and rearing habitat, and potentially decreased temperatures. Carrying capacity for salmon is expected to increase long term from creation of high-quality pools and spawning habitat and improved stream temperatures during the summer. More juvenile salmon would be expected to be present in the project area, and more adult salmon would be expected to spawn.

Although individual juvenile salmon would be affected by the project for the short term during implementation and limited mortality could occur, effects to staging or spawning adult salmon and salmon redds are not expected because of the timing of the de-watering events, and lack of redds documented in the past.

Effects to spring Chinook salmon populations in Crooked River and the upper South Fork Clearwater River are not expected for the following reasons. First, implementation of design criteria and fish salvage operations are expected to minimize direct mortality of any juvenile salmon. Second, high numbers of juvenile salmon have not been observed in reaches proposed for de-watering during snorkel surveys conducted in 2013; therefore, the potential to affect large numbers of juveniles is low. Third, IDFG collection, propagation, and supplementation practices in Crooked River provide a source of locally adapted smolts that are stocked in high numbers annually in Crooked River; fourth, connectivity to other source populations of spring Chinook salmon in the upper South Fork Clearwater is high; and fifth, the project is expected to result in long-term improvements to Chinook populations and a reduction in extinction risk, due to improved spawning and rearing habitat.

Westslope Cutthroat Trout

Westslope cutthroat trout (*Oncorhynchus clarki lewisi*) are included as a sensitive species in Region 1 of the U.S. Forest Service and are designated as a species of special concern by the State of Idaho. Westslope cutthroat trout are also identified as an MIS in the Nez Perce Forest Plan.

Currently, this subspecies is not listed or proposed for listing under the Endangered Species Act. Westslope cutthroat trout are distributed widely in the Crooked River watershed and have been found in virtually every tributary where surveys have been conducted.

Although population status of resident westslope cutthroat trout is thought to be strong in some streams, particularly in West Fork and East Fork Crooked rivers, larger adult fluvial fish that migrate between Crooked River and the South Fork Clearwater River appear to be less abundant. Recent establishment of restrictive harvest regulations by Idaho Department of Fish and Game in both the South Fork Clearwater River and Crooked River appears to be resulting in increased abundance of larger fish (J. DuPont, IDFG, personal communication).

IDFG parr monitoring data show no definitive trend in westslope cutthroat trout densities. Mean densities appear to be less than other tributaries in the South Fork Clearwater, including Newsome Creek and Red River. Highs of 1.8 and 1.6 fish/100 m^2 were documented in 1989 and 2001, respectively; mean densities ranged between 0 and 0.6 fish/100 m^2 in all other years where data are available (1985–2003). It should be noted, however, that monitoring sites are not located in the areas of the watershed with the highest known cutthroat densities, such as West and East Fork Crooked rivers. Monitoring sites are limited to mainstem areas (Kiefer and Lockhart 1997).

Limited density data are also available from the Nez Perce National Forest database, but these data were taken in largely the same areas as IDFG parr monitoring data and indicate similar mean densities. Although it is generally understood where the population strongholds exist, density data are not available.

Alternative 1 would not result in direct or indirect effects to westslope cutthroat trout and would therefore not result in effects to the species population. The status quo regarding habitat in the Meanders section would be maintained, however, with limited potential for improvement over both the short and long term. The existing condition of the habitat is probably adversely affecting the numbers of cutthroat trout that could use this area, both as a migratory corridor and for spawning and rearing.

Alternative 2 would result in direct and indirect effects to individual westslope cutthroat trout, assuming that they were present during implementation of the project. Direct effects would occur during the project construction phase. Individual cutthroat trout could be present when Crooked River is de-watered and would therefore be subjected to disturbance, handling, and potential mortality, although design criteria and salvage are expected to minimize mortality. The same could happen when the bypass channel is decommissioned at the end of the channel reconstruction phase. Individual fish immediately downstream of the bypass channel would also be temporarily affected by short-term increases in suspended sediment when it is initially watered, and then again when the new channel is watered following reconstruction and decommissioning of the bypass channel. Migrating cutthroat trout would be expected to use the bypass channel for the duration of the channel construction phase as it is designed to do, so fish passage would continue to occur.

Indirect effects to cutthroat trout would generally include long-term improved habitat conditions tied to the indicators previously discussed, such as cover, spawning and rearing habitat and potentially decreased temperatures. Carrying capacity for cutthroat trout is expected to increase long term from creation of high-quality pools and spawning habitat and improved stream temperatures during the summer. More adult fluvial cutthroat trout would be expected to be present in the project area, especially during the summer.

Effects to westslope cutthroat trout populations in Crooked River are not expected because the primary areas in which cutthroat currently spawn and rear are well upstream of the project area and would not be affected. In addition, Crooked River is well connected to other tributaries in the South Fork Clearwater subbasin. High connectivity combined with increasing numbers of migratory cutthroat trout, which may be occurring as a result of restrictive harvest regulations in the South Fork Clearwater River, are expected to result in increased cutthroat trout in upper South Fork Clearwater tributaries, including Crooked River. Long-term improvement in the Meanders sections would be expected to contribute to such increases.

Pacific Lamprey

Pacific lamprey (*Entosphenus tridentatus*) is designated a USDA Forest Service sensitive species and a State of Idaho endangered species. Pacific lamprey are a keystone species for the Nez Perce Tribe culture, being used for subsistence, ceremonial, and medicinal purposes.

Pacific lamprey is one of the oldest of all vertebrates (Columbia River Inter-Tribal Fish Commission 2013). Lamprey juveniles (called ammocoetes) burrow in mud and sand in freshwater habitats where they undergo metamorphosis over 5 to 7 years into adults. Adult lamprey migrate to the ocean where they spend 1 to 2 years before returning to freshwater to spawn. These species are an important component of the ecosystem, serving as a prey base and a source of marine-derived nutrients in freshwater habitats (NPT 2013a).

Similar to other anadromous fishes, the distribution and abundance of Pacific lamprey has been reduced by the construction of dams and water diversions as well as degradation of spawning and rearing habitat. Lamprey are excluded from large areas where they were historically present, including upstream from Hells Canyon Dam on the Snake River and Chief Joseph Dam on the Columbia River (USDA Forest Service 1998).

Sampling in the South Fork Clearwater River conducted in the early 2000s indicated the presence of juvenile lampreys in the South Fork Clearwater River and lower reaches of Red River (Cochnauer and Clair 2003). Similar sampling conducted in Crooked River in 2001 did not identify any lampreys (Cochnauer and Clair 2001, 2002). The lower reaches of Crooked River were likely historic habitat for lamprey (NPCC 2005).

Although long-term trend data have not been collected, all available data regarding presence/ absence in the South Fork Clearwater River and trends of returning adult lamprey to Snake River and Columbia River mainstem dams indicate that the population is severely depressed and has declined substantially from historic levels. Habitat degradation in the Columbia River and Snake River basins associated with mining, livestock grazing, stream channelization, logging, road construction, and urbanization, in combination with hydroelectric impacts, are implicated as the major factors contributing to the declines of Pacific lamprey (Cochnauer and Claire 2003; Close et al. 1995; Jackson et al. 1996; Jackson et al. 1997). Hydroelectric dam upstream passage ladders are difficult structures for adult lamprey upstream migrants to navigate.

The Nez Perce Tribe is actively restoring Pacific lamprey population in the Upper South Fork Clearwater River. Lampreys have been released in Newsome Creek and Red River (E. Crow, personal communication, 2012); however, no lampreys have been released into Crooked River to date.

Alternative 1 would not result in direct or indirect effects to Pacific lamprey and would therefore not result in effects to the species population in Crooked River or the South Fork Clearwater River.

Alternative 2 would result in direct effects to lampreys if they were present. Previous surveys suggest lampreys are not present in Crooked River, although suitable habitat is present. Additional surveys would be conducted prior to implementation of this alternative to confirm absence. If lampreys are found, best management practices to reduce the effects of instream projects would be implemented (USDI-FWS 2010). Effects to lamprey populations are therefore not expected.

Western Pearlshell Mussel

Western pearlshell mussels (*Margaritifera falcata*) are designated a sensitive species in Region 1 of the U.S. Forest Service. This species lives in cold streams and prefers stable sand and gravel substrates. Large boulders are an important habitat feature, stabilizing the habitat type. Mussels are sedentary in their adult stage and are reliant on salmonid hosts during the parasitic larval portion of their life cycle. Individuals can live many years, leading to populations existing for many years without successful reproduction occurring (Montana Field Guide 2013). Although mostly sedentary, adult mussels are capable of making short movements, and if disturbed can burrow back into substrates.

Western pearlshell mussels are known to be present in Crooked River, including the Meanders section, and the South Fork Clearwater River near the mouth of Crooked River. A robust population is present in American River, and mussels are present in Red River. Trends on populations are not known, but available information suggests mussels are widely distributed in the South Fork Clearwater River and in American River and Red River.

Alternative 1 would not result in direct or indirect effects to Western pearlshell mussel and would therefore not result in effects to the species population.

Alternative 2 would result in direct effects to mussels where they are present within the Meanders section of Crooked River, and where de-watering and reconstruction are proposed. Design criteria specify removal of any stranded mussels and placement upstream when de-watering occurs. Although effects to individuals would occur, only a short section of stream would be de-watered (relative to the entire occupied area), any stranded individuals would be moved to watered areas, and mussels would continue to be present up and downstream from the affected area so only a small portion of the entire population in Crooked River would be affected. In addition, robust colonies located nearby in the South Fork Clearwater River could serve as source populations if repopulation was necessary. Long-term improvement in habitat conditions would benefit mussels as well as fish.

Table 3-6 summarizes information regarding these species and provides preliminary determinations of effect for Alternative 2. The effects analysis and determination rationale would be described in a Biological Assessment/Biological Evaluation under this alternative.

Table 3-6. Occurrence, habitat, and preliminary determinations of effect (Alternative 2) for threatened, endangered, and sensitive aquatic species.

Fish Species	Status	Known Occurrence	Habitat Present	Alternative 2 – Preliminary Determination
Fall Chinook salmon *Oncorhynchus tschawytscha*	T	No	No	NE
Snake River steelhead trout *Oncorhynchus mykiss gairdneri*	T/MIS	Yes	Yes	LAA
Columbia River bull trout *Salvelinus confluentus*	T	Yes	Yes	LAA
Westslope cutthroat trout *Oncorhynchus clarki lewisi*	S/MIS	Yes	Yes	MI

Fish Species	Status	Known Occurrence	Habitat Present	Alternative 2 – Preliminary Determination
Spring Chinook salmon *Oncorhynchus tschawytscha*	S/MIS	Yes	Yes	MI
Interior redband trout *Oncorhynchus mykiss gairdneri*	S	Yes	Yes	MI
Pacific lamprey *Entosphenus tridentatus*	S	No	Yes	MI
Western pearlshell mussel *Margaritifera falcata*	S	Yes	Yes	MI

T = Threatened, S = Sensitive, MIS = Management Indicator Species.
Threatened Species Determination: NE = No Effect; **NLAA** = May Affect, Not Likely to Adversely Affect; **LAA** = May Affect, Likely to Adversely Affect.
Sensitive Species Determination: NI = No Impact; **MI** = May impact individuals or habitat but not likely to cause trend toward federal listing or reduce viability for the population or species; **LI** = Likely to impact individuals or habitat with the consequence that the action may contribute towards federal listing or result in reduced viability for the population or species.

Cumulative Effects

Geographic Boundary: For aquatic resources, the cumulative effects analysis area includes the entire project area, as well as the South Fork Clearwater River from the mouth of Crooked River, downstream to the Forest Service boundary at Mount Idaho Grade bridge.

Time frame: These effects are considered for the aquatic species potentially affected by this project from 2015 through the proposed and reasonably foreseeable future (approximately 10-20 years).

Past actions: The primary management activities that have influenced aquatic habitat in the Crooked River Valley Rehabilitation area include past timber harvest and supporting road construction, instream and floodplain restoration, recreation, wildfires, and mining. Of these activities, mining has been extensive in the past and have resulted in highly altered aquatic conditions. Ongoing and foreseeable actions within the proposed activity areas consist of recreation, road maintenance, fire suppression, fuels management, mining, watershed restoration, and weed treatments. Refer to Appendix C for a complete list and details of past, present, and foreseeable future actions. The two specific reasonably foreseeable actions are the Orogrande Community Protection project and the Crooked River Narrows Road Improvement project. Both projects are upstream and adjacent to the proposed action.

Crooked River

Discussion of cumulative effects for fisheries is addressed through the general trend of the suitable habitat required by these species as a result of past, present, and future management actions. The changes in condition and abundance of specific habitats important to these species are largely unknown, but can be inferred through stream reaches in the Upper South Fork Clearwater River that have incurred much less impact than Crooked River. Therefore, the effects of these past projects can be qualified only through general discussions. However, the results of past projects contribute to the current condition, which can be used to discuss and quantify effects of proposed activities on fisheries.

Alternative 1 – No Action

Under the No Action alternative, additional effects to fisheries or their habitat would not occur in the project area, as compared to past activities. No cumulative effects on fisheries or their habitats would occur because there are no direct or indirect effects from the No Action alternative. The effects of the past activities and extreme valley and stream conditions would continue, including altered hydrologic regime and function, directly affecting fish habitat and productivity in the project area. Alternative 1, while presenting no short-term risks, would not result in significant long-term improvement in watershed condition or the indicators analyzed above. Pools, habitat, and woody debris would all improve slowly, but would take many years.

Under Alternative 1 there would likely be very slow vegetation growth and due to the valley condition, shade inputs would probably not increase substantially so there would likely be a long-term impact on temperature. Alternative 1 could cause slow changes but would take many years.

Alternative 2 – Proposed Action

Alternative 2 would have cumulative effects with the past, present, and reasonably foreseeable activities in Crooked River. Past actions include timber harvest, mining, recreation, fire and road building. The most extensive and lasting of these was mining. The entire valley, from the South Fork Clearwater River to Orogrande, and even in the uplands and up the tributaries, shows signs of varying degrees of mining. Fire has also had a strong impact on the Crooked River watershed. Since 1996, nearly 10,000 acres have burned in the watershed. Most are in the upper portions of the East and West forks, which are nearly roadless areas.

Sediment inputs of the Meanders project, sediment inputs and alleviations of the proposed Crooked River Narrows Road project, along with harvest, thinning, burning, and road building in the Orogrande Community Protection project, would be increased during parts of implementation. The sediment inputs of the Meanders actions would be at discrete times, as permitted by regulatory agencies. The predicted Orogrande Community Protection project sediment inputs could overlap with the implementation of this project. However, though the projects would overlap in time, there would be very little direct overlap in space. The proposed Crooked River Narrows Road Project would yield a long term decrease in the sediment inputs upstream of the Meanders; the project would occur after the completion and upstream of the Meanders. The Meanders would improve sediment transport processes to deposit sediment in the most natural, beneficial locations in the stream system (i.e., inside of stream bends). The short-term impacts of sediment should be outweighed by the long-term benefits of more naturally functioning instream and floodplain processes. Impacts are expected to decrease, and condition is expected to improve in the ensuing years, resulting in a habitat condition that is improved compared to the current condition. Alternative 2, while presenting a moderately high short-term increased risk of sediment inputs, would have a long-term benefit of proper sediment transport processes and long-term improvement in watershed condition.

Stream temperature is also an indicator at high risk of cumulative impacts, given the stream's existing condition. Alternative 2 would reduce temperature in the long term through increased floodplain function, groundwater connection, and increased riparian and instream cover.

Pools, habitat, and woody debris would all improve throughout the project area under Alternative 2. There are many miles of stream throughout the watershed that have drastically reduced habitat features from legacy mining impacts; by improving the lowest 2 miles of valley bottom, fisheries habitat should increase exponentially locally and could beneficially impact upstream species with a more connected system to the South Fork Clearwater River.

South Fork Clearwater River

Substantial physical changes to aquatic resources in the Crooked River and South Fork Clearwater River have occurred since the initiation of human disturbances in the 19th century. Specific activities included mainstem dams, in-channel mining in the mainstem rivers and tributaries, timber harvest throughout the subbasin, road construction and encroachment on streams, domestic livestock grazing, home construction and private land development, agriculture and cultivation, fire suppression, and many other activities. Water quality and habitat in the South Fork Clearwater River is in a degraded condition, both from sediment and temperature impacts (USDA Forest Service 1998; USDA Forest Service 1999b).

As described in this section, dredge mining and hydraulic mining caused significant erosion in the tributaries, and accelerated sediment deposition in the mainstem river.

Fish passage in the South Fork Clearwater River has been impacted by mainstem dams since the early days of settlement. The first dam reported in the South Fork Clearwater River was the Dewey Mine Dam, which was in place by about 1895. This dam was reported to be 6 to 8 feet high and located about 3.3 miles above the Harpster Bridge. The dam was in place for a few years with no documentation of fish passage conditions. Lower in the South Fork, near the town of Kooskia, was the site of the Kooskia Flower Mill Dam. This dam was in place from 1910 into the 1930s. The dam was estimated to be about 6 feet high. The Washington Water Power Dam was reportedly built in 1911 (Siddall 1992). This dam was a total barrier to fish migration; a fish ladder was constructed in 1935 but was washed out in 1949. This dam was reported to be 33 or 56 feet high, depending on the source. It was removed on August 3, 1963. The existing salmon and steelhead populations are a result of fish stocking, likely supplemented by straying adults from the Clearwater River.

Current land uses occurring on private lands include livestock grazing, timber harvest, agriculture, residence construction, road construction, sewage treatment, and water withdrawals for domestic use and irrigation. Increases in general land uses would likely occur in the next decade. Additional information on private land activities is found in the South Fork Clearwater River Biological Assessment (USDA Forest Service 1999b).

Given all the above information, the South Fork Clearwater River is at high risk for cumulative impacts, especially from additional sediment and increased water temperature. The Crooked River Valley Rehabilitation project is designed to improve overall fish habitat by reducing non-point sediment sources and improving instream fish habitat. Sediment increases from instream restoration and road improvement activities would, however, increase sediment in the short term. In general, the level of activity on federal lands is currently substantially less than in recent decades, and many federal actions contain watershed improvements as part of the projects (USDA-FS 2005a, 2006, 2013c). Proposed mining activities may contribute to the conditions in the subbasin, but mitigation for these projects is expected to reduce some of these impacts. Proposed timber sales on National Forest lands are subject to similar mitigation and upward trend requirements (USDA-FS 1987a) as the Crooked River Valley Rehabilitation project, and although spikes of sediment may occur, in general stream habitat is expected to improve at least locally.

The South Fork Clearwater River TMDL for sediment and water temperature would govern activities on state and private lands as well as federal lands (IDEQ et al. 2004). Under this guidance, aquatic conditions should continue to improve in the South Fork Clearwater River.

Effectiveness of Mitigation

The following design and mitigation measures are to be implemented for the action alternative. The measures are specified in full in Chapter 2, Design and Mitigation Measures.

Sediment/Turbidity

The following design and mitigation measures related to sediment and turbidity would be implemented for Alternative 2: #1, 6–10, 13, 16–19, 46–49, and 52.

Aspects of the proposed project that have the potential to elevate turbidity and increase sediment include: construction of temporary bypass channel and road; clearing of vegetation; preparing staging areas; watering the temporary bypass channel; and re-watering the stream. Floodplain grading activities and new channel construction would increase sediment production; however, sediment basins would be constructed throughout the project area to capture and settle out sediment. Design and mitigation measures, such as installing sediment barriers (#8) and mulching/stabilizing side slopes (#19), would reduce the overall amount of sediment that reaches live water, but would not prevent all sediment from reaching the stream.

Sediment effects of fish are dictated by timing, duration, intensity, and frequency of exposure (Bash et al. 2001). The extent of the effect is higher when turbidity is increased and particle size is decreased (Bisson and Bilby 1982). Protective mucus levels of individual fish are lower during periods when instream sediment backgrounds are lower (i.e., low flow work window), which may increase turbidity effects on fish during this period (Bash et al. 2001). Watering the temporary bypass channel and re-watering the newly constructed channel are the activities that would increase turbidity the most. The project area is primarily composed of larger cobble since most of the fine sediment was washed out during the dredging activities, which would reduce the overall amount of sediment produced during construction activities. Timing of watering the temporary bypass channel would be coordinated with the Central Idaho Level 1 Team (ESA Section 7 Consultation Team) and other agencies to reduce the impacts on ESA-listed fish (#45). The temporary bypass channel may be watered during high flows (April–May) when turbidity background levels are naturally higher to reduce the impacts on fish. Re-watering the newly constructed channel would likely occur during low flow. However, since fine sediment is already lacking in the project area, the amount that is mobilized during the re-watering process would be reduced.

Providing a temporary bypass channel and constructing a road that separates the bulk of the construction area from the temporary channel would reduce the amount of sediment from entering live water (#45, #46, #52 [RDG et al. 2013a]). As a part of the design, temporary ponds would be constructed to capture sediment across the work area to prevent any from reaching the bypass channel or the South Fork Clearwater River. Turbid water may be pumped to the floodplain or settling ponds to keep areas dry during construction to reduce sediment inputs to Crooked River and South Fork Clearwater River.

Design and mitigation measure #16 includes monitoring to be conducted as directed by the USACE, EPA, NMFS, and USFWS, and adaptive management would be applied if turbidity reaches 50 NTUs over background during low flow. The Idaho standard for turbidity is 50 NTU instantaneous measurement over background, which is considered protective of cold water aquatic life.

Petroleum-Based Products

The following design and mitigation measures related to petroleum-based products would be implemented for Alternative 2: #2, 3, 4, and 5.

Fish have the potential to be affected by chemical contamination from the proposed project activities. Heavy equipment would be used in most aspects of the project activities (floodplain re-grading, new channel construction, LWD placement). Machinery would likely be working in live water due to the high water table of the valley, even though the stream would be diverted into a temporary bypass channel. Washing and maintaining all equipment would reduce the amount of petroleum-based products entering the water from day-to-day operations. Staging areas for machinery, fuels storage, and maintenance work would occur off site and far enough away from live water that fish would not likely be exposed to petroleum products in the case of a spill (#3, #5). Since much of the project area is composed of porous cobble, any spills would percolate to the groundwater quickly. Storing petroleum products in containment structures with impervious liners would prevent much of the chemical from entering the water, and having spill containment kits and a spill containment plan on site would allow for a quick response to reduce the amount of chemicals leaching into the groundwater (#4).

Toxics

The following design and mitigation measures related to toxins would be implemented for Alternative 2: #15 and 20.

Mercury is a naturally occurring element in the environment that has several forms. Metallic mercury is a shiny, silver-white, odorless liquid. Metallic mercury (inorganic mercury and its compounds) enters the air from mining and manufacturing activities and from burning coal and waste. It has also been added to the environment from historic gold mining activities. Although mercury was not used in dredge mining in the upper South Fork Clearwater, there is a small potential to find this element during restoration activities. Past geochemistry studies, including the *Crooked River Stream Survey and In-Situ Toxicity Results* (Baldigo 1986), *Water Quality Status Report 80: Crooked River* (Idaho Department of Environmental Quality (IDEQ 1988), and *Idaho Champion Group Lode and Pacific Group Load Claims: Preliminary Assessment and Site Inspection Report* (IDEQ 2011), have all shown that concentrations of heavy metals in both soil and water are generally equivalent to background levels or below detection limits.

Because of its color, mercury would be visible to contractors, Forest Service, and Nez Perce Tribe personnel on site during construction. Any mercury that is found would be removed from the site following methods outlined in Appendix E. This would reduce the potential for bioaccumulation of mercury in aquatic species in Crooked River and the South Fork Clearwater River.

Temporary Bypass Channel

The following design and mitigation measures related to the temporary bypass channel would be implemented for Alternative 2: #45, 48, and 52.

The temporary bypass channel would be constructed prior to any instream or floodplain activities. The bypass channel would be constructed to accommodate a 10-year flow recurrence and would remain in operation until the floodplain and new channel are complete. Cofferdams and/or a head gate would be constructed on the main channel to control the flow to the bypass channel. This would allow for increasing the flow in both the bypass channel and newly constructed channel to reduce the amount of sediment mobilized during re-watering. The bypass channel would allow for migration of all fish species during their migratory periods. The temporary bypass channel would not likely provide suitable spawning habitats for steelhead, spring/summer Chinook salmon, or bull trout due to limited spawning sized gravels. However, primary spawning sites for spring/summer Chinook salmon are upstream of where the bypass channel would be constructed. Bull trout have not been found to spawn in the lower Crooked

River, and the current channel conditions of low velocity and high cobble embeddedness limit steelhead spawning in the project area.

The temporary channel would be watered during high flows if possible. This would allow sediment produced to be flushed out during periods when natural sediment background is already high and there is enough water so as not to dewater the existing channel. The bypass channel would not be fully used until the low-flow work window of July 1 or as specified in consultation with NMFS or USFWS.

Fish and Aquatic Organism Salvage

The following design and mitigation measures related to fish and aquatic organism salvage would be implemented for Alternative 2: #11 and 45.

Fish salvage would occur in the mainstem Crooked River and connected ponds after July 1 or as consulted on by NMFS and USFWS. Juvenile steelhead, spring/summer Chinook, westslope cutthroat trout, and other aquatic species would likely be present. Mainstem fish salvage would include a combination of dewatering, netting, and electrofishing. Methods for salvaging the ponds would include blocknetting, electrofishing, staged dewatering, and seining.

Dewatering/Seining/Netting. Cofferdams and/or a head gate would be constructed on the mainstem channel. Water would slowly be released into the temporary bypass channel to reduce flows in the mainstem channel. This would allow fish to move downstream and out of the project area. Seining and netting would be used in combination with dewatering to “encourage” fish to move downstream and out of the project area in the main channel and ponds that are connected to the channel.

Electrofishing. It is uncertain how many electrofishing passes would be needed to remove fish from the mainstem channel and ponds. Since the channel and ponds would be slowly dewatered, the amount of area needed to be electrofished would be reduced. It is not likely that the in-channel pools or the ponds would completely dry up due to the high elevation of the water table across the valley. It is possible that many of the fish could be chased into these pools during dewatering and only the pools and ponds would require electrofishing.

Consistency with Forest Plan and Environmental Laws

Nez Perce National Forest Land and Resource Management Plan Direction

The project would comply with forestwide standards for fisheries resources in the Nez Perce National Forest Plan (USDA Forest Service 1987a, pp. II-18 through II-20). Full details of consistency of the project with the Forest Plan are located in the project record.

Cooperative efforts would occur among Nez Perce – Clearwater National Forests, BLM, Nez Perce Tribe, Idaho Department of Fish and Game, and U.S. Fish and Wildlife Service to monitor population levels of all MISs. Government-to-Government consultation has occurred to recognize fishing and hunting rights guaranteed to the Nez Perce Tribe. The Forest Service and Idaho Department of Fish and Game would continue to coordinate to achieve mutual goals for fish and wildlife.

Alternative 2 would restore degraded fish habitat, but Alternative 1 would not. Alternative 2 would move the conditions within Crooked River toward meeting established fishery/water quality objectives in Crooked River, which is currently not meeting objectives.

With respect to Management Area 10 (Riparian Areas), short-term decreases in streamside canopy would occur under Alternative 2, but thousands of plants would be planted to increase streamside canopy. Alternative 2 would implement riparian improvements, including connecting vegetation to groundwater and floodplain processes and planting native grasses, forbs, shrubs, and trees. Alternative 2 would implement habitat improvements in all drainages presently below stated objectives.

Nez Perce Forest Plan, Amendment 20 (PACFISH)

The PACFISH decision amended the Nez Perce Forest Plan in 1995 and was incorporated into the Forest Plan as Amendment 20 (PACFISH; USDA Forest Service 1995b). PACFISH establishes riparian goals and riparian management objectives (RMOs) and defines riparian habitat conservation areas. It includes specific direction for land management activities within riparian areas adjacent to streams, lakes, wetlands, and landslide-prone terrain. Riparian goals establish an expectation of the characteristics of healthy, functioning watersheds, riparian areas, and fish habitat. The goals direct the Nez Perce National Forest to maintain or improve habitat elements such as water quality, stream channel integrity, instream flows, and riparian vegetation.

Standards and guidelines specific to watershed and habitat restoration include the following:

- 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.
- WR-3: Do not use planned restoration as a substitute for preventing habitat degradation (i.e., use planned restoration only to mitigate existing problems, not to mitigate the effects of proposed activities).

Alternative 2 would be consistent with these standards and guidelines. The objective of this alternative is to restore the ecological and watershed integrity of the Meanders sections of Crooked River and would contribute to attainment of RMOs, which are currently not being met. Planned restoration under Alternative 2 is not proposed to mitigate the effects of other activities in the watershed.

Table 3-7. PACFISH RMOs (USDA 1987) habitat parameters. These objectives are part of determining the complexity of habitat available for fish within the analysis area.

<table>
<tr><th>Habitat Feature</th><th colspan="10">Riparian Management Objectives</th></tr>
<tr><td rowspan="2">Pool Frequency</td><td>Wetted width (ft)</td><td>10</td><td>20</td><td>25</td><td>50</td><td>75</td><td>100</td><td>125</td><td>150</td><td>200</td></tr>
<tr><td>Number pools/mile</td><td>96</td><td>56</td><td>47</td><td>26</td><td>23</td><td>18</td><td>14</td><td>12</td><td>9</td></tr>
<tr><td>Water Temperature</td><td colspan="10">Compliance with water quality standard or maximum temp. <68ºF</td></tr>
<tr><td>Large Woody Debris</td><td colspan="10">>20 pieces/mile, >12-inch diameter, >35-ft length</td></tr>
<tr><td>Bank Stability</td><td colspan="10">>80 percent stable</td></tr>
<tr><td>Width/Depth Ratio</td><td colspan="10"><10, mean wetted width divided by mean depth</td></tr>
</table>

Endangered Species Act and Biological Opinions

The Endangered Species Act requires the listing of species that are threatened or endangered with extinction, federal agency consultation on activities affecting these species, and the development of recovery plans. These missions are the responsibility of NMFS for anadromous fish species and the U.S. Fish and Wildlife Service for resident fish species and terrestrial wildlife. The ESA-listed aquatic species found in Crooked River are steelhead trout and bull trout.

Under Alternative 2, the Forest Service and Nez Perce Tribe would submit a biological assessment documenting the project effects on listed species to the regulatory agencies, and formal consultation would be concluded prior to a record of decision being signed.

The USFWS and NMFS have developed draft recovery plans for ESA-listed fish in the project area. The USFWS identified the South Fork Clearwater as a core area for bull trout recovery and Crooked River as supporting a local population (draft USDI-FWS 2002). Historic dredge mining was identified as a principal factor degrading bull trout habitat in Crooked River, with ongoing legacy effects. Although previous restoration efforts were acknowledged, it was noted that they did not fully restore the stream channel.

Actions identified to meet recovery goals for bull trout included identification of problem mine sites and remediation of tailings, ponds, and other associated waste. Within the South Fork Clearwater core area, Newsome Creek and Crooked River were identified as the top priorities. Therefore, Alternative 2 is consistent with recovery goals identified in this draft plan.

In the draft Snake River Steelhead Recovery Plan for the Clearwater subbasin the South Fork Clearwater steelhead population was described as “intermediate” based on size and historic habitat potential (draft NMFS 2011). Crooked River was identified as a major spawning area. The draft plan emphasized the importance of riparian habitat restoration in American River, Red

River, Newsome Creek, and Crooked River, citing the loss of riparian vegetation, which has reduced recruitment of large woody debris to stream channels and reduced habitat complexity. It also cited channel modification and simplification, most commonly resulting from historic dredging mining, which has affected both rearing and spawning habitat.

Priority areas identified for restoration in the South Fork Clearwater subbasin were primarily associated with major spawning areas, which included lower Crooked River in the Meanders section. Direction to meet recovery goals specifically included the following: "Restore stream channels and floodplain function in reaches impacted by historic dredge mining and other land uses in the Newsome, Crooked, American, and Red River watersheds. Many of these stream reaches have straightened channels, infrequent pools, inadequate pool depth, inadequate riparian vegetation, and reduced habitat complexity, including lack of cover. Projects may include restoring natural floodplain meander patterns by reconnecting historic meanders or reconstructing stream channels."

Since Alternative 2 proposes these types of activities, it is consistent with the recovery goals identified in this draft plan.

Magnuson–Stevens Act

Pursuant to Section 305(b) of the Magnuson–Stevens Act and its implementing regulations (50 CFR 600.920), federal agencies must consult with NMFS regarding any of their actions that are authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken that may adversely affect essential fish habitat. The Magnuson–Stevens Act, Section 3, defines essential fish habitat as "those waters and substrate necessary for fish for spawning, breeding, feeding, or growth to maturity."

Federal agencies may incorporate an assessment of essential fish habitat into biological assessments required by the Endangered Species Act. The following designation for essential fish habitat occurs in the project area:

- Essential fish habitat for Chinook salmon (*Oncorhynchus tschawytscha*). Essential fish habitat for Chinook salmon includes all historically accessible reaches of the Clearwater River subbasin (except the North Fork above Dworshak Dam). Essential fish habitat for Chinook salmon is present in Crooked River.

Clean Water Act and Idaho Water Quality Standards

The Clean Water Act stipulates that states are to adopt water quality standards. Included in these standards are provisions for identifying beneficial uses, establishing the status of beneficial uses, setting water quality criteria, and establishing best management practices to control nonpoint sources of pollution.

Designated beneficial uses have been established for Crooked River and South Fork Clearwater River up and downstream of the mouth of Crooked River (IDAPA 58.01.02, IDEQ 2013). These beneficial uses include coldwater biota, salmonid spawning, secondary contact recreation in Crooked River, and primary contact recreation in South Fork Clearwater River.

Water Resources

Scope of Analysis

The purpose of the proposed Crooked River Valley Rehabilitation Project is to improve fisheries habitat degraded from historical dredge mining by restoring stream and floodplain functions. The project area is located in the Crooked River watershed within the Red River Ranger District of the Nez Perce – Clearwater National Forests in north-central Idaho, approximately 5 air miles southwest of Elk City, Idaho.

The proposed action would rehabilitate the lower 2 miles of Crooked River valley by re-grading 115 acres of the floodplain and by reconstructing 7,400 feet of new stream channel (see Figure 2-1 and Appendix A). The resources of concern that could potentially be affected by the proposed action are water quality, geomorphology, wetlands, and floodplains. The effects on water yield (the quantity of precipitation after plant use that is available as surface and subusurface flow) would be minimal given that the floodplain to be re-graded has extensive tailings piles and is not densely vegetated; therefore, water yield is not a resource of concern.

Project Area

The project area is located in the Lower Crooked River 6th Hydrologic Unit Code (6th Code HUC) Nez Perce National Forest Plan (Forest Plan) prescription watershed as defined in the Forest Plan (USDA Forest Service 1987a), which is within the Crooked River watershed and a tributary to the South Fork Clearwater River. The project boundary is the Crooked River valley from 0.1 mile upstream from the mouth to approximately 2 miles upstream from the mouth to where the valley constricts and narrows. The area for direct and indirect effects on water quality, geomorphology, wetlands, and floodplains is the project boundary.

Cumulative Effects Area

The area for cumulative effects includes the Crooked River watershed and the South Fork Clearwater River to its confluence with the Middle Fork Clearwater River near Kooskia, Idaho.

Analysis Methods and Indicators

This section describes the indicators used in the analysis to evaluate the effects of the proposed action on the water resources of concern, the analysis methods used, and the data and information used for the analysis.

The data and information sources used for the water resource analysis include:

- *Design Criteria Report: Crooked River Valley Rehabilitation Design* (RDG et al. 2012)
- *Final Design Report: Crooked River Valley Rehabilitation Design* (RDG et al. 2013a)
- *Crooked River Temperature Summary* (RDG 2013a)
- *Hydraulic Modeling and Habitat Mapping for Existing Conditions* (RDG 2013b)

- *Crooked River Valley Rehabilitation Project Wetland Delineation Report* (Geum Environmental Consulting 2012)
- *South Fork Clearwater River Subbasin Assessment and TMDLs* (IDEQ et al. 2004)
- Great West Engineering Specifications Sheets (Great West Engineering 2013)
- Digital information from Nez Perce – Clearwater National Forests GIS data layers
- Project-specific road feature data collected by Nez Perce – Clearwater National Forests.

The resources of concern that could potentially be affected by the proposed action are water quality, geomorphology, groundwater–surface water interactions, wetlands, and floodplains. Groundwater–surface water interactions in the project area are highly variable with much uncertainty, and the disturbed nature of the site makes it difficult to determine whether the reach of Crooked River within the project area is gaining or losing reach groundwater, and how much flow is traveling subsurface through coarse valley bottom substrates (RDG et al. 2012). For these reasons, effects on groundwater–surface water interactions could not be evaluated.

The effects on water yield would be minimal since the floodplain that would be re-graded has extensive tailings piles that are sparsely vegetated; therefore, effects on water yield in response to the clearing of vegetation is not a resource of concern.

Water Quality

The indicator used to evaluate potential effects on water quality is water temperature. For this analysis, a surrogate indicator of effective shade is used for water temperature. Effective shade is the percent reduction of solar radiation by streamside vegetation, and is used as a surrogate indicator for water temperature for the purpose of consistency with *South Fork Clearwater River Subbasin Assessment and TMDLs* (IDEQ et al. 2004) and *South Fork Clearwater River TMDL Implementation Plan* (South Fork Clearwater River Watershed Advisory Group 2006).

Mine tailings have potential issues with soil and water contamination from heavy metals, and mercury is typically the heavy metal of concern. Although mercury was not used in dredge mining in the upper South Fork Clearwater, there is a small potential to find this element during restoration activities. Past geochemistry studies, including the *Crooked River Stream Survey and In-Situ Toxicity Results* (Baldigo 1986), *Water Quality Status Report 80: Crooked River* (Mann and Lindern 1988), and *Idaho Champion Group Lode and Pacific Group Load Claims: Preliminary Assessment and Site Inspection Report* (IDEQ 2011), have all shown that concentrations of heavy metals in both soil and water are generally equivalent to background levels or below detection limits. Recent heavy metals monitoring data collected within the project area in 2013 by the Nez Perce Tribe did not exceed cold water biota water quality standards (Nez Perce Tribe 2013 unpublished data). Based on these studies, mercury levels were not used as a water quality indicator.

The turbidity water quality criteria state that turbidity shall not exceed background turbidity by more than 50 nephelometric turbidity units (NTU) instantaneously or more than 25 NTU for more than 10 consecutive days (IDEQ 2013, IDAPA 58.01.02, sec 250). Design and mitigation measures would be implemented to minimize turbidity; however, it is anticipated that exceeding the instantaneous and 10-day turbidity criteria would be unavoidable for specific activities such as coffer dam installation and removal, and de-watering /watering of the main channel and temporary bypass channel. The specific design and mitigation measures that would be implemented to minimize turbidity include: completing ground-disturbing activities during low-flow conditions and adjusting instream work dates site-specifically through coordination with the Central Idaho Level 1 Team and other agencies; diverting or pumping stream water around the work site and placing screens on intake pipes; installing silt fences, straw bales, and/or sand bag windrows as needed before excavation occurs to separate disturbed areas from waterbodies; and operating dewatering systems continuously until project construction has been completed on each reach to minimize turbidity and sedimentation.

Geomorphology

Geomorphology is the examination of river forms and processes that operate through mutual adjustments to achieve a condition of stability, where a river attains balance between erosion and deposition. Geomorphic processes have been altered in the project area, resulting in a condition of instability and degraded aquatic habitat. These processes include channel–floodplain interaction and sediment transport/bed mobility. The following geomorphic indicators were used to evaluate the potential effects from the proposed action on these geomorphic processes.

- **Channel entrenchment ratio** is a measure of how incised a river is, or the extent of vertical containment of a river relative to its adjacent floodplain. It is calculated as the ratio of flood-prone area width to bankfull width, and used as an indicator of floodplain connectivity (flood-prone area width/bankfull width).
- **Channel width-to-depth ratio** is a measure of the shape of a channel cross section (e.g., wide and shallow or narrow and deep). It is calculated as the ratio of bankfull surface width to mean bankfull depth, and is used as an indicator of the shape of the channel (bankfull width/mean bankfull depth).
- **Channel sinuosity** is a measure of the degree of meandering and channel migration within a valley. It is calculated as the ratio of valley gradient to channel gradient, and is used as an indicator of flow velocity (valley gradient/channel gradient).
- **Sediment Transport/Bed Mobility** is the movement of sediment, and is used as an indicator of the channel's ability to maintain appropriately sized spawning gravel and clean interstitial spaces, where interstitial spaces are the gaps between gravel particles.

Floodplains

The proposed action would alter the existing tailings piles to restore the Crooked River stream channel and floodplain function. The indicator used to evaluate the potential effects on floodplains is **floodplain type and area (acres)**.

Wetlands

The proposed action would alter the existing wetlands in the project area. The indicator used to evaluate the potential effects on wetlands is **wetland class and area (acres)**.

The proposed action would be subject to permitting by the United States Army Corps of Engineers (USACE) under the Clean Water Act, Section 404(b)(1) guidelines (40 CFR 230) for discharge of dredge and fill material into waters of the United States.

Crooked River Hydrology

Although hydrology is not identified as an indicator, this section presents a discussion of the hydrology within the project area, including baseflow, bankfull flow, and groundwater–surface water interactions, and the design flows used for the reconstructed Crooked River. Information for this section was summarized from *Design Criteria Report: Crooked River Valley Rehabilitation Design* (RDG et al. 2012) and *Final Design Report: Crooked River Valley Rehabilitation Design* (RDG et al. 2013a).

Groundwater–surface water processes in the project area are heavily disturbed due to both mining impacts and rehabilitation efforts. Channel capacity estimates calibrated to field-surveyed bankfull indicators suggest that channel capacity in the middle of the project area (Reaches 2 and 3; see Figure 3-14) is roughly 50 percent less than the upstream (Reach 1) and downstream (Reach 4) project limits. Low flow discharge measurements were taken at four instream locations in the project area in August 2012. Discharge measurements varied from 24.4 cfs to 25.8 cfs, and indicate that baseflow discharge is consistent throughout the project area.

Temperature data collected suggest potential groundwater influence. Vegetation data suggest that lateral groundwater and surface water inputs to the valley bottom from ephemeral tributaries may be influencing the floodplain water table, whereby groundwater elevations are higher near the edges of the valley relative to the center of the valley bottom. LiDAR data were used to evaluate low flow surface water elevations throughout the valley bottom for ponds, wetlands, side channels, and the main channel. Results indicate that surface water elevations are highly variable, and the analysis yielded no distinct trends that would be useful for predicting groundwater gradients or surface water relationships.

In summary, groundwater–surface water interactions in the project area are highly variable with much uncertainty. The disturbed nature of the site from both mining and rehabilitation makes it difficult to determine whether Crooked River within the project area is gaining or losing groundwater, and how much flow is traveling subsurface through coarse valley bottom substrates. Additional data collection and analysis would be useful only for characterizing a highly disturbed existing condition that ultimately would be changed upon implementation of the design, and would not provide useful information to inform project design.

Low flow, or baseflow, frequency statistics are useful to determine the minimum water availability for fish passage under extreme conditions as well as to evaluate the risk of channel dewatering. For Crooked River, baseflow statistics were estimated using the regional regression equations presented in USGS SIR-2006-5035, which utilize drainage area, mean annual precipitation, and percent of developed land. A summary of baseflow estimates for a consecutive number of days and recurrence intervals is presented in Table 3-8. The baseflow discharge used in the hydraulic model to design the reconstructed channel is the 30-day, 5-year flow return interval (Q_5) of 10 cubic feet per second (cfs).

Bankfull discharge was evaluated using multiple methods for hydraulic geometry and calibrating roughness based on empirical data as well as measured field data for observed bankfull indicators. Field discharge measurements were taken to calibrate bed roughness. Estimates of bankfull discharge using field-surveyed bankfull indicators are summarized in Table 3-9. Results indicate that the recurrence interval for bankfull discharge is $Q_{1.1}$ or less, which is much less than a $Q_{1.5}$ recurrence interval that is typically associated with bankfull discharge.

Hydrologic analyses identified a significant disparity among methods for estimates of bankfull discharge. Estimates of bankfull discharge using field data (bankfull indicators, channel cross section geometry, water surface slope, and roughness derived from bed substrate) resulted in values that were one-quarter to one-half of those derived from regional regression equations and USGS gage data from nearby drainages (Table 3-10). One possible reason for the disparity is flow attenuation caused by water storage in dredge ponds in the project area as well as the upper watershed near the town of Orogrande. Another possible reason for the disparity is subsurface flow through disturbed coarse deposits.

The design bankfull discharge was assumed to be between the estimates using field-surveyed bankfull indicators and the estimates derived from regional regression equations and gage data from nearby drainages, and the bankfull discharge of 300 cfs with a recurrence interval of 1.1 years was used in the model to design the reconstructed channel (personal communication with Matt Daniels, RDG, 2013).

Table 3-8. Crooked River baseflow estimates (cfs) (RDG et al. 2012**).**

Baseflow Statistic[1]	Baseflow	Range
1 Day Q_{10}	6.2	4.3 – 8.1
7 Day Q_{10}	7.4	5.1 – 9.7
7 Day Q_2	12.3	9.1 – 15.4
30 Day Q_5	10.6	7.6 – 13.5

[1] Q10: 10- year flow return interval; Q2: 2-year flow return interval; Q5: 5-year flow return interval

Table 3-9. Estimates of bankfull discharge using field-surveyed bankfull indicators (RDG et al. 2012).

River Reach	Area (sq ft)	Mean Depth (ft)	Gradient (ft/ft)	Discharge (cfs)	Recurrence Interval
Reach 1	61	1.5	0.0086	220	$< Q_{1.1}$
Reach 2	51	1.4	0.0039	142	$< Q_{1.1}$
Reach 3	57	1.6	0.0036	143	$< Q_{1.1}$
Reach 4	65	1.6	0.0077	225	$< Q_{1.1}$

Table 3-10. Summary of Crooked River flood frequency estimates (RDG et al. 2012**).**

Recurrence Interval (years)	WRIR-02-4170 Region 4 Regression (cfs)	Scaled 17B Flood Frequency			
		USGS 13337500 SF Clearwater (cfs)	USFS 170603050104 Main Red River (cfs)	USGS 13337177 SF Red River (cfs)	USFS 170603050603 Johns Creek (cfs)
1.5	492	489	157	324	489
2	597	594	187	395	615
2.33	648	642	200	428	676
5	871	856	247	563	961
10	1,061	1,031	277	667	1,213
25	1,316	1,250	306	789	1,551
50	1,500	1,414	323	873	1,818
100	1,688	1,576	338	953	2,097
200	1,883	1,738	350	1,029	2,388
500	2,175	1,958	363	1,123	2,796

Baseflow conditions were simulated using a discharge of 50 cfs. Lower baseflow conditions occur during late summer, early fall, and winter; however, simulation of very low discharges was not practical due to model resolution and computation difficulties.

Simulated water depths for a baseflow discharge of 50 cfs are presented in Figure 3-10. Simulated water depths in the reconstructed channel for a bankfull discharge of 300 cfs are presented in Figure 3-11.

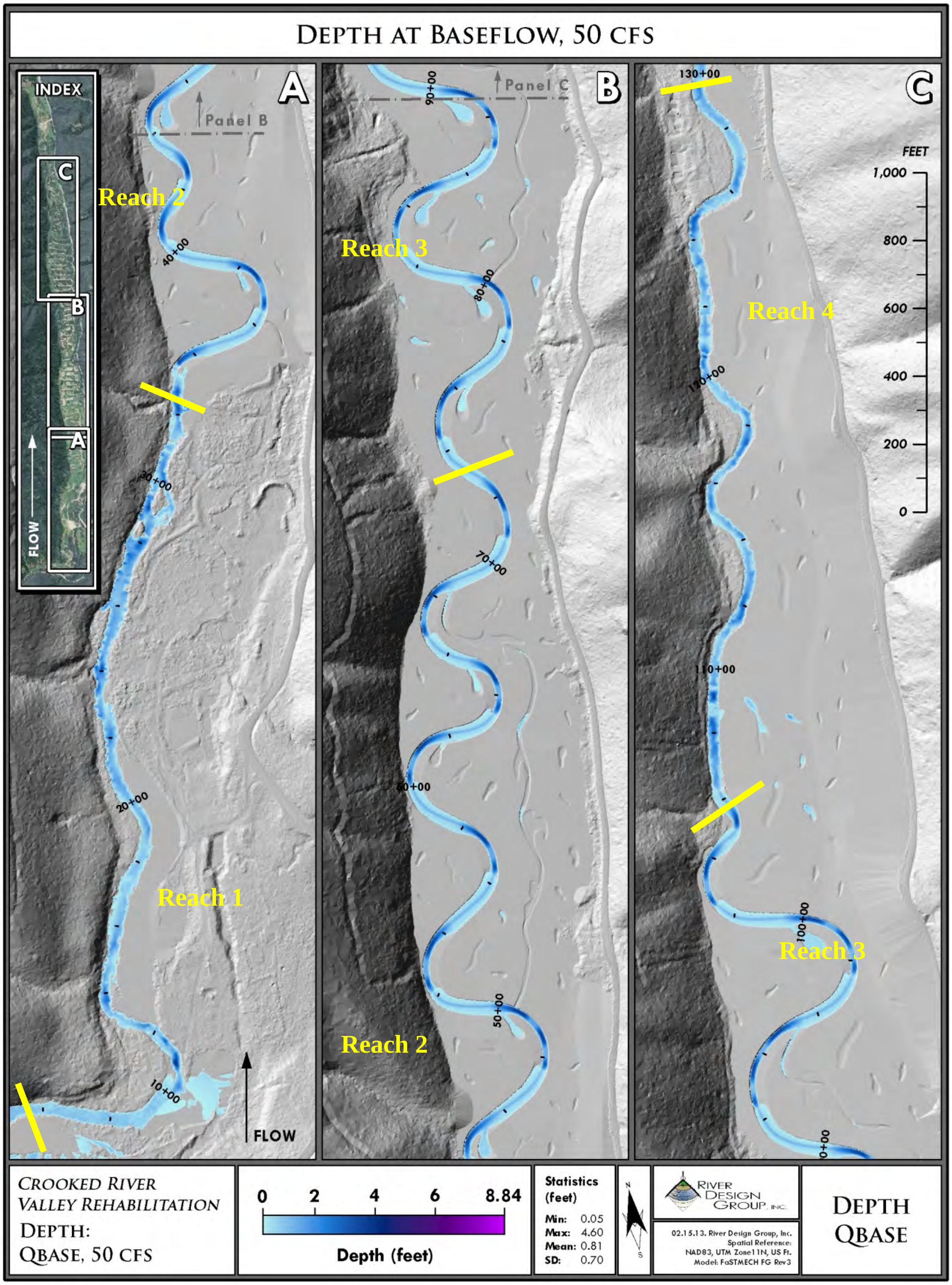


Figure 3-10. Water depths in the reconstructed channel for a baseflow discharge of 50 cfs (RDG et al. 2013b) (A through C depicts upstream to downstream in the area).

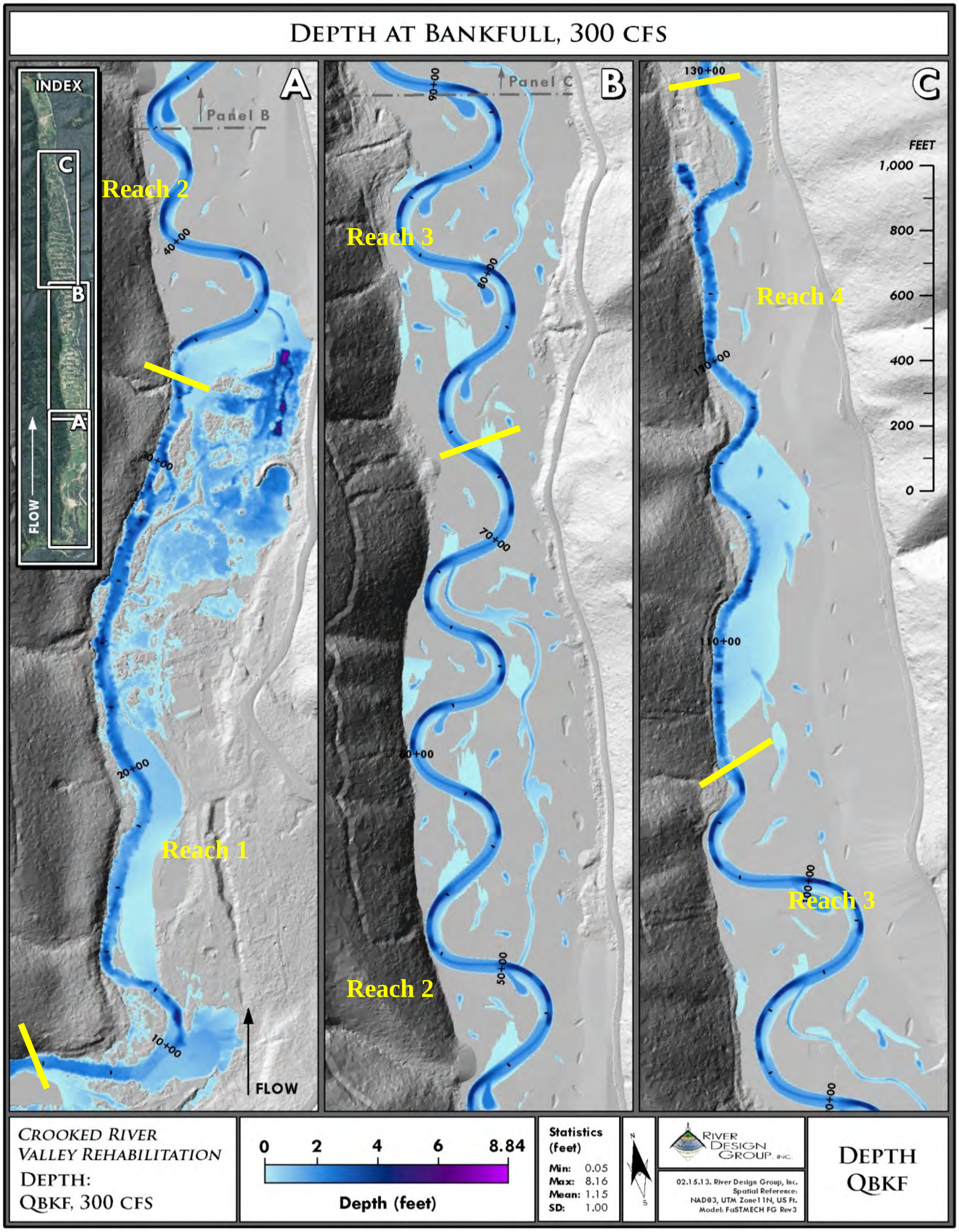


Figure 3-11. Water depths in the reconstructed channel for a bankfull discharge of 300 cfs (RDG et al. 2013b).

Affected Environment and Environmental Consequences

This section defines the existing condition and presents the analysis of direct, indirect, and cumulative effects of the proposed action and alternative on water resources.

Affected Environment – Water Temperature

Information for the water temperature analysis was summarized from *Design Criteria Report: Crooked River Valley Rehabilitation Design* (RDG et al. 2012) and *Final Design Report: Crooked River Valley Rehabilitation Design* (RDG et al. 2013a).

Crooked River from the mouth to Relief Creek is assessed under §305(b) of the Clean Water Act as water quality impaired for temperature, and a temperature TMDL (total maximum daily load) has been developed and approved (IDEQ et al. 2004). The TMDL states that increased stream temperatures in the South Fork Clearwater River are primarily the result of increased heat loading from increased solar radiation reaching the water surface and increased local environmental temperatures as a result of the removal of riparian shading (IDEQ et al. 2004). Percent effective shade targets were established in the TMDL as surrogate measures necessary to achieve temperature criteria, with a percent increase effective shade target of 24 percent for forested tributaries of the South Fork Clearwater River (IDEQ et al. 2004). The means of achieving these effective shade targets is through restoring and protecting riparian vegetation, and narrowing stream channel widths (IDEQ et al. 2004).

Disturbed riparian conditions alongside Crooked River have resulted in altered plant communities and reduced canopy cover, which has contributed to elevated water temperatures by increasing solar radiation and decreasing effective shade. Disturbed riparian conditions alongside Crooked River include a lack of floodplain connectivity due to channel entrenchment, and extensive tailings piles with coarse, well-drained substrates. Lack of floodplain connectivity limits the interaction between Crooked River and its floodplain, which inhibits the process of sediment deposition along the river and within the floodplain that initiates woody plant community succession. The coarse, well-drained tailings piles lack sufficient fine-grained rooting material to support a healthy, diverse plant community, and their extent significantly limits the area available for woody plant communities to establish.

The existing plant communities within the project area are displayed in Figure 3-12, which shows the extent of reed canary grass located streamside along Crooked River, and herbaceous plants and conifers located streamside on the tailings piles along Crooked River. The existing percent composition of streamside plant communities and streamside average percent summer solar radiation and average percent summer effective shade are presented in Table 3-11. The existing percent composition of streamside plant communities and streamside maximum percent summer solar radiation and minimum percent summer effective shade are presented in Table 3-12. As shown by Tables 3-11 and 3-12, reed canary grass currently occupies 40% of the streamside with average and maximum percent summer solar radiation of 82 and 94%, respectively. Corresponding streamside average and minimum summer percent effective shade for the current reed canary grass are 18 and 6%, respectively. Conifer and herbaceous plants currently located streamside on tailings piles each occupy 8% of the streamside, and have average percent summer solar radiation of 41% and 80%, respectively, and average percent summer effective shade of 59% and 20%, respectively. Conifer and herbaceous plants currently located streamside on tailings piles have maximum percent summer solar radiation of 85% and 94%, respectively, and minimum percent summer effective shade of 15% and 5%, respectively. The existing streamside weighted average percent summer effective shade is 30%, and the existing streamside weighted minimum percent effective shade is 16%, indicating surface water temperatures are elevated due to high solar radiation and low percent effective shade from disturbed riparian conditions.

Table 3-11. Existing streamside plant community composition, average summer solar radiation, and average summer effective shade by percent.

Plant Community	Composition	Ave. Summer Solar Radiation	Ave. Summer Effective Shade
Reed canary grass	40	82	18
Water sedge	19	68	32
Alder/Mesic forb	12	52	48
Dredge – Herbaceous	8	80	20
Drummond's willow	8	65	35
Dredge – Conifer	8	41	59
Conifer/Tall forb	3	48	52
Mesic forb meadow	1	82	18
Red-osier dogwood	1	57	43
Weighted Average		**70**	**30**

Data source: RDG et al. (2012). Compiled using data from Tables 4-1 and 4-7. Weighted average calculated by D. Traeumer.

Table 3-12. Existing streamside plant community composition, maximum summer solar radiation, and maximum summer effective shade by percent.

Plant Community	Composition	Max. Summer Solar Radiation	Min. Summer Effective Shade
Reed canary grass	40	94	6
Water sedge	19	67	33
Alder/Mesic forb	12	66	34
Dredge – Herbaceous	8	95	5
Drummond's willow	8	87	13
Dredge – Conifer	8	85	15
Conifer/Tall forb	3	83	17
Mesic forb meadow	1	84	16
Red-osier dogwood	1	95	5
Weighted Average		**84**	**16**

Data source: RDG et al. (2012). Compiled using data from Tables 4-1 and 4-7. Weighted average calculated by D. Traeumer.

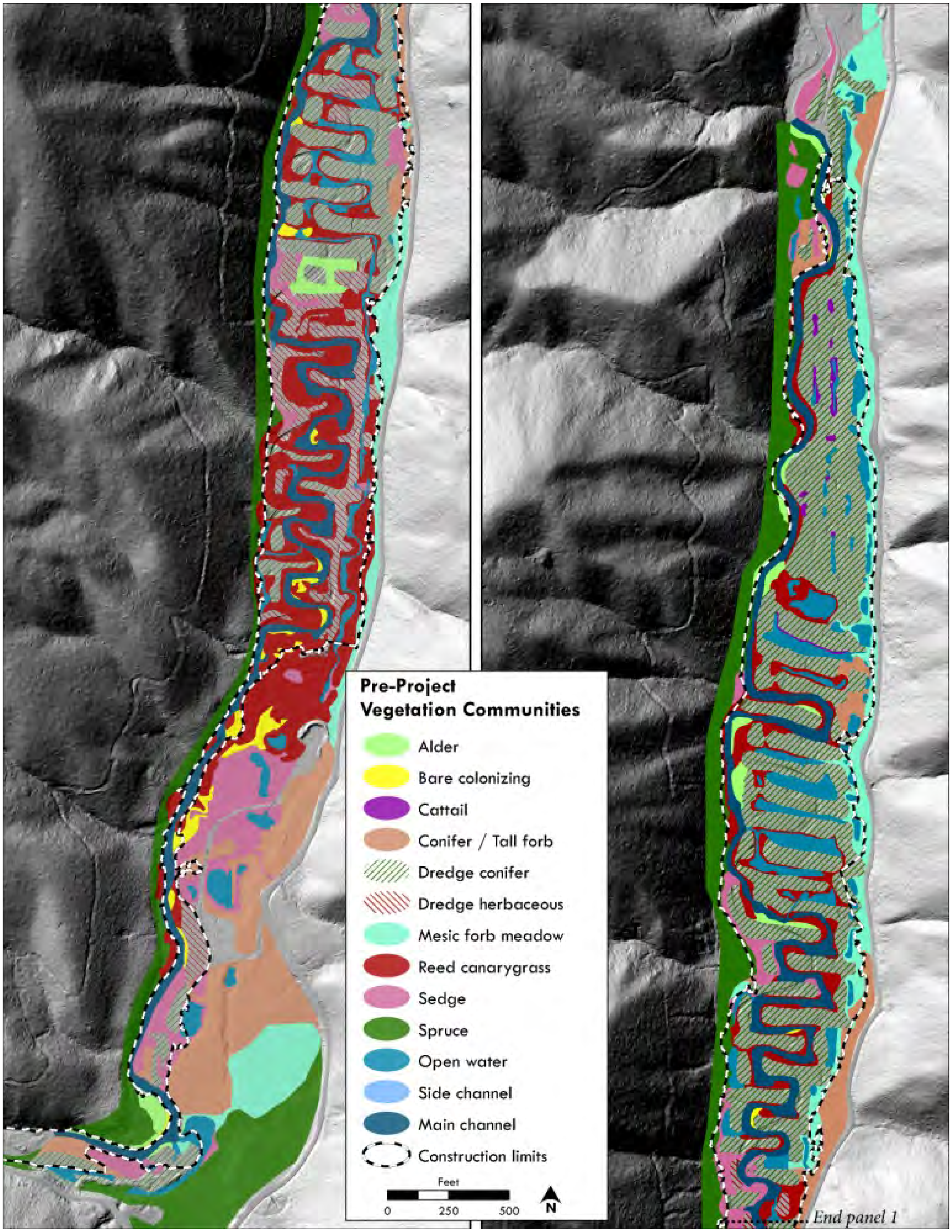


Figure 3-12. Crooked River existing vegetation communities (RDG et al. 2013a).

Environmental Consequences – Water Temperature

Direct and Indirect Effects

The proposed project would reconstruct Crooked River to reduce channel entrenchment and increase floodplain connectivity; re-grade the floodplain to remove tailings piles; and import suitable substrate. These actions would create the conditions necessary to support the establishment and succession of desired riparian plant communities, including woody vegetation that increases percent effective shade. Alder and spruce would grow rapidly, and can form dense stands that would provide shade within 10 years or less; however, a minimum of 20 years would be needed for conifer communities to grow to sufficient heights to provide shade (RDG et al. 2013a).

The proposed project would reduce the potential for establishment of reed canary grass on the new floodplain surface by constructing diverse topography and incorporating woody debris in these areas. This would create a mosaic of microsites to promote the establishment of woody vegetation. Reed canary grass productivity is reduced by shade, and dense woody vegetation establishment on the floodplain surface would create conditions less suitable for reed canary grass.

The expected post-project plant communities within the project area are shown in Figure 3-13, which displays the extent of streamside alders expected to replace reed canary grass that is currently occupying 40% of the streamside. A comparison of the extent in acres of existing and expected vegetation communities is presented in Table 3-13. Reed canary grass is expected to decrease by 13%, and alder is expected to have the greatest increase (32%). The expected post-project streamside average percent summer shade is 83% (RDG et al. 2012b), which would be an increase of 177% over existing streamside average percent summer shade of 30%. Data are not available to calculate expected post-project streamside minimum percent summer shade, but if an increase of 177% is assumed, the value would be 44%. These percent effective shade increases exceed the TMDL target of 24% for forested watersheds tributary to South Fork Clearwater River, and exceeding this target could result in Crooked River from the mouth to Relief Creek cooling to temperatures that do not exceed the water temperature criteria. If that occurs, the condition of attaining water temperature criteria for removal from the §305(b) list would be met, and Crooked River from the mouth to Relief Creek could be removed from the §305(b) list.

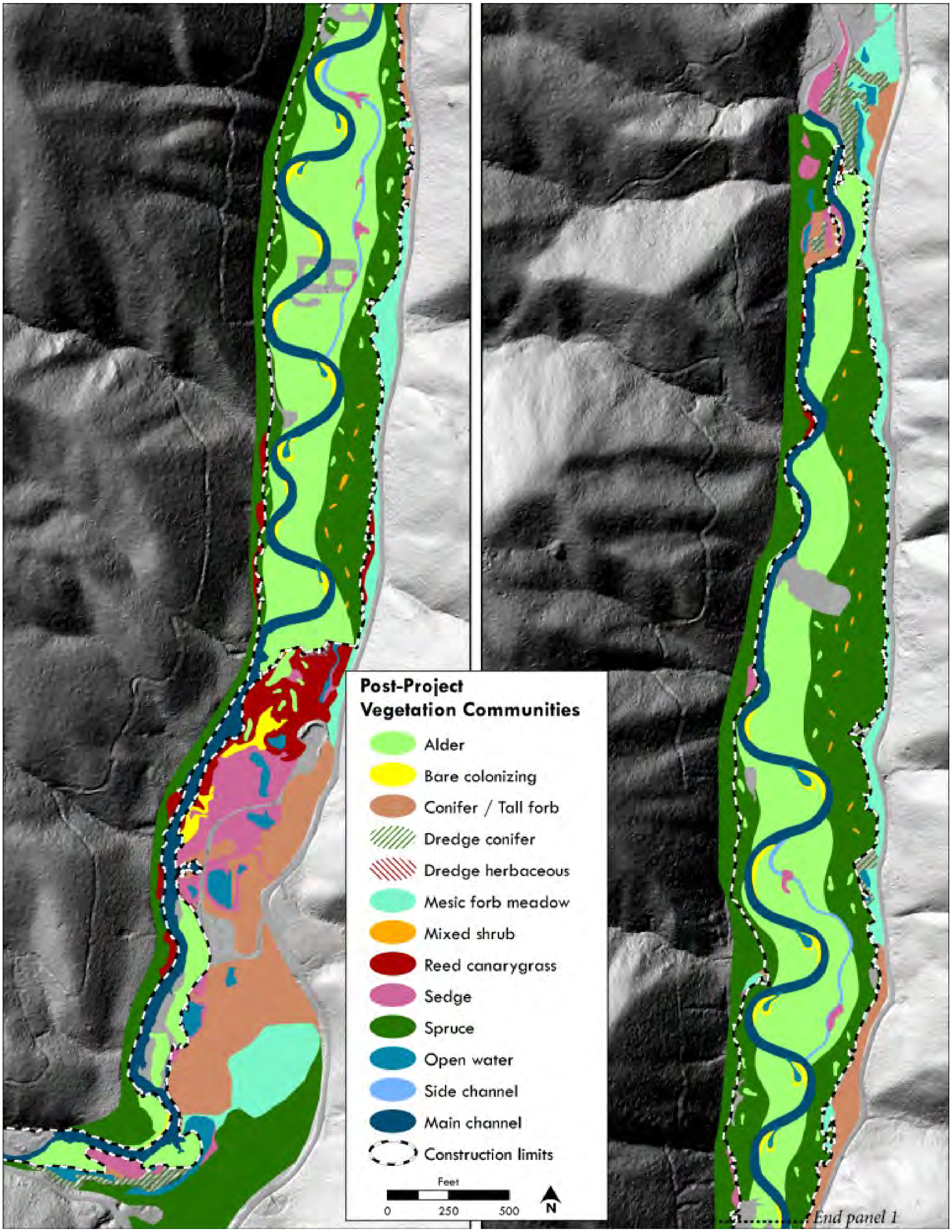


Figure 3-13. Crooked River expected post-project vegetation communities (RDG et al. 2013a).

Table 3-13. Comparison of vegetation communities (acres) and percent change, by alternative (RDG et al. 2013a).

Vegetation Community	Alternative 1	Alternative 2	Percentage Change
Alder	1.9	33.5	32.1
Bare colonizing	1.2	1.7	0.5
Cattail	0.3	0	-0.3
Conifer/Tall forb	11.9	10.3	-1.6
Dredge conifer	31.7	2.2	-29.5
Dredge herbaceous	5.1	0.2	-4.9
Mesic forb meadow	10.1	7.8	-2.3
Mixed shrub	0	0.3	0.3
Reed canary grass	17.6	4.6	-13
Sedge	8	6.4	-1.6
Spruce	19.3	44.8	25.5
Totals	**107.1**	**111.8**	

Alternative 1 – No Action

Under Alternative 1, the Nez Perce – Clearwater National Forests would maintain the current management of the Meanders, which would not result in further increases in water temperature pursuant to IDEQ Antidegradation Policy (IDEQ 2013; IDAPA 58.01.02, sec. 52), and does not include restoration. Current elevated water temperatures would persist, water temperature criteria would likely not be attained, and Crooked River from the mouth to Relief Creek would likely remain on the 305(b) list as water quality impaired for temperature. Hydraulic analysis estimates it would require at least a 500-year return period flood flow event to mobilize large cobble material (RDG et al. 2012), which is present in the tailing piles. An event of that magnitude has a 0.2% chance of occurring in any given year; thus, the time frame for natural recovery to erode the tailings pile and restore floodplain connectivity, which would create the conditions for streamside vegetation that would provide enough effective shade to decrease water temperatures, would occur on an estimated time scale of thousands of years.

Alternative 2 – Proposed Action

Under Alternative 2, there would likely be a short-term increase in water temperature with the removal of streamside vegetation along the reconstructed channel and the temporary bypass channel and associated decreases in effective shade. This short-term increase would continue while flow is diverted to the temporary bypass channel (approximately 3 to 6 years), and until desired riparian vegetation has grown to sufficient height to provide effective shade (approximately 10 and 20 years for alders and conifers, respectively). However, under Alternative 2, there would be a long-term beneficial effect (decrease) on water temperature. Water temperatures would decrease with the expected increase in effective shade of 177% with the establishment of desired riparian plant communities, including woody vegetation. This increase in effective shade would exceed the TMDL target of 24% increase in effective shade for forested tributaries of the South Fork Clearwater River. Exceeding the TMDL effective shade target could result in Crooked River from the mouth to Relief Creek attaining water temperature criteria. The time for this to occur would be a minimum of 20 years (the time needed for conifer communities to provide shade). Attaining the water temperature criteria would meet the condition for removal from the §305(b) list for temperature impairment. While 10 to 20 years are anticipated for the growth of riparian plant communities that would provide shade for cooler water temperatures, in the 75 years since the project area was disturbed, riparian growth has resulted in 30% average summer effective shade and 16% minimum summer effective summer shade, and without project implementation, natural recovery within 20 years would not occur.

Cumulative Effects: Water Temperature

Cumulative effects occur from the incremental effects of an action when added to other past, present, or reasonably foreseeable future actions.

The cumulative effects analysis area for water temperature includes the Crooked River watershed and the South Fork Clearwater River to its confluence with the Middle Fork Clearwater River near Kooskia, Idaho. A full description of past, present, and future foreseeable actions considered in this analysis is presented in Appendix C.

Past, Present, and Foreseeable Future Actions

Past dredge mining has had the most notable management-related effects on water temperature in Crooked River. Several different large bucket dredges operated in Crooked River between 1936 and 1958. The Mount Vernon dredge first operated in Crooked River in 1938, and except for a few interruptions, continued to work in the area until the late 1950s. In several of the years that it operated in Crooked River, the dredge ran 24 hours a day with shifts of up to 20 men. It consistently topped annual production in the Orogrande Mining District, and several times ranked number one in Idaho County. These intensive mining activities disturbed riparian conditions alongside Crooked River and left extensive tailings piles with coarse, well-drained substrates that are a poor growth medium, resulting in undesirable riparian vegetation with high solar radiation that has caused elevated water temperatures. Ongoing actions include recreation, road maintenance, fire suppression, fuels management, mining, watershed restoration, and weed treatments. The proposed Orogrande Community Protection project is a reasonably foreseeable future action within the Crooked River watershed, and would include prescribed burning, vegetation treatments, and temporary road construction.

Alternative 1 – No Action

Cumulative effects occur from the incremental effects of an action when added to other past, present, or reasonably foreseeable future actions. Since no direct or indirect effects would occur under Alternative 1, no cumulative effects would occur.

Alternative 2 – Proposed Action

Under Alternative 2, water temperatures in Crooked River would likely increase in the short term with the removal of existing riparian vegetation for the construction of the new channel and the temporary bypass channel, which could cause a cumulative effect of increased water temperatures in South Fork Clearwater River. This short-term temperature increase in South

Fork Clearwater River could dissipate in the downstream direction from its confluence with Crooked River with instream mixing and tributary inflows. Water temperatures are not expected to increase in the short- or long-term in Crooked River or South Fork Clearwater River from the implementation of the proposed Orogrande Community Protection project. Some vegetation treatments would occur in riparian habitat conservation areas along Crooked River, but not to the extent that they would prevent the attainment of Riparian Management Objectives that include adequate water temperatures for cold water biota, and no shading trees would be affected (USDA Forest Service 2013 draft). In the long term, water temperatures are expected to decrease in Crooked River as desired riparian vegetation grows and provides effective shade to the channel. As with temperature increases, decreased temperature effects could occur in South Fork Clearwater River beginning at its confluence with Crooked River. However, these effects could also be expected to dissipate in the downstream direction with instream mixing and tributary inflows.

Affected Environment – Channel Entrenchment Ratio

Information for the channel entrenchment ratio analysis was summarized from *Design Criteria Report: Crooked River Valley Rehabilitation Design* (RDG et al. 2012) and *Final Design Report: Crooked River Valley Rehabilitation Design* (RDG et al. 2013a).

Channel entrenchment ratio is a measure of how incised a river is, or the extent of vertical containment of a river relative to its adjacent floodplain. It is calculated as the ratio of flood-prone area width to bankfull width (flood-prone area width: bankfull width), and used as an indicator of floodplain connectivity. The desired condition for Crooked River is low channel entrenchment per Rosgen Stream Classification (Rosgen and Silvey 1996).

Geomorphology through the project area is altered, and existing channel entrenchment is moderate per Rosgen Stream Classification (Rosgen and Silvey 1996), with mean channel entrenchment ratios for the four river reaches within the project area ranging from 1.7 to 2.5, as presented in Table 3-14. The locations of the four river reaches are presented in Figure 3-14. Flow direction is from south to north (Reach 1 to Reach 4).

Channel entrenchment between tailings piles is containing Crooked River within its banks, and in most cases the 100-year flood flow event (Q_{100}) is contained in narrow overbank areas between the channel and the tailing piles. This is preventing channel-floodplain interaction, and floodplain connectivity is lacking. More than 50% of the valley bottom is elevated greater than 1.5 feet above the bankfull elevation (Table 3-15 and Figure 3-15), suggesting that a majority of the valley contains tailings piles and is not part of the functioning floodplain.

Hydraulic analysis estimates that at least a 500-year return period flood flow event would be required to mobilize large cobble material (RDG et al. 2012), which is present in the tailing piles. An event of that magnitude has a 0.2% chance of occurring in any given year; thus, the time frame for natural recovery to erode the tailings pile, reduce channel entrenchment, and restore floodplain connectivity is on the scale of thousands of years.

Table 3-14. Existing channel entrenchment ratios by river reach.

River Reach	Channel Entrenchment Ratio (Flood-prone area width: bankfull width)		
	Minimum	Maximum	Mean
Reach 1	2.2	2.8	2.5
Reach 2	1.8	3.2	2.5
Reach 3	1.6	1.8	1.7
Reach 4	1.8	2.9	2.4

Data source: RDG et al. (2012), Appendix A.

Table 3-15. Tabulation of areas on the existing valley bottom relative to surveyed bankfull indicators (RDG et al. 2012).

Valley Bottom Elevations Relative to Surveyed Bankfull Indicators	Percentage of Valley Bottom
Less than -6.0	0.0
-5.0 to -6.0	1.3
-4.0 to -5.0	2.2
-3.0 to -4.0	7.2
-2.0 to -3.0	6.9
-1.0 to -2.0	8.8
-0.5 to -1.0	2.5
-0.5 to 0.5	8.0
0.5 to 1.0	2.8
1.0 to 1.5	6.8
1.5 to 2.0	6.2
2.0 to 3.0	10.1
3.0 to 4.0	10.9
4.0 to 5.0	5.1
5.0 to 6.0	4.2
Greater than 6.0	17.0
Total	**100.0**

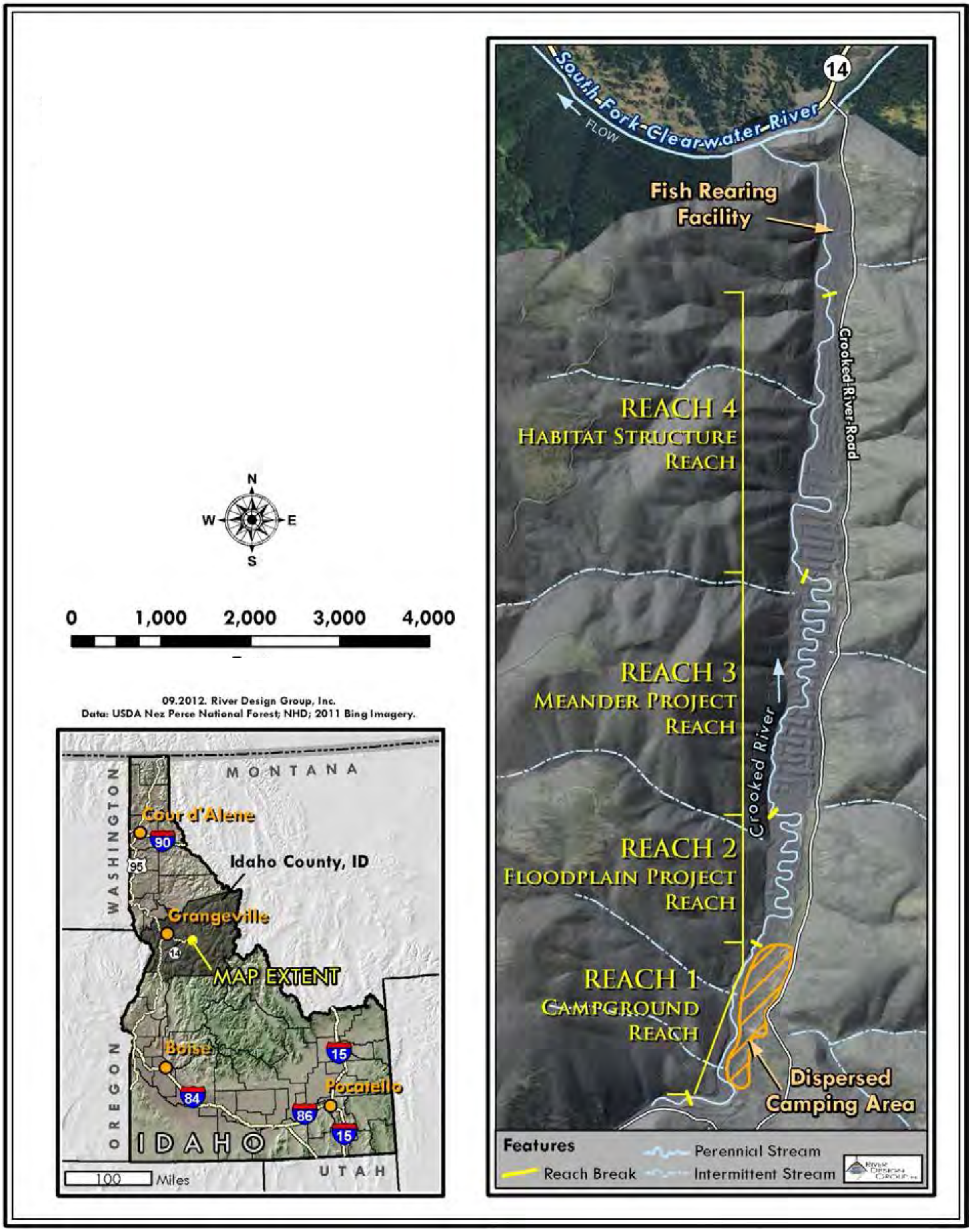


Figure 3-14. Reach delineations for Crooked River (RDG et al. 2012, page A-9).

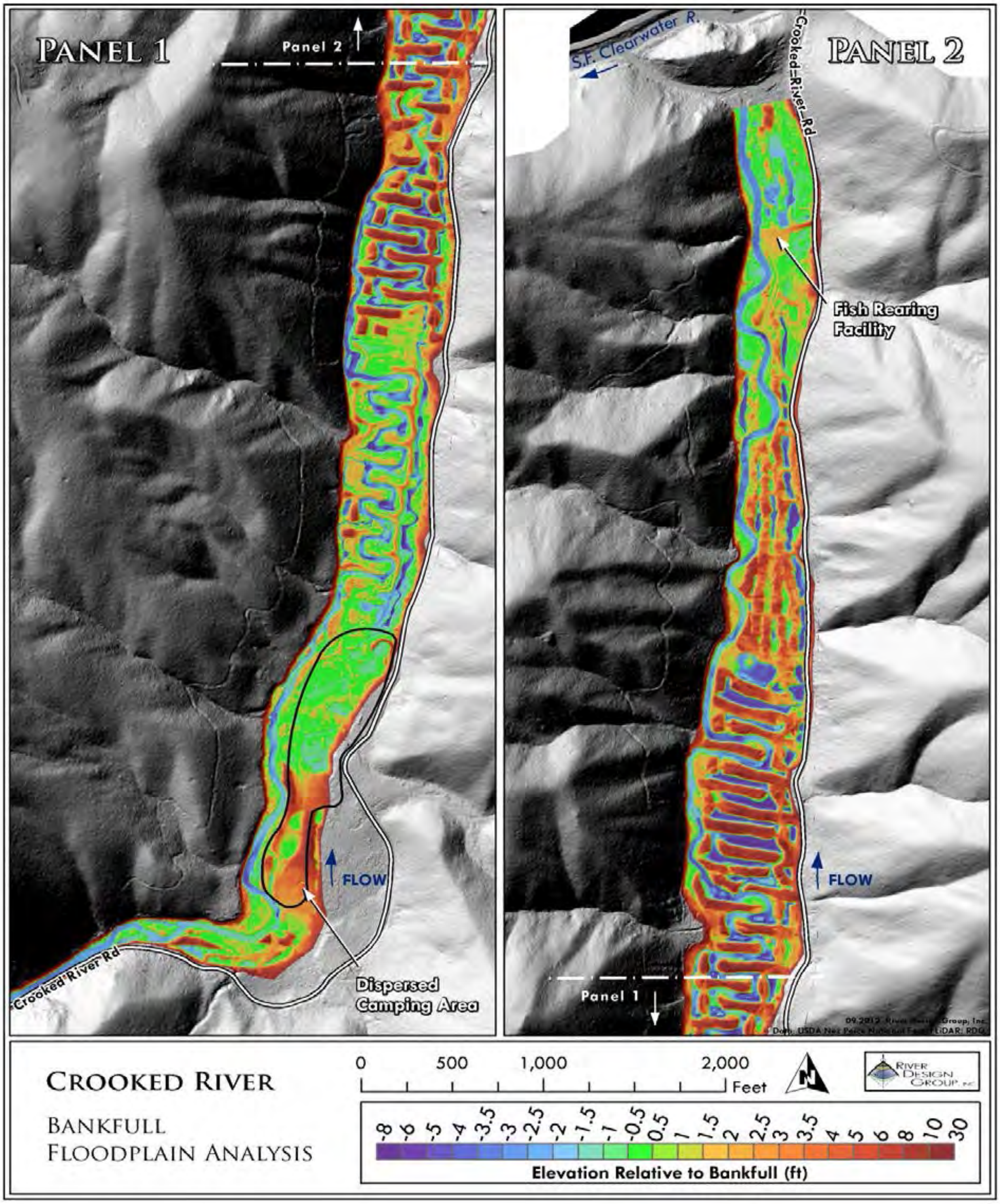


Figure 3-15. Crooked River Valley elevation relative to bankfull indicators (RDG et al. 2012).

Environmental Consequences – Channel Entrenchment Ratio

Direct and Indirect Effects

Alternative 1 – No Action

Under Alternative 1, the Nez Perce – Clearwater National Forests would maintain the current management of the project area, which does not include restoration. Moderate channel entrenchment would persist with entrenchment ratios ranging from 1.7 to 2.5, and floodplain connectivity would remain lacking. Natural recovery processes that could erode the tailings piles and re-grade the floodplain to an elevation that reduces channel entrenchment and restores floodplain connectivity would occur on an estimated time scale of thousands of years.

Alternative 2 – Proposed Action

Alternative 2 proposes to excavate the majority of the tailings piles, re-grade the floodplain, and size the new channel capacity for bankfull discharge to reduce channel entrenchment and restore floodplain connectivity. Estimated channel entrenchment ratios for the re-constructed channel were calculated using channel design criteria data (RDG et al. 2013a), and range from 10.0 to 12.5 (Table 3-16), indicating slight channel entrenchment and thus restored floodplain connectivity. A summary comparison of channel entrenchment ratios by alternative is presented in Table 3-17. The increase in channel entrenchment ratio from the existing 1.7–2.5 to 10.0–12.5 under Alternative 2 represents a change from moderate channel entrenchment to slight channel entrenchment per Rosgen Stream Classification (Rosgen and Silvey 1996), indicating that Crooked River would be reconnected with its floodplain and more natural and frequent flooding of the floodplain would occur.

Table 3-16. Expected channel entrenchment ratios for the reconstructed channel.

Bed Feature	Bankfull Discharge (cfs)	Bankfull Width (ft)	Max. Bankfull Depth (ft)	Flood-prone Area Width[1] (ft)	Alternative 2 Channel Entrenchment Ratio
Riffle	300	40 – 45	2.0 – 2.6	500	11.1 – 12.5
Run	300	45 – 50	2.6 – 3.5	500	10.0 – 11.1
Glide	300	45 – 50	1.8 – 2.4	500	10.0 – 11.1

Data source: RDG et al. (2013a), Table 3-3. Channel entrenchment ratios calculated by D. Traeumer.
[1] Flood-prone area width assumed to be maximum floodplain width (500 ft).

Table 3-17. Summary comparison of channel entrenchment ratios, by alternative.

	Alternative 1	Alternative 2
Channel Entrenchment Ratio	1.7 – 2.5	10.0 – 12.5
Description[1]	Moderate	Slight

[1] Channel entrenchment descriptions per Rosgen Stream Classification (Rosgen and Silvey 1996).

Affected Environment – Channel Width-to-Depth Ratio

Information for the channel width-to-depth analysis was summarized from *Design Criteria Report: Crooked River Valley Rehabilitation Design* (RDG et al. 2012) and *Final Design Report: Crooked River Valley Rehabilitation Design* (RDG et al. 2013a).

The existing channel width-to-depth ratios for the four river reaches of Crooked River within the project area (Figure 3-15) range from 17 to 31, as presented in Table 3-18. These width-to-depth ratios are moderate to high, indicating a wide, shallow channel shape per Rosgen Stream Classification (Rosgen and Silvey 1996).

Table 3-18. Existing channel width-to-depth ratios by river reach.

River Reach	Width-to-Depth Ratio		
	Minimum	Maximum	Mean
Reach 1	22.0	30.8	26.4
Reach 2	23.6	26.9	25.2
Reach 3	16.9	31.2	24.0
Reach 4	24.6	26.8	25.7

Data source: RDG et al. (2012), Appendix A.

Environmental Consequences – Channel Width-to-Depth Ratio

Direct and Indirect Effects

Alternative 1 – No Action

Under Alternative 1, the Nez Perce – Clearwater National Forests would maintain the current management of the project area, which does not include restoration. The existing moderate to high channel width-to-depth ratios (17 to 31) indicating a wide and shallow channel shape would persist, as would elevated water temperatures that exceed the temperature criteria. Wide and shallow channel shapes have slower water velocities and larger surface areas; therefore, they have greater exposure time and area to solar radiation if there is little shading of the stream, and water temperatures become elevated.

Alternative 2 – Proposed Action

Alternative 2 proposes to re-construct two miles of Crooked River with expected channel width-to-depth ratios ranging from 23 to 36, as presented in Table 3-19, which are moderate to high and indicate a wide, shallow channel shape. A comparison of channel width-to-depth ratios by alternative is presented in Table 3-20, which shows that there would be little effect on channel shape under Alternative 2 initially, and the channel shape would remain wide and shallow in the short term. In the long term, however, width-to-depth ratios are expected to decrease in response to increased complexity of the channel margins through the addition of woody debris structures, and increased complexity within the channel through the addition of large woody debris. This increased complexity would cause localized backwater and localized flow acceleration, which would result in deeper flow from backwater effects, and scour and the formation of deeper holes with deeper flow depth from flow acceleration effects. In addition to localized flow acceleration resulting from increased channel complexity, stream velocity would increase in Reaches 2 and 3 where channel slope would be increased, as discussed in the Channel Sinuosity sections. Increased stream velocity and expected post-project streamside average percent effective summer shade of 83 percent, as discussed in the Water Temperature sections, could result in decreased water temperatures.

Table 3-19. Expected channel width-to-depth ratios for the reconstructed channel.

Bed Feature	Bankfull Width (ft)	Mean Bankfull Depth (ft)	Alternative 2 Width-to-Depth Ratio
Riffle	40 – 45	1.4 – 1.6	25 – 32
Run	45 – 50	1.6 – 2.0	23 – 31
Glide	45 – 50	1.4 – 1.6	25 – 36

Data source: RDG et al. (2013a), Table 3-3. Width-to-depth ratios calculated by D. Traeumer.

Table 3-20. Summary comparison of channel width-to-depth ratios, by alternative.

	Alternative 1	Alternative 2
Channel Width-to-Depth Ratio	17 – 31	25 – 32
Description[1]	Moderate to High	Moderate to High

[1] Channel width-to-depth ratio descriptions per Rosgen Stream Classification (Rosgen and Silvey 1996).

Affected Environment – Channel Sinuosity

Information for the channel sinuosity analysis was summarized from *Design Criteria Report: Crooked River Valley Rehabilitation Design* (RDG et al. 2012) and *Final Design Report: Crooked River Valley Rehabilitation Design* (RDG et al. 2013a).

Geomorphology in the project area has been altered by the past mining, which has left tailings piles and resulted in a tortuous meander pattern (Figure 3-16, Appendix C). Channel sinuosity is 1.2 and 1.4 in the upper and lower reaches, respectively (Reaches 1 and 4, Figure 3-14), with higher channel sinuosity of 2.2 and 2.7 in the tortuous Meanders middle reaches (Reaches 2 and 3, Figure 3-14). The higher channel sinuosity in the tortuous Meanders reaches indicates lower channel gradients, which are approximately half the gradients of the upper and lower reaches (Table 3-21). Lower channel gradients result in slower water velocities, which reduce the river's sediment transport competence and capacity. Sediment transport competence is the maximum particle size that can be transported, and sediment transport capacity is the maximum amount of sediment that can be transported. Low competence in the tortuous Meanders reaches (Reaches 2 and 3) coupled with an abrupt decrease in channel gradient that exists between Reaches 1 and 2 have caused gravel entering the project area from upstream (south) to deposit in Reach 2, thus depriving downstream Reaches 3 and 4 of suitable spawning substrate, as presented in Table 3-21.

Figure 3-16. Crooked River's existing tortuous meander pattern.

Table 3-21. Existing channel gradient, channel sinuosity, and riffle substrate (percent).

	Channel Gradient (%)	Channel Sinuosity	Silt/Clay <0.062 mm	Sand 0.062–2 mm	Gravel 2–64 mm	Cobble 64–256 mm	Boulder 256–2048 mm
Reach 1	0.9	1.4	2.8	2.8	37.7	54.7	1.9
Reach 2	0.4	2.2	0	4.9	67.7	23.5	3.9
Reach 3	0.4	2.7	0	4.8	38.5	57.0	0
Reach 4	0.8	1.2	0	4.7	34.0	59.4	1.9

Compiled using data from Tables 5-1 and 5-11 of RDG et al. (2012).

Environmental Consequences – Channel Sinuosity

Direct and Indirect Effects

Alternative 1 – No Action

Under Alternative 1, the Nez Perce – Clearwater National Forests would maintain the current management of the project area, which does not include restoration. Geomorphology would remain altered, channel sinuosity ranging from 2.2 to 2.7, a tortuous meander pattern would persist, and channel gradients and velocities would remain low. The river's sediment transport competence would remain low, and downstream reaches would continue to be deprived of gravel needed for suitable spawning substrate.

Alternative 2 – Proposed Action

Alternative 2 would remove the majority of the tailing piles and reconstruct the channel and its floodplain to create more natural stream sinuosity and meet the design objective of restoring geomorphology in the project area. Existing channel sinuosity ranging from 2.2 to 2.7 representing the tortuous meander pattern would be decreased, and more natural channel sinuosity ranging from 1.2 to 1.6 would be created. This more natural channel sinuosity would provide higher channel gradients and corresponding higher velocities, which would increase the river's competence to transport gravel and provide suitable spawning substrate to the downstream reaches. A comparison of the existing and expected channel sinuosity and channel gradients by alternative is presented in Table 3-22.

Table 3-22. Comparison of channel sinuosity and channel gradients, by alternative.

River Reach	Alternative 1		Alternative 2	
	Channel Sinuosity[1]	Channel Gradient[1] (%)	Channel Sinuosity	Channel Gradient[2] (%)
Reach 1	1.4	0.9	1.4	0.9
Reach 2	2.2	0.4	1.6	0.6
Reach 3	2.7	0.4	1.4	0.7
Reach 4	1.2	0.8	1.2	0.8

Data sources: [1]RDG et al. (2012); [2]personal communication with RDG. Alternative 2 channel sinuosity by reach calculated by D. Traeumer.

Affected Environment – Sediment Transport/Bed Mobility

Information for the sediment transport/bed mobility analysis was summarized from *Design Criteria Report: Crooked River Valley Rehabilitation Design* (RDG et al. 2012), *Final Design Report: Crooked River Valley Rehabilitation Design* (RDG et al. 2013a), and *Hydraulic Modeling and Habitat Mapping for Existing Conditions* (RDG 2013b).

Natural processes influencing sediment supply in the Crooked River watershed include geology, soils, hillslope mass wasting, forest fires, and lateral migration/bank erosion. Granitic geology, relatively stable hillslopes, infrequent fires, and low bank erosion rates appear to be factors contributing to a low sediment supply. Sediment transport in the Crooked River is affected by valley gradient, stream type, and supply. An evaluation of valley gradients and stream types indicates that sediment transport capacity likely decreases downstream of the Narrows, creating the potential for sediment deposition near the upper boundary of Reach 2 (Figure 3-14). Similarly, past rehabilitation efforts to increase channel sinuosity by routing the river through large dredge ponds have reduced channel gradient and increased the potential for sediment storage, thus making the dredge ponds function as large sediment traps capable of depleting downstream reaches of sediment supply. Downstream, the reduced stream power through meandering channel segments combined with a lack of sediment supply have resulted in static bed conditions and subsequent armoring of the riverbed with the over-sized remains of coarse dredging deposits. These static conditions represent bed immobility.

As discussed in the Channel Sinuosity section, lower channel gradients have resulted in slower water velocities, which have reduced the river's sediment transport competence and capacity and caused gravel entering the project area from upstream to deposit in Reach 2, thus depriving downstream Reaches 3 and 4 (Figure 3-14) of suitable spawning substrate (see Table 3-21).

Environmental Consequences – Sediment Transport/Bed Mobility

Direct and Indirect Effects

Alternative 1 – No Action

Under Alternative 1, the Nez Perce – Clearwater National Forests would maintain the current management of the project area, which does not include restoration. Channel gradients and water velocities would remain low, the river's sediment transport competence would remain low, static conditions representing an immobile and armored riverbed would persist, and downstream reaches would continue to be deprived of gravel needed for suitable spawning substrate.

Alternative 2 – Proposed Action

Under Alternative 2, the channel would be reconstructed to support a mobile gravel bed, which would provide downstream reaches with appropriately sized spawning gravel and support the maintenance of clean interstitial spaces. This would be accomplished by increasing channel gradients in Reaches 2 and 3, as presented in Table 3-22, which would increase water velocities in the meandering reaches and increase sediment transport competence and capacity to provide suitable spawning gravels to downstream reaches. A comparison of channel gradients by alternative is presented in Table 3-22.

A summary comparison of areas for particle size mobility is presented in Table 3-23, which shows an increase in gravel mobility under Alternative 2 for both the bankfull discharge of 300 cfs with a recurrence interval of 1.1 years, and the Q_2 discharge of 597 cfs with a recurrence interval of 2 years. Figures 3-17 and 3-18 illustrate particle bed mobility for bankfull and Q_2 discharges, respectively, where the reconstruction of the floodplain and channel would result in smaller particles being distributed across more of the floodplain and larger particles suitable for spawning to move into Reaches 3 and 4 of Crooked River (see also Aquatic Resources section).

Table 3-23. Summary comparison of areas (acres) for particle size mobility, by alternative.

	Alternative 1		Alternative 2	
Particle Size	$Q_{bankfull}$[1]	Q_2[2]	$Q_{bankfull}$	Q_2
Silt (0.002–0.062 mm)	1.6	3.6	0.1	0.0
Sand (0.062–2.0 mm)	4.6	7.9	1.4	1.0
Gravel (2.0–64 mm)	13.7	17.4	14.6	44.8
Cobble (64–256 mm)	2.8	4.3	3.2	6.5
Boulder (>256 mm)	0.1	0.1	0.0	0.0

[1] $Q_{bankfull}$ = bankfull discharge of 300 cfs with 1.1-year recurrence interval.

[2] Q_2 = discharge of 597 cfs with 2-year recurrence interval. Data source: RDG (2013b).

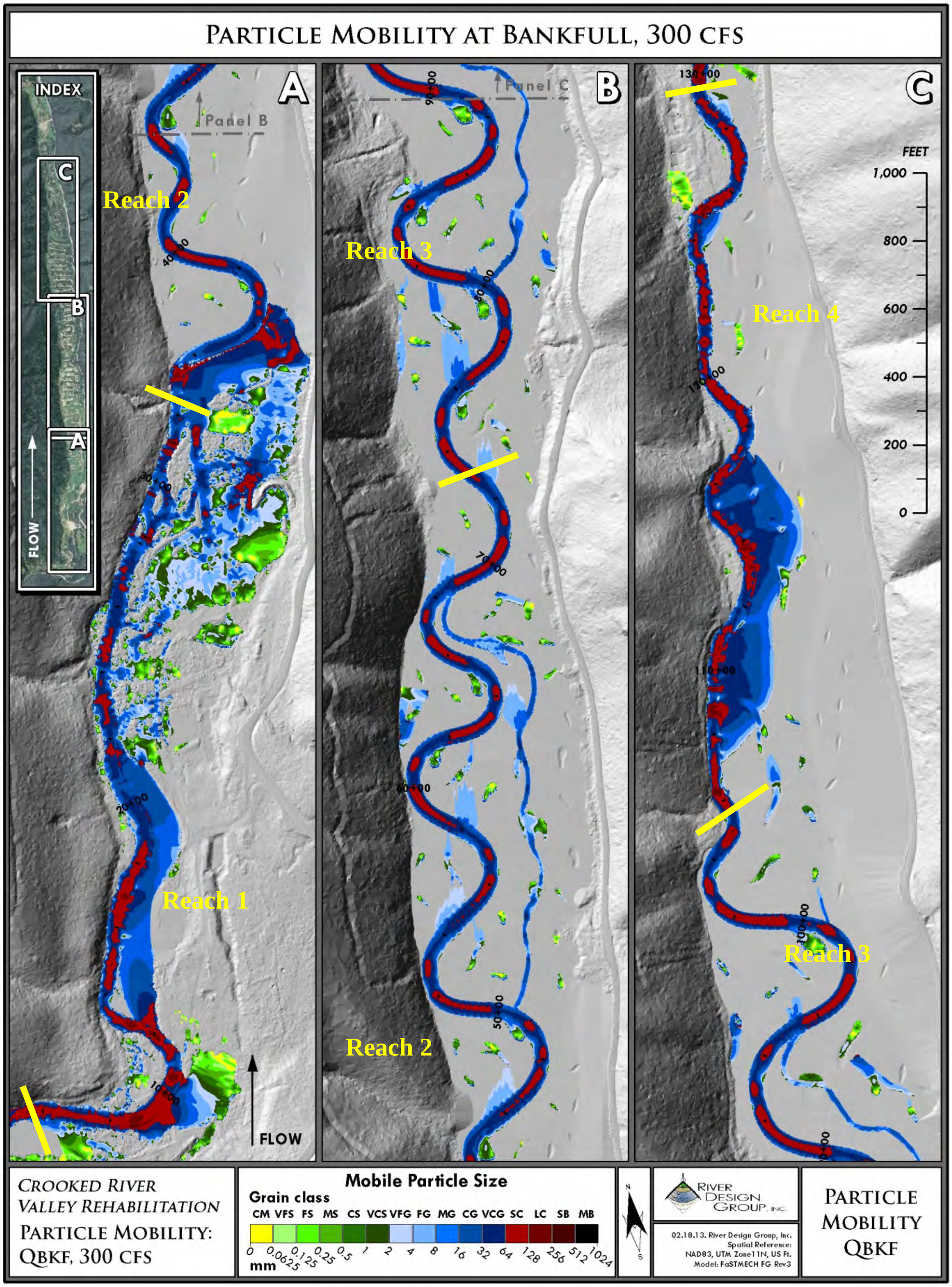


Figure 3-17. Alternative 2, particle mobility at bankfull, 300 cfs (RDG et al. 2013a).

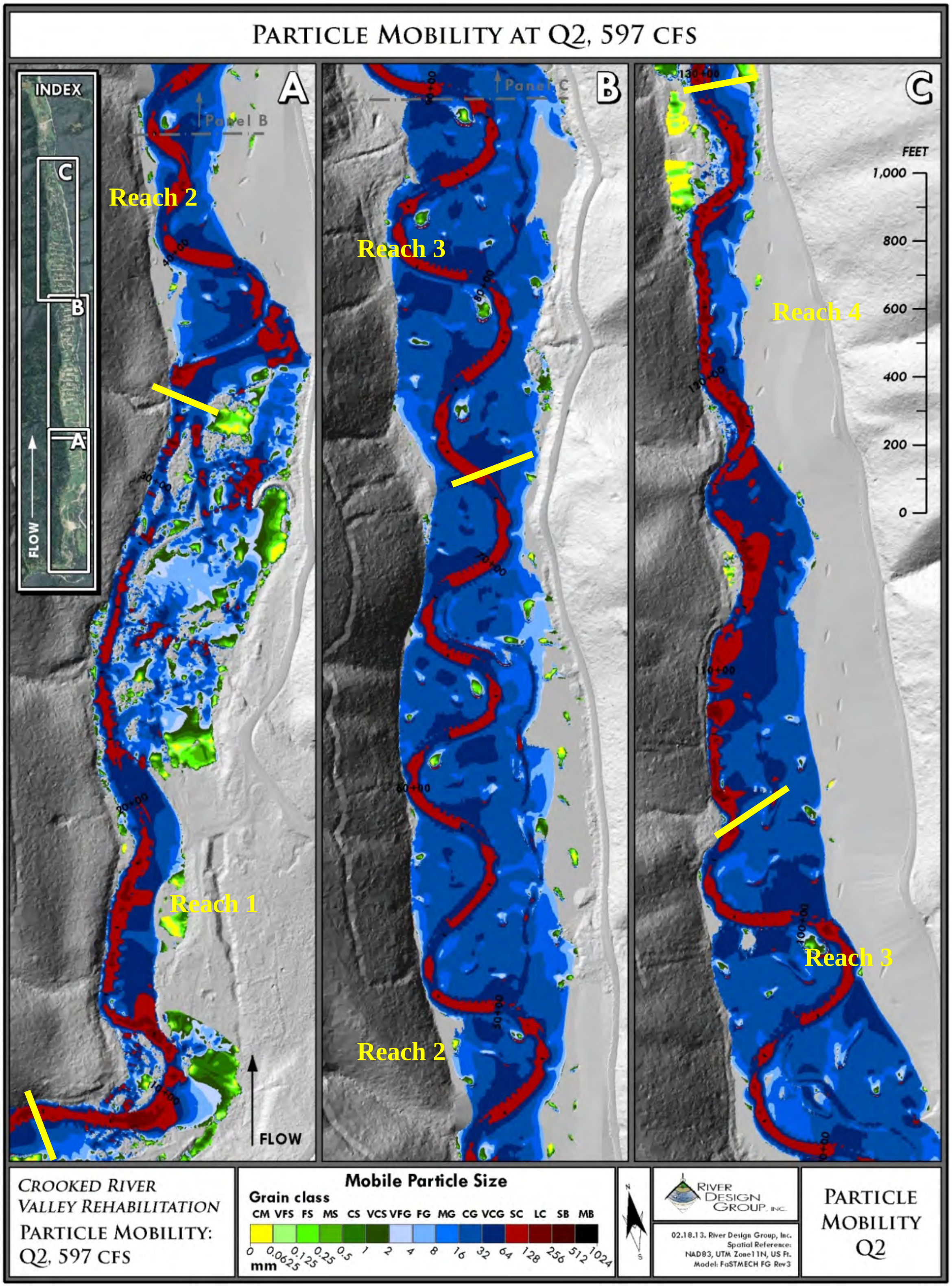


Figure 3-18. Alternative 2, particle mobility at Q_2, 597 cfs (RDG et al. 2013a).

Cumulative Effects – Geomorphology

Cumulative effects occur from the incremental effects of an action when added to other past, present, or reasonably foreseeable future actions.

The cumulative effects analysis area for the geomorphic indicators channel width-to-depth ratio, channel sinuosity, and channel entrenchment ratio is the project area. The cumulative effects analysis area for the geomorphic indicator sediment transport/bed mobility is the project area and the South Fork Clearwater River to its confluence with the Middle Fork Clearwater River near Kooskia, ID. A full description of past, present, and future foreseeable actions is in Appendix C.

Past, Present, and Foreseeable Future Actions

Past dredge mining has had the most notable management-related effects on geomorphology in the project area. There are no present or foreseeable future actions within the project area that would affect channel sinuosity, channel entrenchment ratios, or channel width-to-depth ratios.

Alternative 1 – No Action

Since no direct or indirect effects would occur under Alternative 1, no cumulative effects would occur.

Alternative 2 – Proposed Action

Alternative 2 would have direct effects on channel sinuosity, channel entrenchment ratios, and channel width-to-depth ratios. Since no other actions would affect these indicators, there would no cumulative effects.

Affected Environment – Wetlands

Information for the wetlands analysis was summarized from *Design Criteria Report: Crooked River Valley Rehabilitation Design* (RDG et al. 2012), *Final Design Report: Crooked River Valley Rehabilitation Design* (RDG et al. 2013a), and *Crooked River Rehabilitation Project Wetland Delineation Report* (Geum Environmental Consulting 2012).

Within the 115-acre project area, 52.5 acres of wetlands have been delineated. Wetland classes delineated include palustrine aquatic bed, palustrine emergent, palustrine scrub shrub, palustrine forested, and riverine as presented in Table 3-24 and Figures 3-19, 3-20, and 3-21. Each of the wetlands types provide various wetland functions, including: aquatic and terrestrial habitat, debris recruitment, surface and groundwater storage, sediment and nutrient filtering, streambank stabilization, thermal cover, and terrestrial habitat.

Palustrine aquatic bed wetlands account for 9.7 acres (18.5%) of the existing wetland area in the project area, and include dredge ponds and low-gradient side channel features flowing along the edges of the valley. Aquatic bed wetlands in the project area provide surface and groundwater storage that maintain streamflows, and provide habitat for aquatic and terrestrial species. The function of aquatic bed wetlands is limited through lack of connectivity with the mainstem Crooked River.

Table 3-24. Existing wetland classes, functions, and areas (Geum Environmental Consulting 2012).

Wetland Class	Wetland Function	Area (acres)	Percent of Project Area
Palustrine Aquatic Bed	SG, ATH	9.7	18.5
Palustrine Emergent	SG, ATH, SN, SS	28.1	53.5
Palustrine Scrub Shrub	TC, DR, SS, ATH	1.7	3.2
Palustrine Forested	TH	0.5	1.0
Riverine	ATH	12.5	23.8
Total		**52.5[1]**	**100.0**

[1] Geum Environmental Consulting (2012) lists this total as 52.6.
ATH = aquatic and terrestrial habitat; DR = debris recruitment; SG = surface and groundwater storage;
SN = sediment and nutrient filtering; SS = streambank stabilization; TC = thermal cover; TH = terrestrial habitat

Palustrine emergent wetlands are the most abundant wetland class in the project area, and account for 28.1 acres (53.5%) of the existing wetland area. Emergent wetlands, defined by the dominance of erect rooted herbaceous (not woody) wetland plants, occur throughout the floodplain including on streambanks of Crooked River, alongside channels, around dredge ponds, at the toe of valley slopes, and on floodplain surfaces. Sedges and reed canary grass are the dominant emergent wetland species on streambanks and connected floodplain features. As discussed in the water temperature analysis, reed canary grass occupies 40% of the streamside and provides average and minimum summer percent effective shade of 18 and 6%, respectively, thereby providing little thermal cover.

Emergent wetlands are supported by a number of hydrologic regimes, including: temporarily flooded, seasonally flooded, and semi-permanently flooded. Emergent wetlands provide surface and groundwater storage that maintain streamflows, and provide habitat for aquatic and terrestrial species. Where connected to Crooked River, these wetlands provide sediment and nutrient filtering and streambank stabilization functions. The function of emergent wetlands is limited due to lack of connectivity with Crooked River.

Palustrine scrub shrub wetlands account for 1.7 acres (3.2%) of the existing wetland area in the project area, and are located in a few scattered locations on the floodplain that supports this wetland class. Scrub shrub wetlands are located mostly along the main Crooked River channel and support a range of floodplain and aquatic habitat functions, including thermal cover, debris recruitment, and streambank stability. These wetlands provide habitat for aquatic and terrestrial species. Function of these wetlands is limited due to the lack of floodplain connectivity and the small area occupied by this wetland type.

Two palustrine forested wetlands accounting for 0.5 acres (1.0%) of existing wetland area were delineated in the project area. Both wetlands are associated with seep features on slopes on the east side of valley that drain into the floodplain. In the project area, forested wetlands are rare and associated with seeps along valley slopes. These wetlands provide habitat for terrestrial species, including terrestrial insect input as a food source and leaf drop as a nutrient source for other wetlands and aquatic habitat. Function of these wetlands is limited due to the small area occupied by this wetland type.

Riverine wetlands accounting for 12.5 acres (23.8%) of existing wetland area were delineated in the project area. These wetlands provide habitat for fish and other aquatic species, convey water and sediment, and provide an influx of nutrients and organic matter to adjacent wetland features, which supports nutrient cycling.

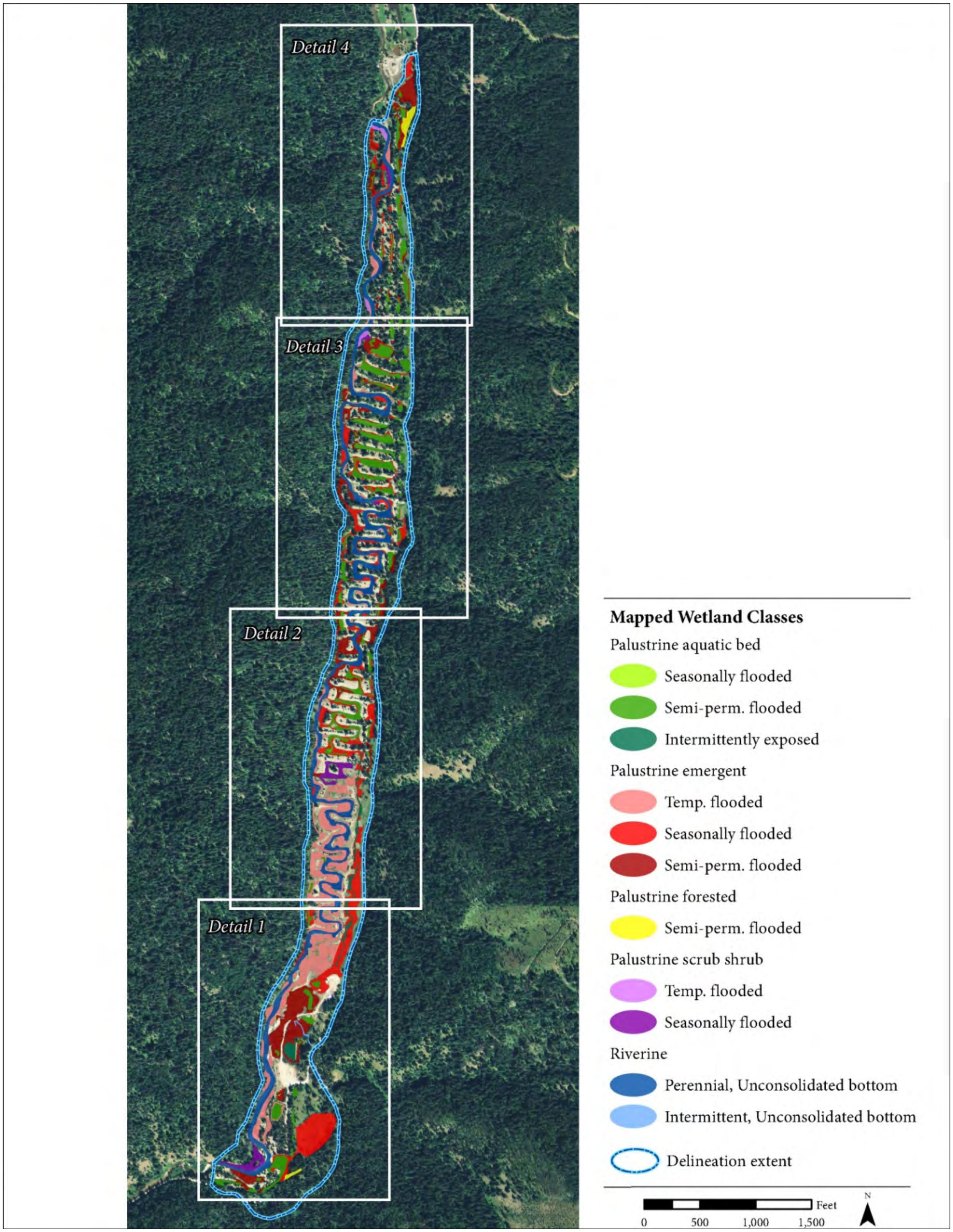


Figure 3-19. Overview of wetlands delineated in the project area (Geum Environmental Consulting 2012).

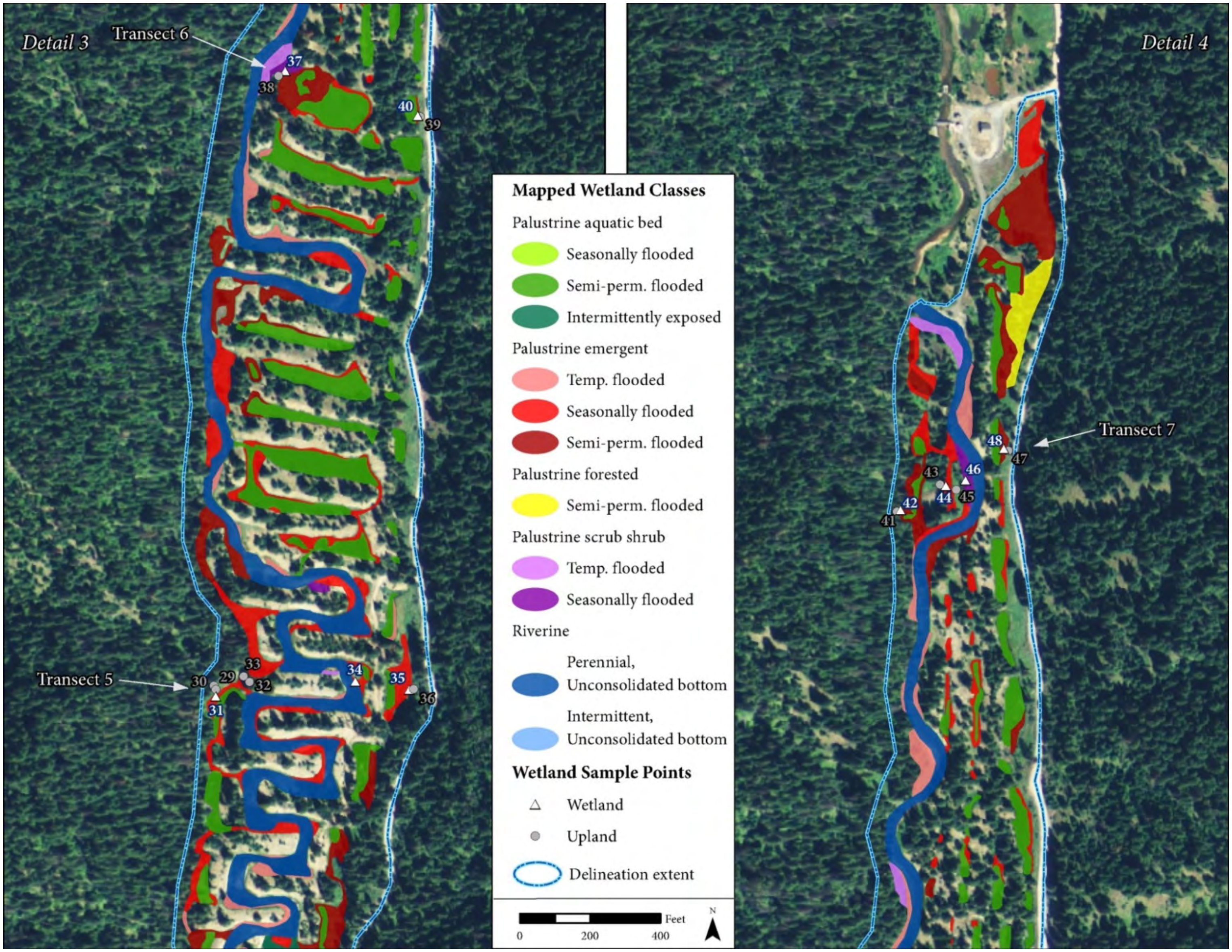


Figure 3-20. Wetlands delineated in upstream (southern) portion of the project area (Geum Env. Consulting 2012).

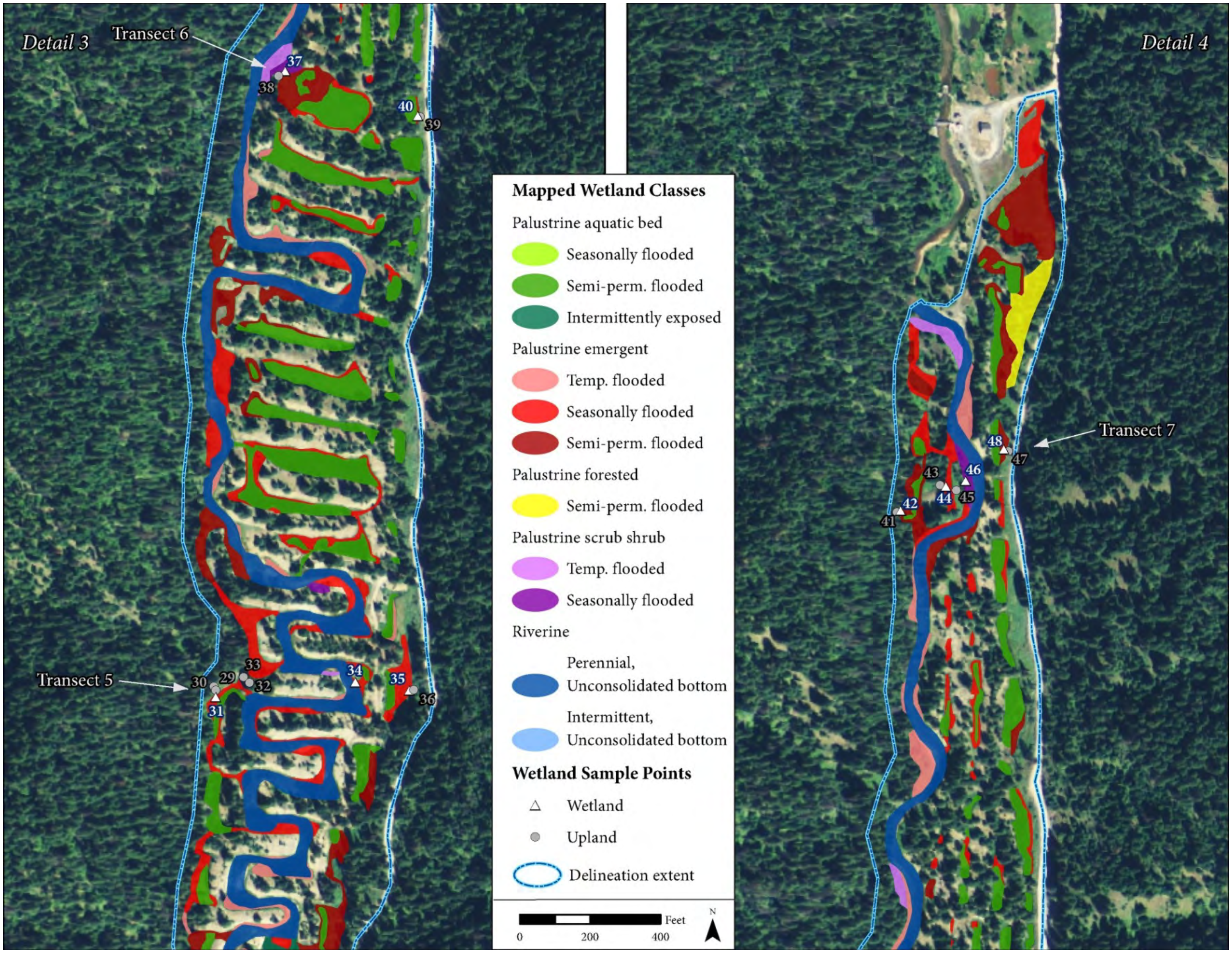


Figure 3-21. Wetlands delineated in downstream (northern) portion of the project area (Geum Env. Consulting 2012).

Environmental Consequences – Wetlands

Direct and Indirect Effects

Alternative 1 – No Action

Under Alternative 1, the Nez Perce – Clearwater National Forests would maintain the current management of the project area, which does not include restoration. Emergent wetlands that do not provide thermal cover and currently account for the majority (53.5%) of the existing 52.5-acre delineated wetland area would likely persist at these high levels. Desired scrub shrub wetlands that provide thermal cover and currently account for only 3.2% of the wetland area would likely persist at these low levels. Existing wetlands by area, function, and class are presented in Table 3-24.

Alternative 2 – Proposed Action

Under Alternative 2, a mosaic of vegetation communities would be created that would provide more ecological functions than currently exist. This would be accomplished by restoring channel-floodplain interaction through decreased channel entrenchment in the reconstructed channel, whereby the floodplain would be inundated more frequently at flows greater than the 1.1-year recurrence interval, and through the construction of side channels that would connect to the main channel at elevations above baseflow and below bankfull stage and would convey less than 10 percent of the total flow.

Two types of wetland features would be constructed: slope wetlands and side channel wetlands. Slope wetlands are lateral seeps entering the valley bottom from side drainages. Side channel wetlands are wide, shallow depressions connected to side channel features. Side channel wetlands would create areas of low velocity along the side channels to promote natural recruitment of vegetation and organic matter and retain late-season moisture in the floodplain.

Existing aquatic bed and emergent wetlands would be converted to shrub and forest-dominated vegetation communities that would provide aquatic and terrestrial habitat and increase streamside shading. Alternative 2 is expected to impact 30.6 acres of the existing 52.5 acres of wetland during construction (Figure 3-22), and create 42 acres of wetlands (Figure 3-23). Following implementation, the expected wetland area would be 64.1 acres, which would be a total net gain of 11.6 acres of wetlands in the long term.

A comparison of the areas of existing and expected wetland classes by alternative is presented in Table 3-25. Existing wetlands outside construction limits would be preserved in their present condition. Table 3-26 shows the existing wetland area, estimated project-related wetland impact area, estimated area of wetland creation resulting from the project, and the total estimated area of wetland post-project.

Alternative 2 would comply with Executive Order 11990 (Protection of Wetlands) as: (1) potential effects to wetlands in the project area have been evaluated; (2) design and mitigation measures have been developed to avoid adversely impacting wetlands wherever possible or to minimize wetlands destruction and preserve the values of wetlands; and (3) Alternative 2 would enhance the natural and beneficial value of wetlands.

Table 3-25. Comparison of wetland classes and areas (acres), by alternative (RDG et al. 2013a).

Wetland Class	Wetland Function	Alternative 1	Alternative 2
Palustrine Aquatic Bed	SG, ATH	9.7	1.8
Palustrine Emergent	SG, ATH, SN, SS	28.1	13.9
Palustrine Scrub Shrub	TC, DR, SS, ATH	1.7	34.3
Palustrine Forested	TH	0.5	0.5
Riverine	AH	12.5	13.6
Total		**52.5**	**64.1**

ATH = aquatic and terrestrial habitat; DR = debris recruitment; SG = surface and groundwater storage; SN = sediment and nutrient filtering; SS = streambank stabilization; TC = thermal cover; TH = terrestrial habitat

Table 3-26. Acres of USACE jurisdictional wetlands/waters of the U.S. permanently impacted and/or created (RDG et al. 2013a).

Wetland Class[1]	Existing Wetlands[2]	Existing Wetlands Impacted	Wetland Area Created	Total Wetland Area Post-project[3]
Palustrine Aquatic Bed	9.7	7.9	0.0	1.8
Palustrine Emergent	28.1	14.3	0.3	13.9
Palustrine Scrub Shrub	1.7	0.3	32.6	34.3
Palustrine Forested	0.5	0.0	0.0	0.5
Riverine	12.5	8.1	9.1	13.6
Total	**52.5**	**30.6**	**42.0**	**64.1**

[1] Cowardin et al. (1979).
[2] Existing wetlands are described in the *Crooked River Valley Rehabilitation Project Wetland Delineation Report* (Geum 2012).
[3] This estimate includes existing wetlands that would not be impacted by project actions combined with wetlands expected to be created by the project.

Wetlands are expected to increase in both area and diversity in the project area as a result of the project, and associated wetland and floodplain functions are also expected to increase. The project design would create a diverse floodplain surface that is hydrologically connected with the Crooked River channel. The floodplain would include a variety of geomorphic surfaces, including a defined main channel, point bars, bankfull floodplain, side channels, and large and small depression features. Frequent disturbance from floods, combined with groundwater and hyporheic exchange, would result in a heterogeneous mosaic of habitats across the floodplain, each capable of supporting a variety of plant species. These enhanced hydrogeomorphic conditions would cause many of these diverse, newly created habitats to develop into ephemeral, seasonal, or persistent wetland types.

The time needed for wetlands to develop in the floodplain depends on a number of factors. Some wetland types, such as riverine wetlands, would be present immediately after project implementation. Other wetlands, such as shrub and forested wetlands, would not be present until woody vegetation has a chance to colonize and establish these areas. The diversity of features incorporated into the design floodplain would provide both sources and storage of organic matter, which would promote soil development over time. Deposited and accumulated sediment within the hydrologically diverse floodplain would influence the development and maintenance of wetland and riparian vegetation communities. Hydrologic conditions would dictate what vegetation communities would ultimately develop and thrive in the floodplain and what type of soils would develop over time.

Table 3-27 presents design vegetation communities with the expected wetland classes that are likely to develop over time. Most of the rehabilitated floodplain is designed to support riparian shrub and forest plant communities. The rehabilitated floodplain includes approximately 32.6 acres of alder vegetation community type, which is expected to develop into a palustrine scrub shrub wetland over time (Figure 3-24). Other design features that are expected to develop into wetland over time include bare colonizing surfaces, water features such as the main channel, alcoves and side channels, and sedge vegetation communities. Palustrine forested wetlands may develop in portions of the conifer/tall forb, mixed shrub, and spruce design vegetation community types when they are located in areas with wetland hydrology (i.e., slope wetlands) but these are not included in the estimated total expected wetland area because it is unclear how the hydrology would develop in these areas.

Alternative 2 would create a connected, topographically heterogeneous floodplain with a mosaic of vegetation communities, where the rehabilitated Crooked River floodplain would be able to provide more ecological functions compared to the existing conditions. Conversion of existing aquatic bed and emergent wetlands that are disconnected from the main channel by extensive tailings piles to shrub and forest-dominated vegetation communities connected with the river would support sediment and water retention, provide habitat for aquatic and terrestrial species, increase allochthonous inputs of carbon and other nutrients, as well as increase shading of the channel to help maintain water temperatures.

Table 3-27. Expected vegetation communities and associated wetland class potential (RDG et al. 2013a).

Design Vegetation Community or Water Feature	Alternative 2 Expected Wetland Class[1]	Alternative 2 Expected Wetland Area (acres)
Alder	Palustrine Scrub Shrub	32.6
Bare colonizing	Riverine Unconsolidated Shore	1.1
Conifer/Tall forb	–	(see footnote 2)
Main channel	Riverine Unconsolidated Bed	6.7
Mixed shrub	–	(see footnote 2)
Alcove	Riverine Unconsolidated Shore	0.4
Sedge	Palustrine Emergent	0.3
Side channel	Riverine Unconsolidated Bed	0.9
Spruce	–	(see footnote 2)
Total		**42**

[1]Cowardin et al. (1979).
[2]These design vegetation communities are not included in the total expected wetland development area, but portions of these areas may develop wetland characteristics over time.

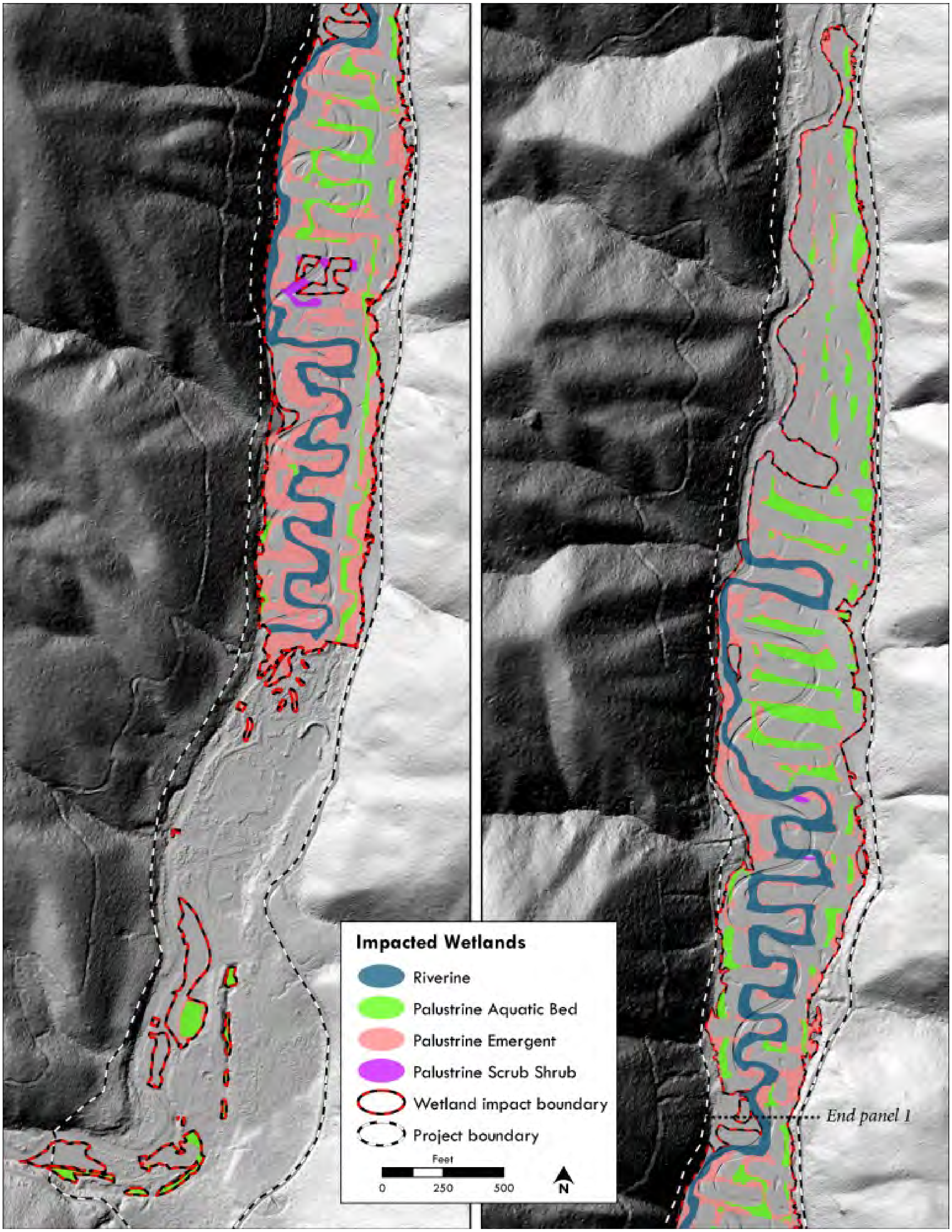


Figure 3-22. Wetlands expected to be impacted during construction. Existing wetlands in the project area that would not be impacted are not shown. (RDG et al. 2013a)

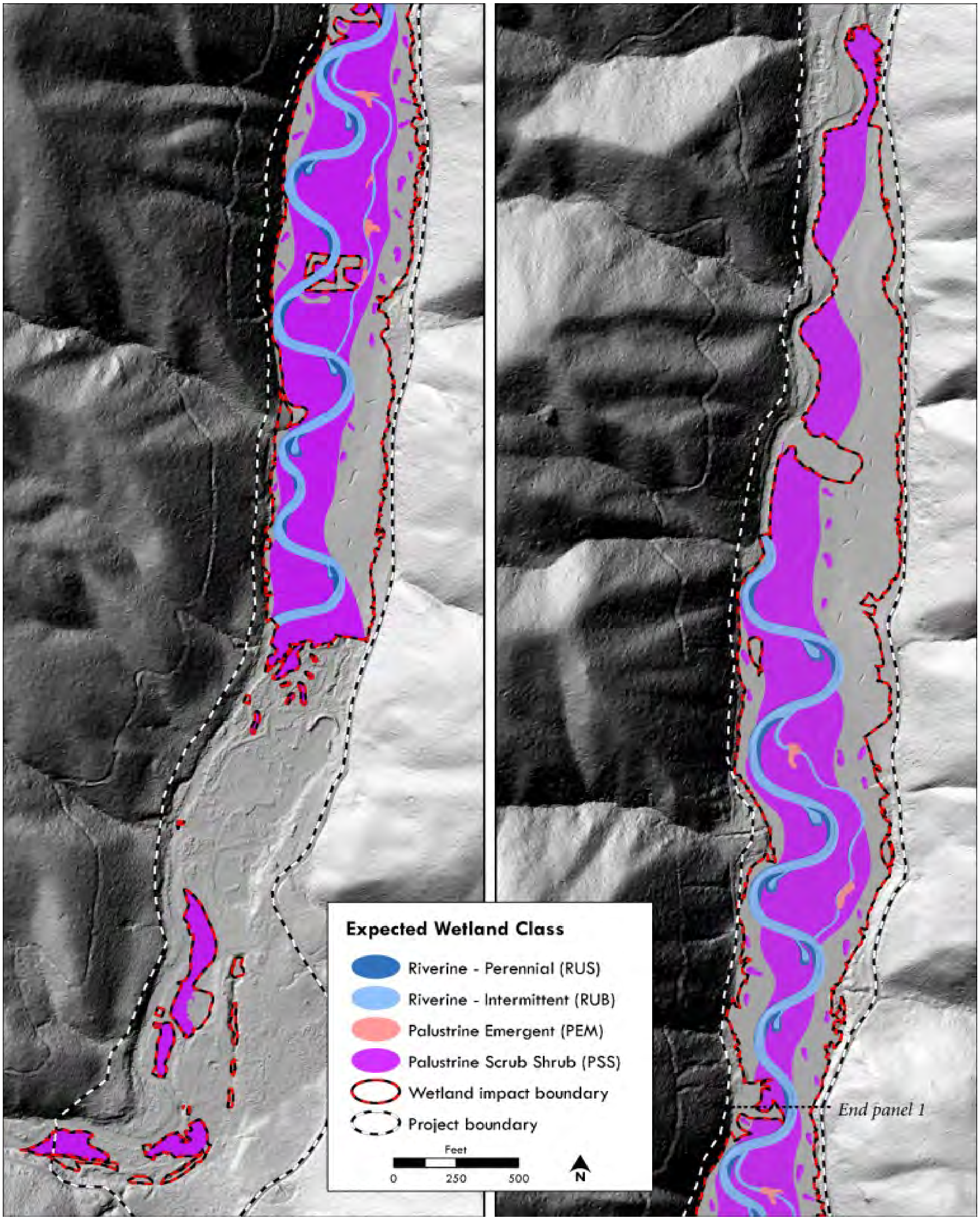


Figure 3-23. Overview of wetland classes expected to develop. Existing wetlands in the project area that are located outside of construction limits are not shown. (RDG et al. 2013a)

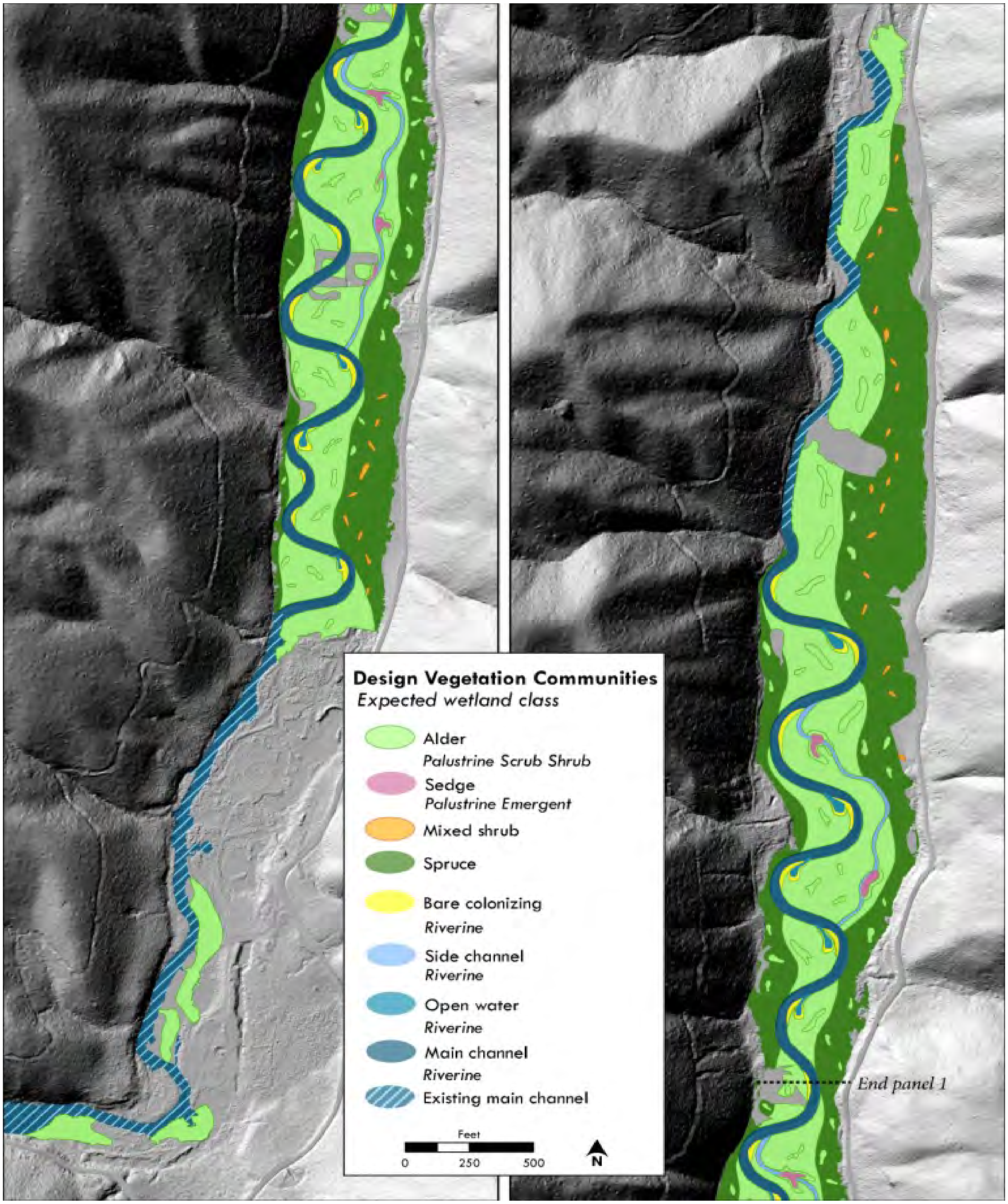


Figure 3-24. Alternative 2 – Overview of desired vegetation communities.[1]

[1] Desired vegetation communities incorporated into the rehabilitation design indicating those communities where hydrologic conditions are expected to support wetland development over time. This figure does not show existing wetlands in the project area that are located outside of construction limits. (RDG et al. 2013a)

Affected Environment – Floodplains

Information for the floodplains analysis was summarized from *Design Criteria Report: Crooked River Valley Rehabilitation Design* (RDG et al. 2012) and *Final Design Report: Crooked River Valley Rehabilitation Design* (RDG et al. 2013a).

As discussed in the channel entrenchment analysis, tailings piles are extensive on the valley floor, Crooked River is confined within its banks as a result, and more than 50 percent of the valley bottom is not part of the floodplain (Table 3-15 and Figure 3-15). As discussed in the water temperature analysis, this lack of floodplain connectivity limits the interaction between the stream channel and the floodplain, which inhibits the processes that support desired riparian vegetation communities. Within the 115-acre project area, there are approximately 22.7 acres of floodplain, of which 15.6 acres are bankfull floodplain and 7.1 acres are upland floodplain.

Environmental Consequences – Floodplains

Direct and Indirect Effects

Alternative 1 – No Action

Under Alternative 1, the Nez Perce – Clearwater National Forests would maintain the current management of the project area, which does not include restoration. The majority of the project area would remain outside of the floodplain, the lack of floodplain connectivity would persist, and conditions to support desired vegetation communities and desired aquatic habitat would not be created. The area of existing floodplain, by alternative, is presented in Table 3-28.

Alternative 2 – Proposed Action

Under Alternative 2, the floodplain and channel profile would be gradually raised 2.8 feet beginning near the upstream boundary of Reach 2 (Figure 3-10) and then gradually lowered to transition back to the existing channel and bankfull indicators near the downstream boundary of Reach 4 (Figure 3-10). Interaction between the stream channel and floodplain would be restored with floodplain inundation occurring more frequently at flows greater than the 1.1-year recurrence interval, and sustainable floodplain morphology would be established that is capable of supporting aquatic habitat and desired vegetation communities, which would provide more ecological functions than currently exist. Under Alternative 2, approximately 22.7 acres of floodplain would be impacted during construction, and 56.3 acres of new floodplain would be created. Of the new floodplain created, 43.1 acres would be bankfull floodplain, and 13.2 acres would be upland floodplain. Following implementation, the floodplain area would be 56.3 acres, for a total net gain of 33.6 acres of floodplain. A comparison of the area of existing and proposed floodplain types, by alternative, is presented in Table 3-28. Table 3-29 shows the existing floodplain acres, project-related floodplain impact acres, and the post-project acres of new floodplain created.

Table 3-28. Comparison of floodplain type and area (acres), by alternative.

	Alternative 1	Alternative 2
Bankfull Floodplain	**15.6**	**43.1**
Upland Floodplain	**7.1**	**13.2**
Total	**22.7**	**56.3**

Data sources: RDG et al. (2012); RDG et al. (2013a).

Table 3-29. Existing floodplain area, existing floodplain area to be impacted, and total post-project floodplain area.

Floodplain Type	Alternative 1 Existing[1]	Alternative 2 Existing Floodplain Impacted	Alternative 2 Total Post-project Floodplain Area
Bankfull Floodplain	15.6	15.6	43.1
Upland Floodplain	7.1	7.1	13.2
Total	**22.7**	**22.7**	**56.3**

[1] Data source: RDG et al. (2012), Table 5-8. Areas calculated by D. Traeumer.

The new floodplain would be characterized by complexity and diversity, and consist of surface elevations that correspond to a range of desired floodplain vegetation communities and desired geomorphic features. These include wetlands, side channels, and oxbow or pond features of varying depth that would create an abiotic template to support complex and highly functioning plant communities. The result would be a wide range of ecological niches within a diverse mosaic of plant communities for both short and long term. Further diversifying the floodplain through placement of varying textures and thicknesses of substrate, and integrating woody debris in patterns mimicking natural recruitment, would create the physical components necessary for river processes to initiate development of a highly functioning floodplain environment. The width of the bankfull floodplain would vary from 100 to 400 feet with the valley width, with an average width of 300 feet. The bankfull floodplain would correspond to the elevation from the top of the new channel banks to 1.5 feet higher, and would be inundated frequently at flows with recurrence intervals greater than the 1.1-year flood flow event. The upland floodplain would be constructed as a transition area between the bankfull floodplain and existing ground, and the elevation would correspond to 1.5 to 2.0 feet above the top of the new channel banks. The upland floodplain width would vary from 0 to 200 feet based on the balance of earthwork. The height of the upland floodplain would be set at an elevation corresponding to slightly drier vegetation community types. The upland floodplain would be inundated infrequently at flows with recurrence intervals greater than the 25-year flood flow event (or, on average, inundated every 25 years).

Alternative 2 would comply with Executive Order 11988 (Floodplain Management) as: (1) potential effects to floodplains in the project area have been evaluated; (2) design and mitigation measures have been developed to reduce short-term impacts to floodplains; and (3) Alternative 2 would restore the function of the floodplain.

Cumulative Effects – Wetlands and Floodplains

Cumulative effects occur from the incremental effects of an action when added to other past, present, or reasonably foreseeable future actions. The cumulative effects analysis area for wetlands and floodplains is the project area.

Past, Present, and Foreseeable Future Actions

Past dredge mining has had the most direct notable management-related effects on wetlands and floodplains in the project area. A full description of past, present, and future foreseeable actions considered in this analysis is presented in Appendix C.

There are no present or foreseeable future actions within the project area that would affect floodplains or wetlands.

Alternative 1 – No Action

Past dredge mining would continue to affect floodplain and wetlands currently in the project area because these systems have been physically altered. However, since no direct or indirect effects would occur under Alternative 1, no cumulative effects would occur.

Alternative 2 – Proposed Action

Past dredge mining continues to affect the Crooked River floodplain and wetlands. The proposed action would reduce the effects from past dredge mining on the Crooked River floodplain and wetlands in the project area through the proposed rehabilitation efforts.

Alternative 2 would have short-term adverse effect on wetlands with the reconstruction of the channel and the re-grading of the floodplain; however, not all wetlands would be impacted. Of the existing 52.5 acres of wetlands, 30.6 acres would be impacted, and 21.9 acres would be preserved. These short-term adverse effects on wetlands are expected to be off-set by long-term improvements that include the conversion of existing aquatic bed and emergent wetlands to higher-quality shrub and forest-dominated vegetation communities that would provide aquatic and terrestrial habitat and increase streamside shading, and by the net increase of 11.6 acres of wetlands from the existing 52.5 acres to 64.1 acres post-project (Table 3-26).

Alternative 2 would have short-term adverse effects on the existing 22.7 acres of floodplain with the re-grading of the floodplain; however, these short-term adverse effects would be offset by the restoration of floodplain connectivity and improvement of floodplain function, and by the net gain of 33.6 acres from the existing 22.7 acres to 56.3 acres post-project (Table 3-29).

Since there are no present or foreseeable future actions within the project area that would affect floodplains or wetlands, there would be no cumulative beneficial effects under Alternative 2.

Summary and Other Cumulative Effects

Table 3-30 compares project indicators, by alternative.

Table 3-30. Summary comparison of indicators, by alternative.

Meanders Indicators	Alternative 1	Alternative 2
Effective Shade (%)	30.0	83.0
Channel Entrenchment Ratio	1.6 – 2.9	10.0 – 12.5
Channel Entrenchment	Moderate	Slight
Width-to-Depth Ratio	17.0 – 31.0	25.0 – 32.0
Channel Sinuosity	1.2 – 2.7	1.2 – 1.6
Bankfull Floodplain (acres)	15.6	43.1
Upland Floodplain (acres)	7.1	13.2
Palustrine Aquatic Bed Wetland (acres)	9.7	1.8
Palustrine Emergent Wetland (acres)	28.1	13.9
Palustrine Scrub Shrub Wetland (acres)	1.7	34.3
Palustrine Forested Wetland (acres)	0.5	0.5
Riverine Wetland (acres)	12.5	13.6

Cumulative Effects: Watershed Condition

The proposed Crooked River Narrows Road Improvement project would have minimal direct and indirect effects on total and streamside road densities and no direct or indirect effects on watershed condition; therefore, no cumulative effects on watershed condition would occur.

Cumulative Effects: Sediment Yield

Cumulative effects occur from the incremental effects of an action when added to other past, present, or reasonably foreseeable future actions. The cumulative effects area for sediment yield is the Crooked River watershed, Campbell Creek, and Deadwood Creek. A full description of past, present, and future foreseeable actions is presented in Appendix C.

Past, Present, and Foreseeable Future Actions

Existing roads have had the most notable management-related effects on sediment yield in Crooked River watershed, Campbell Creek, and Deadwood Creek. Ongoing actions include road maintenance.

There are two reasonably foreseeable future actions within the Crooked River watershed that were considered. The proposed Orogrande Community Protection project would include prescribed burning, vegetation treatments, and temporary road construction activities. The proposed Crooked River Narrows Road Improvement project would reconstruct a portion of Road 233. Both future activities, with the Crooked River Valley Rehabilitation project, as modeled by NEZSED, would be below Forest Plan sediment yield guidelines, and therefore would have no cumulative effect on sediment yield.

Effectiveness of Mitigation

The following project design and mitigation measures meet the intent of Clean Water Act, Section 303, and are considered project-specific best management practices for the action alternative (Alternative 2). The measures are specified in full in Chapter 2, Design and Mitigation Measures. See, also, Federal Consistency Check List in the project record.

Erosion Control/Sediment Yield/Turbidity

The following design and mitigation measures related to erosion control, sediment yield, and turbidity are to be implemented for Alternative 2: #1, 6–10, 13, 16, 19, 46, 48, 49, and 52.

Activities of the proposed action with the potential to increase turbidity and sediment yield include: reconstruction of channel; construction of the temporary bypass channel and temporary haul road; clearing of vegetation; regrading the floodplain; preparing staging areas; watering the temporary bypass channel; and re-watering the reconstructed channel. Floodplain regrading activities and channel reconstruction would increase sediment production; however, sediment basins would be constructed throughout the project area to capture and settle out sediment. Design and mitigation measures, such as installing sediment barriers (#8) and mulching/ stabilizing side slopes (#19), would reduce sediment yield to waterbodies but would not prevent all sediment from reaching waterbodies.

Watering the temporary bypass channel and re-watering the reconstructed channel are the activities that would increase turbidity the most. The project area is primarily composed of larger cobble since most of the fine sediment was washed out during the dredging activities, which would reduce the overall amount of sediment produced during construction activities.

Providing a temporary bypass channel and constructing a temporary work road would physically separate the majority of the construction area from direct contact with Crooked River and would reduce the amount of sediment yield delivered to waterbodies during construction (#47, #48 [RDG et al. 2013a], and #52). As a part of the design, temporary ponds would be constructed to capture sediment across the work area and prevent sediment yield to the bypass channel or the South Fork Clearwater River. Turbid water may be pumped to the floodplain or settling ponds to keep areas dry during construction and to reduce sediment yield to Crooked River and South Fork Clearwater River.

Design and mitigation measure #16 may include actions or monitoring to be conducted as directed by regulatory agencies, and adaptive management would be applied if turbidity reaches 50 NTUs over background during low flow. The Idaho standard for turbidity is 50 NTUs instantaneous measurement over background, which is considered protective of cold water aquatic life.

The erosion control plan ensures coordination between the Forest Service and contractor to reduce offsite sediment and erosion. This is BMP Conservation Practice (CP) 15.03 in the

Region 1 and 4 Soil Conservation Handbook (USDA Forest Service 1988a), which was adopted to comply with the Clean Water Act (also see BMP Fac-2 and AqEco-2 in the Forest Service National Core BMPs [USDA Forest Service 2012]). Newly constructed or disturbed surfaces have surface runoff as the dominant erosion mechanism for this scale of activity (Lane et al. 1997). Runoff is reduced by dispersing runoff with groundcover and shaping the surface, and by preserving the soil's capacity to take in precipitation.

Design and mitigation measures 9 and 13 rely on groundcover as a means to reduce erosion. The measures tier to BMPs CP 11.03, 13.01, and 13.04 (USDA Forest Service 1988a) and National Core BMPs Fac-2, Fac-10, Road-3, Road-6, and Veg-2 (USDA Forest Service 2012). Groundcover is commonly used to reduce erosion for road bases and reclaimed soil areas. The effectiveness depends on the slope and infiltration capacity of the soil. For roadsides where fill provides poor infiltration, grasses disperse runoff but the infiltration capacity remains reduced. However, rock and organic mulch both protect the surface and reduce the generation of overland flow. The Water Erosion Prediction Project models illustrate the effectiveness with percent rock and vegetation as primary inputs (Elliot et al. 1999). An annual rye is used since this grass grows quickly and binds soil with roots. The vegetation reduces the incidence for rill forming by minimizing the expanse of bare soil that can generate runoff. Measure 10 increases efficiency by emphasizing use of onsite materials. Measure 26 indirectly bolsters erosion control since weeds tend to be single-stemmed forbs that create less-effective groundcover than do grasses (Lacey et al. 1989).

Measure 13 effectively reduces erosion by avoiding compaction and rutting that can occur when machines operate in saturated conditions. Soil strength decreases substantially during wet saturated conditions and operation (NCASI 2004). Saturated conditions increase runoff incidence since soils lack capacity to take in precipitation.

Measure 10 shapes the constructed surfaces to reduce rill and gully formation from concentrated water flow. The effectiveness is proven as a core design concept for constructing road surfaces to shed water.

Petroleum-Based Products

The following design and mitigation measures related to petroleum-based products are to be implemented for Alternative 2: #2, 3, 4, and 5.

Heavy equipment would be used for project activities that include floodplain regrading and channel reconstruction. Washing and maintaining all equipment would reduce the amount of petroleum-based products entering waterbodies from day-to-day operations. Staging areas for machinery, fuels storage, and maintenance work would occur off site and far enough from live water that waterbodies would likely not be exposed to petroleum products in the case of a spill (#3, #5). Since much of the project area is composed of porous cobble, any spills would percolate to the groundwater quickly. Storing petroleum products in containment structures with impervious liners would prevent much of the chemical from entering waterbodies or groundwater, and having spill containment kits and a spill containment plan on site would allow for a quick response to reduce the amount of chemicals leaching into groundwater (#4).

Toxics

The following design and mitigation measures related to toxics are to be implemented for Alternative 2: #15 and 20.

Mercury is a naturally occurring element in the environment that has several forms. Metallic mercury is a shiny, silver-white, odorless liquid. Metallic mercury (inorganic mercury and its compounds) enters the air from mining and manufacturing activities and from burning coal and waste. It has also been added to the environment from historic gold mining activities. Although mercury was not used in dredge mining in the upper South Fork Clearwater, there is a small potential to find this element during restoration activities. Past geochemistry studies, including the *Crooked River Stream Survey and In-Situ Toxicity Results* (Baldigo 1986), *Water Quality Status Report 80: Crooked River* (Mann and Lindern 1988), and *Idaho Champion Group Lode and Pacific Group Load Claims: Preliminary Assessment and Site Inspection Report* (IDEQ 2011), have all shown that concentrations of heavy metals in both soil and water are generally equivalent to background levels or below detection limits.

Because of its color, mercury would be visible by contractors, Forest Service, and Nez Perce Tribe personnel on site during construction. Any mercury that is found would be removed from the site following methods outlined in Appendix E (Best Management Practices for Mercury Collection from Restoration Activities in Crooked River). This would reduce the potential for bioaccumulation of mercury in aquatic species in Crooked River and the South Fork Clearwater River.

Temporary Bypass Channel

The following design and mitigation measures related to the temporary bypass channel are to be implemented for Alternative 2: #48 and 52.

The temporary bypass channel would be constructed prior to any instream or floodplain activities. The bypass channel would be constructed to accommodate flows with a 10-year recurrence interval, and would remain in operation until the floodplain and new channel are complete. A cofferdam or headgate would be constructed on the main channel to control the flow to the bypass channel. This would allow for increasing the flow in both the bypass channel and newly constructed channel to reduce the amount of sediment mobilized during re-watering.

The temporary channel would be watered during high flows if possible. This would allow sediment produced to be flushed out during periods when natural sediment background is already high and there is enough water so as not to dewater the existing channel.

Site Rehabilitation

The following design and mitigation measures related to site rehabilitation are to be implemented for Alternative 2: #17, 18, 19, 25, 26, 28, and 31.

The reclamation relies on local soil and plant material to ensure regrowth success (measure 18). Local plants and soils have adapted to the local climate conditions. Measure 17 increases the site capacity to support desired vegetation, as demonstrated by local road decommissioning monitoring and research (Conner 2003, Lloyd et al. 2013). However, the disturbed conditions favor establishment of noxious weeds that will compete with and exclude desired vegetation. The exclusion of opportunistic weed species is critical to allow for desired vegetation to take hold. Measures 25, 26, 28, and 31 would select for desired plant species using a combination of preventive and control measures. The effectiveness would depend greatly on the ability for follow-up treatment.

Consistency with Forest Plan and Environmental Laws

Nez Perce National Forest Land and Resource Management Plan Direction

The project would comply with the Forest Plan's forestwide and management area standards for water resources (USDA Forest Service 1987a, pp. II-22 and II-23). Chapter 2 contains a full list of project design and mitigation measures, including best management practices (BMPs) that have been identified to reduce effects to water quality and measures to reduce sediment delivery from roads for the action alternative (Alternative 2). Clean Water Act Section 404, stream alteration, or NPDES permits would be obtained for Alternative 2.

Guide for Predicting Sediment Yields from Forested Watersheds (Cline et al. 1981) and *Forest Hydrology, Part II: Hydrologic Effects of Vegetation Manipulation* (USDA Forest Service 1974) were used in the above analysis to compare alternative effects on sediment and water yields.

Alternative 1 would not move toward fishery/water quality objectives in Crooked River, whereas Alternative 2 would move toward these objectives.

Clean Water Act

Section 303 of the Clean Water Act requires federal agencies to comply with all federal, state, interstate, and local requirements; administrative authorities; and process and sanctions with respect to control and abatement of water pollution. Executive Order (EO) 12088 requires the Forest Service to meet the requirements of this Act. Therefore, all state and federal laws and regulations applicable to water quality would be applied, including 36 CFR 219.27; the Clean Water Act; the Nez Perce Forest Plan, including PACFISH Riparian Management Objectives (RMOs) and Riparian Habitat Conservation Areas; Idaho State Best Management Practices (BMPs); and Stream Alteration procedures.

The Forest would apply for a joint Clean Water Act Section 404 – Stream Alteration Permit with the USACE and State of Idaho, Department of Water Resources, for Alternative 2. In addition, a Section 404(1)(b) Practicability Analysis will be completed for the selected alternative (Appendix B). The results of Section 404(1)(b) Practicability Analysis would identify the Least Environmentally Damaging Practicable Alternative (LEDPA).

Idaho State Water Quality Standards

Short-term adverse effects on water temperature are not anticipated; however, pursuant to IDEQ Antidegredation Policy, short-term adverse effects on water temperature may be allowed by IDEQ without an antidegradation review where determined necessary to secure long-term water quality improvement through restoration projects designed to trend toward natural characteristics and associated uses to a water body where those characteristics and uses have been lost or diminished (IDAPA 58.01.02, sec. 52).

Project-specific BMPs have been developed to reduce potential impacts to assigned beneficial uses in the project area. Alternative 2 would be consistent with the State of Idaho Antidegredation Policy. See Federal Consistency Check List in project record.

Executive Orders 11988 and 11990

These federal executive orders (EOs) provide for the protection and management of floodplains and wetlands. The Crooked River Valley Rehabilitation project activities have been designed to be consistent with the requirements of EO 11988 and EO 11990. As required, the Forest would apply for a Joint Section 404 Permit with the USACE and a Stream Alteration Permit with the Idaho Department of Water Resources.

Executive Order 11988 (Floodplain Management)

EO 11988 (Floodplain Management) requires each federal agency to evaluate the potential effects of actions it may take in a floodplain to avoid adverse impacts wherever possible, to ensure that its planning programs and budget requests reflect consideration of flood hazards and floodplain management, including restoring and preserving such land areas as natural undeveloped floodplains, and to prescribe procedures to implement the policies and procedures of this EO.

The action alternative has been evaluated for its potential effects to floodplains in the project area (see previous analysis). Design and mitigation measures have been developed to reduce short-term impacts to floodplains (Chapter 2).

Executive Order 11990 (Protection of Wetlands)

EO 11990 (Protection of Wetlands) requires federal agencies to take action to avoid adversely impacting wetlands wherever possible, to minimize wetlands destruction and preserve the values of wetlands, and to prescribe procedures to implement the policies and procedures of this EO.

The action alternative has been evaluated for its potential effects to wetlands in the project area (see previous analysis). Design and mitigation measures have been developed to avoid adversely impacting wetlands wherever possible, or to minimize wetlands destruction and preserve the values of wetlands (Chapter 2).

Alternative 2 is expected to impact 30.6 acres of the existing 52.5 acres of wetlands during construction, and create 42 acres of wetlands. Following implementation, the expected wetland area would be 64.1 acres, which would be a total net gain of 11.6 acres of wetlands in the long term.

The Forest would apply for a joint Clean Water Act Section 404 – Stream Alteration Permit and apply actions or monitoring as required.

Idaho Forest Practices Act

The Idaho Forest Practices Act regulates forest practices on all land ownership in Idaho. Forest practices on NFS lands must adhere to the rules pertaining to water quality (IDAPA 20.02.01). The rules are also incorporated as BMPs in the Idaho Water Quality Standards. The Crooked River Valley Rehabilitation project activities have been designed to be consistent with the Idaho Forest Practices Act.

Idaho Stream Channel Protection Act

The Idaho Stream Channel Protection Act regulates stream channel alterations between mean and high water marks on perennial streams in Idaho (IDAPA 37.03.07). Instream activities on NFS lands must adhere to the rules pertaining to the Act. The rules are also incorporated as BMPs in the Idaho Water Quality Standards. Project activities have been designed to be consistent with the Idaho Stream Channel Protection Act. The Forest would apply for a Joint Stream Alteration permit with the State of Idaho.

Cultural Resources

Scope of Analysis

This section describes the potential effects to known cultural resources that are eligible, or potentially eligible, for listing on the National Register of Historic Places (NRHP) as a result of implementing the proposed action. These two categories of sites, by law, require management protection or mitigation and are hereinafter referred to as historic properties. Cultural properties include things and places that demonstrate evidence of human occupation or activity related to history, architecture, archaeology, engineering, and culture. Historic properties, as defined by 36 CFR 800, the implementing regulations of the National Historic Preservation Act (NHPA; 16 USC 470 et seq.), are a subset of cultural properties that consists of any district, site, building, structure, artifact, ruin, object, work of art, or natural feature important in human history that meets defined eligibility criteria for the NRHP.

The types of historic properties on the Nez Perce – Clearwater National Forests are varied and reflect the type of use, and pattern of use, humans have employed across what is now the Forests for thousands of years. Locally, historic properties may include, but are not limited to, archaeological sites, historic buildings and structures, trails, wagon roads, bridges, mining features, rock art, cairns, traditional cultural properties, historic landscapes, communication lines, historic trash middens, and backcountry airstrips. Historic properties are by nature non-renewable, and are generally unable to recover from adverse effects.

The geographic and social scope of the analysis for cultural properties is the area of potential effects (APE). The APE "means the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking." (36 CFR 800.16(d)) In this section, APE is also referred to as project area.

Area of Potential Effects

The APE is the lower approximate 2 miles of the Crooked River Valley bottom.

Cumulative Effects Area

The cumulative effects area is the same as the APE.

Analysis Methods and Indicators

The project area (except for extremely steep slopes) was methodologically surveyed utilizing 15-meter-wide, pedestrian transects (or less) (Desert West Environmental 2013).

Per 36 CFR 60.4, in order for cultural properties to be eligible for (or remain eligible for) inclusion to the National Register of Historic Places they must retain **integrity** and meet one of four evaluation criteria:

a) Are associated with events that have made a significant contribution to the broad patterns of our history; or
b) Are associated with the lives of persons significant in our past; or
c) Embody 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) Have yielded, or may be likely to yield, information important in prehistory or history.

Given the NRHP evaluation criteria, the following indicator was used in analysis of effects of the alternatives on cultural properties:

- Would characteristics that qualify historic properties for the National Register of Historic Places be adversely affected (irretrievably lost)? (Yes/No)

Affected Environment and Environmental Consequences

Gold was discovered near present day Elk City, Idaho, in 1861. Miners immediately dispersed into the surrounding mountains and developed claims. These workings resulted in tens of thousands of mining features being located across the greater Red River Ranger District (and beyond). Successive waves, "booms," and mining strikes resulted in the construction of additional features or the reworking of previously existing mining features. Today, the remains of these activities can be seen in the form of stamp mills, ditches, prospects, adits, hand-placer piles, dredge piles, habitation features, structures, can-dumps, trails, roads, and resulting artifact scatters. The Crooked River Valley possesses all of these site types. Perhaps best known of these features are the dredge piles along the Crooked River. They are considered one of the best examples of dredge mining technology remaining in central Idaho.

Recreation along the Crooked River has also been a popular past-time for decades. This activity has resulted in the construction of formal campgrounds, dispersed campsite development, and related archaeological components.

Affected Environment

Four cultural properties are found within the project area, with characteristics spanning a wide range throughout the National Register integrity/evaluation criteria continuum (see Table 3-31). One of these properties (site SHC-32) is considered eligible for listing on the NRHP. As a historic property, under 36 CFR 800.16(l)(1), the federal agencies must consult with interested parties to identify ways to avoid, minimize, or mitigate the adverse effects of a federal undertaking under NHPA.

Table 3-31. National Register characteristics of cultural properties[1] located within the affected environment.

Site Number	Site Type	Historical Theme	Location	Meets National Register Criteria?[2]
10IH1701	Haigh Mill	Mining	Meanders	No
SHC-17	Crooked River Road	Transportation	Meanders	No
SHC-23	Privy	Recreation	Meanders	No
SHC-32	Dredge tailings	Mining	Meanders	Yes [criteria (c) and (d)]

[1] No historic properties associated with American Indian use and settlement of the landscape exist within the project areas. This does not reflect a lack of historical presence by American Indians such as the Nez Perce Tribe. Rather, the sites associated with this use have likely been masked or otherwise removed by historic mining activity prevalent throughout the greater project areas.

[2] Meets definition of historic property, defined in 36 CFR 800.16(l)(1).

Environmental Consequences

Direct and Indirect Effects

Alternative 1 (No Action) would have no impact on one historic property (site SHC-32) of the project area.

Alternative 2 would remove the dredge tailings (site SHC-32) along 2 miles of the lower Crooked River. These tailings are perhaps the best example of bucket-line dredge mining technology found in central Idaho and therefore are an important historical resource. The tailings resulted from extensive dredging operations conducted by the H&H Mining Company, which operated a Yuba-manufactured dredge (locally referred to as the Mount Vernon dredge) along the lower Crooked River from 1938–1942. The dredge piles of the lower 2 miles are morphologically distinct. Their U-shaped pattern reflects the technology employed by bucket-line dredges, which pivot around a central anchor-spud. The resulting architecture of the dredge piles is directly reflective of this unique mining technology. These historical features are important to not only understanding a given mining technology and its associated engineering, but also reflect and convey business histories, commerce and trade, and regional/local economics. The historic features are also related to larger world events. The H&H Mining Company was forced to cease operations on the Crooked River by order of the War Production Board in 1942. Gold mining was declared non-essential to the war effort and its labor force dispersed to other industries deemed more important in defeating the Axis Powers of World War II.

Alternative 2 would adversely (irretrievably) affect the National Register characteristics of site SHC-32 (see Table 3-32). Mitigation would thus be required to ameliorate this adverse effect (36 CFR 800.6(a)), as described below (see Chapter 2 for a full list of design and mitigation measures). A Forest Plan amendment would also be needed to allow this adverse effect to occur to the historic property (see Appendix D).

Table 3-32. Comparison of potential irretrievable effects, by alternative.

Crooked River Meanders	Would Irretrievable Effects Occur?	
Site #	**Alternative 1**	**Alternative 2**
SHC-32[1]	No	Yes

[1] Meets definition of historic property, defined in 36 CFR 800.16(l)(1).

To mitigate for the irretrievable effect to site SHC-32, the following design and mitigation measures would be employed:

- Thoroughly photograph, document, and map historic dredge piles that are proposed for removal (design and mitigation measure 42). This would create a formal record of the historic property such that it can be studied and measured, thus ensuring the resource's ability to convey information related to dredge mining once the resource is removed.
- Retain a representative sample of dredge piles for public interpretation (design and mitigation measure 39). Retention of a small portion of the dredge piles ensures that the visiting public can interact with the actual resource and tangibly understand their form and function through a first-person experience.
- Construct a three-panel educational kiosk in the Meanders to inform the public of the history of the Crooked River Valley (design and mitigation measure 40). This would educate the public as to the greater historical context associated with dredge mining along the Crooked River.
- Record the historic Gnome village (design and mitigation measure 43). This is offsite mitigation meant to enhance a resource that would not be affected by the project, but is nonetheless languishing along the Crooked River. The Gnome village site is a Depression-era hamlet built to support the Gnome Mine, which operated from about 1932–1937. The village is structurally in poor shape and its formal recording is crucial to understanding the architecture and function of this "company-town." Enhancement of the Gnome village would help mitigate impacts of the project on the dredge piles because the two resources share a similar historical theme, timeframe, and geographic scope.
- Perform a social business history related to the economic contribution historic dredge mining operations made to the local central Idaho economy (design and mitigation measure 44). This would promote understanding of the economic value of historic mining activities to local rural economies such as Elk City, Idaho.

Cumulative Effects

Historic properties of the greater project areas date to perhaps 1861, but many of these older sites have been destroyed by subsequent mining activity. The last temporally significant wave of mining within the Crooked River Valley occurred during the Great Depression. Thus, many of the sites date from as recent as the 1930s.

The timeframe for determination of cumulative effects is circa 1938 to hundreds of years into the future.

Past Actions

Historic mining activity has greatly altered the landscape. Evidence of American Indian use of the landscape along with early mining features have nearly all been removed/altered by subsequent mining actions. Recreation activity and all-terrain vehicle use has deflated (flattened) dredge piles. Use of the dredge pile gravels for road maintenance activity has also altered this historic landscape. Additionally, artifact collecting has removed vast amounts of scientific data from historic mining sites. Natural events have also affected the historic landscape. Wildland fire has burned historic properties within the greater project area, periodic flooding and its associated erosion has affected streamside sites, and wind-throw events have displaced historic features and artifacts as root wads were upended.

No Action Alternative

Alternative 1 would retain one historic property (site SHC-32) of the project area and it would continue to exist in its current form. These dredge tailings could persist for hundreds of years. Some deflation could occur as recreationists climb/drive over the dredge piles. Soil would slowly build upon them, supporting a larger amount of vegetation and thus somewhat masking their extent, form and outline. Wind-throw events could slowly displace dredge piles as root wads are upended, deforming the once recognizable and morphologically distinct features.

Action Alternative

Alternative 2 would have direct and indirect adverse effects to one historic property (site SHC-32). This alternative would immediately and irretrievably remove virtually the entirety of the historic property (SHC-32) from the landscape, which is the best example of bucket-line dredge mining technology found in central Idaho. This action would adversely (irretrievably) affect the National Register characteristics of site SHC-32; however, the application of design and mitigation measures 39, 40, 42, 43, and 44 would ameliorate this adverse effect (36 CFR 800.16(a)) and therefore would have no cumulative effect.

Ongoing and Foreseeable Future Actions

Ongoing and foreseeable future actions include recreation, vandalism, artifact collecting, wildland fire events, fire suppression actions, and natural decay. Within the project area, the proposed Orogrande Community Protection project would have no adverse effect on historic properties, and therefore would have no cumulative effect.

Effectiveness of Mitigation

The Idaho State Historic Preservation Officer has concurred with the suitability and merit of the mitigation measures proposed for the Crooked River Valley Rehabilitation project. For additional details on the effectiveness of these measures, see Direct and Indirect Effects (above).

Consistency with Forest Plan and Environmental Laws

Nez Perce National Forest Land and Resource Management Plan Direction

The project would comply with the Forest Plan's forestwide and management area standards for cultural resources (USDA Forest Service 1987a, pp. II-22 and II-23), except for protection of historic property #SHC-32. A Forest Plan amendment is proposed under the 2012 Planning Rule for Forestwide Standards #2 and 4 and Management Area 3 – Cultural Resource Standard #4 (see Appendix D). Full details on consistency with the Forest Plan are located in the project record.

All landforms having a high probability for historic property locations would be surveyed for the presence of cultural resources. No American Indian related sites are known to be located within the project area. No American Indian related sites are known to be located within the project area. Government-to-Government and staff-to-staff consultation has occurred with the Nez Perce Tribe. All cultural properties within the APE would be evaluated for their National Register eligibility. All landforms having a high probability for historic property locations would be surveyed for the presence of cultural resources and would have their conditions documented. Measures meant to recover significant values of site SHC-32 are described above in Direct and Indirect Effects.

Other Laws and Regulations

The National Historic Preservation Act (NHPA) of 1966 (16 USC 470; as amended) requires federal agencies to take into account their actions on historic properties. The required regulatory review of effects resulting from federal undertakings is found in Section 106 of the Act, and has been codified in 36 CFR 800 Part B. The mitigation proposed for site SHC-32 meets the intent of the NHPA when the Idaho Historic Preservation Officer concurs on the proposed mitigation package.

Soil Resources

Scope of Analysis

This analysis documents current conditions within the Crooked River Valley Rehabilitation project, identifies soil limitations for the Meanders floodplain restoration, and how the project addresses these limitations.

Spatial and Temporal Analysis Bound

The analysis area includes the footprint of the restoration project to evaluate direct, indirect, and cumulative effects, approximately 115 acres.

The timeframe used to consider effects from past activities is the past century, during which mining and road construction created the need for the current project. Future projects that were evaluated that could impact this project success were within the next 10 years.

Analysis Methods and Indicators

Data and analysis were taken from the *Design Criteria Report: Crooked River Valley Rehabilitation Design* (RDG et al. 2012), *Final Design Report: Crooked River Valley Rehabilitation Design* (RDG et al. 2013a), technical drawings (RDG et al. 2013b), *Mining Claim Inventory*: *Crooked River Valley Rehabilitation Design* (RDG 2012), *Crooked River Valley Rehabilitation Project Wetland Delineation Report* (Geum Environmental Consulting 2012), engineering specifications sheets (Great West Engineering 2013), and South Fork Clearwater River Landscape Assessment (USDA Forest Service 1998).

A concurrent study on soil impacts from the Orogrande Community Protection project located upstream from the Crooked River Valley Rehabilitation project provided information on existing condition.

Current conditions and potential soil interpretations within the Crooked River Valley project area were verified during a field visit in spring 2013. Digital information was used from Nez Perce corporate GIS data layers, including: transportation, streams, terrestrial ecosystem unit (now SSURGO ID609), watersheds, and project-generated digital information from River Design Group. Terrain calculations were derived from LiDAR and 10-meter digital elevation models.

The Forest Plan directs to maintain soil productivity and minimize soil erosion when conducting management activities (USDA Forest Service 1987a, p. II-5). The regional guidelines further clarify that soil productivity is maintained where lands managed are part of the productive landbase (USDA Forest Service 1999a, p. 3). Roads and infrastructure such as campgrounds and administrative structures have designated uses other than for vegetation purposes.

The intent of the project is to restore the floodplain from a disturbed, non-natural state to a functional valley bottom. The structure and function of the valley bottom would be improved to support a natural soil and vegetation environment. The main concerns are the interim disturbance created by restoration earth-moving activities and the net improvement in soil productivity at the project conclusion.

The proposed action may change soil properties for hydrologic and biologic function. The indicators below are used to show the effects from the project and interpret long-term recovery trends:

A. Improved soil and plant habitat: Percentage of the project area that has improved plant and soil habitat across project area using factors of plant community composition. Improvements to soil physical, chemical, and biological function will be qualitatively discussed.
B. Detrimental soil disturbance (acres or percentage).
C. Forest Plan Amendment (Yes/No).

Indicator A: Improved soil and plant habitat

This indicator shows the changes to soil and plant environment from the restoration project. Terminology in the Forest Service guidance documents refer to no net loss in productivity (USDA Forest Service 1987a, USDA Forest Service 1999a). Production itself measures annual yield or the amount of carbon fixed per annum (Grier et al. 1989). However, the restoration action's objective is to re-establish a dynamic system in which the plant and soil associations depend on the proximity to the river. Frequently flooded areas have shallow soils from annual scouring by water. In contrast, elevated riverine terraces have only periodic flooding at 2- to 50-year frequencies, depending on height and proximity to river. The time between flooding events on these terraces allows for vertical soil development and a wider suite of plant and soil communities.

For the purposes of this project, productivity in the strictest sense as yield does not represent a good measure of success; frequently flooded areas are natural but have poor production per square unit area when compared to elevated river terraces. Thus, the merits of the project will be evaluated based on the extent to which the project develops the site into a natural floodplain environment. Factors of desired geomorphic surfaces and the improved soil physical, chemical, and biological components will be evaluated. Since soil and vegetation communities are coupled, the desired plant groups will be used as an indicator to compare to existing groups.

Indicator B: Detrimental soil disturbance

Soil standards in the Nez Perce Forest Plan specify management to maintain a minimum of 80 percent of an activity in a non-detrimental condition (USDA Forest Service 1987a, p. II-22). These standards address impairments by land management activities such as timber harvest using measures of the extent and degree of disturbance. Detrimental soil disturbance (DSD) is a standard measure used to evaluate the impact of these management actions whereby long-term reductions in soil productivity could occur. Detrimental disturbance is defined by indications of erosion, compaction, displacement, rutting, severe burning, loss of organic matter, and soil mass movement. Management actions on the Nez Perce National Forest (NPNF) must comply with the Forest Plan standards; thus, this analysis documents the amount of detrimental disturbance resulting from the restoration activities. The NPNF standards apply to the Meanders project since this is part of the productive landbase. These standards do not apply to the Narrows Road project since the road prism has an administrative purpose and therefore is not part of the productive landbase.

Indicator C: Forest Plan Amendment

Indicator C evaluates the need to amend the Nez Perce Forest Plan. An amendment is proposed that would exempt the Crooked River Rehabilitation project from the Forest Plan's Soil Standard #2. The goal of the Forest Plan is establish standards to comply with the National Forest Management Act and the Multiple Use Act. Soil Standard #2 prevents permanent impairment to productivity by limiting the amount of detrimental disturbance from management actions. However, the standard does not provide for activities intended to restore productivity on areas that were degraded by prior historical activities such as mining. The Crooked River Valley Rehabilitation project intends to restore the floodplain and, thus, improve productivity. Additional analysis is provided in Appendix D.

Affected Environment and Environmental Consequences

Physical Setting

The project is planned along the valley bottom of a deep set canyon. The sideslopes have steep pitches of 50% to 70% slopes formed by metasediment bedrock. Colluvium forms thin mantles over the bedrock on steep slopes and collects in draws and concavities, but overall slopes have bedrock close to the surface. Warm aspects and areas of recent failure expose these bedrock surfaces. Soil and vegetation development is highest where slope material accumulates on cool aspects that have abundant water and may also contain remnant loess from volcanic ash deposition.

The underlying geology structurally controls the slope topography and sets up the steep slope pitches. The metasediments exposed on canyon are biotite schist and gneiss of the Elk City metamorphic sequence that were most recently uplifted from the Idaho batholith pluton (75 to 100 Ma) (Lewis et al. 1990). These metasediments form a cap over the batholith which lies just below the valley bottom surface of the Crooked River. A 285-foot-deep well drilled to sample groundwater at the mouth of the Crooked River penetrated mostly granite bedrock from the Idaho batholith (Mann and Lindern 1988). Thus, the Meanders section of Crooked River overlies an impermeable bedrock surface that resists downcutting – at least in the near term of thousands of years.

The geologic uplift is important since this started the sequence of canyon development which frames the larger context of how and when material from the sideslopes erodes into the valley bottom. The uplift and subsequent downcutting by the stream set up very steep slopes that contribute sediment in only rare events of mass wasting.

Over millennia, faults formed by the geologic uplift get exploited by streams and thus advance the development of canyons. The degree of strata movement is extensive, as evidenced by upturned metasediments and the density of faults. The Meanders and Orogrande valley segments of the Crooked River both follow north-to-northeast-trending faults. However, the Narrows section of road has an eastern trend where the river “jogs” from a northeastern fault to a more direct north-trend fault. This east orientation runs counter to the regional fault trend, which might explain why the Narrows has exceptionally steep canyon slopes and narrow canyon width when compared to the upstream and downstream segments.

The geomorphic sequence that contributes to valley fill is a result of rare climatic events. At least in the recent 10,000 years, the evidence for natural erosion is rare outside of pulse climate events that trigger debris flows (Kirchner et al. 2001). In the Crooked River setting, canyons and particularly side draws, contribute sediment pulses from debris flows where upslopes experience large-scale losses to vegetation from wildfire succeeded by major storm events (Meyer et al. 2001, Wondzell and King 2003). In the Nez Perce – Clearwater National Forests area, storms and/or the sequence of storms that produce the level of saturation needed to start debris flows appear to occur every 20 to 30 years, with substantial events occurring in 1945, 1975, and 1996 (McClelland et al. 1997). In the Lolo Creek area, there is evidence suggesting that a very large storm event produced substantial floodplain deposits following the 1910-era wildfires based on peak flow events in 1912 and examination of streamside terraces.

The debris flow deposits are redistributed along the valley bottom and integrated into the floodplain by seasonal flooding. The factors of sediment size and texture, access to year-long water, and annual exposure to floodwaters dictate the distribution of plants and soil communities. Stable uplands outside the influence of Crooked River have conifer communities that grade down in elevation to sedge and riparian shrub communities along the primary floodplain.

Mining activity

One of the primary needs for the project is to correct the arrangement of the valley bottom fill to accommodate a natural flooding and deposition regime. The valley bottom was altered by historic placer mining that took place from the 1930s through the 1950s (USDA Forest Service 1998 and 2005). Mining activities sifted the valley bottom material, releasing fines and leaving rubble piles behind a dredge. Gold and silver mining affected 6 miles of the river across 200 acres (RDG 2012). The coarse cobble-sized dredge piles reach over 30 feet above the primary floodplain, which no longer functions as a natural alluvial floodplain (RDG et al. 2012). Despite the yearly high flow volumes, the dredge pilings have remained *in situ* except for a 1980s rehabilitation project that improved the channel connectivity to the dredge ponds.

Mine tailing have potential issues with soil and water contamination from heavy metals and arsenic. In preparation for the 1980s channel rehabilitation work, the Idaho Department of Environmental Quality commissioned several investigations to monitor dissolved and total metal content and perform bioassays using 1-year-old steelhead and Chinook salmon (Baldigo 1986, Mann and Von Lindern 1988). Testing took place in ponds and channel sections distributed throughout the proposed Meanders project area to establish existing conditions. In addition, a pilot project analyzed the metal content in response to moving the tailings.

For the existing conditions, the studies found that water samples had metal contents within expected ranges using reference data from Red River, the American River, Deadwood Creek, and Newsome Creek and comparing to EPA 95% thresholds. The metal contents in sediment samples were also below the EPA's established 95% threshold values.

Results from the pilot study found that moving the tailings produced short-term iron levels over the 95% threshold for total iron but not for dissolved iron. The hazard was considered low since total iron is bioavailable and the effect was short term.

Meanders soil and plant habitat

The Crooked River Enhancement Project in the 1980s increased the connectivity of the channel to ponds and introduced riparian vegetation where possible. However, the floodplain remains vastly departed both functionally and structurally for a typical alluvial valley form for this setting. The *Design Criteria Report* (RDG et al. 2012) outlines how the current tailing piles do not accommodate the various flows that refresh floodplains nutrients and sediment. The report lists the limiting factors as (1) lack of floodplain connectivity, (2) the tailings create a preponderance of coarse, well-drained substrates, (3) widespread distribution of reed canary grass, (4) heavy browse and herbivory that selects for certain vegetation success, and (5) recreation impacts that damage vegetation and introduce weeds (RDG 2012, p. 24).

The lack of a widespread floodplain has hindered the re-establishment of the desired species since the valley bottom does not have the array of wetlands and terraces. The coarse cobble and rock-sized tailings create a difficult growing medium for forb, grass, and shrub species with insufficient water holding capacity. Likewise, the droughty conditions hinder soil development. In a natural environment, the connection with seasonal flooding provides fine sediments that bootstrap riparian growth with propagules, seeds, organic matter. The sediment amends soil physical function by increasing water holding capacity and provides a substrate for seedlings to take hold. Most of the current valley bottom remains outside the influence of seasonal flooding, which explains why 70 years after mining disturbance the major vegetation form remains upland conifer.

Indicator A: Improved soil and plant habitat

River Design Group et al. (2012) inventoried project vegetation and grouped the vegetation into categories. Table 3-33 shows the distribution of vegetation forms. The columns display the relative amount of desired vegetation groups across the area for the existing condition and the action alternative (Alternative 2). The direct actions of the project would establish the functional characteristics needed to return the site towards what is expected. The Meanders would need several years of regrowth and an influx of sediment and seed source to fully reach the desired conditions. Figure 3-25 displays a floodplain segment to illustrate the difference in the array of vegetation between the existing and the desired conditions.

Table 3-33. Comparison of desired plant community composition using percent project area, by alternative.

Plant Community Composition		Alternative	
Community	**Location**	**1 (No Action)**	**2 (Proposed Action)**
Desired plant communities			
Bare – colonizing	Point bars along channel	1.1	1
Alder	Bankfull floodplain, side channel wetlands	1.8	51
Sedge	Side channel wetlands	8.5	0.5
Mixed Shrub	Bankfull floodplain, upland floodplain, upland	0	0.5
Spruce	Upland	18	25
Conifer/Tall forb	Upland	41.1	22
Undesired plant communities			
Dredge herbaceous	Tailing piles	4.6	0
Mesic forb meadow	North and south end, project area	8.2	0
Reed canary grass/Cattail	Throughout project area	16.7	0

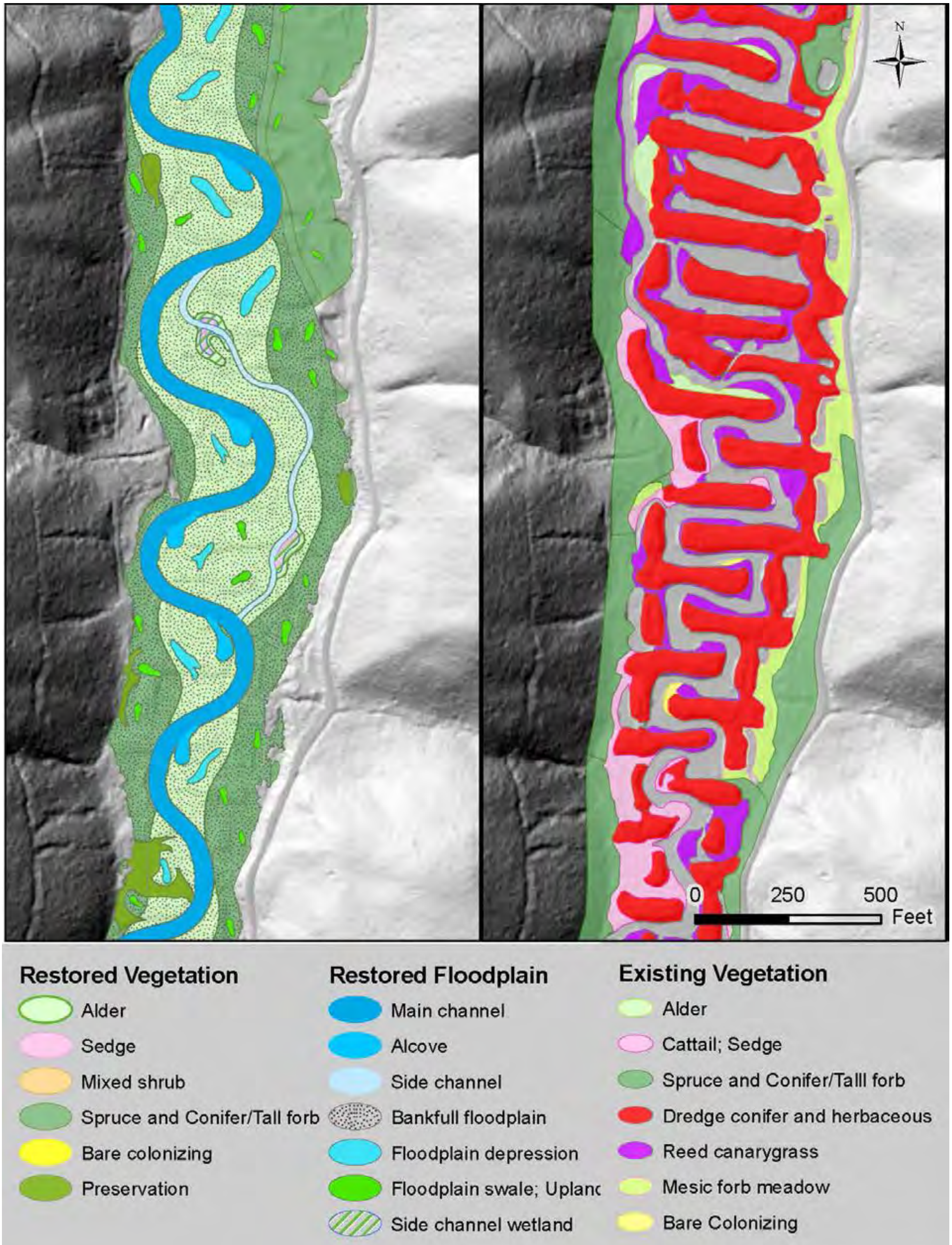


Figure 3-25. Comparison of existing versus restored vegetation distribution and geomorphic forms in Meanders.

Direct and Indirect Effects

Alternative 1 (No Action) would not improve the current soil and plant habitat since the Meanders does not have a functioning valley bottom.

Alternative 2 would meet the purpose and need by restoring the geomorphology of the valley bottom to grow and redevelop into the desired diversity of plant and soil habitat.

Vegetation relies on physical, biological, and chemical soil properties for growth. Alternative 2 lays the foundation to rebuild these soil functional properties. The alternative would overcome the current limitations for plants, including poor access to water and nutrients from floodflows, poor water holding capacity, and insufficient growth substrate in the tailings.

Geomorphic forms

The action alternative (Alternative 2) would use three geomorphic forms to rebuild the valley bottom that consist of a primary floodplain, upland floodplain, and upland. The streamflow disturbance interval for these forms corresponds to flooding at 1.5 years ($Q_{1.5}$), 25 years (Q_{25}), and 500 years (Q_{500}). See Glossary for description of terms related to streamflow return interval (Q). Table 3-34 outlines the type and general extent of the geomorphic forms compared to the current extent.

Table 3-34. Comparison of valley bottom geomorphic forms across alternatives for Meanders using area extent.

Geomorphic feature	Flooding frequency	Stability	Soils	Alternative 1 (No Action)	Alternative 2 (Proposed Action)
Primary floodplain	$Q_{1.5}$	Moderate disturbance	Fluvial	27.6 acres	43.1 acres
Upland floodplain	Q_{25}	Stable, low disturbance	Shallow depth (<24 inches)	16.2 acres	2.5 acres
Upland	Q_{500}	Stable, very low disturbance	Moderate to deep depth (>24 inches)	15.6 acres	13.8 acres

The primary floodplain would have similar soil physical properties to the current floodplain, but the areal extent would expand substantially from 27.6 to 43.1 acres (see Figure 3-25). Soils are coarse grained with layers of silt, sand, gravel, cobble, and rock from riverwash. Soil drainage is well drained to excessively well drained, but with shallow access to the water table and localized saturated conditions. The wider low-elevation floodplain would also increase lateral flow from the channel.

Soil chemical and biological properties on the primary floodplain would advance as yearly flooding deposits nutrients and sediments and alder establishes. Alder is a nitrogen-fixing species well suited for this primary successional environment.

Uplands floodplain habitat represents a small portion of the project area at only 2.5 acres. Soils on the upland floodplain would experience infrequent flooding and develop shallow and moderate depths to support a wide array of grass, forb, shrub, and trees. The soil physical properties would be restored by limiting elevations to less than 4 feet above the river bankfull elevation. This low elevation ensures access to the water table by mesic (water loving) shrubs and trees. The soils would be amended with a wood chips and organic material to increase water holding capacity since seasonal moisture deficits in the topsoil could occur. The biological and chemical soil properties of the upland floodplain would develop incrementally over time as the plants and soil colonize the site.

The uplands would be retained where possible since restoring soils in these environments takes much longer than on the areas near water. The uplands rarely experience flooding and thus have an inherently stable environment where soils develop vertically, *in situ*, over long periods of time. As Table 3-34 shows, Alternative 2 would result in a net decrease in uplands from 15.6 acres to 13.8 acres. Construction would excavate tailings on the east side, but would leave the west side river bank due to natural conditions. The biological and chemical properties of the constructed uplands would develop incrementally as the plants and soil colonize the site.

One of the current limitations to vegetation is the lack of water and poor substrate for rooting. The soil mix used in the upland floodplain and uplands bolsters water holding capacity with fine sediment and organic matter. The soil medium relies on salvaged soil on site, mixed with fine-textured fill, and organics from salvaged sod and vegetation residue. An estimated 17,346 cubic yards of soil would be salvaged and re-used on the project (RDG et al. 2013a, p. 75). The soil medium would provide at least 12-inch topsoil depth and cover 50% of the area for the upland floodplain and upland. Additional mulch using woody debris residue from the Orogrande Community Protection project would be applied to the surface and mixed into the topsoil.

The project would advance the growth of soil and vegetation communities by bootstrapping the site with sod that contains soil microbes for recolonization. The rooting zone is considered a partnership among plants, soil microbes, and the soil substrate (Clapperton 2006). Plants rely on soil microbes to access water and nutrients, while providing secretions and residues that microbes use as a food source. An example is that all conifers have obligate relations with ectomycorrhizae fungi to access nutrients (Horton et al. 1999). Within the upland and primary floodplains, Alternative 2 would establish microsites that increase the diversity of soil and vegetation habitat. Microsites include wetlands in addition to large aggregations of wood debris. Functionally, the application increases the surface roughness to lend stability. The microsites also provide unique habitat for wetland soils to develop and cool, moist areas for mesic soil and plants. The swales trap seed and organic matter from passing flows and the coarse wood provides shade that conserves moisture and stimulates overall soil development (RDG et al. 2013a, p. 68).

Large woody debris and wood chips would be distributed throughout the site and are considered key elements for productivity (Harvey et al. 1987, Graham et al. 1994). These materials act as a microsite and can provide biological recovery. Root crowns and roots are major foci for microbial activity (Egerton-Warbuton 2005, Molina et al. 2011), and leaving green trees can inoculate soils for regenerating seedlings.

Habitat diversity

Table 3-33 displays the current vegetation composition compared to the desired condition. Figure 3-25 shows the contrast in diverse desired alder, shrub, and sedge communities to the distribution of tailings that currently dominate the site. The greatest change from the action alternative would be an alder increase from 1.8 to 51%. The amount of conifer would be halved from current extent along with the intended replacement of mesic forb meadows and reed canary grass/cattail communities with vegetation that is expected for this particular stream setting.

The reconstruction of the valley bottom would increase habitat diversity by providing for side channels, alcoves, floodplain depressions, floodplain swales, side channel wetlands, and slope wetlands (Figure 3-25). The provision for wetland communities would lead to a net gain in palustrian shrub scrub from 1.7 to 34.3 acres (see Geum Environmental Consulting 2012).

Invasive species

The current conditions include abundant reed canary grass along the streams and within several wetland areas. The action alternative avoids spreading reed canary grass by not using sod for surface planting from infected areas. Following implementation, monitoring would be done to detect invasive and noxious weeds, including reed canary grass. The weeds would be treated using already approved measures (USDA Forest Service 1988a).

Weeds are a concern for the project since so much area is being returned to primary successional conditions. Weeds are well suited for these disturbed conditions with opportunistic growth strategies to quickly occupy sites where abundant sunlight, water, and nutrients are available (James et al. 2010). Newly disturbed soils are characterized as having small periods of high nutrient availability that favors forb or grass species that can grow quickly (Eviner and Firestone 2007). As the riparian and valley bottom establishes, the initial nutrient flush should decrease and shade from overstory tree and shrub species would lessen the risk for weeds. Using the estimate from River Design Group et al. (2013a) for alder regrowth on the floodplain, the risk should be low after 10 years on the primary and upland floodplain. However, on the slower-growth upland environments, the risk may extend longer.

Cumulative Effects

The action alternative would almost completely rework the valley bottom to rehabilitate past conditions from mining dredge work. Trampling or compaction of soils may reduce rehabilitation success adjacent to recreational sites. The project mitigates this potential impact by designated staging sites in areas that are already compacted.

Indicator B: Detrimental soil disturbance

Direct, Indirect, and Cumulative Effects

Alternative 1 would not result in any additional detrimental soil disturbance. The current River Design Group estimate of the project area is 65 percent detrimental soil disturbance (DSD) based on the need for restoration. The current conditions have persistent infertile growing conditions of the tailings and lack the expected plant and soil habitat. The estimate is derived from the comparison of the project area (115 acres) versus the amount of area that needs restoration (74.8 acres).

Alternative 2. The Meanders is managed as part of the productive landbase and thus was evaluated for long-term impact to productivity using Nez Perce Forest Plan standards.

Substantial earthwork is needed to excavate and transport the tailings into a valley form that functions properly in order to restore the valley bottom. Approximately 65 percent of the project area would be impacted by construction equipment. Figure 3-26 illustrates the elevation changes needed to reconstruct the geomorphic forms for a river section. The red coloration indicates excavation while the blue coloration shows the degree of fill needed. Much of the red corresponds to tailings piles. The complete displacement, translocation, and re-dispersal qualify as DSD using Nez Perce Forest Plan standards (USDA Forest Service 1987a) and Region 1 Soil Quality Guidelines (USDA Forest Service 1999a).

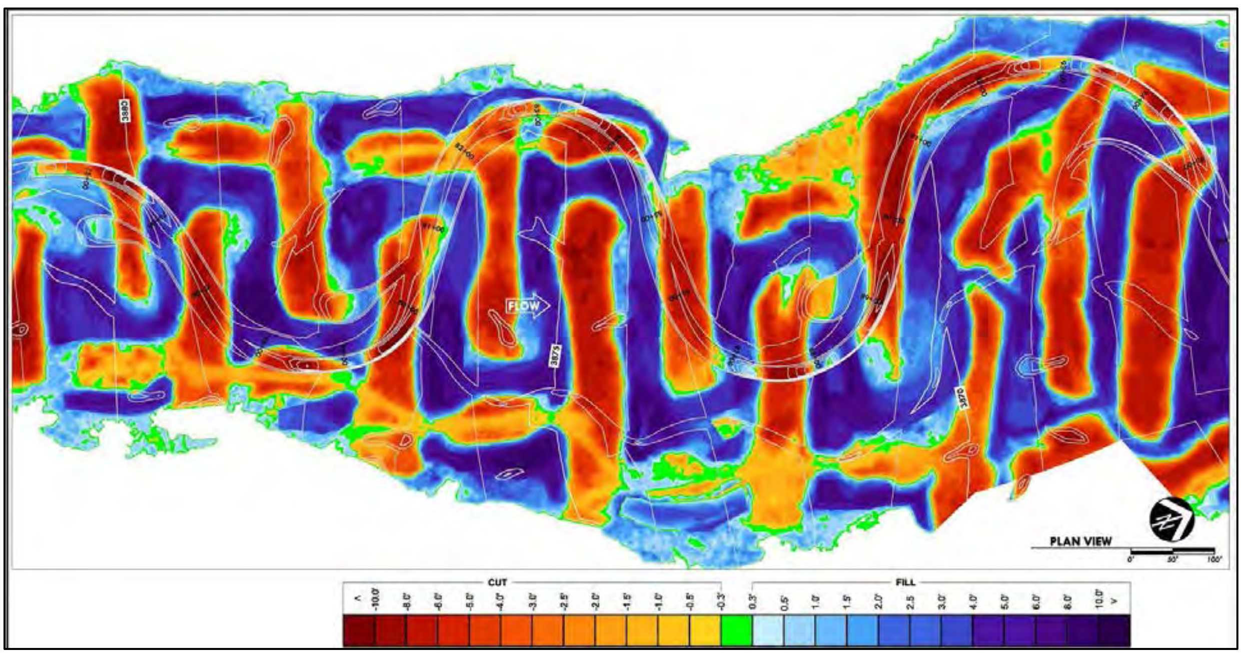


Figure 3-26. Design drawing showing extent of cut and fill planned to restore channel (RDG et al. 2013b, p. 25).

The application of the Nez Perce Forest Plan standards requires an assessment of the extent of DSD across a project area compared to the 20 percent threshold value where long-term productivity could occur. The existing condition is 65 percent and, thus, conducting management activities would exceed the 20 percent threshold in the Forest Plan's Standard #2. However, management activities would meet Region 1 Soil Quality Guidelines.

The disparity between the NPNF and the Region 1 Soil Quality Guidelines is the ability to restore productivity on severely impaired soils. The Regional guidelines state:

> In areas where more than 15 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effects from project implementation and restoration should not exceed the conditions prior to the planned activity and should move toward a net improvement in soil quality. (USDA 1999, p. 2)

The restoration actions would lead to a net improvement for soil productivity by reducing the level of DSD to levels below the existing conditions in the first year after implementation.

Table 3-35 shows the gradual soil recovery over time, depending on plant group and location. In the first-year recovery, the site would move from the current condition of 65 percent to 48 percent DSD with channel restoration and the bare fluvial soils put in place. Soils would recover physical function very quickly for all geomorphic forms. Chemical and biological soil functions would recover most quickly in the floodplain habitat where adequate water promotes the accrual of organic matter. In the uplands, lack of water and slower growth would create a longer term for recovery.

River Design Group et al. (2013a, p. 28) estimated alder stands would establish within 10 years on the primary floodplain, and the upland spruce and conifer groups would take 20 years. By 10 years the DSD would be down to 13 percent with alder securing the primary floodplain and incremental soil development on the uplands. At 20 years, the DSD would be at 4 percent as the upland recovery continues.

Table 3-35. Restoration trajectory for plant groups and associated geomorphic forms.

Plant Group	Geomorphic Forms	Year	DSD (%)
Channel, primary floodplain	Channel and adjacent primary floodplain	1	48
Alder and sedge where perennial water, seasonal flooding; initial conifer/tall forb and spruce	Primary floodplain, upland floodplain; uplands begin forb and grass development	3	40
Mixed scrub, more alder; continued spruce and conifer/tall forb	Primary, upland floodplain; grass and forb continue with shrub and trees taking hold	5	32
Alder established, spruce continues	Primary, upland recovery complete; uplands securing understory vegetation; trees and shrubs continue	10	13
Spruce established	Uplands continue long term soil and vegetation development	20	4

Indicator C: Forest Plan Amendment

Direct, Indirect, and Cumulative Effects

Alternative 1 would retain the existing Nez Perce Forest Plan standards. No amendment to the Forest Plan is proposed.

Alternative 2 proposes an amendment to the Nez Perce Forest Plan to address restoration actions (see Appendix D for details). The main purpose for the amendment is to enable active restoration actions. The amendment would exempt the Crooked River Rehabilitation project from Forest Plan – Soil Standard #2. The goals of the Nez Perce Forest Plan soil standards are to prevent substantial and permanent impairment to productivity. Soil Standard #2 controls against management activities further degrading a site. However, the standard does not provide for restoration of productivity for severely degraded soils. The exemption of Standard #2 would allow for the restoration activities to improve soil productivity from 65 percent DSD currently to 48 percent in the first year after implementation and 4 percent in 20 years.

Other Cumulative Effects

Cumulative Effects – Flooding Risk

No adverse cumulative effects were identified for the action alternative or for the potential Crooked River Narrows Road Improvement project. The road would continue to receive use as a main thoroughfare or reduced traffic trail. The future Crooked River Narrows Road Improvement project could reduce flooding risk over time.

Cumulative Effects – Mass Movement

No past or ongoing activities would increase mass movement along the Narrows for the action alternative or for the proposed Crooked River Narrows Road Improvement project. Ongoing activities of road repair and maintenance are administrative and occur within the current road prism. The road was initially constructed in the late 1800s. Although frequent washouts have occurred, no evidence of hillslope failure triggered from the road construction activities or placement was found.

Planned prescribed burning as part of the Orogrande Community Protection project poses a risk to the proposed Crooked River Narrows Road Improvement project since the burning can result in loss of groundcover. The burning could occur within the next 5 to 10 years depending on suitable burn windows. The effect would be from slope cutting and thus after the Narrows work is complete. The potential risk is low since the Orogrande project would prescribe burn at low intensity. The burning takes place on the west-facing slopes along 2.5 miles of the Narrows (milepost 3.5 to 6.0). The project specifically addresses mass wasting risk by avoiding concentrated burning in large expanse concave draws, high-intensity burning that removes all groundcover. A mosaic burn pattern is planned that would moderate potential runoff effects.

The five roadcuts for road widening after milepost 4.0 have planned prescribed burning on the hillslopes above. The road cut with high risk for cutslope failure is outside the burn areas.

Effectiveness of Mitigation

The following design and mitigation measures are to be implemented for the action alternative (Alternative 2) for the project. The measures are specified in full in Chapter 2, Design and Mitigation Measures.

Erosion Control

The following design and mitigation measures related to erosion control are to be implemented for Alternative 2: #1, 6, 8, 9, 10, 13, 19, 25, 26, 46, and 49.

The erosion control plan ensures coordination between the Forest Service and contractor to reduce offsite sediment and erosion. This is BMP CP 15.03 in the Region 1 and 4 Soil Conservation Handbook (USDA Forest Service 1988b), which was adopted to comply with the Clean Water Act (also see BMP Fac-2 and AqEco-2 in the Forest Service National Core BMPs [USDA Forest Service 2012]). Newly constructed or disturbed surfaces have surface runoff as the dominant erosion mechanism for this scale of activity (Lane et al. 1997). Runoff is reduced by dispersing runoff with groundcover and shaping the surface, and by preserving the soil’s capacity to take in precipitation.

Design and mitigation measures 9 and 13 rely on groundcover as a means to reduce erosion. The measures tier to BMPs CP 11.03, 13.01, and 13.04 (USDA Forest Service 1988b) and National Core BMPs Fac-2, Fac-10, Road-3, Road-6, and Veg-2 (USDA Forest Service 2012). Groundcover is commonly used to reduce erosion for road bases and reclaimed soil areas. The effectiveness depends on the slope and infiltration capacity of the soil. For roadsides where fill provides poor infiltration, grasses disperse runoff but the infiltration capacity remains reduced. However, rock and organic mulch both protect the surface and reduce the generation of overland flow. The Water Erosion Prediction Project models illustrate the effectiveness with percent rock and vegetation as primary inputs (Elliot et al. 1999). An annual rye is used since this this grass grows quickly and binds soil with roots. The vegetation reduces the incidence for rill forming by minimizing the expanse of bare soil that can generate runoff. Measure 10 increases efficiency by emphasizing use onsite materials. Measure 26 indirectly bolsters erosion control since weeds tend to be single-stemmed forbs that do not create as effective groundcover as grasses (Lacey et al. 1989).

Measures 13, 46, and 49 effectively reduce erosion by avoiding compaction and rutting that can occur when machines operate in saturated conditions. Soil strength decreases substantially during wet saturated conditions and operation (NCASI 2004). Saturated conditions increase runoff incidence since soils lack capacity to take in precipitation.

Measure 10 shapes the constructed surfaces to reduce rill and gully formation from concentrated water flow. The effectiveness is proven as a core design concept for constructing road surfaces to shed water.

Mitigation measures #46 and 49 serve as an operational control to minimize deleterious effects of equipment.

Site Rehabilitation

The following design and mitigation measures related to site rehabilitation are to be implemented for Alternative 2: #3, 17-19, 25, 26, 28, and 33.

The reclamation relies on local soil and plant material to ensure regrowth success (#18). Local plants and soils have adapted to the local climate conditions. Measure 17-18 increases the site capacity to support desired vegetation, as demonstrated by local road decommissioning monitoring and research (Conners 2003, Lloyd et al. 2013). However, the disturbed conditions favor establishment of noxious weeds that would compete with and exclude desired vegetation. The exclusion of opportunistic weed species is critical to allow for desired vegetation to take hold. Measures 25, 26, 28, and 33 select for desired plant species using a combination of preventive and control measures. The effectiveness would depend greatly on the ability for follow-up treatment. Mitigation measure #19 provides essential groundcover that adds organic matter while retaining moisture for desired vegetation to take hold.

Consistency with Forest Plan and Environmental Laws

This section describes the guidance for managing soils on the NPNF (USDA Forest Service 1987a). The action alternative would comply with the amended Nez Perce Forest Plan using the determinations for detrimental soil disturbance. The project would lead to a net improvement in detrimental soil condition and thus complies with Region 1 Soil Quality Guidelines (USDA Forest Service 1999a). Full details on consistency of the project with the Forest Plan are located in the project record.

The Washington, D.C., soil direction was used to clarify plant and soil function to address productivity impacts (USDA Forest Service 2010a). The project intends to restore the floodplain to a more natural state. Using vegetation and soil communities as an indicator, the greatest improvement would be the expansion of a limited primary flood at 1.8 acres to 51 acres.

The project ultimately complies with the National Forest Management Act. The action alternative would not produce substantial and permanent impairment of the productivity of the land. Rather, the activities would lead to a net improvement of soil conditions in the short term (1 year) and long term (20 years) after implementation.

The following lists how the action alternative meets the requirements of the Nez Perce Forest Plan Standards, as proposed to be amended:

(1) Soil disturbance evaluation: The EIS displays the effects to soils for DSD.

(2) Soil disturbance thresholds: The project would comply with the Nez Perce Forest Plan with the amendment to adopt the Region 1 Soil Quality Standards. The amendment would enable the project to improve lands that currently impaired soil conditions beyond 20 percent DSD. The Crooked River Valley Rehabilitation project would comply with

the Region 1 Soil Guidelines by improving the site. The restoration would reduce DSD from the existing 65 percent to 48 percent in year 1 and down to 4 percent by year 20.

(3) Effective groundcover: The project has design criteria that maintain sufficient ground cover for the project to reduce erosion on the uplands and upland floodplain where stable soils are desired. Roughly 60% areal cover is desired. The ground cover would be obtained from planting and applying wood fiber mulch.

Nez Perce National Forest Land and Resource Management Plan Direction

The Nez Perce National Forest soil quality standards (Forest Plan II-22, USDA Forest Service 1987a) apply to lands in the Crooked River Valley Rehabilitation project area. The Forest Plan directs the NPNF to maintain soil productivity and minimize soil erosion through the application of BMPs, careful riparian area management, use of fish/water quality drainage objectives, and soil and water resource improvement projects (p. II-5).

The project would not meet Forest Plan soil quality standard #2, which says, "A minimum of 80 percent of an activity area shall not be detrimentally compacted, displaced, or puddled upon completion of activities…." Therefore, an amendment to the Forest Plan is proposed (see Appendix D). Full details on consistency of the project with the Forest Plan are located in the project record.

Region 1 Soil Direction

Regional direction is available from the Region 1 Forest Service Manual for Soil Management (FSM 2500-99-1, USDA Forest Service 1999a), referred to as R1 Soil Quality Standards. The analysis standards address basic elements for the soils resource: (1) soil productivity (including soil loss, porosity, and organic matter), and (2) soil hydrologic function. The soil productivity direction identifies a value of 15 percent detrimental soil disturbance as a guideline that indicates potential impairment from project activities. Regional guidance for soil management provides direction that agency activities should result in a net benefit to soil conditions when past activities have left detrimental soil disturbance in excess of 15 percent areal extent (USDA Forest Service 1999a). As noted above (Consistency with Forest Plan and Environmental Laws), the project would comply with Region 1 soil direction.

Washington Office Soil Direction

New direction provided by the Washington Office Forest Service Manual (Chapter 2550, USDA Forest Service 2010a) addresses impacts to soil function from management activities. Permanent impairment is defined as detrimental changes in soil properties (physical, chemical, and biological) that result in the loss of the inherent ecological capacity or hydrologic function of the soil resource that lasts beyond a land management planning period. The current R1 Manual direction for soil management centers on minimizing disturbance and limiting the extent of detrimental soil disturbance from management activities (USDA 1999). Direction for maintaining site productivity is implicit in the National Forest Management Act (1976), which requires that management "will not produce substantial and permanent impairment of the productivity of the land." However, the newly released Washington Office manual (USDA Forest Service 2010a) takes this beyond a protective role to an active role in recognition that ecological processes are dynamic. The new manual provides soil management objectives to: (1) Maintain or restore soil quality on National Forest System lands, and (2) Manage resource uses and soil resources on National Forest System lands to sustain ecological processes and function so that desired ecosystem services are provided in perpetuity. Soil quality indicators are further defined to include factors that provide insight to inherent soil function.

Soil function extends to trees, shrubs, grass, and herb growth, as well as underground productivity – all attributes of soil productivity (Figure 3-27).

As noted above (Consistency with Forest Plan and Environmental Laws), the project would comply with Washington Office soil direction.

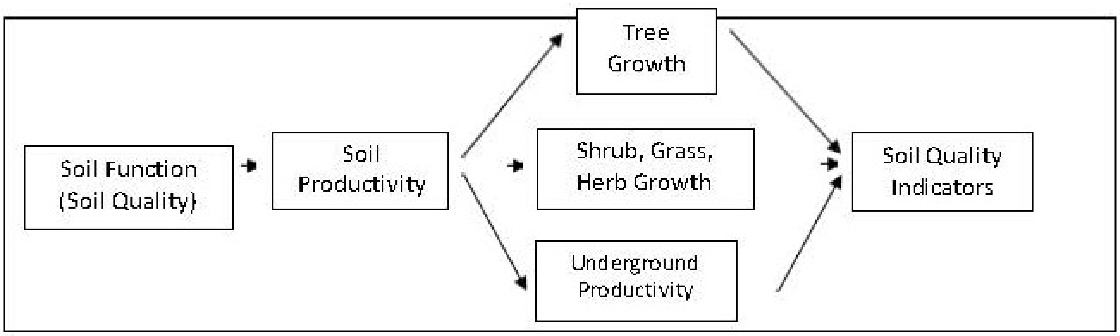


Figure 3-27. Soil quality indicator relationship to soil productivity (from 2020 WO FSM Chap. 2550).

National Forest Management Act

The National Forest Management Act states, "…timber harvested from National Forest System lands...only where soil, slope, or other watershed conditions will not be irreversibly damaged." Forest plans will "insure…evaluation of the effects of each management system to the end that it will not produce substantial and permanent impairment of the productivity of the land" [16 USC 1604(g)(3)(C) and 16 USC 1604(g)(3)(E)(i)]. As noted above (Consistency with Forest Plan and Environmental Laws), the project would comply with the Act.

Wildlife Resources

Introduction

The Crooked River Valley Rehabilitation project has the potential to affect wildlife species and their habitats. This section provides an analysis of wildlife species potentially present in the project area and the effects that proposed activities may have on them or their habitat. For the purpose of this analysis, wildlife species include endangered, threatened, sensitive species, and management indicator species.

Geographic Scope

Project Area

Direct and indirect effects were analyzed for the project area for the restoration and improvement of 2.0 miles of the Crooked River Meanders.

Cumulative Effects Area

The area of consideration for cumulative effects includes lands associated with this project and the proposed Crooked River Narrows Road Improvement project:

- Crooked River Meanders – 2.0 miles of stream and floodplain restoration and improvement
- Proposed Crooked River Narrows Road Improvement project – improvement of up to 4 miles of Road 233 or rerouting portions of Road 522 and decommissioning approximately 3.5 miles of Road 233 to foot trail.

The rationale for the selection of these analysis areas is that the effects are site specific to areas treated within the project area (as delineated in Chapter 2) and would not extend beyond the boundaries, and effects from outside the defined area would likewise not affect the resource within.

The cumulative effects boundary for elk is the Forest Plan elk habitat analysis units.

Methodology

Analysis of effects for terrestrial wildlife species was completed using comparisons of Crooked River Valley Rehabilitation project-related effects relative to the most limiting habitat factors for each species.

Wildlife observation databases were reviewed to establish the presence of wildlife species in the project area. The primary reference for information on observations is Idaho Department of Fish and Game (2010a). Additional information was provided by River Design Group et al. (2012 and 2013a) and Toweill (2011).

Table 3-36 displays each of the federally listed Threatened and Endangered species and Forest Service Region 1 Sensitive Species that have the potential to occur on the Nez Perce National Forest, as well as Nez Perce National Forest MIS. Wildlife species and/or their habitat were evaluated for potential to be affected by the proposed project. Some species were eliminated from further consideration based on range, lack of habitat, and/or lack of known occurrence in the analysis area.

Wetlands have been delineated in the project area by Geum Environmental Consulting (2012). Acres of wetland classifications were used to determine the amount of habitat available for the western toad and moose (Cowardin et al. 1992).

Elk habitat effectiveness calculations were completed to determine existing elk habitat conditions (Leege 1984 [same as USDA Forest Service 1987a, Appendix B]).

Direct and indirect effects are discussed for each species. Direct effects could result from road and stream alteration. Indirect effects for some species may include the expansion of weeds. Road improvements that are limited to the road prism would not have any direct or indirect effects on any species of concern. Cumulative effects are the overall effects to species from past, present, and reasonably foreseeable future projects. Historically, such effects on individual species were not measured or noted. However, the past effects on general habitat condition can be qualified and matched to species dependent on a particular habitat.

Resource Indicators

The effect on species and their potential habitat, measured in acres, is the primary indicator used in the analysis. For species without modeled habitat, a qualitative discussion of habitat conditions and effects to such habitat is the indicator used in the analysis.

Table 3-36. Nez Perce National Forest threatened, endangered, sensitive, and management indicator species.

Species Name	Status[1]	Primary Habitat Summary and Consideration for Analysis of Effects/Potential Impacts
Canada lynx *Lynx canadensis*	T	Nez Perce National Forest is considered unoccupied, secondary habitat (Northern Rockies Lynx Amendment [USDA Forest Service 2007a]). No – lack of mapped habitat within vicinity of project activities. No verified sightings on the Nez Perce Forest. There is no potential for effects from this project.
Northern Idaho ground squirrel *Spermophilus brunneus brunneus*	T	Southern portion of the Salmon River Ranger District. Grasslands. Not a listed species for Idaho County. No – lack of habitat, suitable habitat not altered. There is no potential for effects from this project.
Grizzly bear *Ursus arctos horribilis*	T MIS	Not a listed species for Idaho County. No – There is no potential for effects from this project.
Wolverine *Gulo gulo*	P	Remote areas where human disturbance is minimal, often in timber near rockslides, avalanche areas, cliffs, swamps, and meadows. No – No suitable habitat. The threat to wolverine is loss of habitats with persistent snow cover as a result of climate change and increasing temperatures. A proposed rule found that dispersed recreational activities, infrastructure development, transportation corridors, and land management activities do not pose a threat to wolverines. There is no potential for effects from this project.
Western (boreal) toad *Bufo boreas boreas*	S	A variety of aquatic and moist terrestrial habitats; prefers ponds, pools, and slow-moving streams. Yes – Elimination of breeding habitat associated with ponds created from past mining activities. Potential disturbance or mortality effects to individual toads from project activities. Beneficial effects: restored floodplain function and connectedness, improved non-breeding habitat.
Gray wolf *Canis lupus*	S MIS	Semi-secluded mesic meadows for denning and rendezvous sites. Ungulate summer and winter range. Yes – possible short-term disturbance effects from project activities.
Townsend's big-eared bat *Corynorhinus townsendii*	S	Associated with grasslands, xeric shrublands, ponderosa pine, Douglas-fir, and mixed xeric forests. Roosts in buildings, mines, and caves for roosts, maternity colonies, and hibernacula. Uses forest edges, open canopied stands, and forest openings for foraging. No – lack of habitat, suitable habitat not altered. There is no potential for effects from this project.
Black swift *Cypseloides niger*	S	Neotropical migratory bird. Nests are built on cliff ledges, near or behind waterfalls or in shallow caves. No – lack of habitat, suitable habitat not altered. There is no potential for effects from this project.
Ringneck snake *Diadophis punctatus*	S	Dry coniferous forests with brushy understories, open grasslands, rocky hillsides and early-seral riparian areas. No – lack of habitat, suitable habitat not altered. There is no potential for effects from this project.

Species Name	Status[1]	Primary Habitat Summary and Consideration for Analysis of Effects/Potential Impacts
Peregrine falcon *Falco peregrinus anatum*	S	Nests on ledges on steep cliff faces. No – lack of habitat, suitable habitat not altered. There is no potential for effects from this project.
Common loon *Gavia immer*	S	Lakes with shallow and deep waters areas for breeding. Winter in coastal mine habitats. No – lack of habitat, suitable habitat not altered. There is no potential for effects from this project.
Bald eagle *Haliaeetus leucocephalus*	S MIS	Uses larger fish-bearing streams, rivers, and lakes for foraging, nests nearby. No known nesting sites. South Fork Clearwater River is considered winter habitat. No – lack of habitat, suitable habitat not altered. There is no potential for effects from this project.
Harlequin duck *Histrionicus histrionicus*	S	Forested mountain streams with gradient less than 3%, shrub cover greater than 50%, and minimal human disturbance. Yes – alterations in breeding habitat. Disturbance effects. Beneficial effects: restored stream channel, improved breeding habitat.
Fisher *Martes pennanti*	S MIS	Diverse, moist, mature forests at low to moderate elevations, with high canopy cover, often along riparian areas, and abundant large-diameter woody debris. Yes – possible short-term disturbance effects from project activities.
Long-eared myotis *Myotis evotis*	S	Prefers coniferous forests. Roosts are in caves, mines, buildings, bridges, crevices, rock outcrops, and under tree bark. No – lack of habitat, suitable habitat not altered. There is no potential for effects from this project.
Long-legged myotis *Myotis volans*	S	Prefers coniferous forests. Roosts in tree hollows and under bark, in rock crevices, caves, mines, bridges, and buildings. No – lack of habitat, suitable habitat not altered. There is no potential for effects from this project.
Fringed myotis *Myotis thysanodes*	S	Associated with grasslands, xeric shrublands, ponderosa pine, Douglas-fir, and mixed xeric forests. Maternity colonies, day roosts, and night roosts for the fringed myotis are found in caves, buildings, underground mines, rock crevices, tree hollows, and bridges. Roost trees tend to be large-diameter snags in early to medium stages of decay. No – lack of habitat, suitable habitat not altered. There is no potential for effects from this project.
Long-billed curlew *Numenius americanus*	S	Prairies and grassy meadows near water. No – lack of habitat, suitable habitat not altered. There is no potential for effects from this project.
Mountain quail *Oreortyx pictus*	S	Warm/dry shrub and riparian habitat in Salmon River basin. No – lack of habitat, suitable habitat not altered. There is no potential for effects from this project.
Flammulated owl *Otus flammeolus*	S	Open-canopy mature to old-growth ponderosa pine and Douglas-fir forests. Forest edges with adjacent grass/forb communities for foraging. Small home ranges. No – lack of habitat, suitable habitat not altered. There is no potential for effects from this project.

Species Name	Status[1]	Primary Habitat Summary and Consideration for Analysis of Effects/Potential Impacts
Bighorn sheep *Ovis canadensis*	S MIS	Open grasslands, rock outcrops – security. No – lack of habitat, suitable habitat not altered. There is no potential for effects from this project.
White-headed woodpecker *Picoides albolarvatus*	S	Open-canopy mature to old-growth ponderosa pine forests. Moderate-sized home ranges. Salmon River basin. No – lack of habitat, suitable habitat not altered. There is no potential for effects from this project.
Black-backed woodpecker *Picoides arcticus*	S	Montane forests, primarily stands with ponderosa pine and/or lodgepole pine component. Respond opportunistically to fire and insect outbreaks. No – lack of habitat, suitable habitat not altered. There is no potential for effects from this project.
Coeur d'Alene salamander *Plethodon idahoensis*	S	Riparian habitats in spray zones of waterfalls in the Selway River basin. No – lack of habitat, suitable habitat not altered. There is no potential for effects from this project.
Pygmy nuthatch *Sitta pygmaea*	S	Strong and almost exclusive preference for ponderosa pine habitat, especially older, open (<70% canopy coverage) habitats. No – lack of habitat, suitable habitat not altered. There is no potential for effects from this project.
Moose *Alces alces*	MIS	A mosaic of forest conditions, openings, lakes, and wetlands. Yes –possible short-term disturbance from project activities and a reduction in ponded foraging habitat.
Elk *Cervus elaphus*	MIS	Open grasslands, brush fields, and riparian areas for foraging, dense forests for cover. Yes – possible short-term disturbance from project activities.
Northern goshawk *Accipiter gentilis*	MIS	Mature to old growth, closed canopy forests for nesting. Pole stage or larger stands with open understories for foraging. May also forage along forest edges. No – lack of habitat, suitable habitat not altered. There is no potential for effects.
Pileated woodpecker *Dryocpus pileatus*	MIS	Nest in mature forests with high canopy closure, decadence, and multi-layered structure. Forages on stumps, trees, and logs with abundant ant populations. Will use habitats with small to large trees/snags for foraging. No – lack of habitat, suitable habitat not altered. There is no potential for effects from this project.
Pine marten *Martes americana*	MIS	Mature, higher-elevation subalpine fir/Engelmann spruce forests with large woody debris and high canopy closure. Yes – possible short-term disturbance effects from project activities.

[1]. Status: T = Threatened, S = Sensitive, P = Proposed, MIS = Management Indicator Species.

Affected Environment and Environmental Consequences

Past land management activities, most importantly mining and road construction, have substantially affected the landscape in many parts of the watershed, as well as instream and riparian function in the main stem of Crooked River (Appendix C). Fire suppression, mining, road construction, and timber harvest have caused a shift in many of the natural processes in the watershed. The area surrounding Crooked River was mined for mineral resources from the 1900s through the 1950s. Mining waste (also referred to as mine tailings) is concentrated in the valley bottom, altering the physical condition of the stream system, restricting the natural migration pattern of the stream and other changes in channel morphology (channel size, form, and function), and impairing the recolonization of riparian vegetation and its function as a natural buffer. Road 233 is within the floodplain of Crooked River for approximately 3 miles through the “Narrows” and 1 additional mile to Relief Creek. The road often floods during high water events, constricts the river, and contributes sediment to Crooked River. These alterations have resulted in a reduced area of productive aquatic and terrestrial habitat.

Federally Listed Species

The U.S. Department of Interior, Fish and Wildlife Service (USFWS) requires the Forest Service to analyze threatened species for which there may be suitable habitat in a project area. In Idaho County, the USFWS has indicated that there may be suitable habitat for Canada lynx (*Lynx canadensis*) and wolverine (*Gulo gulo*).

The Canada lynx was listed as a threatened species under the Endangered Species Act in 2000. The Nez Perce National Forest is recognized as secondary, unoccupied Canada lynx habitat and none of the Nez Perce National Forest has been identified as critical habitat by the USFWS (USDA Forest Service 2007a, p. 3-5; USDA Forest Service 2007b, pp. 7 and 29; USDA Forest Service and USDI Fish and Wildlife Service 2006). The project area is not within lynx habitat and there are no verified sightings of lynx on the Nez Perce National Forest. There is one incidental sighting of lynx within 3 miles of the project area. Activities associated with the project would have “no effect” to lynx or their habitat. This species is not analyzed further in this EIS.

The USFWS published a proposed rule for the North American wolverine on Monday, February 4, 2013, in the *Federal Register* (78 FR 23 2013). The proposed rule found that dispersed recreational activities, infrastructure development, transportation corridors, and land management activities do not pose a threat to wolverines. The land management activities in the Crooked River Valley Rehabilitation project are not considered a threat to wolverine. With regard to the proposed rule and the proposed federal action associated with the Crooked River Valley Rehabilitation project, the project is “not likely to jeopardize the continued existence of the wolverine.” The threat to wolverine is loss of habitats with persistent snow cover as a result of climate change and increasing temperatures. This species is not analyzed further in this EIS.

The project does not contain habitat (cottonwood galleries) for the yellow-billed cuckoo (*Coccyzus americanus*), a candidate species; therefore, this species is not analyzed further in this EIS.

Sensitive Species

The Northern Region Sensitive Species List, which contains those species identified as sensitive by the Regional Forester, was last updated on February 2011 (USDA Forest Service 2011b). This section considers those sensitive species (or their habitats) on the list that are known or suspected to occur on the Nez Perce National Forest within the vicinity of the Crooked River Valley Rehabilitation project area (Table 3-36).

Western Toad

Affected Environment

The analysis area for the western toad is the project area. Western toads use moist areas such as streams, ponds, and lakes for breeding, foraging, and overwintering habitat. They prefer shallow areas with mud bottoms and high-temperature areas, often in sites with vegetation present for breeding. A wide variety of upland habitats are used during non-breeding times. Riparian areas serve as migratory or dispersal corridors. Important upland habitat structure needed includes down woody debris where individuals can access moist microhabitats during the hot daytime summer hours to avoid desiccation.

There are three main types of habitat western toads use throughout the course of a year: (1) breeding habitat, (2) summer or terrestrial non-breeding habitats, and (3) over-winter hibernacula (Keinath and McGee 2005). Breeding habitat includes shallow water (<20 cm [<8 in.]) at the edges of ponds, lakes, streams, river edges where water is pooled or very slow moving, oxbow ponds, flooded meadows, beaver ponds, reservoirs and quarries, thermal pools and ponds, and ephemeral pools. The water temperature at breeding sites typically ranges from 15–21°C (59–70°F) (Keinath and McGee 2005). In Montana, water temperatures for breeding may be as low as 7.5°C, but usually more than 9°C (Montana Field Guide 2013). The active period for western toads begins in April or May and extends to September or October (Montana Field Guide 2013). The breeding period is from April to mid-July. Juvenile toads have been observed in the project area in June in wetlands or wet areas near the ponds and Crooked River.

Summer habitats include a diversity of forested and non-forested wet and dry areas. Juvenile and adult western toads use these summer habitats for foraging, shelter, resting, and dispersal. Toads prey on anything smaller than they are and easy to catch (invertebrates and vertebrates).

Adults and young of the year use terrestrial habitats and wet areas near water as hibernacula. They use burrows made by small mammals, dig burrows, or over-winter under debris piles (logs and rocks).

Western toads are known to occur along Crooked River in the part of the project area known as the Meanders (Geum Environmental Consulting 2012). There are approximately 53 acres of wetland habitat and open water environments (ponds) available to the western toad as potential breeding habitat (approximately 38 acres identified as breeding and 15 acres identified as non-breeding habitat) (Table 3-37 and Figure 3-28). There are more than 40 permanent and seasonal ponds that may provide breeding habitat for western toads; however, they have been observed breeding in only one of the larger ponds. It is unknown why western toads are not seen breeding in more of the ponds in the project area. It is also unknown if western toads use the main channel of Crooked River for breeding. These ponds are not connected to each other, nor are they connected to the stream, except for only one or two ponds. The rubble (tailing piles) left from past mining and the stream edge provide marginal non-breeding habitat. Over-winter habitat to burrow in may be currently limited due to the disturbed state of the stream and floodplain, which consists of larger, loose cobble that does not provide suitable habitat for the western toad.

Toads have been observed breeding in only one of the ponds within the Meanders (Geum Environmental Consulting 2012, p. 31). Many of the shallow ponds dry up during the summer, and tailing piles do not provide quality cover or overwinter habitat.

There is very little long-term monitoring data for western toad populations in Idaho. Species are provided a status to show viability of populations. The status is ranged from 1 to 5 (1 being critically impaired; 5 being secure) and G or S (G- global status and S- state status). The western toad is apparently secure (G4/S4) across its range and in Idaho (Digital Atlas of Idaho 2012 [accessed August 7, 2013]; [G4/S3] NatureServe 2013 [accessed August 7, 2013]). Declines in abundance have been reported throughout the species' range due to disease and parasites.

Environmental Consequences – Direct and Indirect Effects

Alternative 1 (No Action)

Under Alternative 1 (No Action), there would be no rehabilitation of the Crooked River Meanders. There would be no direct or indirect effects to western toads or their habitat. The western toad would continue to occupy the area in the vicinity of the Meanders. It is determined that there would be *No Impact* to western toads or their habitat with Alternative 1.

Alternative 2

There would be a reduction of 22 acres of breeding habitat (wetlands) available to western toads after completion of this project within the Meanders (Table 3-38). More than 40 permanent and seasonal ponds that may provide breeding habitat would be lost during the construction of the temporary bypass channel and side channel, and rehabilitation/restoration of the floodplain. These ponds are not connected to each other, nor to the stream except for only one or two ponds. As part of the project design, a minimum of three ponds would be retained, including the ponds where western toad breeding has been observed. In addition to the three retained ponds, swales would be constructed in the floodplain and alcoves would be constructed along the stream and side channels (Table 3-37). The swales or floodplain depressions might have the potential to hold water for potential breeding sites (RDG et al. 2013b [see Appendix A, Figures A-3, A-4, and A-5; and Wildlife specialist report – Appendix A]). The alcoves associated with the stream and side channels provide slow backwater that could provide breeding areas. In addition, the design to restore the main channel of Crooked River reduces the number of pools from what currently exists. The plan is to reduce the pool:riffle ratio from 63:37 to 40:60 (see Aquatic Resources section). This would also reduce the potential breeding sites available to western toads in the main channel.

Table 3-37. Acres of newly constructed floodplain with swales and alcoves, Alternative 2.

Type	Acres
Side Channel	~1
Floodplain Depressions	1.5
Floodplain Swales	~1
Side Channel wetlands	<1
Swales/Depressions	<1
Alcoves	~1

Alternative 2 would increase and improve non-breeding habitat by 33.7 acres (Table 3-38 and Figure 3-28; Geum Environmental Consulting 2012). Figure 3-20 depicts the current wetland conditions in the Meanders; Figures 3-21 and 3-22 depict the proposed wetland conditions under Alternative 2.

Table 3-38. Western toad habitat, Alternative 2.

Wetland Type	Type of Western Toad Habitat	Existing Habitat (Acres)	Habitat Potentially Altered (Acres)	Habitat Potentially Retained (Acres)
Palustrian Shrub/scrub	Non-breeding	2	32 (+)	34
Palustrian Forested	Non-breeding	<1	0 (0)	<1
Aquatic Bed	Breeding	10	8 (-)	2
Palustrian Emergent	Breeding	28	14 (-)	14
Riverine	Non-breeding	13	1 (+)	14
Total		53	11 (+)	64

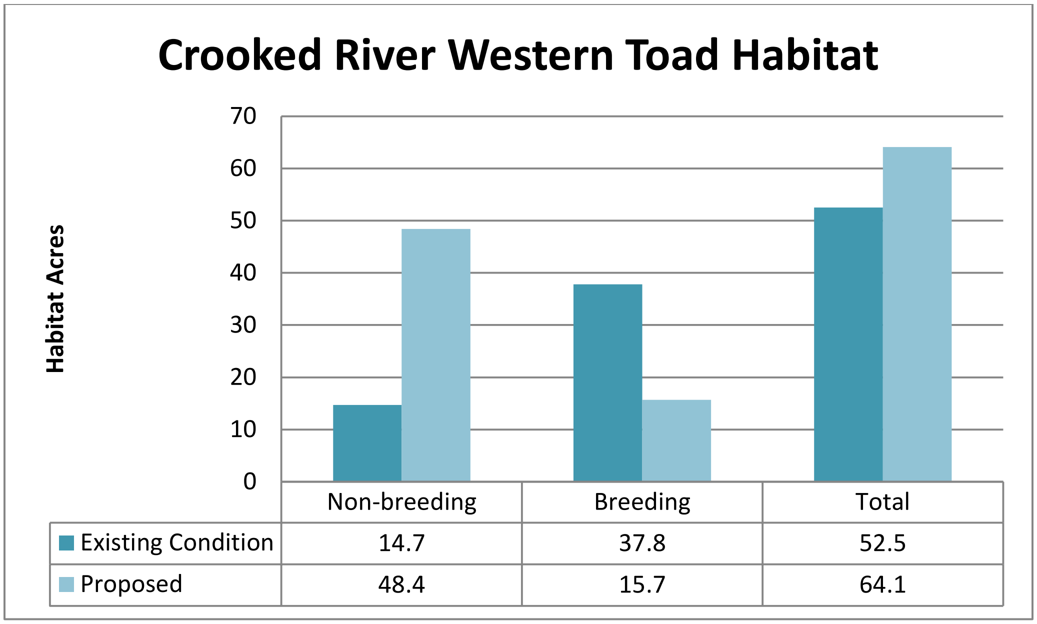


Figure 3-28. Western toad habitat in project area.

Alternative 2 would restore the stream channel and floodplain and would provide improved foraging, non-breeding, and over-winter habitat as sediments accumulate and settle across the valley floor (stream channel and floodplain). A more natural functioning stream channel and connected floodplain would also allow for easier and safer travel of toads across the floodplain. Approximately 60 acres of floodplain habitat would be improved by adding woody debris and implementing the revegetation strategy, which would provide much needed cover and diversity to the floodplain. This would reduce the incidence of toads drying out or mortality by predators while traversing the area to and from breeding sites. Providing woody debris and restoring the floodplain are expected to improve over-winter habitat, as well.

There is potential for western toad mortality (adults, egg masses, tadpoles, and juveniles) during construction of the temporary bypass channel and dewatering/rechanneling of existing open water ponded environments; construction of the side channel; construction of the temporary bypass road; dewatering of the main Crooked River channel; dewatering of the temporary bypass channel; regrading/reshaping the valley bottom, stream channel, and tailing piles; and equipment traffic. Aquatic organism salvage operations are intended to reduce the loss/mortality of aquatic organisms during construction and dewatering activities.

Activities associated with dewatering and constructing the temporary bypass channel and road and side channel and dewatering the main Crooked River have greatest potential for mortality and reduction in potential western toad breeding habitat. Aquatic organism salvage operations would reduce mortality impacts during construction, watering, and dewatering activities. It is assumed that aquatic organism salvage and construction would occur after July 1 and before April 1. This would allow the western toads to complete their breeding cycle and tadpoles to metamorphose and leave the water. Depending on the water temperature, breeding and egg laying may be delayed because tadpoles may still be in the water and aquatic organism salvage operations would capture and release tadpoles in appropriate wetted environments to finish the metamorphosis process. Activities occurring between April 1 and July 1 would impede western toad breeding activities, crush egg masses and tadpoles, and cause mortality of tadpoles, juveniles, and adults. Any part of the breeding cycle that is not captured during aquatic organism salvage operations would result in the desiccation of eggs, tadpoles, and metamorphosing toadlets. Aquatic organism salvage operations; construction of the bypass channel and main channel; regrading the floodplain; and watering of the bypass and main channel between April 1 and July 1 would result in mortality of current year's egg masses and tadpoles and a loss of western toad production for that year. There is also the potential to lose several years of western toad production due to the loss of potential breeding sites associated with construction and restoration activities as part of restoring the Crooked River Meanders.

Determination of effects for the western toad is *May impact individuals or habitat but not likely to cause trend toward federal listing or reduce viability for the population or species* under Alternative 2.

Gray Wolf

Affected Environment

The analysis area for the gray wolf is the project area. Three aspects of wolf habitat were reviewed: security of dens and rendezvous sites, prey base (elk), and security from human disturbances and harm. The gray wolf occupies diverse habitats, from open meadows to heavily forested stands. Wolves occupy broad territories and travel extensively in search of prey, generally medium to large ungulates, especially elk. They are adaptable to human and land management activity in general, but sensitive to disturbance at denning and rendezvous sites. Wolves are known to inhabit the project area; however, there are no known den or rendezvous sites in the project area.

The gray wolf has a global rank of G4/G5 (apparently secure) and an Idaho State ranking of S3 (vulnerable) (NatureServe 2013 [accessed August 7, 2013]); S1 (critically imperiled) (Digital Atlas of Idaho 2013 [accessed August 7, 2013]).

Environmental Consequences – Direct and Indirect Effects

Alternative 1 (No Action)

Under Alternative 1 (No Action), there would be no rehabilitation of the Crooked River Meanders. Therefore, there would be no direct or indirect effects to gray wolves or their habitat. It is determined that there would be *No Impact* to gray wolves or their habitat under Alternative 1.

Alternative 2

Gray wolves could be subject to noise disturbance effects under the action alternative (Alternative 2). Short-term impacts would be limited to displacement of wolves from the project area if individuals are within the area at the time of work.

Over time, revegetation of the floodplain along the Meanders area would improve habitat (cover and forage) for prey species.

Determination of effects for the gray wolf is *May impact individuals or habitat but not likely to cause trend toward federal listing or reduce viability for the population or species* under Alternative 2.

Harlequin Duck

Affected Environment

This species is a Nez Perce National Forest sensitive species and an Idaho species of greatest conservation need (IDFG 2005). Harlequin ducks use swift-flowing mountain streams on the Forest (IDFG 2005). They feed on benthic macroinvertebrates and use 2nd-order or larger streams containing reaches with an average gradient of 1–7%, riffle habitat, clear water, gravel to boulder–sized substrate, and forested bank vegetation.

There have been sightings of harlequin duck along Crooked River in both the Meanders and Narrows sections. There are approximately 13 acres of existing riverine habitat along Crooked River that provides potential breeding and foraging habitat for harlequin ducks in the Meanders area. The current habitat has been impacted by past mining, creating a non-functioning stream channel and disconnected floodplain.

The harlequin duck has a global rank of G4 (apparently secure) and an Idaho State ranking of S1B (critically imperiled) (NatureServe 2013 [accessed July 29, 2013]; Digital Atlas of Idaho 2013 [accessed July 29, 2013]).

Environmental Consequences – Direct and Indirect Effects

Alternative 1 (No Action)

Under Alternative 1 (No Action), there would be no rehabilitation of the Crooked River Meanders. There would be no direct or indirect effects to harlequin ducks or their habitat. It is determined that there would be *No Impact* to harlequin ducks or their habitat under Alternative 1.

Alternative 2

Direct effects include the potential to disturb or displace migrating harlequin ducks traveling through the area to breeding sites during construction activities.

Alternative 2 would improve a total of 14 acres of riverine habitat, thus improving potential breeding and foraging habitat by restoring a more natural functioning stream channel and connected floodplain.

Approximately 60 acres of floodplain habitat would be improved by adding woody debris and vegetation, thus increasing cover and diversity to the floodplain. Macroinvertebrates, such as stonefly and Odenata (dragonfly larvae), are an important food source for harlequin ducks. Macroinvertebrate habitat would be improved under Alternative 2 by providing greater riffle habitat, reducing cobble embeddedness, and reducing stream temperatures. Altering the morphology of the stream would provide scouring of riffles, which reduces cobble embeddedness. Creating more, higher-quality riffle habitat would increase the abundance and productivity of macroinvertebrates in the project area. Stream temperatures would be reduced by reconnecting the groundwater and surface water interaction and providing a wider riparian area that would support larger trees and shrubs.

Determination of effects on harlequin duck is *May impact individuals or habitat but not likely to cause trend toward federal listing or reduce viability for the population or species* under Alternative 2. Over the long term, potential breeding and foraging habitat would be improved.

Fisher

Affected Environment

The fisher is a management indicator and sensitive species on the Nez Perce National Forest. Fisher occurrence in western North America is closely associated with low- to mid-elevation forests with a coniferous component, large snags or decadent live trees and logs for denning and resting, and complex physical structure near the forest floor to support adequate prey populations (Aubry and Lewis 2003).

The Comprehensive Wildlife Conservation Strategy (IDFG 2005) summarizes fisher habitat in Idaho as a mosaic of mesic (moist/wet) conifer, dry conifer, and subalpine forests. Mature and older forests are used during summer; early seral and late successional forests are used in the winter.

Fisher are known to occur in the vicinity of the project area.

Fisher has a global rank of G5 (widespread, abundant, and secure) and an Idaho State ranking of S1 (critically imperiled) (NatureServe 2013 [accessed August 7, 2013]; Digital Atlas of Idaho 2013 [accessed August 7, 2013]). In Idaho, the species occurs in the northern and central parts of the state.

Environmental Consequences – Direct and Indirect Effects

Alternative 1 (No Action)

Under Alternative 1 (No Action), there would be no rehabilitation of the Crooked River Meanders. As a result, there would be no direct or indirect effects to fisher or their habitat. It is determined that there would be *No Impact* to fisher or their habitat under Alternative 1.

Alternative 2

Displacement effects would occur under the action alternative (Alternative 2) during implementation. Indirect effects would be limited to noise associated with project activities if individuals are within the area at the time of work.

Alternative 2 would improve cover and diversity in the floodplain along the Crooked River. This would improve habitat (cover and forage) for fisher and their prey species.

Determination of effects on fisher is *May impact individuals or habitat but not likely to cause trend toward federal listing or reduce viability for the population or species* under the action alternative.

Management Indicator Species

Management indicator species were designated for the Nez Perce National Forest in the 1987 Forest Plan (USDA Forest Service 1987a).

Elk

Affected Environment

Elk tend to inhabit open grasslands, brush fields, and riparian areas for foraging and dense forested areas for cover.

The project area is located in Game Management Unit (GMU) 15. Elk populations in this GMU are near or above objectives, with cow numbers being stable or slightly increasing and bull numbers increasing (Rachael 2011).

Hunting pressure in Crooked River is estimated as moderate to high. Forage is mainly in open old harvest units, open coniferous forests, and shrublands and comprises about 20% of the project area. Vegetation management activities (primarily timber harvest with associated road development) have changed summer habitat quality and distribution.

Elk summer habitat was analyzed using the Guidelines for Evaluating and Managing Summer Elk Habitat in Northern Idaho (Leege 1984). The project area contains all or portions of three elk analysis units that have been assigned a 50% effectiveness habitat objective. The Center Star (61%) and Wheeler (51%) elk units are above Forest Plan objectives and Deadwood (46%) is below.

Elk are known to occur in the project area.

Elk are secure (G5/S5-rating of species status) in Idaho and across their range (NatureServe 2013 [accessed August 7, 2013]; Digital Atlas of Idaho 2013 [accessed August 7, 2013]).

Environmental Consequences – Direct and Indirect Effects

Alternative 1 (No Action)

Under Alternative 1 (No Action), there would be no rehabilitation of the Crooked River Meanders. As a result, there would be no direct or indirect effects to elk or their habitat.

Alternative 2

Alternative 2 would improve cover and forage habitat for elk by improving vegetation and diversity to the floodplain along Crooked River.

Elk could be subject to short-term disturbance effects under Alternative 2. Short-term indirect effects would be limited to displacement from noise associated with project activities if individuals are within the area at the time of work.

Alternative 2 would not change existing elk habitat effectiveness levels for any elk units.

Moose

Affected Environment

Moose are very dependent during the winter upon old-growth grand fir forest types with an understory of Pacific yew. The analysis area for moose is the project area. In Idaho, moose occur mainly in mountainous conifer forest. Forest vegetative types used by moose include grand fir and subalpine fir. Winter habitat is the most limiting habitat component for moose. Winter range is characterized by double-canopy coniferous forests, which intercept significant amounts of snow and also provide palatable evergreen forage. Grand fir–Pacific yew habitats fit these criteria and are favored for winter foraging. The project area does not contain grand fir–Pacific yew communities; however, the project area is used by moose.

No population data for moose have been collected on a regular basis in the region. Some populations appear to be increasing and seem to respond favorably to extensive habitat alteration by silvicultural practices. However, other populations may be displaced or eliminated because they cannot adapt to habitat changes, particularly where yew thickets are eliminated through logging and where increased road densities make moose more vulnerable to harvest (Toweill 2011). Even though population levels and trends are unknown, moose populations are large enough to support hunting. Moose have been observed in the project area.

Moose are secure (G5/S5) in Idaho and across their range (NatureServe 2013 [accessed August 7, 2013]; [G5/S4] Digital Atlas of Idaho 2013 [accessed August 7, 2013]).

Environmental Consequences – Direct and Indirect Effects

Alternative 1 (No Action)

Under Alternative 1 (No Action), there would be no rehabilitation of the Crooked River Meanders. As a result, there would be no direct or indirect effects to moose or their habitat.

Alternative 2

Alternative 2 would improve cover and forage habitat for moose by adding vegetation and diversity to the floodplain along Crooked River. Figure 3-29 depicts the current vegetation communities along the Meanders and Figure 3-30 the proposed vegetation communities under Alternative 2. At least three larger ponds would remain that would continue to provide forage for moose. Swales and alcoves would be constructed that would also potentially provide forage areas. Adverse impacts to moose habitat would occur during construction and for a short-term post-implementation period until vegetation can become re-established.

Moose could be subject to short-term disturbance effects under Alternative 2. Short-term indirect effects would be limited to displacement from noise associated with project activities if individuals are within the area at the time of work.

Pine Marten

Affected Environment

The pine marten (also known as the American marten) was selected as a Nez Perce Forest MIS to represent trapped species and high-elevation old-growth forests. Marten inhabit dense, moist to wet coniferous forests that support abundant vole populations (Buskirk and Ruggiero 1994). They prefer higher-elevation, mature subalpine fir/Engelmann spruce forests with large woody debris, and well-developed canopy cover (Kujala 1993). Marten avoid openings greater than 150 feet from cover. Existing project area openings do not inhibit use of the area by marten.

Pine marten have not been observed in the project area, but they are suspected to occur in the vicinity of Road 522.

Pine marten are apparently secure (G5/S5) in Idaho and across their range (NatureServe 2013 [accessed August 7, 2013]; [G4/S4] Digital Atlas of Idaho 2013 [accessed August 7, 2013]). Samson (2006) showed that habitat on the Nez Perce National Forest is more than sufficient to contribute to a viable population of the marten at a regional scale.

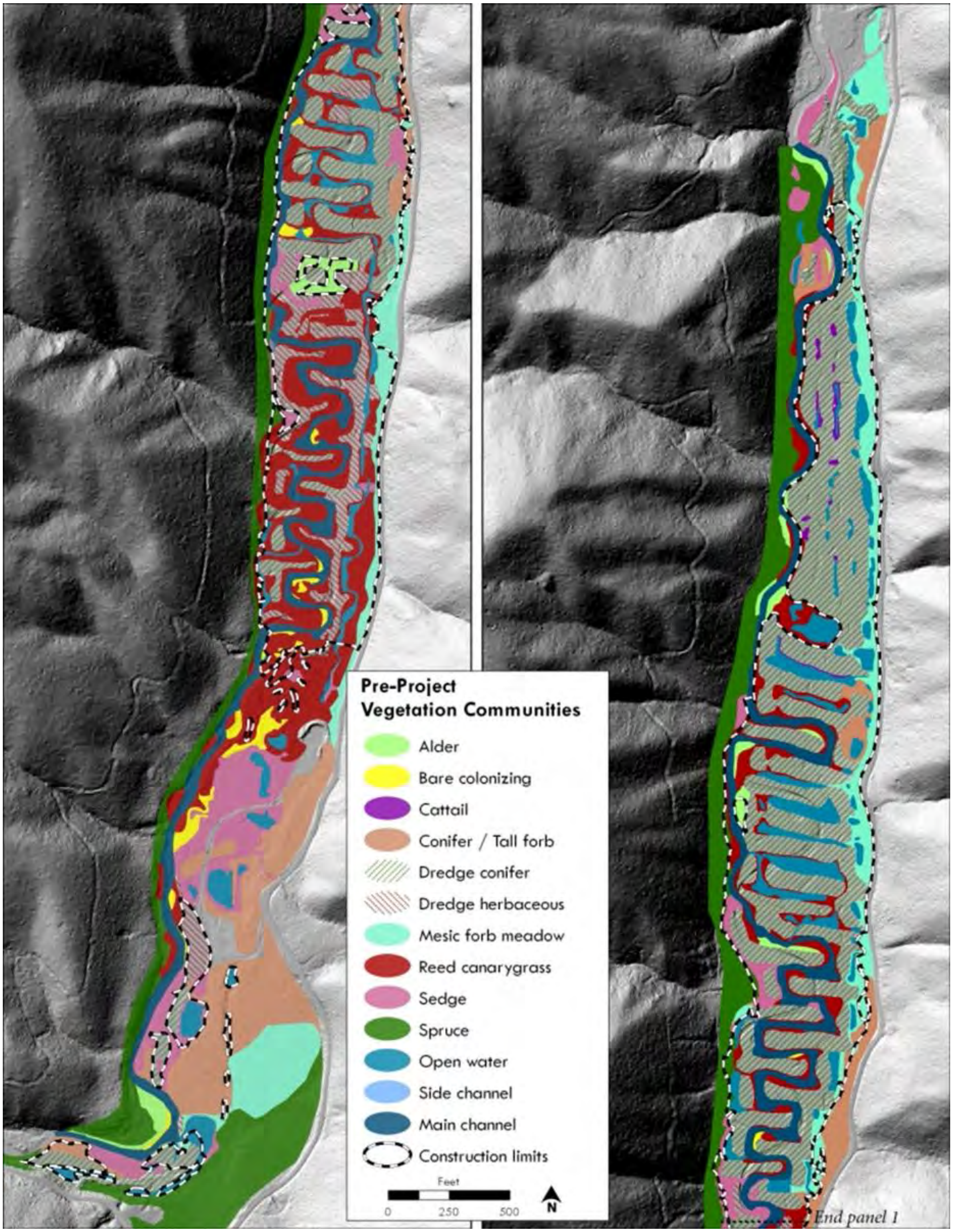


Figure 3-29. Current vegetation communities in Crooked River Meanders (RDG et al. 2013a, Figure 8-1).

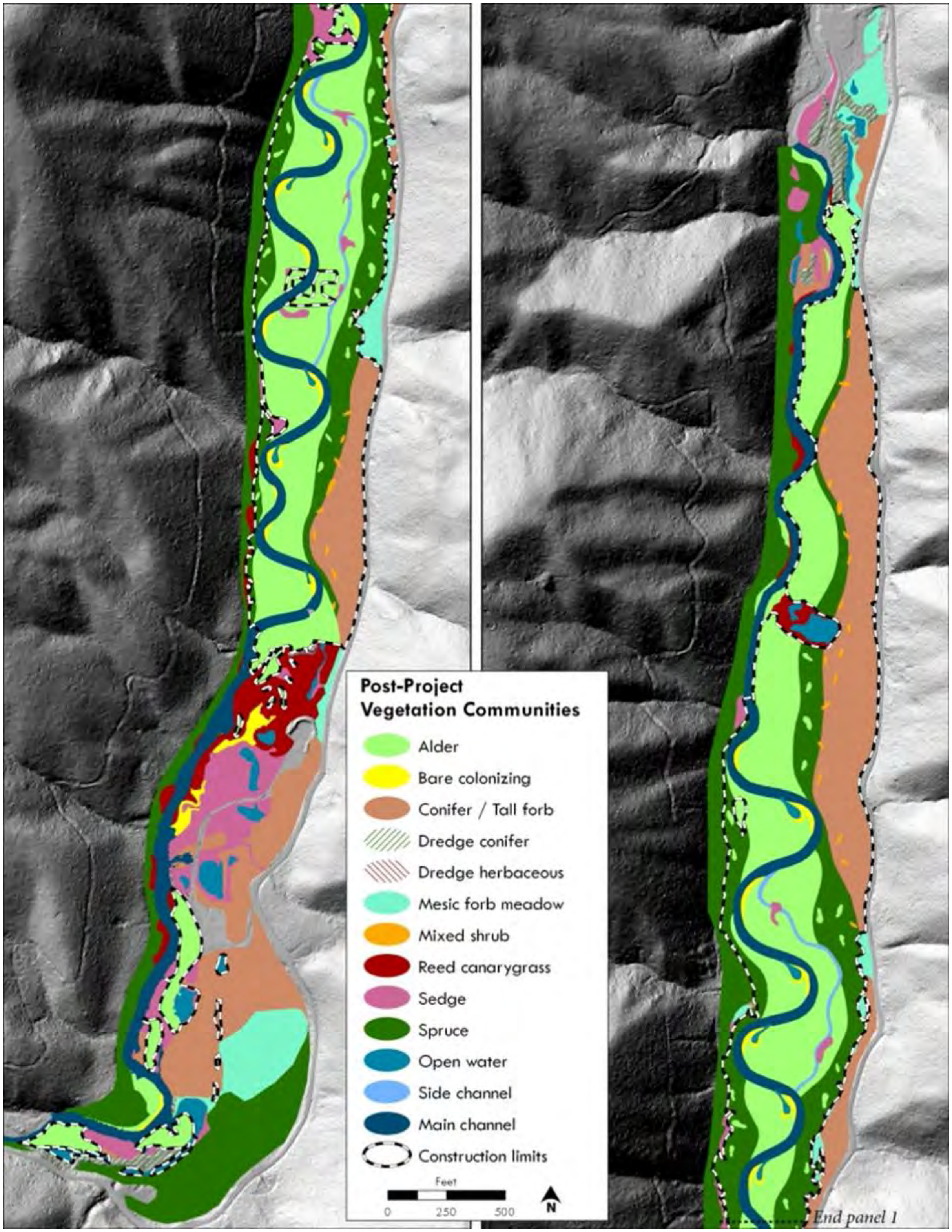


Figure 3-30. Proposed vegetation conditions in Crooked River Meanders, Alternative 2 (RDG et al. 2013a, Figure 8-2).

Environmental Consequences – Direct and Indirect Effects

Alternative 1 (No Action)

Under Alternative 1 (No Action), there would be no rehabilitation of the Crooked River Meanders. As a result, there would be no effects on marten or their habitat.

Alternative 2

Alternative 2 would improve cover and forage habitat for marten by adding vegetation and diversity to the floodplain along Crooked River.

Marten could be subject to short-term disturbance effects under Alternative 2. Short-term indirect effects would be limited to displacement from noise associated with project activities if individuals are within the area at the time of work.

Neotropical and other Migratory Birds

Affected Environment

Forest landbirds include all the avian species, sometimes collectively termed "neotropical migratory birds" and "resident songbirds." This group of birds is not treated separately by species, because they are an extremely diverse group of species, with widely disparate habitat requirements.

In 1988, an amendment to the Fish and Wildlife Conservation Act required the U.S. Fish and Wildlife Service (USFWS) to "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973." To carry out this mandate, the USFWS published "Birds of Conservation Concern 2002," which recommends that its lists be consulted in accordance with E.O. 13186. In addition, numerous birds are protected by Idaho Department of Fish and Game (IDFG) nongame status and the Migratory Bird Treaty Act. Currently, there are no Nez Perce Forest Plan standards specific to migratory birds.

The Migratory Bird Treaty Act covers many ground-nesting and shrub-nesting birds. Some migratory birds are covered by state hunting regulations; others are protected by non-game status by the IDFG. Neotropical migrant birds use coniferous forest habitats in the U.S. during the summer breeding season but migrate to southern latitudes to spend winters in habitats as far south as Mexico and South America. Tropical deforestation and other environmental effects related to bird wintering grounds are thought largely responsible for declines in some neotropical migrant bird populations.

The Crooked River valley bottom was dredge mined with a bucket dredge from the 1930s through the 1950s, which left large tailings piles and ponds. Mining waste (also referred to as tailings piles) is concentrated around the stream corridor, altering the physical, hydrologic and geomorphic conditions of the stream system, delivering sediment to the stream during both low- and high-flow conditions, restricting the natural pattern of stream migration and other changes in channel morphology (channel size, form, and function), and inhibiting the recolonization of native riparian vegetation.

The project area provides habitat primarily for riparian associated species. Species associated with riparian vegetation include the rufous hummingbird, willow flycatcher, black-billed magpie, American dipper, yellow warbler, and MacGillivray's warbler.

Environmental Consequences – Direct and Indirect Effects

Neotropical and other migratory birds habitats found in the Crooked River Valley Restoration project area that are most vulnerable and may be impacted by project activities are those associated with riparian vegetation. There are currently no Forest Plan standards specific to migratory birds.

Alternative 1 (No Action)

Under Alternative 1 (No Action), there would be no rehabilitation of the Crooked River Meanders. This alternative would have no direct or indirect effects on migratory birds. However, the tailing piles would continue to provide less-than-desirable riparian breeding and foraging habitat.

Alternative 2

The tailing piles are considered less-than-desirable riparian habitat for neotropical and other migratory birds. Project activities associated with restoring the stream channel and floodplain could cause short-term disturbance and displacement effects. There is the potential for temporary loss of breeding sites with the removal of shrubs and trees during reshaping of the floodplain. However, there are several preserve areas that will not be disturbed and will be retained to provide nesting substrate for riparian-associated nesting birds.

Native plant species abundance, composition, and distribution would likely increase or improve above current levels due to restoration of the stream channel and riparian vegetation. Improved habitat or vegetative conditions include providing the vegetative structure, cover, and overall habitat quality for many riparian-associated bird species.

The long-term benefits include improved stream and floodplain conditions, thus improving nesting and foraging habitat for riparian-associated bird species. Re-vegetating the floodplain with native vegetation and maintaining for several years after project completion through replanting and protection from browsing will improve foraging and nesting habitat for neotropical migratory birds as well.

Cumulative Effects

Geographic Boundary

The area of consideration for cumulative effects includes lands within the entire project area, those areas of disturbance associated with the proposed action and with the proposed Crooked River Narrows Road Improvement project (segments of Roads 233 and 522). The rationale for this analysis area is that the effects are site specific to areas treated within the project area and would not extend beyond the boundaries, and effects from outside the defined area would likewise not affect the resource within.

Time Frame

These effects are considered only for the species potentially affected by this project from the initial habitat transformations in the early 1900s through the present, including this project and reasonably foreseeable future actions. The timeframe for the cumulative effects assessment is the duration of project activities and approximately 10–20 years after the completion of project activities (which is the amount of time expected for the riparian vegetation to become mature). This is the length of time for the alder and conifer communities to provide shade and to have a stable, functioning wetland/floodplain that provides for wildlife and their habitat.

Past, Present, and Foreseeable Future Actions

The primary management activities that have influenced wildlife habitat in the Crooked River Valley Rehabilitation area include past timber harvest and supporting road construction and mining. These activities have been extensive in the past and have resulted in much more open, transitory habitats than likely existed historically. Overall trends of harvest activity have been downward in recent years with a corresponding decline in initiation of early seral conditions, although open conditions continue to be extensive. Refer to Appendix C for a complete list and details of past, present, and foreseeable future actions that are considered in this analysis. Ongoing and foreseeable actions within the proposed activity areas consist of recreation, road maintenance, fire suppression, fuels management, mining, watershed restoration, and weed treatments.

Alternative 1 (No Action)

The No Action alternative (Alternative 1) would produce no additional effects to wildlife or their habitat, as compared to past activity levels. Alternative 1 would have no direct or indirect effects and therefore no cumulative effects on wildlife or their habitat. Existing vegetation would not be altered nor would these species be disturbed or displaced.

Alternative 2

Alternative 2 and the proposed Crooked River Narrows Road Improvement project would add short-term disturbance effects to this landscape through associated stream restoration, road construction, and road decommissioning activities. The construction and removal of roads may impact existing occurrences of wildlife species or habitats that are found in the immediate vicinity of the project.

Motorized recreation and dispersed-camping activities would change in the future, but the effects to wildlife and their habitats would be limited to designated existing routes and dispersed-camping areas following implementation of the Nez Perce National Forest Travel Management

Plan decision. Ongoing maintenance of these travel routes is considered routine and ongoing, with virtually no effects to the habitat through which they pass.

Currently there are numerous mineral claims in the project area (see Chapter 3, Mineral Resources). These activities typically occur in disturbed areas and may have some disturbance impacts to wildlife. There is one minerals plan of operation on file with the forest at this time for exploration activities from existing roads.

The Orogrande Community Protection project would modify wildlife habitats and cause disturbance effects. Activities associated with Orogrande project in the vicinity of the Crooked River Valley Rehabilitation project are designed to reduce fuels, primarily in the understory (prescribed burning and understory thinning). This would reduce understory cover (sapling and pole-sized trees and shrubs), yet at the same time improve forage for big game species.

Fire-suppression activities would be anticipated in the future in the project area, but the occurrence, extent, and/or intensity of suppression efforts cannot be estimated or predicted. As with all these activities, the effects to the species would likely be mixed.

Noxious weed treatments would occur in the project area under the current weed management plan in the future. Generally, spot applications should not affect any wildlife species of concern due to avoidance by spray crews. The risk associated with herbicide treatment is the potential that wildlife species, particularly amphibians, would accidentally be sprayed. The design criteria specified in Chapter 2 would provide adequate protection for wildlife species by minimizing the amount and type of herbicide to which amphibians could be exposed by restricting application methods and applying buffer distances along streams, ponds, and wetlands.

Habitat alterations and disturbance associated with the implementation of this project have the short-term potential to combine with ongoing and foreseeable actions within the proposed activity areas consisting of recreation, road maintenance, fire suppression, fuels management, mining, watershed restoration, and weed treatments. The action alternative would cumulatively add to the loss of some wildlife species habitats (ponds), but also provide a more natural functioning stream and floodplain and may even be beneficial for some of the wildlife species using this area (i.e., improved habitat). There would be no concerns for viability of these species because of the extent and long-term improvement of suitable wildlife habitats associated with improving the Crooked River valley bottom.

Determination of Effects

Effects on threatened, endangered, and sensitive wildlife species by management activities of this project and the proposed Crooked River Narrow Road Improvement project are summarized in Table 3-39. This table includes all wildlife species on the Nez Perce National Forest sensitive list. There is potential for impacts to western toads, gray wolves, harlequin ducks, and fisher. The proposed action would likely harm existing western toads, but would also create a more connected and natural functioning river valley bottom and disturb or displace western toads, wolves, harlequin ducks, and fisher. For these reasons and because only a low percentage of habitats would be disturbed, there would be no concerns for the overall species viability.

Based on short-term impacts resulting from the project, it is determined that the Crooked River Valley Rehabilitation project *may impact individuals, but would not lead to a trend toward federal listing or a loss of viability* for the western toad, gray wolf, harlequin duck, or fisher.

Table 3-39. Summary of effects on threatened and sensitive wildlife species.

Latin Name	Common Name	Category	Alternative 1	Alternative 2	Proposed Narrows Road Improvement Project
Gulo gulo	Wolverine	P	NE	NLJCE	NLJCE
Lynx canadensis	Lynx	T	NE	NE	NE
Bufo boreas boreas	Western (boreal) toad	S	NI	MI	MI
Canis lupus	Gray wolf	S	NI	MI	MI
Corynorhinus townsendii	Townsend's big-eared bat	S	NI	NI	NI
Cypseloides niger	Black swift	S	NI	NI	NI
Diadophis punctatus	Ringneck snake	S	NI	NI	NI
Falco peregrinus anatum	Peregrine falcon	S	NI	NI	NI
Gavia immer	Common loon	S	NI	NI	NI
Haliaeetus leucocephalus	Bald eagle	S	NI	NI	NI
Histrionicus histrionicus	Harlequin duck	S	NI	MI	MI
Martes pennanti	Fisher	S	NI	MI	MI
Myotis evotis	Long-eared myotis	S	NI	NI	NI
Myotis volans	Long-logged myotis	S	NI	NI	NI
Myotis thysanodes	Fringed myotis	S	NI	NI	NI
Numenius americanus	Long-billed curlew	S	NI	NI	NI
Oreortyx pictus	Mountain quail	S	NI	NI	NI
Otus flammeolus	Flammulated owl	S	NI	NI	NI
Ovis canadensis	Bighorn sheep	S	NI	NI	NI
Picoides albolarvatus	White-headed woodpecker	S	NI	NI	NI
Picoides arcticus	Black-backed woodpecker	S	NI	NI	NI
Plethodon vandykei idahoensis	Coeur d'Alene salamander	S	NI	NI	NI
Sitta pygmaea	Pygmy nuthatch	S	NI	NI	NI

Threatened (T) Species Determination: NE = No Effect; **NLAA** = Not Likely to Adversely Affect; **LAA** = Likely to Adversely Affect; **NLJCE** = Not Likely to Jeopardize Continued Existence.
Proposed (P) Species Determination: **NE** = No Effect; **NLJCE** = Not Likely to Jeopardize Continued Existence; **LJCE** = Likely to Jeopardize Continued Existence
Sensitive (S) Species Determination: NI = No Impact; **BI** = Beneficial Impact; **MI** = May impact individuals or habitat but not likely to cause trend toward federal listing or reduce viability for the population or species; **LI** = Likely to impact individuals or habitat with the consequence that the action may contribute towards federal listing or result in reduced viability for the population or species.

Effectiveness of Mitigation

By applying design and mitigation measures 11, 45, and 52 (as described in Chapter 2, Design and Mitigation Measures), the effects to western toads, neotropical migratory birds, and their habitat would be reduced. Applying aquatic species salvage operations prior to construction and dewatering activities would reduce the amount of western toad mortality in the Meanders section of Crooked River.

Conducting construction/dewatering activities prior to the western toad and bird breeding cycle (April and May) or after July 1 may reduce the amount of western toad mortality and disturbance/displacement impacts to neotropical migratory birds in the Meanders section of Crooked River.

In response to the introduction and spread of noxious weeds, actions would be taken to restore vegetative conditions along Crooked River. These actions would also improve habitat for wildlife species by applying design and mitigation measures 9, 10, 18, 22, and 24–31 (see Chapter 2, Design and Mitigation Measures).

Regulatory Framework

The principal policy document relevant to wildlife management on the Nez Perce National Forest is the 1987 Nez Perce National Forest Plan (Forest Plan), which contains goals, objectives, standards, and guidelines for management of wildlife species and habitats on the Forest. Forest Plan goals (USDA Forest Service 1987a, pp. II-1 and -2) addressing wildlife and wildlife habitats are summarized below:

- Provide and maintain a diversity and quality of habitat to support viable populations of native and desirable non-native wildlife species.
- Provide habitat to contribute to the recovery of Threatened and Endangered plant and animal species in accordance with approved recovery plans. Provide habitat to ensure the viability of those species identified as sensitive.
- Recognize and promote the intrinsic ecological and economic value of wildlife and wildlife habitats. Provide high-quality and quantity of wildlife habitat to ensure diversified recreational use and public satisfaction.
- Protect or enhance riparian-dependent resources.

Forest Service Manual 2670 (file code for threatened and endangered species) directs that all federal departments and agencies shall seek to conserve endangered and threatened species and shall utilize their authorities in furtherance of the Endangered Species Act and to avoid actions that may cause a species to become threatened or endangered. FSM 2670 also calls for the Forest Service to maintain viable populations of all native and desirable non-native wildlife, fish, and plant species in habitats distributed throughout their geographic range on system lands.

The three principal laws relevant to wildlife management on lands managed by the Forest Service are the Endangered Species Act of 1973, the National Forest Management Act of 1976 and its implementing regulations at 36 CFR 219, and NEPA. Regulations promulgated subsequent to passage of these laws require the Forest Service to maintain viable populations of all native and desirable non-native wildlife species with emphasis on assuring that federally listed (threatened and endangered) species populations are allowed to recover (36 CFR 219.9). Regional Foresters provide a list of sensitive species for each Forest. Forests are required to assure that sensitive species populations do not decline or trend towards listing under the Endangered Species Act (FSM 2670.22).

This analysis incorporates the effects on terrestrial sensitive species (i.e., Biological Evaluation), per direction pertaining to streamlining (USDA Forest Service 1995a). The streamlined process for doing biological evaluations for sensitive species focuses on two areas:

- Incorporating the effects on sensitive species into the NEPA document
- Summarizing the conclusions of effects of the biological evaluations for sensitive species (Appendix A).

Executive Order (E.O.) 13186, "Responsibilities of Federal Agencies to Protect Migratory Birds," (January 10, 2001) pertains to conservation of migratory birds. A Memorandum of Understanding to carry out the mandate of the E.O. was signed by the U.S. Forest Service and the U.S. Fish and Wildlife Service on January 7, 2001. In 1988, an amendment to the Fish and Wildlife Conservation Act required the U.S. Fish and Wildlife Service to "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973." To carry out this mandate, the U.S. Fish and Wildlife Service published "Birds of Conservation Concern 2002," which recommends that its lists be consulted in accordance with E.O. 13186. In addition, numerous birds are protected by Idaho Department of Fish and Game nongame status and the Migratory Bird Treaty Act. Currently, there are no Nez Perce Forest Plan standards specific to migratory birds.

Consistency with Forest Plan and Environmental Laws

Threatened and Endangered Species – Federal agencies are required to address effects to threatened, endangered, and proposed species during project planning (Endangered Species Act of 1973 as amended, P.L. 96-1591531(c)). This analysis incorporates the effects on terrestrial threatened and endangered species (i.e., Biological Evaluation), per direction pertaining to streamlining (USDA Forest Service 1995a). This project is in compliance with the Endangered Species Act.

Sensitive Species – Sensitive wildlife species are those that show evidence of a current or predicted downward trend in population numbers or habitat suitability that would substantially reduce species distribution. Federal laws and direction applicable to sensitive species include the

National Forest Management Act (NFMA 1976) and Forest Service Manual 2670.22. The Nez Perce Forest has standards to conduct analyses to review programs and activities to determine their potential effect on sensitive species and to prepare biological evaluations. The Forest Service is bound by federal statutes (Endangered Species Act, National Forest Management Act), regulation (USDA 9500-4), and agency policy (FSM 2670) to conserve biological diversity on National Forest System lands and assure that sensitive species populations do not decline or trend toward listing under the Endangered Species Act. A biological evaluation for sensitive species has been prepared. The action alternative would not affect sensitive species viability on Nez Perce National Forest lands, nor would it cause sensitive species to become federally listed as threatened or endangered. This project is in compliance with sensitive species direction. This analysis incorporates the effects on terrestrial threatened and endangered species (i.e., Biological Evaluation), per direction pertaining to streamlining (USDA Forest Service 1995a). This project is in compliance with the Endangered Species Act.

Species Viability – The action alternative—in combination with, and within the context of past, present, and reasonably foreseeable future management actions in the analysis area—would not affect population viability or distribution of native and desired nonnative vertebrate species on the Forest. This project is in compliance.

National Forest Management Act – The National Forest Management Act requires (among other things) the Forest Service to "preserve and enhance the diversity of plant and animal communities."

The Endangered Species Act of 1973, National Forest Management Act of 1976, and Forest Service regulations require federal land managers to maintain viable populations of all native and desirable non-native wildlife species with special care taken to assure that federally listed (threatened and endangered) species populations are allowed to recover. There are no federally listed threatened or endangered species using the project area. The action alternative is in compliance with the National Forest Management Act (also see Sensitive Species and Species Viability in this section).

Neotropical Migratory Bird Laws – Migratory Bird Treaty Act (MBTA) and Migratory Bird Conservation Executive Order 13186 (dated January 10, 2001) – The action alternative is in compliance with the MBTA and Executive Order 13186, which authorizes activities including habitat protection, restoration, enhancement, necessary modification, and implementation of actions that benefit priority migratory bird species (Memorandum of Understanding Between USDA Forest Service and USDI Fish & Wildlife Service – 01-MU-11130117-028).

Nez Perce Forest Plan – As stated under Regulatory Framework, the objective for managing sensitive species is to ensure population viability throughout their range on National Forest lands and to ensure that they do not become federally listed as threatened or endangered. The Forest Plan supports this direction but does not set specific standards and guides for sensitive species.

Proposed activities are consistent with this direction to the extent that proposed management actions do not adversely affect viability of existing sensitive wildlife populations.

Applicable standards of the Nez Perce Forest Plan associated with the management of wildlife and key habitats of threatened, endangered, sensitive, and management indicator species have been reviewed and are being met, and in some instances, exceeded.

The Crooked River Valley Rehabilitation project would be consistent with Forest Plan wildlife standards (USDA Forest Service 1987a). The project would not lead to a loss of viability of existing native and desirable non-native vertebrate wildlife species. A biological evaluation has been prepared in compliance with sub-section 7(a)(2) of the Endangered Species Act. Government-to-Government consultation has occurred for this project, and the Forest continues to recognize the fishing and hunting rights guaranteed to the Nez Perce Tribe. The Forest has coordinated with the Idaho Department of Fish and Game (IDFG) to achieve mutual goals for fish and wildlife, including use of the IDFG Idaho Fish and Wildlife Information System for habitat and species observation/distribution information for this project. The *Guidelines for Evaluating and Managing Summer Elk Habitat in Northern Idaho* (Leege 1984) was used to assess the attainment of summer elk habitat objectives for this project.

Regarding Forest Plan management area standards, streamside vegetation canopy, structure, composition and diversity are currently lacking along the Meanders section of the Crooked River Valley Rehabilitation project (Alternative 1). Alternative 2 would implement habitat improvements to move the area toward stated objectives.

The project would also comply with PACFISH (USDA Forest Service 1995b) standards and guidelines applicable to this project. Riparian Management Objectives would be maintained and enhanced by the action alternative.

Full details on consistency of the project with the Forest Plan are located in the project record.

Rare Plants

Affected Environment

The Crooked River Valley Rehabilitation project has the potential to affect rare plant species and their habitats. This section provides an analysis of rare plant species potentially present in the project area and the effects proposed activities may have on them. For the purpose of this analysis, rare plant species include endangered, threatened, and sensitive plant species.

Geographic Scope

Project Area

Direct and indirect effects were analyzed for the project area for the restoration and improvement of 2.0 miles of the Crooked River Meanders.

Cumulative Effects Area

The area of consideration for cumulative effects includes lands associated with this project and the proposed Crooked River Narrows Road Improvement project and the Orogrande Community Protection project:

- Crooked River Meanders – 2.0 miles of stream and floodplain restoration and improvement
- Proposed Crooked River Narrows Road Improvement project – improvement of up to 4 miles of Road 233 or rerouting portions of Road 522 and decommissioning approximately 3.5 miles of Road 233 to foot trail.

The rationale for the selection of these analysis areas is that the effects are site specific to areas treated within the project area (as delineated in Chapter 2) and would not extend beyond the boundaries, and effects from outside the defined area would likewise not affect the resource within.

Methodology

Analysis included reviewing threatened, endangered, and sensitive species observation records and topographic and forest habitat maps to identify potential habitat for plants of concern. Individual species requirements were reviewed to determine which species or corresponding habitat would be expected to occur in the project area.

Vegetation information was identified in the project area in 2012 (RDG et al. 2012).

Direct and indirect effects are discussed for each species. Direct effects could result from road and stream alteration. Indirect effects for some species may include the expansion of weeds and the mitigating treatments of these infestations. Road improvements that are limited to the road prism would not have any direct or indirect effects on any species of concern. Cumulative effects are the overall effects to species from past, present, and reasonably foreseeable future projects. Historically such effects on individual species were not measured or noted. However, the past effects on general habitat condition can be qualified and matched to species dependent on a particular habitat.

Resource Indicators

- Qualitative discussion of habitat conditions and potential for effects.
- Effects determination to threatened, endangered, and sensitive plant species.

Existing Condition

Past land management activities, most importantly mining and road construction, have substantially affected the landscape in many parts of the watershed, as well as instream and riparian function in the main stem of Crooked River (Appendix C). Fire suppression, mining, road construction, and timber harvest have caused a shift in many of the natural processes in the watershed. The area surrounding Crooked River was mined for mineral resources from the 1900s through the 1950s. Mining waste (also referred to as mine tailings) is concentrated in the valley bottom, altering the physical condition of the stream system, restricting the natural migration pattern of the stream and other changes in channel morphology (channel size, form, and function), and impairing the recolonization of riparian vegetation and its function as a natural buffer. Road 233 is within the floodplain of Crooked River for approximately 3 miles through the “Narrows” and 1 additional mile to Relief Creek. The road often floods during high water events, constricts the river, and contributes sediment to Crooked River. These alterations have resulted in a reduced area of productive aquatic and terrestrial habitat.

Federally Listed Species

The U.S. Fish and Wildlife Service (USFWS) requires the Forest Service to analyze threatened species for which there may be suitable habitat in a project area. In Idaho County, the USFWS has indicated that there may be suitable habitat for Macfarlane’s four-o’clock (*Mirabilis macfarlanei*) and Spalding’s catchfly (*Silene spaldingii*). However, past assessments and direction provided by the USFWS indicate that habitat for these species is limited to the Salmon River basin on the Nez Perce – Clearwater National Forests. There are no occurrences or suitable habitat for any federally listed plant species in the Crooked River Valley Rehabilitation project area, which is in the Clearwater subbasin. These species will not be discussed further.

Water howellia is another listed threatened species. Even though water howellia is known to occur in Idaho, it does not occur in Idaho County and was not detected during rare plant surveys conducted on July 17, 2003. This species will not be discussed further.

Sensitive Species

The USFS Northern Region Sensitive Species List, which contains those species identified as sensitive by the Regional Forester, was last updated on February 2011 (USDA Forest Service 2011b). Idaho barren strawberry is the only rare plant species known or suspected to occur in the project area. Species not known or suspected to occur in the project area will not be discussed further. A complete list of the sensitive plant species for the Nez Perce – Clearwater National Forests can be found in Table 3-40.

Rare plant surveys were conducted in 2012 (RDG et al. 2012) and 2013 (Forest Service personnel) in the project area.

Idaho barren strawberry (Waldsteinia idahoensis)

Idaho barren strawberry has a wide ecological range (Crawford 1980), and is found predominantly in moister grand fir habitat types (cool and moist western red cedar) at mid-elevations (3,500–5,500 feet). Cool, moist micro sites within these general habitats are most favorable for its development (Crawford 1980). Idaho barren strawberry is tolerant of shade but responds favorably to increased light (Crawford 1980) and is also able to colonize disturbed soils (Lichthardt 1999). It can be found growing in stands with open canopies, and transition zones between riparian meadows and conifer forests.

Idaho barren strawberry is known to occur in the project area. Historical records show that Idaho barren strawberry occurs in and around Campground 4. Rare plant surveys conducted on July 2 and 17, 2013, found Idaho barren strawberry north of Campground 3. The area along the Meanders consists of larger, loose cobble, which does not provide suitable habitat for Idaho barren strawberry. Idaho barren strawberry can be found along the Meanders where past activities have maintained a soil component.

Environmental Consequences

Direct and Indirect Effects

Alternative 1 (No Action)

Under Alternative 1 (No Action), there would be no rehabilitation of the Crooked River Meanders. This would have no effects on rare plant species or habitats. It is determined that there would be *No Impact* to sensitive plant species or their habitat with Alternative 1.

Alternative 2

Idaho barren strawberry (Waldsteinia idahoensis)

Idaho barren strawberry appears to be tolerant of disturbances. Population density was greater in open stands with past harvest and in old burns as compared to a more shaded closed conifer community (Crawford 1980). It is capable of colonizing disturbed soils (Lichthardt 1999).

Idaho barren strawberry occurs in and around the area of Campground 3 and 4 at the upper end of the Meanders. The staging of equipment at these sites would further compact soils than what they already are, creating less than ideal growing conditions for Idaho barren strawberry and other plant species. Root systems would have a hard time breaking through the compacted soils. Decompacting soils upon completion of the project would temporarily improve growing conditions for Idaho barren strawberry. Restoring the floodplain would create conditions that are too wet for Idaho barren strawberry. Determination of effects for the Idaho barren strawberry is *May impact individuals or habitat but not likely to cause trend toward federal listing or reduce viability for the population or species* under Alternative 2.

Cumulative Effects

Discussion of cumulative effects for rare plants is addressed through the general trend of the suitable habitat required by these species as a result of past, present, and future management actions. It is generally not possible to directly quantify effects of specific activities that are several years or decades old on species of concern today. The status and occurrence of rare plants was completely unknown for much of the management history of the watershed. Historically, the changes in condition and abundance of specific habitats important to these species are also largely unknown. Therefore, the effects of these past projects can be qualified only through general discussions. However, the results of past projects contribute to the current condition, which can be used to discuss and quantify effects of proposed activities on rare plant species.

Geographic Boundary

The area of consideration for cumulative effects includes lands within the entire project area, those areas of disturbance associated with proposed action and with the proposed Crooked River Narrows Road Improvement project (segments of Roads 233 and 522). The rationale for the analysis area is that the effects are site specific to areas treated within the project area and would not extend beyond the boundaries, and effects from outside the defined area would likewise not affect the resource within.

Time Frame

These effects are considered only for the species potentially affected by this project from the initial habitat transformations in the early 1900s through the present, including this project and reasonably foreseeable future actions. The timeframe for the cumulative effects assessment is the duration of project activities and approximately 10–20 years after the completion of project activities (construction and planting). This is length of time for the alder and conifer communities to provide shade and to have a stable, functioning wetland/floodplain that provides for rare plants and their habitat.

Past, Present, and Foreseeable Future Actions

The primary management activities that have influenced rare plant habitat in the Crooked River Valley Rehabilitation area include past timber harvest and supporting road construction and mining. These activities have been extensive in the past and have resulted in much more open, transitory habitats than likely existed historically. The two plant species potentially impacted by this project would have seen habitats increased under this past management. Overall trends of harvest activity have been downward in recent years with a corresponding decline in initiation of early seral conditions, although open conditions continue to be extensive. Refer to Appendix C for a complete list and details of past, present, and foreseeable future actions. Ongoing and foreseeable actions within the proposed activity areas consist of recreation, road maintenance, fire suppression, fuels management, mining, watershed restoration, and weed treatments.

Alternative 1 (No Action)

The no action alternative (Alternative 1) would produce no direct or indirect effects on potential rare plant habitat, as compared to past activity levels. The progression of forest succession would improve habitat for most sensitive plant species; however, species favored by more open conditions would decline as general forest succession progressed absent of large-scale disturbance such as wildfire. Thus, there would be no cumulative impacts on potential rare plant habitat.

Alternative 2

The action alternative (Alternative 2) and the proposed Crooked River Narrow Road Improvement project would add similar short-term disturbance to this landscape through disturbance activities associated with stream restoration, road construction, and road decommissioning. The construction and removal of roads may impact existing occurrences that are found on the cut/fill slopes of the road corridor or in the open edge habitats adjacent to the road. While some plants may be lost, the activity would also provide soil scarification to benefit the continued existence of these species at these sites. This activity along with the past road building and harvest activities have combined to create extensive open and edge habitats throughout much of the Crooked River watershed. For the Idaho barren strawberry, the overall trend in suitable habitat available has been an increasing one as a result. While plants would likely be lost due to the mechanical actions, there would be no concerns for viability of the species because of the extent and long-term maintenance of suitable habitat.

Motorized recreation and dispersed-camping activities would change in the future, but the effects on soils would be limited to designated existing routes and dispersed-camping areas following implementation of the Nez Perce National Forest Travel Management Plan decision. Ongoing maintenance of these travel routes is considered routine with virtually no effects to the habitat through which they pass.

Currently, there are numerous mineral claims in the project area (see Chapter 3, Mineral Resources). These activities typically occur in disturbed areas that are not considered habitat for any of the sensitive plant species.

The Orogrande Community Protection project would maintain relatively open conditions, allowing sun to reach the soil and provide light disturbance to which these species potentially respond favorably. This activity would be expected to have the small but positive effect of promoting the maintenance of the suitable habitat for the Idaho barren strawberry in areas adjacent to the Crooked River Valley Rehabilitation project.

Fire-suppression activities would be anticipated in the project area in the future, but the occurrence, extent, and/ or intensity of suppression efforts cannot be estimated or predicted. As with all these activities, the effects to the species would likely be mixed.

Noxious weed treatments would occur periodically in the project area under the current weed management plan in the future. Generally, spot applications should not affect any species of concern due to avoidance by spray crews. However, in the case of the two species potentially affected by this project, some spraying may occur along occupied road corridors and impacts are possible.

Habitat alterations associated with the implementation of this project have the short-term potential to combine with ongoing and foreseeable actions within the proposed activity areas, including recreation, road maintenance, fire suppression, fuels management, mining, watershed restoration, and weed treatments. The action alternative would cumulatively add to the loss of sensitive species habitats along Crooked River by providing a more natural functioning stream and floodplain. There would be no concerns for viability of these species because of the extent of sensitive plant locations and suitable habitats within the Crooked River and Red River drainages.

Effectiveness of Mitigation

Actions taken to prevent the introduction and spread of noxious weeds in disturbed areas would be beneficial in maintaining and improving rare plant vegetative communities by reducing the incidence of introduced non-native and noxious weedy plant species. The following design and mitigation measures (as described in full in Chapter 2, Design and Mitigation Measures) are proposed for the action alternative: 9, 10, 17, 18, and 24–31.

Consistency with Forest Plan and Environmental Laws

Nez Perce National Forest Land and Resource Management Plan Direction

The Nez Perce Forest Plan states that no action will be taken that will jeopardize a threatened and/or endangered species (USDA Forest Service 1987a, page VI-12). The objective for managing sensitive species is to ensure population viability throughout their range on National Forest lands and to ensure that they do not become federally listed as threatened or endangered. The proposed action is consistent with this direction to the extent that proposed management actions would not adversely affect viability of existing sensitive plant populations or habitat. The Forest Plan does not set specific standards and guides for sensitive plants. Full details on consistency of the project with the Forest Plan are located in the project record.

Other Laws and Regulations

Threatened and endangered species are designated under the Endangered Species Act. It is the policy of Congress that all federal departments shall seek to conserve endangered and threatened species and shall utilize their authorities in furtherance of this purpose (ESA 1531.2b). The

Crooked River Valley Rehabilitation project area does not contain habitat or populations of threatened or endangered plant species.

Sensitive species are defined in the Forest Service Manual (FSM 2670.5) as “those plant and animal species identified by the Regional Forester for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers, density, or habitat capability that reduce a species/existing distribution.” In FSM 2670.22, management direction for sensitive species is in part, to ensure that species do not become threatened or endangered because of Forest Service actions and to maintain viable populations of all native species. The most recent update to the sensitive species list became effective in May 2011. The Forest Service must evaluate impacts to sensitive species through a biological evaluation (BE).

Effects Determinations

Determination of effects on rare plant species by management activities of this project are summarized in Table 3-40. This table includes all plant species on the Nez Perce National Forest sensitive list. There is potential for impacts on Idaho barren strawberry. The proposed action would likely harm existing plants, but would create or maintain open conditions along the road corridor that the species would find suitable. For this reason and because only a low percentage of habitat would disturbed, there would be no concerns for the overall viability of the species.

Table 3-40. Summary of effects on threatened and sensitive plant species.

Plant Species	Status	Known Occur-rence	Habitat Present	Effects Determination: Alt. 1 No Action	Effects Determination: Alt. 2 Proposed Action	Effects Determination: Proposed Narrows Road Improvement Project
Macfarlane's four-o'clock *Mirabilis macfarlanei*	T	No	No	NE	NE	NE
Spalding's catchfly *Silene spaldingii*	T	No	No	NE	NE	NE
Water howellia *Howellia aquatilis*	T	No	No	NE	NE	NE
Payson's milkvetch *Astragalus paysonii*	S	Yes	No – Meanders Yes – Narrows	NI	NI	MI
Deerfern *Blechnum spicant*	S	No	Yes	NI	NI	NI
Lance-leaf moonwort – *Botrychium lanceolatum var. lanceolatum*	S	No	No	NI	NI	NI
Linear-leaf moonwort *Botrychium lineare*	S	No	No	NI	NI	NI
Mingan moonwort *Botrychium minganense*	S	No	No	NI	NI	NI
Northern moonwort *Botrychium pinnatum*	S	No	No	NI	NI	NI
Least moonwort *Botrychium simplex*	S	No	No	NI	NI	NI
Leafless bug-on-a stick *Buxbaumia aphylla* (moss)	S	No	No	NI	NI	NI
Green bug-on-a-stick *Buxbaumia viridis* (moss)	S	No	No	NI	NI	NI
Broadfruit mariposa *Calochortus nitidus*	S	No	No	NI	NI	NI
Constance's bittercress *Cardamine constancei*	S	No	No	NI	NI	NI
Buxbaum's sedge *Carex buxbaumii*	S	No	No	NI	NI	NI
Many headed sedge *Carex sychnocephala*	S	No	No	NI	NI	NI
Pacific dogwood *Cornus nuttallii*	S	No	No	NI	NI	NI
Clustered lady's-slipper *Cypripedium fasciculatum*	S	No	Yes	NI	NI	NI
Dasynotus *Dasynotus daubenmirei*	S	No	No	NI	NI	NI
Idaho douglasia *Douglasia idahoensis*	S	No	No	NI	NI	NI
Giant helleborine *Epipactis gigantea*	S	No	No	NI	NI	NI

Plant Species	Status	Known Occur-rence	Habitat Present	Effects Determination		
				Alt. 1 No Action	Alt. 2 Proposed Action	Proposed Narrows Road Improvement Project
Puzzling halimolobos *Halimolobos perplexa var. perplexa*	S	No	No	NI	NI	NI
Light hookeria *Hookeria lucens*	S	No	No	NI	NI	NI
Spacious monkeyflower *Mimulus ampliatus*	S	No	No	NI	NI	NI
Thin sepal monkeyflower *Mimulus hymenophyllus*	S	No	No	NI	NI	NI
Gold-back fern – *Pentagramma triangularis spp. triangularis*	S	No	No	NI	NI	NI
Whitebark pine *Pinus albicaulis*	S	No	No	NI	NI	NI
Naked-stem rhizomnium *Rhizomnium nudum* (moss)	S	No	No	NI	NI	NI
Mendocino sphagnum *Sphagnum mendocinum* (moss)	S	No	No	NI	NI	NI
Evergreen kittentail *Synthyris platycarpa*	S	No	No	NI	NI	NI
Short style toefieldia *Triantha occidentalis ssp. brevistyla*	S	No	No	NI	NI	NI
Douglas clover *Trifolium douglasii*	S	No	No	NI	NI	NI
Plumed clover *Trifolium plumosum var. amplifolium*	S	No	No	NI	NI	NI
Idaho barren strawberry *Waldsteinia idahoensis*	S	Yes	Yes	NI	MI	MI

Threatened Species Determination: **NE =** No Effect; **NLAA** = Not Likely to Adversely Affect; **LAA** = Likely to Adversely Affect.

Sensitive Species Determination: NI = No Impact; **BI** = Beneficial Impact; **MI** = May impact individuals or habitat but not likely to cause trend toward federal listing or reduce viability for the population or species; **LI** = Likely to impact individuals or habitat with the consequence that the action may contribute towards federal listing or result in reduced viability for the population or species.

Invasive Plants

Scope of Analysis

This section considers the effects of the Crooked River Valley Rehabilitation project proposed action on invasive plants. The proposed activities that could affect vegetation conditions include removal of vegetative cover, construction activities, importing materials, and revegetation activities.

Invasive plant species are an important ecosystem attribute to consider when assessing potential impacts from the proposed action. Invasive plants, which include listed Idaho noxious weeds, have the potential to affect native species' richness and frequency, erosion rates, and ecological processes. Invasive plants can expand following human-caused or natural disturbances and colonize degraded as well as intact habitats. Many invasive plants found in the Intermountain West were accidentally or intentionally introduced into North America between the 1880s and 1920s. Without their natural predators and pathogens, invasive plant populations can expand.

The Red River Ranger District implements integrated invasive plant management strategies that deal with invasive plant infestations within the project area based on priorities outlined in the Annual Operating Plan for the Upper Clearwater River Weed Management Area, a community-based cooperative. The area generally has potential for invasive plant control work through the life of the proposed project.

Analysis Methods and Indicators

Invasive plant expansion and prevention in the project area is greatly influenced by habitat susceptibility, seed source, seed dispersal, and disturbance. Invasive plants could expand in the analysis area depending on the interaction of these four factors.

The indicators used for this analysis are:

- Susceptible habitat
- Weed expansion risk.

Data for this analysis comes from several sources, including past Forest Service weed inventories (USDA Forest Service 1998 to 2012), the *Design Criteria Report* (RDG et al. 2012), and personal knowledge.

Susceptible Habitats

Susceptibility refers to the vulnerability of plant communities to colonization and establishment of invasive plants. Invasive plants can be expected to colonize those sites or habitats that provide the necessary requirements to complete their life cycle. Those habitats that lack the necessary resources for specific invasive plants are not considered susceptible to colonization.

Under these conditions a site or habitat may be considered as having low susceptibility or may even be unavailable to weed colonization.

Susceptible habitats were identified in the action area using geographic information systems (GIS). A buffer was used around the Meanders in order to assess the maximum amount of area impacted by the action alternative. Habitats were classified as having low, moderate, or high susceptibility based on habitat type group (HTG) characteristics and known ability of invasive plants to colonize in these habitat types. Highly susceptible habitats can be colonized and dominated with invasive plants even in the absence of intense and frequent disturbance. HTGs with a low rating are only slightly susceptible to weed colonization.

Weed susceptibility is determined by HTGs (e.g., warm and dry with overstory species of Douglas-fir/grassland). Historically, the Crooked River Valley bottom was warm and moist with a late seral vegetation community of alder and fir spruce overstory. With the disturbance levels from past mining, the current site conditions are warm and dry (tailings piles are not inundated during seasonal flow events) with seral lodgepole pine and Douglas-fir as overstory species.

Habitats moderately susceptible to weed invasion provide site characteristics where species can invade the herbaceous layer and become a common element across the plant community in the absence of intense and frequent disturbance. Ground- and habitat-altering disturbances are important factors contributing to weed colonization within and adjacent to highly and moderately susceptible habitats.

Of the 10 vegetation community sites identified by River Design Group (2012), four were considered to represent disturbed plant communities; however, these four communities represent over 50% of the composition in the valley bottom. Disturbed community types were dredge conifer, dredge herbaceous, reed canary grass, and mesic forb meadow. These are also the community types that support the greatest amount of invasive species, such as oxeye daisy, hounds tongue, and spotted knapweed, and are currently the most susceptible to invasive plants, with the exception of the reed canary grass community.

Weed Expansion Risk

The risk of weed expansion in the analysis area was determined by assessing the following factors: (1) susceptibility of HTGs, (2) presence of weed infestations (seed source), (3) amount of fire and timber harvest over the past 10 years (site disturbance), and (4) density of roads (spread corridors). Risk was assigned a low, moderate, high, or extreme category. GIS was used to display and calculate acres for activities occurring in each risk zone. The analysis does not include reed canary grass. Table 3-41 displays the rationale for weed spread risk ratings.

Table 3-41. Rationale for weed spread risk ratings.

<table>
<tr><th rowspan="2">Habitat Susceptibility</th><th colspan="3">Spread Components</th></tr>
<tr><th>Seed Source</th><th>Spread Vector</th><th>Expansion Probability</th></tr>
<tr><th>Rating</th><th>Invasive Plants Present or Adjacent?</th><th>Existing Roads</th><th>Rating</th></tr>
<tr><td rowspan="12">High</td><td rowspan="6">Yes</td><td>High</td><td rowspan="2">Extreme</td></tr>
<tr><td>Moderate</td></tr>
<tr><td>Low</td><td rowspan="5">High</td></tr>
<tr><td>High</td></tr>
<tr><td>Moderate</td></tr>
<tr><td>Low</td></tr>
<tr><td rowspan="6">No</td><td>High</td></tr>
<tr><td>Moderate</td><td rowspan="4">Moderate</td></tr>
<tr><td>Low</td></tr>
<tr><td>High</td></tr>
<tr><td>Moderate</td></tr>
<tr><td>Low</td><td>Low</td></tr>
<tr><td rowspan="12">Moderate</td><td rowspan="6">Yes</td><td>High</td><td>High</td></tr>
<tr><td>Moderate</td><td rowspan="5">Moderate</td></tr>
<tr><td>Low</td></tr>
<tr><td>High</td></tr>
<tr><td>Moderate</td></tr>
<tr><td>Low</td></tr>
<tr><td rowspan="6">No</td><td>High</td><td>High</td></tr>
<tr><td>Moderate</td><td rowspan="3">Moderate</td></tr>
<tr><td>Low</td></tr>
<tr><td>High</td></tr>
<tr><td>Moderate</td><td rowspan="2">Low</td></tr>
<tr><td>Low</td></tr>
</table>

Affected Environment and Environmental Consequences

The analysis area has had high levels of past disturbance: the majority of the area has experienced mining (dredging) since the 1930s, and currently there is approximately 2.0 miles per square mile of roads within the Crooked River watershed. Within the greater context of the South Fork Clearwater River subbasin, noxious weeds and invasive plants occupy more than 30,000 acres, on approximately 6% of the subbasin (USDA Forest Service 1998). This includes species known to occur in the analysis area and species that currently do not occur in the analysis area. Spotted knapweed populations have heavily infested areas along the main road and trailhead/dispersed camp sites (spread vectors) within the project area. Reed canary grass has been found to be increasing in the central part of the project area along the main stream channel. Reed canary grass is not listed as a state noxious weed; however, it can easily dominate the wetter habitats and prevent desired native species from colonizing. Reed canary grass has an excellent stability rating. Common tansy and peavine have been found in several small sites.

These common tansy and perennial peavine sites were inventoried in 2012 and no plants were found on these sites, in the project area (Doyle 2012). Other weed species found in the Meanders area include hounds tongue and oxeye daisy. These species are primarily found on dredge tailings, roadsides, and other high-use disturbance areas.

Noxious weeds such as spotted knapweed are spread readily via seeds. Spotted knapweed seeds have an efficient dispersal mechanism. The seeds are capable of being carried several miles due to fine plumes acting like a parachute for the seed. Reed canary grass and common tansy spread rapidly with disturbance to root systems. Roads, as well as trails, are vectors spreading invasive plants within the analysis area. The complete length of the project area has a main corridor road.

Biological control methods have been used in/or near the analysis area. "Classical biological control is the introduction and establishment of carefully selected natural enemies to exert stress on a noxious weed which ultimately causes plant death or reduces the competitive ability of the invasive plants to a point where desirable plant species can out-compete them" (Jette et al. 1999). Bio-agent release sites of *Larinus minutus*, a seed head feeder, on spotted knapweed have been established within the South Fork Clearwater River drainage. These sites were established in the year 2000 and have not shown enough activity to make any determination of effectiveness (Winston 2012).

Weed Inventory Data

Our knowledge of weed populations in the project area is good: however, unknown weed populations may exist. Field surveys for invasive plants have been conducted in the Crooked River drainage for more than 14 years (USDA Forest Service 1998 to 2012). Known weed sites may change in weed density and site boundaries on an annual basis due to factors such as weather and effectiveness of ongoing treatments. Table 3-42 lists invasive plant species, and their acreages, that have been identified in the project area. Figure 3-31 displays known invasive plants, except reed canary grass, in the project area.

Table 3-42. Known acreages of invasive plant species in project area.

Invasive Plant Species	Area (acres)
Canada thistle	0.0
Common mullein	0.0
Common tansy	0.0
Perennial pea	<0.1
Spotted knapweed	55.3
Reed canary grass	28.0
Rush skeletonweed	<0.1

In summary:

- The project area is currently infested with invasive species, mostly spotted knapweed and reed canary grass.
- Knowledge of the extent of existing weed populations is good, due in part to good access from existing roads.

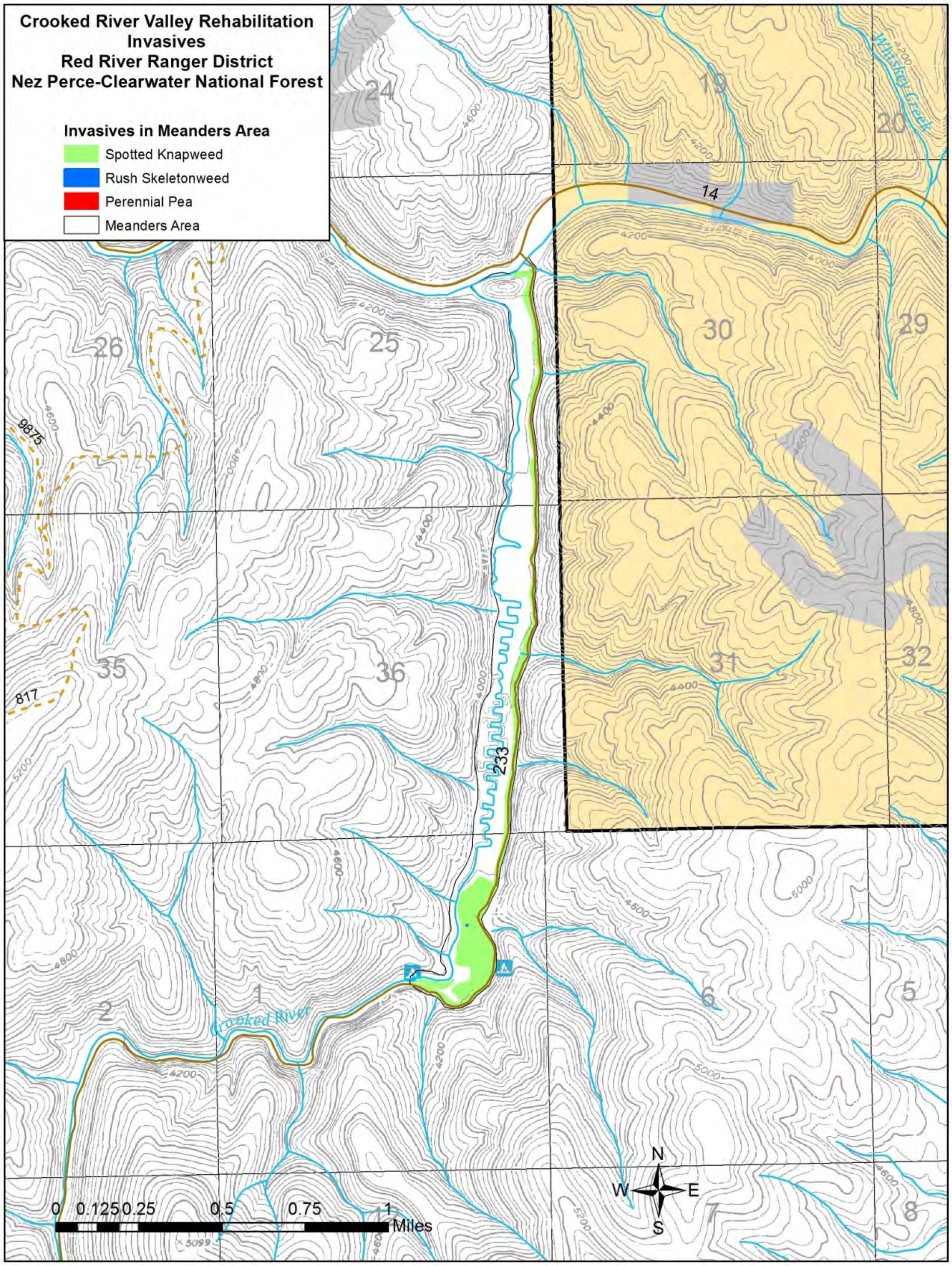


Figure 3-31. Known invasive plants (except reed canary grass) in project area.

- Most existing populations are associated with known disturbances such as dredge mining, roads, and camp sites.
- Past dredge mining and associated road construction have increased the risk of weed expansion in most of the project area.
- Reed canary grass often dominates the lower-gradient stream banks along Crooked River within the southern half of the Meanders area.

Habitat Susceptibility

Direct and Indirect Effects

Alternative 1 (No Action) would maintain the current management of invasive plant species. The Meanders area would continue to have habitat susceptibility as high (1 acre), moderate (54 acres), low (105 acres), and none (3 acres). Figure 3-32 displays habitat susceptibility to weed invasion under Alternative 1.

Alternative 2 (Proposed Action) would, in the short term, increase the levels of low to moderate habitat susceptibility with the implementation of ground-disturbing activities. Long term, habitat is expected to move toward a historic low susceptibility level as water levels rise and wetter, cooler habitats become established adjacent to Crooked River. Short term, levels of reed canary grass would most likely expand. Reestablishing native shrub and conifer cover would decrease levels of reed canary grass due to eventual increased shading from taller shrub and conifer species.

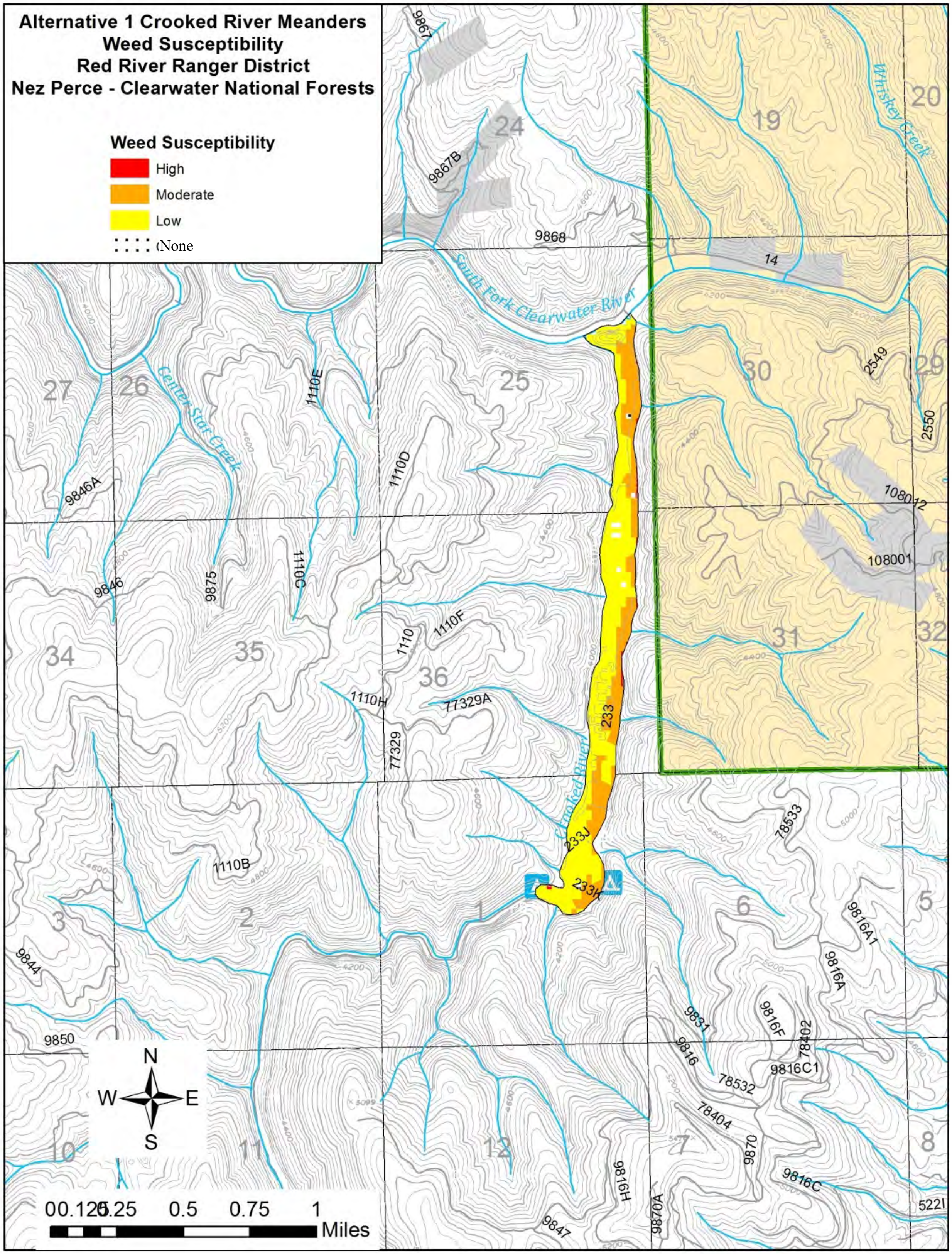


Figure 3-32. Meanders – habitat susceptibility to weed invasion, Alternative 1.

Weed Expansion Risk

Direct and Indirect Effects

The expansion risk of weed populations and introductions is low to moderate due to the generally wetter habitats. Most of the proposed activities are outside the high to extreme expansion risk sites.

While it is well known that the risk of weed invasion increases with disturbance and is variable depending on specific habitats and management activities, making exact determinations of weed response is difficult; consequently, the implementation of design and mitigation measures would minimize an increase in, if not decrease, weed expansion risk over time.

Alternative 1 (No Action) would maintain the current management of the invasive plant species. The Meanders area would continue to have weed risk as high (0 acres), moderate (21 acres), low (140 acres), and none (3 acres). Figure 3-33 displays weed expansion risk under Alternative 1.

Alternative 2 (Proposed Action) would, in the short term, increase the levels of low to moderate weed expansion with implementation of ground-disturbing activities. Long term, weed risk is expected to move toward a historic low level as weed treatments occur, water levels rise, and wetter and cooler habitats become established adjacent to Crooked River; however, in the short term, levels of reed canary grass would most likely expand. Reestablishing native shrub and conifer cover would decrease levels of reed canary grass due to the eventual increased shading from taller shrub and conifer species.

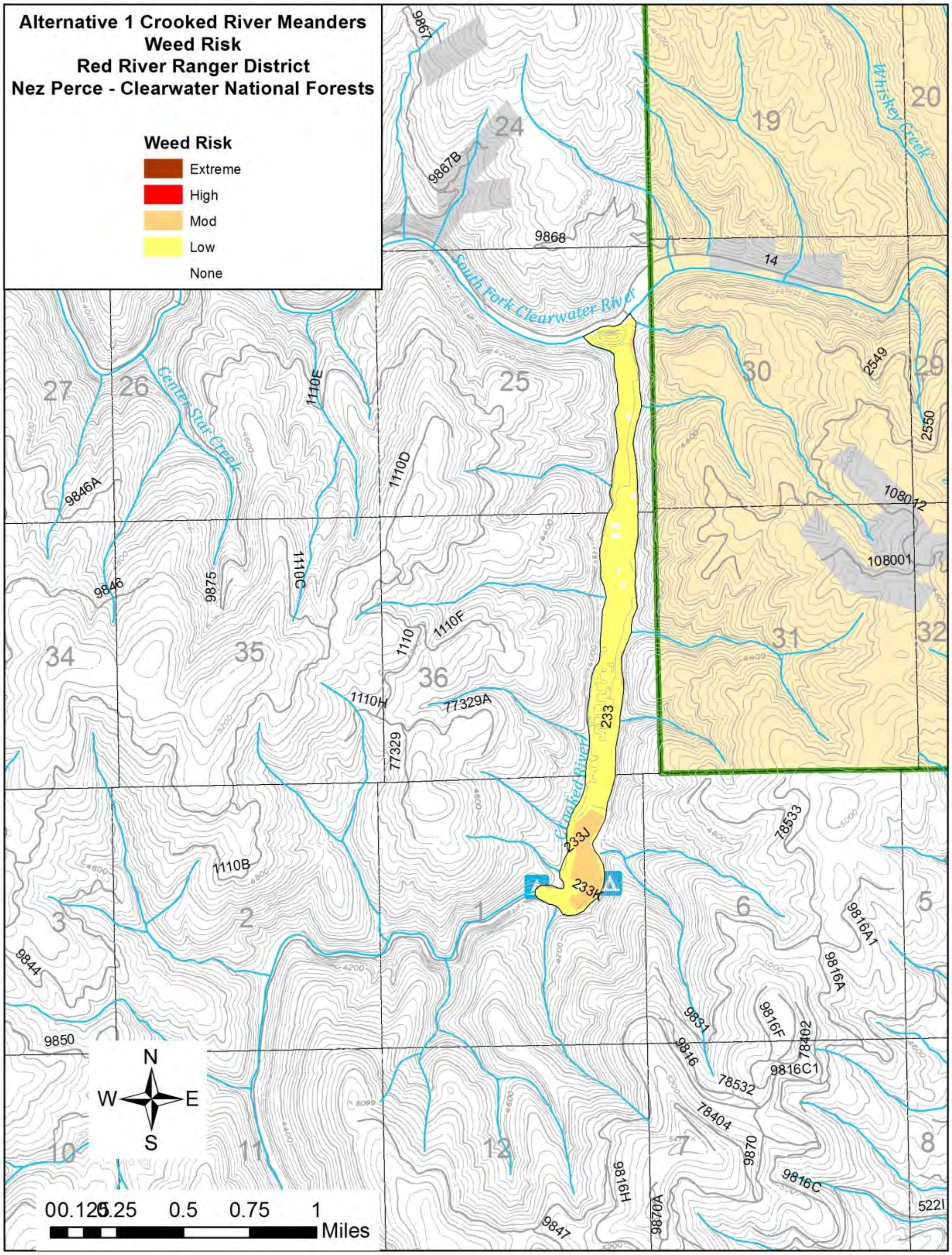


Figure 3-33. Meanders – weed expansion risk, Alternative 1.

Cumulative Effects

Time Frame

Past and present disturbances associated with vegetative treatments, added to reasonably foreseeable actions, would create over the next 10–15 years a cumulative threat of weed expansion through distribution of weed seed, ground disturbance, and creation of spread pathways. Management activities that disturb the ground aid establishment of invasive plants through increased niches or open areas that can be utilized. The risk of weed expansion would be reduced with the implementation of design criteria and mitigation under each action alternative as disturbed surfaces recover to native vegetation. Restoration of wetland habitats would reduce susceptibility and risk to new and or expansion weed populations.

Ongoing and Foreseeable Future Actions

Ongoing weed management would continue under either alternative. New invaders would be given the highest priority.

The Orogrande Community Protection project will increase weed spread risk through ground-disturbing activities such as burning.

The proposed Crooked River Narrows Road Improvement project would in the short term increase the levels of low to moderate habitat susceptibility and the levels of low to moderate weed expansion with the implementation of ground-disturbing activities. Over the long term, implementation of design criteria and mitigation measures would lower the habitat susceptibility and the risk of weed expansion to at least current levels.

In summary:

- Weed spread is likely under both alternatives, including No Action.
- Weed expansion risk is not expected to increase significantly from the proposed activities because of the currently highly disturbed nature of the river system, and long-term risk is already mostly moderate or lower in the project area.
- The extent of weed spread would be dependent on implementation and effectiveness of existing weed treatments, design criteria, and mitigation items.
- Reed canary grass would decrease over time with greater shade/competition from shrubs and conifers, and less disturbance from a restored stream channel.

Effectiveness of Mitigation

Design and mitigation measures 25–28 and 31 (as described in full in Chapter 2, Design and Mitigation Measures) are proposed for the action alternative to help prevent the spread of invasive and noxious weeds.

Consistency with Forest Plan and Environmental Laws

Forest Plan

The Forest Plan calls for the coordination of a weed control program with county, state, and other federal agencies. This directive is met through the participation of the Forest in the Annual Operating Plan for the Upper Clearwater Weed Management Area, a community-based cooperative. Both alternatives would be consistent with the Forest Plan standard for implementing a weed control program (USDA Forest Service 1987a, p. II-20). Full details on consistency of the project with the Forest Plan are located in the project record.

Other Laws and Regulations

Executive Order 13112 for Invasive Species, Section 2a(3), directs each affected federal agency to "not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determinations that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm would be taken in conjunction with the actions."

Analysis and evaluation of invasive plants in this project is based on direction contained in the Federal Noxious Weed Act of 1974 (as amended), Executive Order 13112 for Invasive Species, Forest Service policy (USDA Forest Service 1995c, 2001), and the Nez Perce National Forest Plan (USDA Forest Service 1987a, pp. II-7, II-20, II-26, III-6).

In general, the Forest is directed to implement an effective weed management program with the objectives of preventing the introduction and establishment of noxious weeds; containing and suppressing existing weed infestations; and cooperating with local, state, and other federal agencies in the management of noxious weeds.

The proposed action might cause the spread of invasive species in the Crooked River Valley Rehabilitation project area to some degree. However, this potential harm would be outweighed by the overall benefits to the watershed by the proposed treatments. Design criteria and mitigation measures would be implemented to minimize any harmful effects associated with the spread of invasive species. These measures are designed to meet the guidance of Executive Order 13112. With the project's alteration of the project area to a more fully functioning hydraulic condition, it is expected that non-native invasive plant species populations would decline over time.

Monitoring

Implementation Monitoring

Implementation monitoring would be conducted to ensure that design criteria are being implemented properly.

Monitoring would include the following:

1. Complete and document inspections for weed sources on equipment required to be cleaned according to forest standards (design and mitigation measures 26, 27, and 31).
2. Plant seed, straw and/or mulch would be certified as required and the results would be documented (design and mitigation measures 25 and 26).
3. District and Forest weed coordinators would ensure weed management follows Forest Standards and protocols (design and mitigation measure 28).
4. Sources for gravel, dirt, rock, and other material hauled for the project would be from weed-free sources (design and mitigation measures 26 and 27).
5. Inventory for new weed species (design and mitigation measure 28).

Effectiveness Monitoring

Effectiveness monitoring would be conducted to determine if design criteria achieve their desired objectives.

Monitoring would include the following:

1. Post management monitoring would determine changes in noxious weed populations and inventory for new weeds as a result of the project and guide future weed management actions (design and mitigation measure 28).
2. A documented increase in invasive weeds would trigger Integrated Weed Management (USDA Forest Service 2001; Forest Service Handbook 2080), development and implementation of a management plan, and adjustments of weed treatments as necessary following coordination with the District/Forest weed coordinators and the Central Idaho Level I Team (design and mitigation measure 28).

Recreation Resources

Scope of Analysis

This section considers the direct, indirect, and cumulative effects of the Crooked River Valley Rehabilitation project on recreation within and adjacent to the project area. Recreation along the Crooked River Road (Road 233) consists mostly of camping and fishing; the availability of campsites is the primary concern of forest visitors to this area.

Developed Recreation Sites

A developed recreation site is a discrete area on a Forest that provides recreation opportunities, receives recreational use, and requires a management investment to operate and/or maintain to standard under the direction of an administrative unit in the National Forest System.

Recreation sites range in development from relatively undeveloped areas, with little to no improvements (Development Scale 0 and 1), to concentrations of facilities and services evidencing a range of amenities and investment (Development Scale 2 through 5).

Dispersed Recreation Sites

Dispersed recreation sites are sites with little investment and are at Development Scale of 0 through 1. Sites were identified in accordance with Region 1 primitive sites resource condition survey methodology.

Groomed Snowmobile Trail System

Part of Road 233 and part of Deadwood Road (Road 1803) are on the Groomed Snowmobile Trail System and constitute an important segment of Idaho State Snowmobile Area 25B. Groomed snowmobile trails are shown in Figure 3-34.

Analysis Methods and Indicators

This analysis included review of Nez Perce National Forest Plan direction, GIS roads, trails, dispersed recreation and developed recreation map layers, and existing field conditions.

An inventory of dispersed recreational sites was completed by the Forest Service in 2009 and 2010 (Hammer 2009, 2010). This inventory identified the location of 18 dispersed recreational sites in the project area. Full details are in the project record.

The indicators used for each issue by alternative were:

- Indicator A – Impact on developed recreation (number of sites)
- Indicator B – Impact on dispersed recreation (number of sites)
- Indicator C – Fishing access to Crooked River.

Affected Environment and Environmental Consequences

Existing Condition

Recreation use along Crooked River is moderate with most use occurring during the summer and early fall. The Crooked River Road (Road 233) is a popular travel way for motorists on the "Gold Rush Loop Tour" traveling from Crooked River to Elk City via Penman Hill and Dixie. Winter use also occurs in the area, including snowmobiling on groomed snowmobile trail SNO-1083 located on Road 1803. Campers along Road 233 use these dispersed recreation sites to access Crooked River to fish and use the camp sites as a base camp to drive all-terrain vehicles or sport utility vehicles on the Gold Rush Loop Tour to Orogrande Summit, Wildhorse Lake, and into the hump corridor of the Gospel Hump Wilderness.

Developed Recreation

There are two developed recreation sites and one developed recreation loop tour in the project area (see Figure 3-34). Campground 4 is at the upper end of the project area and is a designated campground. Campground 3 is across Road 233 from Campground 4, and has a few dispersed campsites and a toilet. The Gold Rush loop tour follows Road 233 along the entire project area and identifies the interpretive sign for the Crooked River mill site at the mouth of the watershed.

Dispersed Recreation

There are currently 18 dispersed camping sites in the lower 2 valley miles of Crooked River (see Table 3-43, Figure 3-34). Many of these sites are grouped and are located off three main access routes from Road 233. Not all of the sites are likely to be used at the same time. Typically, recreationists who use dispersed sites will distance themselves from other campers. Therefore, only three or four of the dispersed sites would likely be used at any one time.

Table 3-43. Dispersed recreation sites in Meanders area.

Dispersed Site Number	Type of Dispersed Site
RR233RD-003	Camping
RR233RD-004a	Camping
RR233RD-004b	Camping
RR233RD-005	Camping
RR233RD-006	Camping
RR233JRD-001a	Camping
RR233JRD-001b	Camping
RR233JRD-001c	Camping
RR233JRD-001d	Camping
RR233JRD-001e	Camping
RR233JRD-001f	Camping
RR233JRD-001g	Camping
RR233JRD-001h	Camping
RR233JRD-001i	Camping
RR233JRD-001j	Camping
RR233KRD-001a	Camping
RR233KRD-001b	Camping
RR233KRD-001c	Camping
Total	**18 Camping Sites**

Fishing Access to Crooked River

Recreational fishing is a popular activity in Crooked River. Current access to fishing is by parking on Road 233 shoulders or driving to the 18 dispersed recreational sites and walking to the river.

Direct and Indirect Effects

Alternative 1 (No Action)

No direct or indirect effects would occur to existing developed or dispersed recreation sites. The existing access points would remain and the number of sites would not change. Fishing access to Crooked River would not change.

Alternative 2 (Proposed Action)

Short-term effects to developed and dispersed recreation sites would occur during the implementation of the project. Campgrounds 3 and 4 and 18 dispersed sites would be closed seasonally during construction of the proposed action (April through November), for up to 6 years.

Long term, the access points to the dispersed campsites in the lower 2 miles would remain the same under this alternative. New dispersed sites would not physically be created; however, the opportunity to camp within the same vicinity of the current dispersed camp sites would remain. There would be no changes to the developed camp sites under this alternative. There would be no long-term impacts to developed or dispersed recreation, as the proposed action would maintain campsites in the project area.

Short-term effects to fishing access to Crooked River would be similar to effects to dispersed recreational sites. Fish would be in the bypass channel, but the area closure would limit access in the short term. Long-term fishing access would be similar to the existing condition. Floodplain roughness may make access along Crooked River more difficult because of log placement in the floodplain, but access points to the river would remain the same.

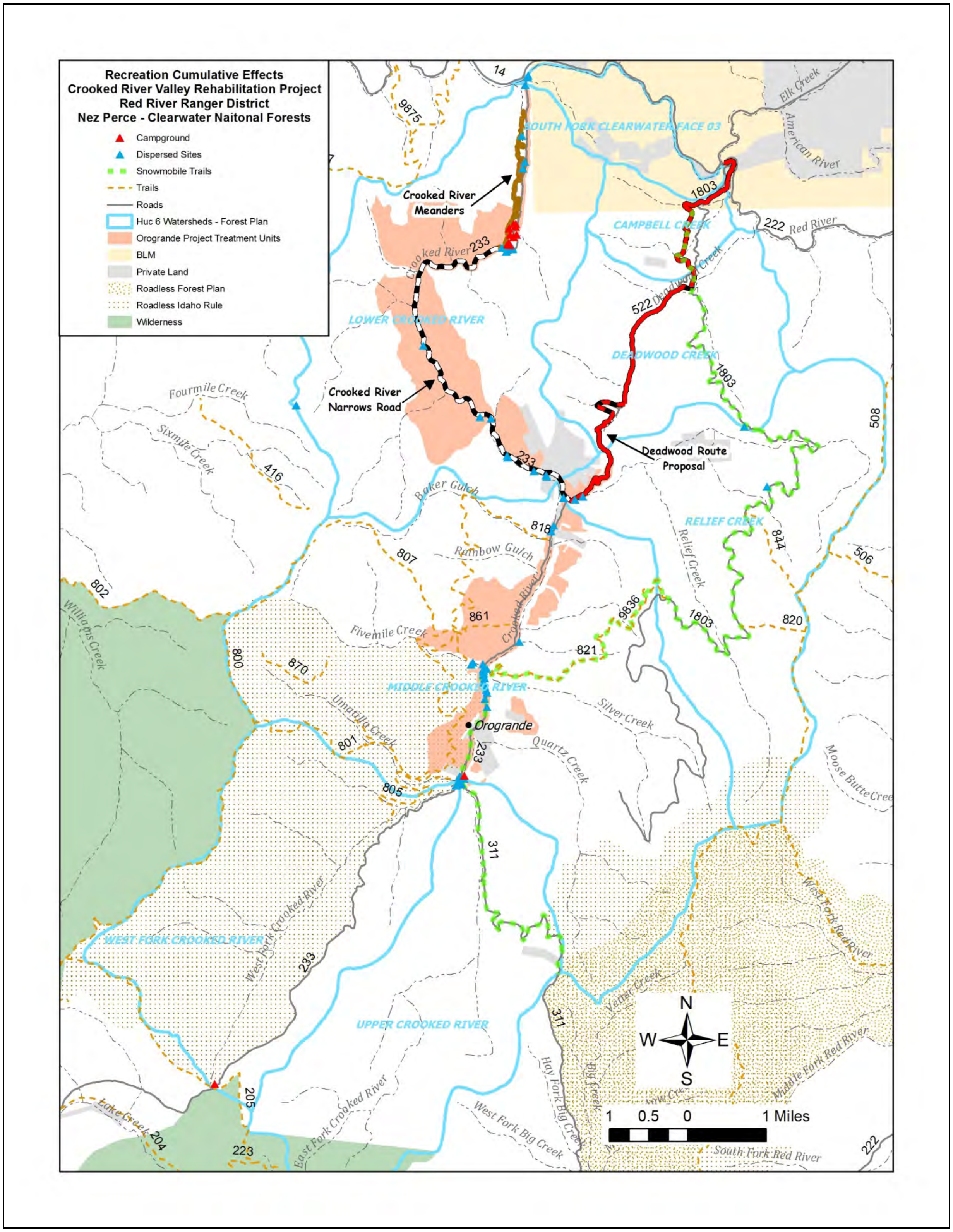


Figure 3-34. Developed and dispersed campsites, trails, and roads in project area and Crooked River watershed.

Cumulative Effects

The cumulative effects area includes the Crooked River watershed (Figure 3-34). The Orogrande Community Protection project overlaps and is adjacent to the Crooked River Valley Rehabilitation project area, and it is possible that the proposed action and the Orogrande project could be implemented concurrently, possibly affecting all developed and dispersed recreation in the Crooked River drainage. The proposed Crooked River Narrows Road Improvement project is upstream of the proposed action and would not occur at the same time. This would allow for camping in either the Narrows or Meanders during the estimated 10-year construction period. Table 3-44 lists dispersed recreation sites within the Orogrande Community Protection project area in addition to those listed in Table 3-43 in the Crooked River watershed (U.S. Forest Service 2013a draft).

Table 3-44. Dispersed sites in Orogrande Community Protection project area.[1]

Dispersed Campsite Number	Type of Dispersed Site
RD233DRD-001	Camping
RR233RD-014	Day use
RR233RD-015	Camping
RR233RD-016	Camping
RR233RD-017	**Camping**
RR233RD-018a	**Camping**
RR233RD-018b	**Camping**
RR233RD-018c	**Camping**
RR233RD-019	**Camping**
RR233RD-020	**Camping**
RR233RD-021	Camping
RR233RD-022	Trailhead
RR233RD-023	Camping
RR233RD-024	Camping
RR233RD-026	Camping
RD2003RD-001	Camping
RD2003RD-002	Camping
RR311RD-001a	Camping
RR311RD-001b	Camping
RR311RD-001c	Camping
RR311RD-002	Camping
RR9836RD-001a	**Camping**
RR9836RD-001b	**Camping**
RR9836RD-001c	**Camping**
RR9836RD-001d	**Camping**
RR9836RD-001e	**Camping**
RR9836RD-001f	**Camping**
RR9836RD-002	Camping
Totals	**1 Day Use; 26 Camping; 1 Trailhead**

[1]There are an additional 18 sites in the Crooked River Meanders project area (Table 3-43), and 12 sites in the Narrows Road Improvement project area. Sites in **boldface** (12) are within units proposed for treatment with the Orogrande Community Protection project.

Time Frame

The implementation period for the proposed action would overlap that of the Orogrande Community Protection project. The proposed action and the proposed Crooked River Narrows Road Improvement project, however, would not occur at the same time.

Past Actions

In the past, fire-suppression activities have included storage of hazardous fuels in dispersed sites for several years before being burned or disposed of as fire wood.

No Action (Alternative 1)

No direct or indirect effects would occur to existing recreation resources, developed recreation, dispersed recreation, or the groomed snowmobile trail system. Thus, there would be no cumulative impacts on recreation resources.

Proposed Action (Alternative 2)

Table 3-45 and Figure 3-34 display recreation resources in the Crooked River and Deadwood subwatersheds. The proposed action would impact three developed recreation sites and 18 dispersed recreation sites over a 6-year period. Design and mitigation measure 33 for Crooked River proposes a 1-year public notice before the Meanders area is closed to the public (18 dispersed sites, three developed sites).

The proposed action and the proposed Crooked River Narrows Road Improvement project could impact as many as three developed recreation sites and 30 dispersed recreation sites total; these projects, however, would not be implemented at the same time.

Implementation overlap of the proposed action and Orogrande Community Protection project could impact as many as nine developed recreation sites and 30 dispersed recreation sites.

There would be short-term effects but no long-term effects to fishing access to Crooked River under the proposed action. If the proposed action and the Orogrande Community Protection project are implemented concurrently, there would be additional short-term effects to fishing access to Crooked River if fuel-reduction activities restrict access to Crooked River.

If the Crooked River Valley Rehabilitation and the Orogrande Community Protection projects are implemented concurrently, the effects on dispersed and developed recreation sites would be the same as described above for the proposed action.

There would be no direct, indirect, or cumulative effects to the 2 miles of the groomed snowmobile trail on Forest Road 1803 during construction (seasonally for up to 2 years).

Table 3-45. Recreation resources in Crooked River and Deadwood subwatersheds.

Recreation Resource	Project Area		
	Proposed Action Meanders (Alternative 2)	Crooked River Narrows Road Improvement Project	Orogrande Community Protection Project
Developed Recreation Sites			
Gold Rush Loop Tour	X	X	X
Crooked River 3 Campground	X		X
Crooked River 4 Campground	X		X
Orogrande Airstrip			X
Jerry Walker Cabin			X
Fivemile Campground			X
Fivemile Fishing Pond			X
Orogrande 1			X
Orogrande 2			X
Total Developed Sites	**3**	**1**	**9**
Dispersed Recreation Sites			
Dispersed sites within Orogrande Community Protection project proposed units	5	8	12
Total Dispersed Sites	**18**	**12**	**58**
Snowmobile Trails			
Snowmobile Trails	0	Trail SNO #1803. 2 miles. No effect.	Trail SNO #311 – 16.5 mi Trail SNO #1803 – 11.5 mi Trail SNO #233 – 1.6 mi Trail SNO #9836 – 4.4 mi
Fishing Access to Crooked River			
Fishing Access to Crooked River	Short-term effect. No long-term effect.	Short-term effect. No long-term effect.	N/A

Effectiveness of Mitigation

Design and mitigation measures 33, 35, and 36 (see Chapter 2, Design and Mitigation Measures) would reduce the short-term effects to recreationists during project implementation. Notifying the public 1 year in advance that the Meanders area, including Campgrounds 3 and 4, would be closed to camping would allow for the public to find new camp sites. Keeping Road 233 open would allow for campers to find campsites in the upper watershed, outside of the project area. The proposed action would also maintain dispersed campsites in the Meanders upon completion of the project and would not impact the designated campgrounds upon completion of the project. This would allow recreationists who frequent the Meanders area to use the same or similar campsites upon completion of the project.

Consistency with Forest Plan and Environmental Laws

Nez Perce National Forest Land and Resource Management Plan Direction

The project would be consistent with Forest Plan recreation standards (USDA Forest Service 1987a, pp. II-15 and II-16 [forestwide] and pp. III-15 and III-16 [Management Area 7]). The project would follow the visual quality objectives (VQOs) established in the *American and Crooked River Project Record of Decision and FEIS* (USDA Forest Service 2005a). VQO retention in the foreground at Campground 3 and 4 would be met under Alternatives 1 or 2. The rest of the project area is considered VQO modification and would be met under Alternatives 1 or 2 (see Table 3-46). Current scenic integrity level (SIL) is very low. Full details on consistency of the project with the Forest Plan are located in the project record.

Alternatives 1 or 2 would not change recreation opportunities in the project area. Alternative 1 would not change the condition of existing developed or dispersed recreation sites. Alternative 2 would maintain the same number of dispersed recreation sites in the Meanders, some physical impacts at these sites would be treated, and the new floodplain would be planted with riparian and uplands species.

Alternative 2 would plant a variety of riparian and upland species adjacent to both developed and dispersed recreational sites. Figure 3-35 displays the Forest Plan's visual quality objectives for the project area and surrounding area.

Alternative 1 would not construct or maintain any new facilities. Alternative 2 would not change existing road and trail facilities.

Table 3-46. Summary of ROS classes, VQOs, and SILs by area.

Class/Objective/Level	Within Project Area?	Within Crooked River Drainage[1]
Recreation Opportunity Spectrum (ROS)		
Semi Primitive Motorized	No	13,893 acres
Semi Primitive Non-Motorized	No	9,355 acres
Roaded Natural	Yes	43 acres
	Total	23,290 acres
Visual Quality Objective (VQO) – Scenic Integrity Level (SIL)		
Retention – High	No	20 acres
Partial Retention – Moderate	Yes	3,507 acres
Modification – Low	Yes	7,210 acres
Maximum Modification – Very Low	Yes	12,550 acres
	Total	23,290 acres

1. From *American and Crooked River Project ROD and FEIS* (USDA Forest Service 2005a).

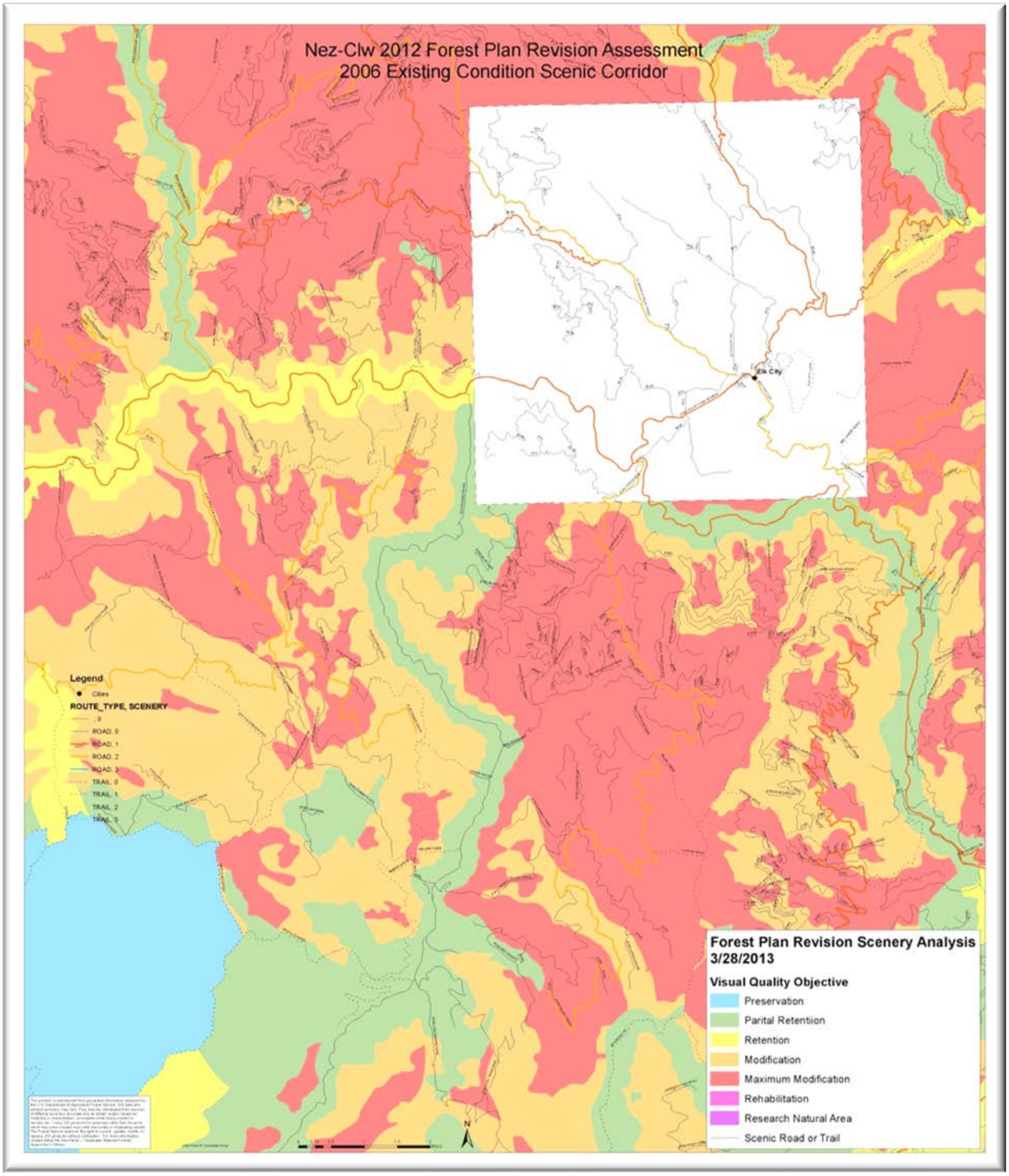


Figure 3-35. Visual quality objectives for project area and surrounding area.

Air Quality

Scope of Analysis

The direct, indirect, and cumulative effects analysis focuses on air quality within the project area and the airsheds—that is, the part of the atmosphere that behaves in a similar manner in the dispersion of emissions—that immediately surround the project area. The Crooked River and Deadwood watersheds lie totally within North Idaho Airshed 13. This airshed encompasses the area from the Idaho state boundary with Montana to the east, Oregon to the west, the North Fork Clearwater – Lochsa hydrologic divide to the north, and the Salmon River to the south.

Analysis Methods and Indicators

The indicator used for this resource was particulate matter.

A "Decision Analysis for Smoke Modeling" was used to select the level of analysis from any burning of slash piles that may occur (Story and Dzomba 2005). A threshold in this decision analysis for particulate matter emission is established at 100 tons/year. This threshold is based on the minimum increase required to establish the existence of a major source for non-compliance with National Ambient Air Quality Standards (NAAQS). Since neither of the alternatives in the analysis area approaches or exceeds 100 tons/year, no further analysis is required.

Affected Environment and Environmental Consequences

Airshed 13 has no nonattainment areas (areas exceeding U.S. EPA NAAQS). Air quality within the Crooked River area is considered good to excellent most of the year (NPCC 2005). Local adverse effects result from occasional wildfires during the summer and fall, and prescribed burning in the surrounding areas during spring and fall. Smoke from wildland and prescribed fires usually drifts eastward and eventually into Montana. Restrictions on prescribed burning in the Nez Perce National Forest have been imposed in the past because of adverse effects on air quality in parts of western Montana. Smoke produced by wildland and prescribed fires in upwind airsheds, including southern Idaho and eastern Oregon, has affected the air quality in the Crooked River area in the past.

Locally, all major canyons are subject to temperature inversions, which trap smoke and pollutants. Temperature inversions can occur anytime during the year, but are most common in the fall.

Based on fire history information, the range of natural variability in the analysis area probably ranged from very clear and clean during non-fire months (November to May) to hazy and smoky for extended periods during the fire months (June to October). Current air quality in the analysis area during non-fire months is probably close to the range of natural variability, while during the fire months, air quality is probably outside the natural range (i.e., clearer and cleaner), except when large wildland fires are burning in the vicinity. This is because under current policy, most wildland fires are suppressed, and therefore the amount of smoke has been greatly reduced from previous historical levels.

Direct and Indirect Effects

Alternative 1 (No Action) — No direct or indirect effects would occur on existing air quality conditions under this alternative. No particulate matter would be produced and visibility would not be impaired in any way.

Alternative 2 (Proposed Action) — Dust and vehicle emissions generated from road activities and increased vehicle traffic during project construction would temporarily affect air quality under the proposed action alternative. This alternative requires a greater amount of earthwork and could result in a longer duration of temporary air quality effects. These temporary impacts are not expected to violate any of the state standards. There would be no expected long-term effects on air quality due to this alternative.

Cumulative Effects

Consideration of cumulative effects for air quality differs from the considerations for other resource areas. Past activities in the analysis area are not considered, except when use of existing roads and facilities may contribute to dust levels. The focus of the cumulative effects analysis for air quality is the Crooked River and Deadwood watersheds.

The action alternative would have a minimal and short-term effect on air quality by increased dust and vehicle emissions generated from road activities and increased vehicle traffic during project construction. Current and future activities that could affect air quality in the Crooked River watershed and would have a cumulative impact include potential prescribed burning projects, including those outlined in the Orogrande Community Protection project and the American and Crooked River Project (see Appendix C). However, mitigation measures and procedures outlined in the North Idaho Smoke Management Memorandum of Agreement are intended to increase the efficiency and effectiveness of communications about, and coordination of, prescribed burning to avoid adverse cumulative effects. Present and future use of the analysis area and activities in the analysis area would not change the current assessment of good to excellent air quality, and therefore have no cumulative effect.

Effectiveness of Mitigation

To reduce potential impacts to air quality, mitigation measures #3, 22, and 51 would be implemented. These measures would reduce the amount of dust produced from driving on roads as well as potential smoke from burning wood chips.

Consistency with Forest Plan and Environmental Laws

Nez Perce National Forest Land and Resource Management Plan Direction

The project would comply with Nez Perce Forest Plan direction to cooperate with the Idaho Department of Environmental Quality and Environmental Protection Agency for the protection of air quality (USDA Forest Service 1987a, p. II-23). Forest Plan direction also dictates following the Clearwater and Nez Perce Fire Management Plan, which incorporates existing interagency plans and assessments. The Montana/Idaho Airshed group is composed of state, federal, tribal, and private member organizations who are dedicated to preserving the air quality of Idaho and Montana. The Montana/Idaho Airshed Group Operating Guide (Montana/Idaho Airshed Group 2010) is meant to provide accurate and reliable guidance to members of the Group and contains pertinent agreements, guidelines, deadlines, plan, and procedures inherent to successfully operating the Group smoke management program. The intent of the smoke management program is to minimize or prevent smoke impacts while using fire to accomplish land management objectives. The smoke management program is designed to help burners meet Idaho and Montana regulatory requirements. Full details on consistency of the project with the Forest Plan are located in the project record. The Nez Perce National Forest is a party to the North Idaho Smoke Management Memorandum of Agreement (MOA), which establishes procedures to regulate the amount of smoke produced by prescribed fire. This MOA is intended to increase the efficiency and effectiveness of communications about, and coordination of, prescribed fire to avoid adverse effects on air quality.

Clean Air Act

The Clean Air Act, passed in 1963 by the U.S. Congress and amended several times, is the primary legal instrument for air resource management. The Clean Air Act amendments of 1977 established a process that includes designation of Class I and II areas for air quality management. The primary differences between Class I and II areas are in the protection and processes provided in the 1977 amendments. Class I areas receive the highest levels of protection under the Prevention of Significant Deterioration program. This program regulates air quality in these areas through application of numerical criteria for specific pollutants and use of the Best Available Control Technology.

The Clean Air Act requires that the U.S. EPA identify pollutants that have adverse effects on public health and welfare and establish air quality standards for each pollutant. Each state is also required to develop an implementation plan to maintain air quality. The U.S. EPA has issued NAAQS for sulfur dioxide, carbon monoxide, ozone, nitrogen dioxide, lead, and particulate matter with a diameter of 10 microns or less (PM_{10}) and 2.5 microns or less ($PM_{2.5}$).

Idaho has similar standards for these pollutants. In general, concentrations of PM_{10} greater than 150 micrograms per cubic meter for longer than 24 hours, or greater than 50 micrograms per cubic meter as an annual arithmetic mean, are considered a hazard to public health and welfare.

Similarly, concentrations of $PM_{2.5}$ greater than 65 micrograms per cubic meter for longer than 24 hours, or greater than 15 micrograms per cubic meter as an annual arithmetic mean, are considered a hazard to public health and welfare.

The Crooked River Valley Rehabilitation project would meet the requirements of the Clean Air Act by following procedures outlined in the North Idaho Smoke Management MOA and Montana/Idaho Airshed Group Operating Guide.

Mineral Resources

Scope of Analysis

This section considers the effects of the Crooked River Valley Rehabilitation proposed action on mineral resources. The proposed action could change access to mineral claims, lode and placer claim corners, or mineral resources within the project area. The minerals analysis area is the same as the project area.

Cumulative Effects Area

The cumulative effects area is the Lower Crooked River, Relief Creek, Deadwood Creek, and Campbell Creek subwatersheds.

Analysis Methods and Indicators

Information presented in this analysis is summarized from the *South Fork Clearwater River Landscape Assessment* (USDA Forest Service 1998), the *Design Criteria Report: Crooked River Valley Rehabilitation Design* (RDG et al. 2012), and *American River Crooked River FEIS and ROD* (USDA Forest Service 2005a). In addition, a Bureau of Land Management mining claim report was generated for use in this analysis.

The following assumption was used to estimate the number of lode claims: within each quarter section, there can be up to eight individual 20-acre lode claims.

For this analysis, the project (Meanders) area includes Road 233 and adjacent sections.

The indicators that were used for each issue by alternative are:

- Access to placer or lode mining claims – Yes/No.
- Effect to placer or lode mining claim material – Narrative.
- Protection or re-establishment of lode and placer claim corners – Yes/No.
- Future reclamation bond cost – No change/Increase/Decrease.
- Number of mining claims that could be impacted.

Affected Environment and Environmental Consequences

Historical Mining Use

From the 1930s through the 1950s the lower 2 miles of the Crooked River Valley was heavily dredge mined, leaving behind large tailing piles and deep ponds throughout the valley bottom. Gold and silver mining affected more than 6 miles of the river and approximately 200 acres of the valley bottom. Major mining occurred in the Meanders area using the famous Mount Vernon dredge (Figure 3-36). For more information, see Chapter 3, Cultural Resources.

Figure 3-36. Mount Vernon dredge in Crooked River. Dredge processing low-grade placer gravels on Crooked River, about 1938 (Elsensohn 1971:48-7).

Past mining disturbance areas and current mining claims are documented in the project file and also in *Mining Claim Inventory*: *Crooked River Valley Rehabilitation Design* (RDG 2012), USDA Forest Service (2005), and USDA Forest Service (1998). Historical mining use in the project area is also summarized in Appendix C.

Smaller mining operations, such as hand placer mining, sluice box, and gold panning, has occurred in the Meanders and adjacent areas (Figure 3-37).

Figure 3-37. Miner at work using sluice box in north-central Idaho.

Current Mining Use

There are no patented mining claims in the Meanders area (RDG 2012).

There are two types of unpatented mining claims on Forest Service lands: lode and placer. Lode claims are for veins or lodes or other rock in place, bearing metallic or certain other valuable deposits, and may not exceed 1,500 feet in length along the vein or lode and may not be more than 300 feet on each side of the middle of the vein at the surface. Adits, shafts, or open pits are features typically found on lode claims. Placer claims are for valuable minerals that occur in other than vein or lode form, such as in sand and gravel deposits containing particles of gold. Techniques for removal include panning or sluice box and can range from small to large scale. Within each quarter of a section, there can be up to eight individual 20-acre placer claims.

There are approximately 3 placer and 24 lode unpatented mining claims in the Meanders area (Figure 1 of RDG [2012]), within 6 quarter sections (Hughes 2013).

There are two proposed Plans of Operation on file with the Forest Service in the project area: one along Road 233 and throughout the Crooked River watershed, and one in the Deadwood subwatershed (see Appendix C).

Other mining activities that have occurred in the past include "recreation suction dredging" permitted by the State of Idaho. Tributaries to the South Fork Clearwater River have been closed to suction dredging since at least 2009 (IDWR 2013a, 2013b). The South Fork Clearwater River and tributaries are also closed to suction dredging by the EPA (USDI-EPA 2013). It is unknown how long these closures may continue. Gold panning, which has not been regulated by the Nez Perce – Clearwater National Forests, occurs on a small scale. Permits for large-scale mining could be authorized following an environmental analysis.

Access to current placer or lode mining claims is provided through a variety of methods including existing roads, trails, or non-motorized methods.

Access to Mineral Claims, Claim Corners, and Mineral Resources

Direct and Indirect Effects

Alternative 1 (No Action) would maintain the current access to 3 placer and 24 lode mining claims in the Meanders area (see Table 3-47). Under this alternative there would be no change to the existing tailings piles and no effect to mining claim access or mineral resources in the project area.

There would be no effect to existing mineral claim corners.

No change to future reclamation bonds would occur.

Alternative 2 (Proposed Action) would have a short-term direct effect on access to mining claims and mineral resources in the Meanders area (see Table 3-47).

During implementation there would be an area closure established in in the Meanders area (see Chapter 2, design and mitigation measure 33). Claim holders would have to find an alternative access during implementation of the Meanders. Construction of the temporary haul/access road would reduce impacts to the mining claimants and the public by maintaining access on Road 233 during construction activities (see Chapter 2, design and mitigation measure 49); however, access to existing claims in the Meanders area would be limited for up to 6 years (2015 to 2021).

Access to mining claims with or without an approved Plan of Operation would also be restricted during implementation over a 6-year period. This would be a short-term impact.

Existing dredge piles (placer claims) would be moved during implementation to reconstruct the stream and floodplain. Dredge materials are not expected to be moved outside a quarter section area. This would be a short-term and long-term effect to the existing mining claims.

Future reclamation bonding would increase, reflecting the surface conditions (stream channel and floodplain) following implementation of Alternative 2. All existing lode mining claim corners would be protected or re-established to their original locations if they are moved during the implementation (see Chapter 2, design and mitigation measure 32).

Table 3-47. Comparison of impacts by indicator, by alternative.

Indicator	Alternative 1	Alternative 2
Number of mining claims that could be impacted	3 Placer 24 Lode	3 Placer 24 Lode
Access to mining claims	Maintained	Area closure in place. Short-term restrictions for up to 6 years.
Effect to placer mining claim material	No effect	Short- & long-term effects. Material moved to within 1 quarter section.
Effect to lode mining claim material	No effect	No effect
Claim corners protected or re-established	No	Yes
Future cost of placer claim reclamation bond	No change	Increased. Must return to improved condition.
Future cost of lode claim reclamation bond	No change	No change

Figure 3-38. Signage for existing claim in Narrows Road area.

Cumulative Effects

Past and Ongoing Actions

The evidence of past mining activities is most visible in the Meanders area. There have been no Plans of Operations for at least 5 years; as a result, there are no current disturbances by miners for the removal of mineral resources.

Crooked River and tributaries to the South Fork Clearwater River are closed to suction dredging by the State of Idaho since 2009. The South Fork Clearwater River is open by the State of Idaho for suction dredging for about one month annually (July 15 to August 15). However, the South Fork Clearwater River and all tributaries are closed by EPA to suction dredging (IDWR 2013a; IDWR 2013b; USDI-EPA 2013).

No Action Alternative

Alternative 1 would have no direct or indirect effect to access to mineral claims, claim corners, or mineral resources in the project area, and would therefore have no cumulative effect.

Action Alternative

Alternative 2 and the proposed Crooked River Narrows Road Improvement project would have a short-term effect on access to mining claims on or adjacent to Road 233 but no effect to long-term access, and would therefore have no cumulative effect. Claim corners would be protected or re-established.

Foreseeable Actions

Two proposed Plans of Operation are on file with the USDA Forest Service – Premium and Gold Zone (Appendix C). The proposals are for exploratory drilling within the Meanders area, adjacent to the Meanders area, and in the Deadwood subwatershed. These projects are planned to be implemented (2014–2015) at the same time as the Crooked River Valley Rehabilitation project (2015–2024); however, there is no decision to implement at this time. Coordination under the approval of a Plan of Operation would be needed regarding access and activities in the project areas.

The Orogrande Community Protection project would have no effect on access to mining claims, corners, or mineral resources (USDA Forest Service 2013a draft).

Suction dredging mining activities in the project area and downstream are dependent on project consultation with NOAA Fisheries and the U.S. Fish and Wildlife Service for the protection of threatened and endangered fish and their habitat.

The action alternative would not restrict or control mining location or methods in the project area. Although the proposed action could result in disturbance to individual claims, there are no other current or foreseeable activities that would result in cumulative effects on mineral resources in the project area.

Effectiveness of Mitigation

Impacts to access to existing mineral claims would be reduced by design and mitigation measures 32, 33, 49, and 50 (see Chapter 2, Design and Mitigation Measures). These measures would provide protection to established mining claim corners. The public and mining claimants would be notified of project activities as they are implemented. The temporary haul/access road and closure periods would reduce impacts to claimants who are traveling on Roads 233, 522, or 1803.

Consistency with Forest Plan and Environmental Laws

Nez Perce National Forest Land and Resource Management Plan Direction

The national forest land administered by the Nez Perce National Forest has been divided into 26 management areas, each with different management goals, resource potentials, and limitations. Management Area 4 (MA 4) deals with mineral resources. The Forest Plan could not predict where, when, and what kinds of minerals development might be proposed, nor specific needs for surface resources. Therefore, MA 4 is not site specific, but applies to any area that consists of active or recently active mining extraction and processing operations. The goal of MA 4 is to "[e]ncourage valid exploration and development of mineral resources, while at the same time minimizing surface impacts from those activities" (USDA Forest Service 1987a). Specific standards for water resources in MA 4 are to meet established fishery/water quality objectives for all "prescription watersheds" (USDA Forest Service 1987a). Forest Plan

Amendment No. 3 (USDA Forest Service1989) makes changes and adds the following statements to the Forest Plan, which apply to this project:

- Page II-23 of Forest Plan: Approximately 56 percent of the Nez Perce National Forest is open to mineral entry under the general mining laws with no restrictions other than valid existing rights and such surface resource protection measures as may be required under 36 CFR 228.
- Page III-11 of the Forest Plan, Management Area 4: The stated goal is to encourage exploration and development of mineral resources, while at the same time minimizing surface impacts from those activities.
- Appendix O-16 of the Forest Plan, Item 2m: The monitoring plan will be a tracking mechanism to make sure that operating plans and bonds accurately reflect the current level of activity, that reclamation work is properly completed and the bond returned upon cessation of mining, and that a reasonable degree of uniformity is maintained.

Within the Crooked River Valley Rehabilitation project area there are no lands considered to be managed as Management Area 4 at this time.

The Forest Plan's forestwide standards for minerals resources would be met for this project (USDA Forest Service 1987a, p. II-23). Reasonable access would be provided to prospect, explore, develop, and produce mineral resources for general access to a claim but does not apply to the project for mining that would create a significant disturbance since there are no current approved Plans of Operation in the project area. Details on consistency of the project with the Forest Plan are located in the project record.

Alternative 1 (No Action) would not change existing access to minerals claims. Alternative 2 would change existing access during implementation in the Meanders area for up to 6 years. Long-term access would remain the same as exists currently.

Claimants (lode and placer claims) were notified about this project and received a copy of the scoping letter for comment. Permission is not required to enter any of the claims associated with this project since none of the claims have recognized surface rights.

Other Laws and Regulations

Several laws regulate exploration or mining on National Forest System lands. The Organic Administration Act requires the Forest Service, as the land manager, to minimize environmental impacts without materially interfering with a mining claimant's rights under the General Mining Laws. Since mining is a legitimate use of the national forest, the Forest Service is mandated to integrate the development and use of minerals with the use of other resources to the extent possible under the laws governing minerals disposal.

Forest Service regulations (36 CFR 228, Subpart A) give the authorized national forest officer the authority to approve Plans of Operation and to require claimants to take measures to prevent adverse impacts from occurring as a result of their mining activities. Mining claimants are required to conduct operations in an environmentally sound manner in conformance with these regulations and with their approved Plan of Operations. While the Forest Service may influence aspects of an operation that affect surface resources, it may not prevent mining claimants from exercising their statutory right to enter upon their claims to search for and extract minerals. Provided that the land in question is open to mineral entry, the Forest Service has no regulatory basis to prohibit legitimate mining activities. There are two proposed Plans of Operation in the project area, but they have not been approved at this time.

The Forest Service is required by law to provide reasonable access to valid existing mineral rights, regardless of their form, whether it be an unpatented claim, lease, or private property (such as a patented claim), or subsurface mineral right. An unpatented claim is an implied property right that can be held, sold, or inherited, and access is regulated under the Mining Law of 1872. Rights are restricted to the extraction and development of a mineral deposit. No land ownership is conveyed under these claims. Patented claims are private property, in which the federal government has passed its title to the claimant, giving the claimant title to the locatable minerals and, in most cases, the surface and all resources. There are no patented claims in the project area. Only unpatented federal mining claims exist in the project area. Reasonable access to mining claims would be provided under the proposed action (Alternative 2).

A mining claim creates a possessory interest in the land, which may be bartered, sold, mortgaged, or transferred by law, in whole or in part, as any other real property. A locator acquires rights against other possible locators when the locator has complied with the applicable federal and state laws. The claimant has the right to dispose of all locatable minerals on a mining claim. The proposed action (Alternative 2) would not change the right of the mining claimant to dispose of locatable minerals from an existing mining claim.

The Forest Service must respect claims and claimants' property by taking precautions to avoid damage to claim corner markers, excavations, and other mining improvements and equipment. The claimant has a number of other rights, including: reasonable access to the claim; the right to use the surface for prospecting, mining, and processing (but not exclusive possession); the use of timber as necessary for the mining operation; and the right to clear timber as necessary for mining (claimant cannot sell the timber). Design and mitigation measures have been developed for the action alternative to protect claim corner markers. There are no currently approved excavations, mining equipment, or improvements that have been identified in the project area.

Transportation

Scope of Analysis

This section considers the effects of the Crooked River Valley Rehabilitation project alternatives on transportation.

The proposed project may impact public access on Road 233 during and following implementation.

Public comments about the transportation system were focused on the Narrows Road proposed action. Some public comments identified concerns about the proposed improvements (aggregate), safety of traveling on roadways, and the cost of activities. There were specific concerns about impacts to access from State Highway 14 to the community of Orogrande. The community of Orogrande is accessed via road by Road 233 (Crooked River) or, alternatively, by Roads 1803 (Wheeler Mountain Road), 522 (Deadwood Road), and 233 (Crooked River Road) (see Figure 1-1). See Chapter 2, Alternatives Considered but Eliminated from Detailed Study, for more information.

Analysis Area

The analysis area includes roads in the project area, specifically Road 233.

Cumulative Effects Area

The cumulative effects area is the same as the analysis area.

Analysis Methods and Indicators

Information from preliminary design products was used for basic inventory and analysis. In addition, for matters related to jurisdiction, discussions were held with the Idaho County road manager.

The indicators used for each issue were:

- Indicator A – Traffic delays. Amount and timing of delays from construction traffic on Road 233 (time of year).
- Indicator B – Safety of traveling on roadways (Roads 233).
- Indicator C – Cost of improvements (dollars, funding source).

Affected Environment and Environmental Consequences

Indicator A – Traffic Delays

Existing Condition

There are no current traffic delays along Road 233 adjacent to the Meanders.

Environmental Consequences

Direct and Indirect Effects

Alternative 1 (No Action) would maintain the current access on Roads 233. **Alternative 2** (Proposed Action) would cause some short-term delays as equipment and supplies are mobilized into the Meanders area. This would occur over a short duration (e.g., week-long) period during spring or summer and again in late fall when equipment is moved out of the area. The construction of the temporary access road and bypass channel would reduce delays and maintain access on Road 233 during implementation. Implementation could take multiple years.

Cumulative Effects

Alternative 1 would have no direct or indirect effect on traffic delays and, therefore, no cumulative effect.

Short-term adverse effects of traffic delays would be present under Alternative 2 or the proposed Crooked River Narrows Road Improvement project. Other ongoing road treatment activities, such as surfacing placement or culvert maintenance, may also cause traffic delays. Because no other construction is proposed at the same time (2015–2021), there would be no cumulative effects.

Indicator B – Safety of Traveling on Roadways (Road 233)

Existing Condition

All roads accessing Orogrande are single-lane roadways.

The existing Road 233 has limited vehicle turnouts available to allow for opposing traffic to pass. This is especially the case in the section through the Narrows. In addition, due to the close proximity of Crooked River to Road 233 through the Narrows, seasonal flood flows can erode the roadway shoulder, causing roadway widths to be reduced. Existing grades on Road 233 are generally mild with most of the length being less than 5% gradient.

Environmental Consequences

Direct and Indirect Effects

Alternative 1 would have no direct or indirect effects to safely traveling on Road 233 because no construction would occur. The existing conditions on roadways would continue.

Alternative 2 would have construction traffic present on the lower 2 miles of Road 233 for up to 6 years. This construction traffic would pose an incremental risk to traveling the roadway. Several design and mitigation measures have been developed to mitigate these risks (23, 33, 49, and 50). Design and mitigation measure 23 would complete maintenance of Road 233 to offset construction-induced impacts during implementation (see Chapter 2). Design and mitigation measure 33 would notify the public when the Meanders construction activities are going to occur, including construction signing (see Chapter 2). Design and mitigation measure 49 would minimize construction traffic by constructing a temporary access road that would reduce the direct effects to the public. Design and mitigation measure 50 would clear debris and equipment off Road 233 as the project is implemented.

Cumulative Effects

Past actions, including construction of Roads 233, 522, and 180, have resulted in the current location of roads to be maintained by the Forest Service or Idaho County. Traveling on these roads has some inherent risks because of their current location, grade, and alignment.

Ongoing activities that affect safety of traveling on these roads are regular road maintenance activities conducted by Idaho County on Road 233 and by the Forest Service on Roads 1803 and 522.

The proposed Orogrande Community Protection project occurs in the project area and would be implemented from 2014 to 2019. Hauling of material and equipment on Road 233 could affect the safety of traveling on Road 233 (USDA Forest Service 2013 draft); however, design and mitigation measures developed for both projects would reduce this potential cumulative effect.

The proposed Crooked River Narrows Road Improvement project is upstream of the project area (Appendix C). This action would provide incremental improvements for safety of traveling on roadways to access Orogrande on Road 233 through the Narrows to provide additional turnouts and reduced shoulder erosion. Condition of Road 233 in the Narrows area along 3.5 miles would be incrementally improved in the road condition through the Narrows. Less seasonal flooding of the surface would occur. The Narrows project would be implemented after the Meanders project.

Indicator C – Cost of Improvements (Dollars, Funding Source)

Existing Condition

No improvements are ongoing at this time. Road maintenance costs depend on jurisdiction and maintenance responsibilities.

Environmental Consequences

Direct and Indirect Effects

Estimated costs and funding sources for the alternatives are presented in Table 3-48.

Alternative 1 (No Action) would not result in direct investment for improvements.

Alternative 2 (Proposed Action) is estimated to cost $2,500,000 to complete stream channel and floodplain re-construction, and revegetation in the Meanders area.

The primary funding source would be the BPA Fish and Wildlife Program.

Table 3-48. Comparison of impacts, Indicator C (cost of improvements), by alternative.

Indicator C	Alternative 1	Alternative 2
Cost of Improvements	$0	$2,500,000
Funding Sources	Not applicable	BPA Fish and Wildlife Program

Cumulative Effects

Implementation of the proposed action or the proposed Crooked River Narrows Road Improvement project (estimated cost, $1,498,000) has the potential to benefit the local economy through the development of construction-based jobs and purchasing of construction materials, fuel, and other local products. In conjunction with other construction-based projects in the local area, these projects have the potential to contribute to the economy.

Road Surfacing

Cumulative Effects

There are no past, ongoing, or future foreseeable actions that would change the mileage of aggregate surfacing on roads in the project area.

The proposed Crooked River Narrows Road Improvement project would directly and incrementally increase the amount of roadway with aggregate surfacing on Road 233. Cumulatively, this would result in approximately 8 miles of aggregate surface on Road 233.

Effectiveness of Mitigation

Design and mitigation measures 23, 33, 49, and 50 (see Chapter 2, Design and Mitigation Measures) would reduce impacts to the public or the transportation system from the proposed action (Alternative 2). The effectiveness of these measures is dependent upon implementation.

Consistency with Forest Plan and Environmental Laws

Nez Perce National Forest Land and Resource Management Plan Direction

The project would meet Nez Perce National Forest Plan standards (forestwide and management areas) for roads, trails, and transportation (USDA Forest Service 1987a).

The economics of proposed access developments have been analyzed using proven tools, and these have been incorporated into the project design. Maintenance of roads in the project area would continue at current levels (commensurate with use, user type, user safety, and facility-resource protection), dependent upon jurisdiction. The action alternative would meet the standard to plan, design, and manage all access to meet land and resource management objectives, State Water Quality Standards, and best management practices.

Impacts from construction would be minimized in identified key riparian and wildlife areas, as described in Chapter 2, Design and Mitigation Measures. Alternative 2 has been developed to minimize effects to key riparian and wildlife areas from proposed activities (see Chapter 3, Aquatic Resources, Water Resources, and Wildlife Resources). Alternative 2 would reduce impacts or improve conditions in riparian areas. Standards for mitigation of sedimentation would also be met. Construction and maintenance would provide public access to interpretive facilities (see Chapter 3, Cultural Resources).

Other Laws and Regulations

The National Forest Roads and Trails Act of October 13, 1964, as amended, authorizes road and trail systems for the national forests. The Act also authorizes granting of easements across National Forest System (NFS) lands, construction and financing of maximum economy roads (FSM 7705), and imposition of requirements on road users for maintaining and reconstructing roads, including cooperative deposits for that work.

Forest Service Manual (FSM) 7700 enumerates the authority, objectives, policy, responsibility, and definitions for planning, construction, reconstruction, operation, and maintenance of forest transportation facilities and for management of motor vehicle use on NFS lands (USDA Forest Service 2010b). The Crooked River Valley Rehabilitation project proposed action is consistent with this policy.

The Travel Management rule (70 FR 216) requires each National Forest to formally designate those roads, trails, and areas where summer motorized travel is permitted and to show them on a Motor Vehicle Use Map (MVUM). Once the rule is implemented, motorized travel will be permitted only on the roads, trails, and areas shown on the MVUM. The Designated Routes and Areas for Motor Vehicle Use (DRAMVU) FEIS and ROD are expected to be released in 2014 for the Nez Perce – Clearwater National Forests. Depending on the alternative selected in the FEIS/ROD, the DRAMVU project decision would: eliminate cross-country travel on the Nez Perce – Clearwater National Forests by permitting motorized use on designated roads and trails, except snowmobiles; implement seasonal closures on some roads and trails in Management Area 16 (Elk and Deer Winter Range) and 21 (Moose Winter Range), and other areas; add up to five new trail connectors to create loop opportunities; identify motorized access for dispersed camping from roads and trails; and eliminate motorized use on some roads and trails to minimize resource damage, reduce conflicts, and provide a full array of recreation opportunities. Within the Crooked River Valley Rehabilitation project, the DRAMVU decision could potentially change access prescriptions on Roads 233, 522, 1803, and spur roads; and eliminate motorized cross-country travel.

The Crooked River Valley Rehabilitation project proposed action would meet Forest Plan standards, moving forest resources toward the goals and objectives described in the Forest Plan, and the project's compliance with all state and federal regulations would minimize effects on Forest resources.

Social and Economic Resources

Scope of Analysis

This section considers the effects of the proposed action on social and economic resources.

The project area is the Crooked River and Deadwood watersheds. The geographical and social scope of the analysis, as well as the cumulative effects area, is the Clearwater River subbasin (Idaho, Clearwater, Nez Perce, Lewis, and Latah counties).

Analysis Methods and Indicators

Existing social and economic data were summarized from the Clearwater River subbasin Climate Change Adaptation Plan (Clark and Harris 2011). The five-county region has a population of about 104,496, with Nez Perce County having the highest population (39,211) in 2009. Idaho County is the 19th most populous county in Idaho and the largest county in total area. Population levels have increased by about 12% from 1990 to 2009 in Idaho County. Median age ranged from 27.9 in Latah County to 42.5 in Lewis County. Median age increased in all of the counties from 1990 to 2009.

Employment was chosen as an indicator relative to Executive Order 12898 (59 FR 32), potential effect on minority and low-income populations. The Crooked River Valley Rehabilitation project area is in Idaho County, Idaho, and within the Nez Perce Tribe ceded lands.

Recreation-based economics was chosen as an indicator based on a comment received during scoping of the proposed action.

The indicators that were used for each issue by alternative were:

- Indicator A – Employment
- Indicator B – Recreation-based economics.

Affected Environment and Environmental Consequences

Indicator A – Employment

Affected Environment

The most recent income data for the Clearwater River subbasin is from 2000 (Census data). Average income in 2000 ranged from $14,411 in Idaho County to $18,544 in Nez Perce County (Clark and Harris 2011). Figure 3-39 provides the household income distribution of the Clearwater subbasin in 2000.

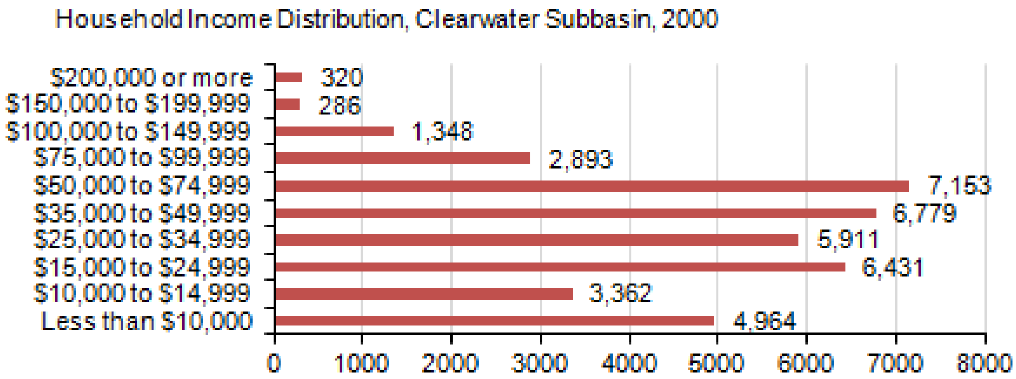


Figure 3-39. Household income distribution for Clearwater River Subbasin, 2000 (Clark and Harris 2011).

Employment within the Clearwater River subbasin is categorized as non-service (farming, mining, construction, agriculture), service (transportation, retail, financial services, and wholesale), and government. Non-service and government employment make up about 17.6% and 22.5% of the working population, respectively, while service employment accounts for 58.5% of the population in 2009 (Clark and Harris 2011).[1] Since 2000, non-service employment has decreased from 23%, service employment has increased from 53%, and government employment has decreased from 23.6%.

Environmental Consequences

Direct and Indirect Effects

Alternative 1 (No Action) would maintain the current management in the Clearwater River subbasin and would not impact the economics or social status of the area. No short-term increase in jobs or secondary economic activities would be created.

Alternative 2 (Proposed Action) could create a short-term increase in job opportunities, and secondary economic activity would be indirectly supported during construction. Job opportunities are directly related to construction jobs created by the proposed action, including jobs for minorities and low-income populations. Secondary economic activity includes purchasing supplies locally, lodging, purchasing fuel, and other such activities. However, the proposed action is unlikely to result in a measurable effect on poverty, unemployment, or income rates in the subbasin.

[1] It is noted that these percentages add up to 98% instead of 100%, but these are as listed in Clark and Harris (2011).

Indicator B – Recreation-Based Economics

Affected Environment

In the Clearwater River subbasin, recreation is an important social component of the lifestyles of the local residents, and access to recreational facilities is highly important. More than two-thirds of the subbasin is forested, with most of the forested lands being federally managed. In 2009, 20% of jobs in the subbasin were in the travel and recreation-related businesses (Clark and Harris 2011). In Idaho, more than 5% of gross state product is from tourism and recreation services and retail sales.

The project area is a popular recreation area for camping, fishing, wildlife viewing, and fire-wood cutting. The Meanders area offers both developed and dispersed recreational camping opportunities. Fishing access in Crooked River is by foot or from a few spur roads that go to campsites. The Narrows Road area provides direct access to Crooked River, although the road is narrow and has few pullouts for parking or camping.

Environmental Consequences

Direct and Indirect Effects

Alternative 1 (No Action) would maintain the current recreation opportunities and not provide an overall improvement of fish habitat in the Crooked River watershed.

Alternative 2 (Proposed Action) would improve overall fish habitat in the Crooked River watershed, which would indirectly improve angling opportunities in Crooked River and the South Fork Clearwater River in the long term. Access to Crooked River for angling opportunities would be improved by the removal of the dredge tailing piles. Currently, the river is closed to salmon and steelhead fishing. Anglers can fish for cutthroat trout, whitefish, and other non-listed species. By providing better overhead cover, instream complexity, and food sources for the fish, localized populations are likely to increase.

The South Fork Clearwater River is open seasonally for spring Chinook salmon and steelhead fishing. The duration of the fishing season is dependent on the number of fish returning to the South Fork Clearwater River. Adult Chinook salmon numbers returning to Crooked River range from around 350 fish to about 800 fish annually (IDFG 2010b, 2011, 2012). Of these, only about 30 fish are allowed to pass above the weir because of the Idaho Supplementation Studies; half of those were females or an undetermined sex. Annual redd counts in the watershed ranged from 4 to 17 from 2007 to 2011 (Table 3-49), which corresponds to the number of females and unknown sexes that were passed above the weir. With the completion of the Idaho Supplementation Study in 2013, more fish may be allowed to pass above the weir. Coupled with an increase in spawning habitat from the proposed action, the potential for more adult Chinook salmon in returning to the upper South Fork Clearwater would potentially provide greater angling opportunities for these fish.

Table 3-49. Idaho Supplementation Studies, adult Chinook salmon returns from 2007 through 2011 (IDFG 2010b, 2011, 2012).

Year	General Production			Natural			Total	Passed Weir	Females Passed Weir	Undetermined Passed Weir	Redds
	M	F	U	M	F	U					
2007	127	0	225	1	1	11	366	14	1	10	4
2008			728	34	17	10	789	31	17	10	17
2009			474	23	12	2	511	37	12	2	14
2010			505	13	6	12	536	31	6	12	13
2011			329	17	7	3	356	27	7	3	15

M – Male; F – Female; U – Undetermined sex.

Stocking efforts in the Crooked River watershed are changing from spring Chinook salmon to summer Chinook salmon. In 2012, 220,000 summer Chinook were released in Crooked River (Becky Johnson, NPT, pers. comm.). It has not been determined by the IDFG and Tribe Production Division how many summer Chinook fish will be passed above the weir after the brood stock fish are collected. It is possible that the project area could be reseeded with fish passed above the weir, and upon completion of the restoration, there would be about four times as much spawning habitat to support an increased number of returning adults. This could provide a summer Chinook fishing season in the South Fork Clearwater River in the long term, which would boost recreation-based economics in the area.

Short-term impacts to recreational activities would be felt in the project area during construction and for a few years upon completion. The project area would be closed seasonally during construction, which would limit camping and recreation activities in the project area. The same number of dispersed and developed campsites would remain in the project area and would be accessible upon completion of the project (see Chapter 3, Recreation Resources). Other areas in the Clearwater River subbasin would remain open for camping and fishing.

Cumulative Effects

Neither the proposed action nor the proposed Crooked River Narrows Road Improvement project is anticipated to generate a cumulative effect on social trends such as population or age, minority status, or income. The anticipated impacts are not in themselves substantial enough to contribute to changes in the social resources of the project area.

Neither the proposed action nor the proposed Crooked River Narrows Road Improvement project is anticipated to generate a cumulative effect on poverty levels, per capita income, or employment rates. Implementation of the projects may contribute to short-term cumulative increases in local incomes if several local firms are select at the same time to implement on-going activities in the national forest, such as stream restoration, timber harvest, weed treatments, road work, and ongoing fisheries studies. Implementation of the projects may contribute to short-term cumulative increases in secondary benefits if several contracts are awarded at the same time, generating demand for local goods and services. The projects would take up to 10 years to complete.

Recreation and angling opportunities would continue in the project area and in the Clearwater River subbasin. Other campsites may be closed within the Crooked River watershed during the area closure for the proposed Crooked River Narrows Road Improvement project; however, since many other campsites exist within the vicinity of Crooked River and in the Clearwater River subbasin, no cumulative effects to recreation-based economics are expected.

Effectiveness of Mitigation

There are no mitigation or design measures for social and economic effects.

Consistency with Forest Plan and Environmental Laws

Nez Perce National Forest Land and Resource Management Plan Direction

The project would meet the Nez Perce National Forest Plan forestwide goals and standards for social and economic resources (USDA Forest Service 1987a, pp. II-1and II-24). The project would provide a sustained yield of resource outputs at a level that would help support the economic structure of local communities and provide for regional and national needs. Outputs relevant to this project—recreation opportunities, jobs, purchasing supplies locally, lodging, purchasing fuel, and other such activities—have been analyzed. Alternatives have been evaluated that emphasize intrinsic ecological and economic wildlife values. Analysis of the economics of proposed changes to access developments was completed.

Other Laws and Regulations

Environmental Justice

Executive Order 12898 requires analysis of the impacts of the proposed action and alternatives to the proposed action on minority and low-income populations. The order is designed in part "…to identify, prevent, and/or mitigate, to the extent practicable, disproportionately high and adverse human health or environmental effects of the United States Department of Agriculture programs and activities on minority and low income populations…"

Neither of the project alternatives is expected to negatively affect the civil rights of minorities, American Indians, women, or any United States citizen. Consultation with the Nez Perce Tribe has been ongoing since 2012. No environmental health hazards are expected to result from implementation of either alternative. Income levels would not be affected by this project.

Short-Term Uses and Long-Term Productivity

The National Environmental Policy Act requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

An evaluation of the relationship between the local short-term uses of the human environment and the maintenance and enhancement of long-term productivity discloses the trade-offs between short-term adverse impacts and long-term benefits of the proposed project. Short-term impacts, disruptions, and uses of the local environment may be worthwhile if there are long-term benefits to the environment resulting from the actions.

Short-term uses of and impacts on the local environment are associated with the construction of the project and are listed below. Discussions of these impacts are documented in the Environmental Consequences section for each resource in Chapter 3. Many of these impacts could be minimized with the application of design and mitigation measures, as recommended in Chapter 2.

The short-term adverse effects that could be caused by the proposed project include:

- Increased turbidity in Crooked River due to instream restoration work and culvert replacement/removal
- Increased water temperature due to riparian vegetation removal for channel reconstruction and temporary bypass construction
- Disturbance of individual fish and macroinvertebrates
- Disturbance of existing wetlands
- Modification of wildlife species habitat and distributions of sensitive and management indicator wildlife species
- Adverse effects due to direct mortality or displacement of individuals, or even loss of habitat (western toad)
- Changes in habitat conditions and distributions of sensitive plant species
- Increased dust and vehicle emissions
- Burying of existing rock, soil, and vegetation by regrading of mining dredge tailings
- Exposure of locatable minerals.

The long-term benefits to be gained through the implementation of the proposed project include the following:

- Recovery of natural processes in the Crooked River floodplain, which would improve habitat conditions (cover and forage) for many of the wildlife species using this area
- Decreased soil compaction and surface erosion problems in the watershed
- Improved fish habitat due to reduction in sediment yield, increased pool habitat quality, and improved health of the riparian plant community
- Reduced water temperatures in Crooked River with potential attainment of water temperature criteria and removal from the §303(d) list for temperature impairment.
- Improved habitat quality for wildlife.

Unavoidable Adverse Effects

Under Alternative 2, there would be a small impact on fish within the project area and downstream to the South Fork Clearwater River. Efforts would be made to work within the fish "window" as designated by the USFWS and NMFS, and to reduce sediment and turbidity during construction. Fish would be provided migratory passage for the duration of the project.

Under Alternative 2, there would be unavoidable and adverse short-term increases in water temperature due to removal of existing riparian vegetation for channel reconstruction and temporary bypass channel construction.

Under Alternative 2, there would be direct mortality to adult western toads, egg masses, tadpoles, and juveniles during construction of the temporary bypass channel and dewatering/rechanneling of existing open water ponded environments; construction of the temporary bypass road; dewatering of the main Crooked River channel; dewatering of the temporary bypass channel; regrading/reshaping of the valley bottom, stream channel, and tailing piles; and equipment traffic. The alternative is consistent with Forest Plan direction to the extent that proposed management actions would not adversely affect viability of existing sensitive wildlife populations.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line right-of-way or road.

Alternative 2 would result in the irreversible and irretrievable use of historic properties. Mining waste and associated artifacts are not only physical representations of history, they—even when newly created—give a visual sense of history. Section 106 of the National Historic Preservation Act makes reference to this visual sense of history when allowing that historic properties may still be eligible for listing even when they have been newly modified, as long as they maintain their visual sense of place. Nowhere is this more applicable than to historic mining areas, known as historic vernacular landscapes. The mining waste and associated artifacts are irretrievable. Once removed from their contextual resting places, artifacts lose their archaeological value as information resources, and if restoration were to take place, the inability to recreate the tailings piles exactly as they were would be irreversible.

Human resources would be used for the construction and maintenance of the project. Economic commitments are also an irretrievable investment. The estimated approximate cost of the preferred alternative is $2.5 million. Funds have already been committed and spent for planning, design, environmental studies, and completing the environmental impact statement.

Implementation of Alternative 2 would commit an undetermined amount of fossil fuels in order to transport material and implement other activities.

The project implementation would result in some loss of fish and wildlife habitat and displacement of fish and wildlife during construction. Stream habitat lost would be replaced by construction of a new channel. Wetland habitats and their associated functions and values lost as a result of the project would be replaced.

Proposed project activities would modify wildlife species habitat and would result in short-term changes in habitat conditions and distributions of sensitive and management indicator wildlife species. The project would result in some loss of wildlife habitat and displacement of wildlife species during implementation of project activities. There would be an irretrievable commitment of resources with the loss of potential breeding sites (ponds) for western toads.

Proposed project activities would modify sensitive plant species habitat and would result in short-term changes in habitat conditions and distributions of sensitive plant species. However, long-term habitat conditions would not be irretrievably or irreversibly lost.

The loss of native vegetation to new or expanding weed infestations would be a possible irretrievable effect if active restoration to native species is not pursued. Intensive invasive treatments and native plant restoration work would improve habitats and plant communities, which would minimize and avoid irreversible effects.

The commitment of resources is based on the belief that the condition of the natural environment in the watershed would be improved by the proposed project. The primary benefits would be improved fish habitat and water quality.

Other Required Disclosures

The National Environmental Policy Act (40 CFR 1502.25[a]) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with … other environmental review laws and executive orders."

The following agencies have been informed of and coordinated with on the proposed project. The Forest Service will continue to coordinate and consult with these agencies in the decision-making process:

- The U.S. Fish and Wildlife Service under the Fish and Wildlife Coordination Act for causing water to be impounded or diverted
- The Idaho State Historic Preservation Office in accordance with the National Historic Preservation Act for causing ground-disturbing actions in historic places
- The U.S. Fish and Wildlife Service and the National Oceanic and Atmospheric Administration in accordance with the Endangered Species Act implementing regulations for projects with threatened or endangered species.

This page was intentionally left blank.

CHAPTER 4. PREPARERS, CONSULTATION, COORDINATION, LAWS, AND REGULATIONS

Preparers of Draft Environmental Impact Statement

The Nez Perce – Clearwater National Forests as the lead agency, and cooperating agencies Nez Perce Tribe, Bonneville Power Administration, and U.S. Army Corps of Engineers, are responsible for the preparation of this document. Table 4-1 identifies the individuals who prepared sections of this document or provided supporting information.

The interdisciplinary team (IDT) for this project is composed of personnel with skills related to the key issues. The IDT consists of a core team as well as an extended team of technical specialists (Table 4-1; Forest Service employees unless otherwise noted). The team is not meant to represent all the resource issues Forest-wide that could relate to the Crooked River Valley Rehabilitation project, or to indicate the priority of resource emphasis.

In preparing this document, the IDT consulted with Nez Perce – Clearwater National Forests line officers and staff: Rick Brazell, Terry Nevius, Ed Koberstein (acting District Ranger), Anne Connor, Bill Conroy, and Laura Smith.

Table 4-1. Preparers of DEIS.

Resource/Role	Name	Education/Background
Air Quality	Justin Pappani	B.S., Wildlife Resources
Aquatic Resources	Erin Grinde (Nez Perce Tribe – Watershed Division)	B.S., Fisheries
	Allison Johnson	M.S., Fisheries B.S., Ecology, Aquatic Wildlife Emphasis
	Katherine Thompson	M.S., Fisheries B.S., Fisheries
Cooperating Agency Bonneville Power Administration	Brenda Aguirre	B.S., Forest Management
Cooperating Agency Bonneville Power Administration	David Kaplowe	B.S., Biology B.A., Spanish M.S., Speech Language Pathology
Cooperating Agency Nez Perce Tribe	Jenifer Harris (Nez Perce Tribe – Watershed Division)	B.S., Ecology A.A., Business
Cooperating Agency U.S. Army Corps of Engineers	Eric Gerke	B.S., Fisheries Science B.S., Logistics, Transportation/ Engineering Mgt.

Resource/Role	Name	Education/Background
Cultural Resources	Steve Lucas	M.A., Interdisciplinary Studies B.A., Anthropology
Geographic Information Systems	Becky Winkler	20 years of work experience in GIS with Forest Service
Editor (Portage, Inc.)	Todd Thompson	B.S., Journalism
Invasive Plants	Steve Hiebert	B.S., Range Conservation
	Jenifer Harris (Nez Perce Tribe – Watershed Division)	B.S., Ecology; A.A., Business
Mineral Resources	Clint Hughes	M.S., Geology B.S., Geology
NEPA Specialist Team Leader	Jennie Fischer	B.S., Watershed Management Qualified Soil Scientist
Project Manager	Jenifer Harris (Nez Perce Tribe – Watershed Division)	B.S., Ecology A.A., Business
Rare Plants	Joanne Bonn	B.S., Wildlife Resources
Recreation and Scenery Management	Randy Borniger	B.A., Political Science
Social and Economic Resources	Jenifer Harris (Nez Perce Tribe – Watershed Division)	B.S., Ecology A.A., Business
Soil Resources	Vince Archer (USFS – Above & Beyond Ecosystems)	M.S., Resource Conservation, Soils Emphasis B.S., Physical Science, Biology Professional Series Soil Scientist
Transportation	Joe Bonn	B.S., Forest Management B.S., Civil Engineering Professional Engineer
Tribal Resources	Christine Bradbury	M.S., Public Adm., Environmental Policy B.S., Communication
Water Resources	Drea Traeumer	B.S., Physical Science
	Bill Conroy	Ph.D., Civil Engineering – Hydrodynamics M.S., Forest Hydrology B.S., Forestry
Wildlife Resources	Joanne Bonn	B.S., Wildlife Resources

Distribution of Draft Environmental Impact Statement

The following federal, state, and local agencies; tribes; and individuals have been involved during the development of this draft environmental impact statement (Table 4-2). A full description is in the project record.

Table 4-2. Distribution of the draft environmental impact statement.

Federal Agencies, Tribes, and Officials	
Red River Ranger District, Nez Perce – Clearwater National Forests, Elk City, Idaho	Northwest Power Planning Council
Nez Perce-Clearwater National Forests, Offices in Grangeville and Orofino, Idaho	Shoshone-Paiute Tribes of the Duck Valley Reservation Owyhee, Nevada
Nez Perce – Clearwater National Forests, Supervisor's Office – Kamiah, Idaho	U.S. Army Corps of Engineers Eric Gerke and Kelly Urbanek
USDA – FS Northern Regional Office, Missoula, Montana	U.S. Army Corps of Engineers Northwest Division – Portland, Oregon
Advisory Council on Historic Preservation Planning and Review, Director	U.S. Coast Guard, Chief of Naval Operations
Confederated Salish and Kootenai Tribes Pablo, Montana	USDA – APHIS PDD/EAD
Confederated Tribes of the Umatilla Indian Reservation, Pendleton, Oregon	USDA – Natural Resources Conservation Service National Environmental Coordinator
Federal Aviation Administration – Northwest Mountain Regional Director	USDI – BLM, Cottonwood, Idaho Will Runnoe, Field Manager
Federal Highway Administration Division Administrator	USDI – EPA Local, Boise, Idaho Lynne McWhorter and Leigh Woodruff
Kootenai Tribe of Idaho Bonners Ferry, Idaho	USDI – EPA Regional, Seattle, Washington EIS Review Coordinator
Nez Perce Tribal Executive Committee and staff, Lapwai, Idaho	USDI – EPA, Washington, D.C. EIS Filing Section
National Agricultural Library Acquisitions and Serials Branch	USDI – Fish and Wildlife Service Spokane, Idaho – Bryan Holt, Megan Kosterman Northern Idaho –Field Office – Ben Conrad
NOAA – NMFS Boise, Idaho – Aurele LaMontagne Boise, Idaho – Dave Mabe Boise, Idaho – Kenneth Troyer	U.S. Department of Energy – Washington, D.C. Director, NEPA Policy & Compliance
NOAA – Office of Policy and Strategic Planning	U.S. Department of Energy, Bonneville Power Administration Portland, Oregon – Brenda Aguirre, Don Rose
NOAA – Habitat Conservation Division, Seattle, Washington	

State, County, and Local Agencies and Officials	
Office of the Governor, Boise	Idaho Department of Water Resources Aaron Golart, Greg Taylor, and Helen Harrington
Idaho Senator – Mike Crapo, Sheryl Nuxoll	Idaho State Historic Preservation Office Mary Anne Davis
Idaho County Commissioners Skip Brandt, James Rockwell, Jim Chemlik	Grangeville Centennial Library, Grangeville, Idaho
Idaho County Road Dept., Elk City, John Enos	Elk City Community Library, Elk City, Idaho
Idaho Department of Environmental Quality Grangeville, Idaho – Daniel Stewart Lewiston, Idaho – Cindy Barrett, Sujata Connell	Kamiah Public Library, Kamiah, Idaho
Idaho Department of Fish and Game – Dave Cadwallader, Ray Hennekey, and Joe Dupont	Missoula Public Library, Missoula, Montana
Idaho Department of Parks and Recreation, Boise, Idaho – Jeff Cook	Clearwater Memorial Public Library, Orofino, Idaho
Businesses and Organizations	
AVISTA – Eric Robie	Redfish Bluefish – Scott Levy
Brown's Industries, LLC	Save our Wild Salmon – Gilly Lyons
Bonneville Environmental Foundation – Angus Duncan	Save our Wild Salmon Coalition – Joseph Bogaard
Columbia Basin Programs, American Rivers- Michael Garrity	Snake River Alliance – Liz Woodruff
Friends of the Clearwater – Gary Macfarlane	Snake River Salmon Solutions – Bill Boyer
Idaho Conservation League – Justin Hayes – Program Director Jonathan Oppenheimer, Ben Otto	Northwest Sportfishing Industry Association – Liz Hamilton
Idaho River United – Greg Stahl, Tom Stuart	Trout Unlimited – Idaho – Jerry Meyers
Idaho Salmon and Steelhead Unlimited -Bill Boyer	Western Rivers Conservancy – Sue Doroff
Open Roads 4 Idaho, LTD – Gene Butler	
Individuals	
Daniel Baldwin	Don Moyer
Woody Blakeley	Don Nuxoll
Ray Brooks	Ed and Donna Perrine
Harvey Dale	Bob, Margie, and Gene Pontius
Teresa Enos	Phil and Jean Poxleitner
Joe Lemire	John and Michele Stickley
Bob McGuire	Robert and Corene Wightman
Margaret McVicker	

Summary of Crooked River Valley Rehabilitation Planning Process and Timeline

Table 4-3 displays the project NEPA planning timeline and public involvement actions completed by the Forest.

Table 4-3. Project NEPA planning process and timeline.

Date	Public Involvement Action
December 12, 2012	Notice of Intent, "Crooked River Valley Rehabilitation Project," published in the *Federal Register* with proposed action
January 17, 2013	Public meeting held in Grangeville to discuss the proposed action
January 26, 2013	Scoping period ends; 25 comment letters received
January 28, 2013	Public meeting held in Elk City to discuss the proposed action
June 19, 2013	Field trip to project area for agencies
June 21, 2013	Field trip to project area for commenters
March 2014	Release DEIS to the public for comment
Estimated May 2014	DEIS scoping period ends

Consultation and Coordination

The IDT consulted agencies and individuals for input, through either formal scoping or informal contacts with specific resource specialists. A summary of public involvement is listed above in Table 4-3. Scoping letters were sent to interested agencies, publics, organizations in December 2012, and to mining claimants in May 2013. The mailing list is located in the project record.

Tribal Consultation

In December 2012, a scoping letter was sent to inform the Nez Perce Tribe of the upcoming analysis, and to solicit comments related to proposed activities. Informal consultation was initiated with the Nez Perce Tribe at the Quarterly Meeting in January 2013.

Federal and State Consultation

Consultation with the U.S. Fish and Wildlife Service and National Oceanic Atmospheric Administration (NOAA) – National Marine Fisheries Service was initiated in February 2013. Biological assessments for federally listed fish, wildlife, and plants are being prepared and are located in the project record. Consultation will be completed prior to making a decision.

The Forest will consult with the U.S. Army Corps of Engineers and Idaho Department of Water Resources to obtain any necessary permits related to streams, wetlands, and floodplains prior to implementation.

Investigations used for this analysis meet requirements of the National Historic Preservation Act and provisions of the Programmatic Agreement between the Idaho State Historic Preservation Office and Region 1 of the USDA Forest Service. The Cultural Resource Inventory Report will be sent to the Idaho State Historic Preservation Office and consultation will be completed prior to making a decision.

Laws and Regulations

As part of this analysis for this project, the IDT evaluated various alternatives under the laws, regulations, and requirements relating to federal natural resource management. Several of the design and mitigation measures presented in Chapter 2 were developed and incorporated to ensure that these requirements would be met. Additional details can be found in Chapter 1 (Regulatory Framework), Chapter 2 (Design and Mitigation Measures), Chapter 3 (by resource), and/or the project record. Chapter 1 contains information on the Nez Perce Forest Plan Direction, and Tribal Treaty Rights. The project record has a full description of Forest Plan consistency, by resource.

Clean Air Act

The Clean Air Act, passed in 1963 and amended numerous times since then, is the primary legal authority governing air quality management. This Act provides the framework for national, state, and local efforts to protect air quality. This project is not expected to have impacts to air quality. The Montana/Idaho State Airshed Group was formed to coordinate all prescribed burning activities in order to minimize or prevent impacts from smoke emissions and ensure compliance with the National Ambient Air Quality Standards (NAAQS) issued by the Environmental Protection Agency (EPA), the federal agency charged with enforcing the Clean Air Act. The project area lies totally within North Idaho Airshed 13. No smoke emissions would occur with this project. See Chapter 3, Air Quality, for more information.

Clean Water Act

Section 303 of the Clean Water Act requires federal agencies to comply with all federal, state, interstate, and local requirements; administrative authorities; and process and sanctions with respect to control and abatement of water pollution. Executive Order (EO) 12088 requires the Forest Service to meet the requirements of this Act. Therefore, all state and federal laws and regulations applicable to water quality would be applied, including 36 CFR 219.27; the Clean Water Act; the Nez Perce Forest Plan, including PACFISH Riparian Management Objectives (RMOs) and Riparian Habitat Conservation Areas; Idaho State Best Management Practices (BMPs); and Stream Alteration procedures. See Chapter 3, Water Resources, and project record for more information.

Region 1 Soil Quality Standards

Region 1 soil quality standards (USDA Forest Service 1999) specify that at least 85% of an activity area (defined as a land area affected by a management activity) must have soil that is in satisfactory condition. In other words, detrimental impacts (including compaction, displacement, rutting, severe burning, surface erosion, and mass wasting) shall be less than 15% of an activity area. In areas where more than 15% detrimental soil conditions exist from prior activities, the cumulative detrimental effects from proposed activities, including restoration, shall not exceed the conditions prior to the proposed activity and should move toward a net improvement in soil quality. Project design criteria would ensure that soil quality standards are met.

Appendix D describes, in detail, a proposed project-specific Forest Plan amendment adopting Region 1 soils standards that would be included in Alternative 2 in this DEIS. The following amendment to Nez Perce Forest Plan Soil Quality Standard #2, specific to the Crooked River Valley Rehabilitation project area, is proposed: "Where detrimental soil conditions from past activities affect 15 percent or less of the activity area, a cumulative minimum of 85 percent of the activity area shall not be detrimentally compacted, displaced, or puddle upon completion of activities. Where detrimental soil conditions from past activities affect more than 15 percent of the activity area, the cumulative detrimental soil disturbance (DSD) from project implementation and past activities shall not exceed the conditions prior to the planned activity and shall provide a net improvement in soil quality." See Chapter 3, Soil Resources, and Appendix D for more information.

Endangered Species Act

Forest Service Manual (FSM) 2670 (USDA Forest Service 2005a) directs the Forest Service to conserve endangered and threatened species and to utilize its authorities in furtherance of the Endangered Species Act (ESA), and to avoid actions that may cause a species to become threatened or endangered. FSM 2670 also requires the Forest Service to maintain viable populations of all native and desirable non-native wildlife, fish, and plant species in habitats distributed throughout their geographic range on NFS lands. As directed by the ESA, biological assessments and consultation under Section 7 of the ESA will be completed for this decision. The action alternative is not expected to result in a jeopardy biological opinion for any listed species. See Chapter 3, Aquatic Resources, Wildlife Resources, and Rare Plants, for more information.

Executive Orders 11988 and 11990

These federal executive orders (EOs) provide for the protection and management of floodplains and wetlands. Numerous floodplains and wetlands exist within the project area.

EO 11988 (Floodplain Management) requires each federal agency to evaluate the potential effects of actions it may take in a floodplain to avoid adverse impacts wherever possible, to ensure that its planning programs and budget requests reflect consideration of flood hazards and floodplain management, including restoring and preserving such land areas as natural undeveloped floodplains, and to prescribe procedures to implement the policies and procedures of this EO.

EO 11990 (Protection of Wetlands) requires federal agencies to take action to avoid adversely impacting wetlands wherever possible, to minimize wetlands destruction and preserve the values of wetlands, and to prescribe procedures to implement the policies and procedures of this EO.

The Crooked River Valley Rehabilitation project activities have been designed to be consistent with the requirements of EO 11988 and EO 11990. As required, the Forest would apply for a Section 404 permit with the Army Corps of Engineers and Stream Alteration permit with the Idaho Department of Water Resources. See Chapter 3, Water Resources, for more information.

Executive Order 12898

EO 12898 (Environmental Justice) directs each federal agency to make environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations. An associated memorandum emphasizes the need to consider these types of effects during NEPA analysis. The proposed activities would not disproportionately adversely affect minority or low-income populations, including American Indian tribal members. See also Chapter 1 for Tribal Treaty information and Chapter 3, Social and Economic Resources.

Executive Order 13112

EO 13112 (Invasive Species) was issued on February 3, 1999, to enhance federal coordination and response to the complex and accelerating problem of invasive species. EO 13112 directs federal agencies to work together [as stated in the Preamble] to "…prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause." Project activities have been designed to be consistent with the requirements of EO 13112. See Chapter 3, Invasive Plants, for more information.

Idaho Forest Practices Act

The Idaho Forest Practices Act regulates forest practices on all land ownership in Idaho. Forest practices on NFS lands must adhere to the rules pertaining to water quality (IDAPA 20.02.01). The rules are also incorporated as BMPs in the Idaho Water Quality Standards. Project activities have been designed to be consistent with the Idaho Forest Practices Act. See Chapter 3, Water Resources, for more information.

Idaho Stream Channel Protection Act

The Idaho Stream Channel Protection Act regulates stream channel alterations between mean and high water marks on perennial streams in Idaho (IDAPA 37.03.07). Instream activities on NFS lands must adhere to the rules pertaining to the Act. The rules are also incorporated as BMPs in the Idaho Water Quality Standards. Project activities have been designed to be consistent with the Idaho Stream Channel Protection Act. The Forest would apply for a Stream Alteration permit with the State of Idaho. See Chapter 3, Water Resources, for more information.

NEPA Sections 101 and 102

The National Environmental Policy Act (NEPA) (42 U.S.C. 4321 et seq.) was enacted on January 1, 1970. NEPA establishes national environmental policy and goals for the protection, maintenance, and enhancement of the environment and provides a process for implementing these goals within federal agencies. NEPA also established the Council on Environmental Quality.

Title I, Section 101, of NEPA contains a Declaration of National Environmental Policy that requires the federal government to use all practicable means to create and maintain conditions under which man and nature can exist in productive harmony. Title I, Section 102, requires federal agencies to incorporate environmental considerations in their planning and decision-making through a systematic interdisciplinary approach. Specifically, all federal agencies are to prepare detailed statements assessing the environmental impact of and alternatives to major federal actions significantly affecting the environment. These statements are commonly referred to as environmental impact statements (EISs).

The public has an important role in the NEPA process, particularly during scoping, to provide input on what issues should be addressed in an EIS and to comment on the findings in an agency's NEPA documents. The public can participate in the NEPA process by attending NEPA-related hearings or public meetings and by submitting comments directly to the lead agency. The lead agency must consider all comments received from the public and other parties on NEPA documents during the comment period.

National Forest Management Act

The National Forest Management Act (NFMA [16 U.S.C. 1600–1614, as amended]) reorganized, expanded, and otherwise amended the Forest and Rangeland Renewable Resources Planning Act of 1974, which called for the management of renewable resources on NFS lands. NFMA requires the Secretary of Agriculture to assess forest lands; develop a management program based on multiple-use, sustained-yield principles; and implement a resource management plan for each unit of the NFS. It is the primary statute governing the administration of national forests. The Forest has implemented a resource management plan: the Nez Perce Forest Plan. Activities for the Crooked River Valley Rehabilitation project have been designed to be consistent with the NFMA and Nez Perce Forest Plan. See Chapter 3, Soil Resources, for more information.

National Historic Preservation Act

Section 101 of NEPA requires federal agencies to preserve important historic, cultural, and natural aspects of our national heritage. The legal processes associated with the protection and preservation of these resources is outlined in the National Historic Preservation Act of 1966 (NHPA [36 CFR 800]) and subsequent amendments. Passed by Congress 2 years before NEPA, the NHPA sets forth a framework for determining if a project is an “undertaking” that has the potential to affect cultural resources. The implementing regulations also outline the processes for identifying, evaluating, assessing effects, and protecting such properties. The coordination or linkage between the Section 106 process of the NHPA and the mandate to preserve our national heritage under NEPA is well understood and is formally established in 36 CFR 800.3b and 800.8. The terminology of “…important historic, cultural, and natural aspects of our national heritage” found in NEPA includes those resources defined as “historic properties” under the NHPA [36 CFR 800.16(l)(1)]. It is thus the Section 106 process that agencies utilize to consider, manage, and protect historic properties during the planning and implementing stages of federal projects. The Forest meets its responsibilities under NHPA through compliance with the terms of a Programmatic Agreement (PA) signed among Region 1, the Idaho State Historic Preservation Office, and the Advisory Council on Historic Preservation. See Chapter 3, Cultural Resources, for more information.

CHAPTER 5. ACRONYMS AND GLOSSARY

303(d) list. List of impaired and threatened waters (stream/river segments, lakes) required by the Clean Water Act that do not meet water quality standards and for which an action plan, called a Total Maximum Daily Load, must be developed to improve water quality.

305(b). Integrated report on the conditions of all waters of a state, include those with a Total Maximum Daily Load.

Abiotic. Characterized by the absence of living organisms.

Adit. An entrance to an underground mine which is horizontal or nearly horizontal, by which the mine can be entered, drained of water, ventilated, and minerals extracted.

Affected environment. The natural environment that currently exists in an area being analyzed. The environment of the area to be affected or created by the alternatives under consideration.

AIRFA. American Indian Religious Freedom Act of 1978.

Allochthonous. Organic and inorganic material, originating outside of a stream, that has fallen or washed into the stream.

Alternative. A combination of management prescriptions applied in specific amounts and locations to achieve a desired management emphasis as expressed in goals and objectives. One of several policies, plans, or projects proposed for decision.

Anadromous fish. Fish that migrate from saltwater seas up freshwater streams to reproduce.

APE. See *area of potential effects*.

Area of potential effects. The geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The APE is influence by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking. (36 CFR 800.16(d))

BA. See *biological assessment*.

Bankfull. The size of a channel to convey bankfull discharge.

Bankfull depth. The depth of flow at bankfull discharge.

Bankfull discharge. The discharge at which a stream first overflows its natural banks. Also the channel-forming discharge. Bankfull discharge generally has a 1.5-year recurrence interval.

Bankfull elevation. The water surface elevation at bankfull discharge.

Bankfull floodplain. The floodplain corresponding to the elevation of the top of new channel banks.

Bankfull width. The surface width of a channel at bankfull discharge.

Baseflow. The portion of stream flow that is not surface runoff and results from seepage of groundwater into a channel slowly over time. The primary source of running water in a stream during dry weather.

Bedform. A feature that develops as the result of bed material being moved by fluid flow. Examples include ripples, dunes, and pools on the bed of a river.

Belt width. The lateral extent of the river meanders across the valley bottom.

Beneficial uses. Legal term describing a person's right to enjoy the benefits of a specific property. As used in the Clean Water Act and by Idaho Department of Environmental Quality: "The designated beneficial use of a water body must consider its actual use, the ability of the water to support in the future a use that is not currently supported, and the basic goal of the Clean Water Act that all waters support aquatic life and recreation where attainable. Idaho must designate its uses accordingly."

Biological assessment. Information prepared by, or under the direction of, a federal agency to determine whether a proposed action is likely to (1) adversely affect listed species or designated critical habitat, (2) jeopardize the continued existence of species that are proposed for listing, or (3) adversely modify proposed critical habitat. Biological assessments must be prepared for "major construction activities." See 50 CFR 402.02. The outcome of a biological assessment determines whether formal consultation or a conference is necessary [50 CFR 402.02 and 402.12].

Biotite schist rock. The biotite schist are a type of metasedimentary rock, with sheet like grains that can split off as flakes and slabs. Schists originally derived from mudstones or clays, very fine grain sediments that were deposited in lake or ocean settings. The biotite indicates the dark phase mineral found in the schist.

BE. Biological evaluation.

BLM. Bureau of Land Management.

BMP. Best management practice.

BPA. Bonneville Power Administration.

Carrying Capacity. The maximum population size that a particular environment can support at a particular time.

CEQ. Council on Environmental Quality.

CFR. Code of Federal Regulations.

CFS. See *cubic feet per second*.

Channel entrenchment. The vertical containment of a river relative to its adjacent floodplain. Characterized by high stream banks and used to indicate channel-floodplain interaction.

Channel entrenchment ratio. A measure of how incised a river is, or the extent of vertical containment of a river relative to its adjacent floodplain. It is calculated as the ratio of flood-prone area width to bankfull width, where the lower the channel entrenchment ratio, the higher the channel entrenchment. Channel entrenchment ratio is used as an indicator of floodplain connectivity.

Channel geometry. The shape of a stream or river channel.

Channel sinuosity. A measure of the degree of meandering and channel migration within a valley. It is calculated as the ratio of valley gradient to channel gradient, and is used as an indicator of flow velocity.

Channel width-to-depth ratio. A measure of the shape of a channel cross section (e.g. wide and shallow or narrow and deep). It is calculated as the ratio of bankfull width to mean bankfull depth.

CP. Conservation Practice.

CRITFC. Columbia River Inter-Tribal Fish Commission.

Critical habitat. The specific areas within a geographical area either occupied or not occupied by the species and deemed essential to the species.

CRVR. Crooked River Valley Rehabilitation.

Cubic feet per second. A rate of flow. For example, 300 cfs means that every second, 300 cubic feet of water is passing a given point in a river. A cubic foot of water is a little bigger than a basketball, so a good way to visualize 300 cfs is to imagine 300 basketballs passing by every second.

Designated Routes and Areas for Motor Vehicle Use project. Nez Perce National Forest NEPA effort to meet the intent of the Travel Management Rule for management of motorized vehicles on roads, trails, and areas.

Detrimental soil disturbance. A standard measure used to evaluate the impact of management actions whereby long-term reductions in soil productivity could occur. Detrimental disturbance is defined by indications of erosion, compaction, displacement, rutting, severe burning, loss of organic matter, and soil mass movement.

Desired future condition. Land or resource conditions that are expected to result if goals and objectives are fully achieved.

Developed recreation site. Site at which modifications (improvements) enhance recreation opportunities and accommodate intensive recreation activities in a defined area.

Dispersed recreation site. Site at which recreation occurs outside of developed facilities. May involve roads and trails and may occur over a wide area. Examples of activities are day-use oriented and include hunting, fishing, berrypicking, off-road vehicle use, hiking, horseback riding, picnicking, camping, viewing scenery, and snowmobiling.

Diversity. The relative abundance of wildlife species, plant species, communities, habitats, or habitat features per unit of area. The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan.

Draft environmental impact statement. The draft version of the environmental impact statement that is released to the public and other agencies for review and comment.

DRAMVU. See *Designated Routes and Areas for Motor Vehicle Use project*.

Dredge herbaceous. Plants whose leaves and stems die down at the end of the growing season surviving on dredge piles.

Dredge mining. The extraction of minerals from an alluvial or glacial deposit, as of sand and gravel, containing particles of gold or other valuable minerals. A dredge or dredge boat is a large structure that uses a suction tube or a chain of buckets to pull dirt and debris from the bottom of the stream or river. The dirt, sand, and rocks left over after the removal of valuable minerals are called tailings.

DSD. See *detrimental soil disturbance*.

EA. Environmental assessment.

Ecosystem. An arrangement of living and non-living things and the forces that move among them. Living things include plants and animals. Non-living parts of ecosystems may be rocks and minerals. Weather and wildfire are two of the forces that act within ecosystems.

Effects (also known as *impacts*). Physical, biological, social, and economic results (expected or experienced) resulting from achievement of outputs. Effects can be direct, indirect, and cumulative and may be either beneficial or detrimental.

Effective shade. The percent reduction of total solar radiation by topography and/or riparian vegetation.

EHE. See *elk habitat effectiveness*.

EIS. See *Environmental impact statement.*

Elk habitat effectiveness. Elk habitat effectiveness, or potential elk use, refers to elk habitat quality. 100% potential elk use means that a site has the optimum amount and interspersion of all habitat factors including security, to permit elk use at the maximum potential for that site. An assessment of summer elk habitat following the direction in the Nez Perce Forest Plan (USDA Forest Service 1987a – Appendix B; Leege 1984).

Embeddedness. The extent to which rocks (gravel, cobble, and boulders) are surrounded by, covered, or sunken into the silt, sand, or mud of the stream bottom. Generally, as rocks become embedded, fewer living spaces are available to macroinvertebrates and fish for shelter, spawning, and egg incubation.

Endangered species. A plant or animal that is in danger of extinction throughout all or a significant portion of its range. Endangered species are identified by the Secretary of the Interior and Department of Commerce in accordance with the Endangered Species Act of 1973.

Environmental impact statement. A formal public document prepared to analyze and disclose the impacts on the environment of the proposed project or action and alternatives.

Entrenchment. Term that quantifies the accessibility of a floodplain; it is the ratio of the floodplain width to the bankfull width—the lower the number, the greater the entrenchment.

EO. Executive order.

EPA. United States Environmental Protection Agency.

ESA. Endangered Species Act.

FCRPS. Federal Columbia River Power System.

Floodplain. Lowland adjoining a watercourse. At a minimum, the area is subject to a 1 percent or greater chance of flooding in a given year.

Flood-prone area width. The width of flow measured at an elevation of two times the maximum bankfull depth.

Fluvial. Pertaining to or living in streams or rivers, or produced by the action of flowing water. *Fluvial* fish indicates that they spawn and rear in the tributaries, but migrate to the larger river systems to reach maturity and persist as adults.

Forage. All browse and non-woody plants that are eaten by wildlife and livestock.

Forb. A broadleaf plant that has little or no woody material in it.

Forest plan. A comprehensive management plan prepared under the National Forest Management Act of 1976 that provides standards and guidelines for management activities in the national forest.

FR. *Federal Register*.

Geomorphology. The examination of river forms and processes that operate through mutual adjustments to achieve a condition of stability where a river attains balance between erosion and deposition.

GIS. Geographic information system.

Gneiss rock. The gneiss name derives from the particular banding in bedrock. Gneiss results from high-grade metamorphism that results in alternating dark and light color bands. The crystalline structure tends to have coarse texture.

Habitat. The physical and biological environment for a plant or animal in which all the essentials for its development, existence, and reproduction are present.

Habitat type. A way to classify land area and streams. A habitat type can support certain climax vegetation or fish species. The habitat type can indicate the biological potential of a site.

Habitat type group. A logical grouping of habitat types to facilitate resource planning.

HTG. See *habitat type group.*

HUC. Hydrologic unit code.

Hydraulic conductivity. The ease with which flow takes place through a porous medium.

Hydraulic mining. The use of pressurized water to cut into a hillside, washing the dirt and gravel down into a sluice box to sort for gold or other minerals.

Hydraulic modeling. Used to evaluate important elements of free surface fluid flow. For Crooked River, numeric models pertaining to hydraulics of stream channels output velocities, depths, widths, mobile bed materials, and vertical and horizontal sheer stresses based on potential flow recurrences for the stream to show stability and effects to fisheries and geomorphology.

Hyporheic zone. The region beneath and alongside a stream bed, where there is mixing of shallow groundwater and surface water.

IDAPA. Idaho Administrative Procedures Act.

IDEQ. Idaho Department of Environmental Quality.

IDFG. Idaho Department of Fish and Game.

IDT. Interdisciplinary Team.

IDWR. Idaho Department of Water Resources.

Impacts (also known as *effects*). Physical, biological, social, and economic results (expected or experienced) resulting from achievement of outputs. Effects can be direct, indirect, and cumulative and may be either beneficial or detrimental.

Indirect effects. Effects that are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

Instream flow. The quantity of water necessary to meet seasonal stream flow requirements to accomplish the purposes of the national forests, including, but not limited to fisheries, visual quality, and recreational opportunities.

Invertebrate. An animal lacking a spinal column.

Irretrievable. One of the categories of impacts mentioned in the National Environmental Policy Act to be included in statements of environmental impacts. An irretrievable effect applies to losses of production or commitment of renewable natural resources.

Irretrievable effect. An effect that is sustained for a certain period of time but is reversible.

Irreversible. A category of impacts mentioned in statements of environmental impacts that applies to nonrenewable resources, such as minerals and archaeological sites. Irreversible effects can also refer to effects of actions that can be renewed only after a very long period of time, such as the loss of soil productivity.

Keystone species. A species that has a disproportionately large effect on its environment relative to its abundance.

Least Environmentally Damaging Practicable Alternative. An environmental permitting term, used by the U.S. Army Corps of Engineers, to specify which of the proposed alternatives is least damaging to the environment. To determine the LEDPA, an applicant conducts a 404(b)(1) Alternatives Analysis. Although the LEDPA determination is only one of many determinations the Corps will make for a project and that the applicant must pass , the LEDPA determination is often the "steepest hurdle" in obtaining a 404 permit.

LEDPA. See *Least Environmentally Damaging Practicable Alternative*.

LWD. Large woody debris.

MA. Management Area.

Management indicator species. Species identified in a planning process that are used to monitor the effects of planned management activities on viable populations of wildlife and fish, including those that are socially or economically important. Mitigation includes (1) avoiding the impact altogether by not taking a certain action or parts of an action; (2) minimizing impacts by limiting the degree of magnitude of the action and its implementation; (3) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and (5) compensating for the impact by replacing or providing substitute resources or environments.

MBTA. Migratory Bird Treaty Act.

Meander wavelength. The distance of one meander along the down-valley axis (see Figure 3-2).

Metasedimentary bedrock. Sedimentary rocks that have undergone metamorphism from heat and pressure that recrystallizes the original mineral constituents. Metasedimentary rocks date from Proterozoic age, roughly 1370 million years, and were morphed from heat and pressure as a series of magma bodies have pushed up from below. Schist and gneiss form from extensive metamorphism.

MIS. See *management indicator species*.

MOA. Memorandum of agreement.

NAAQS. National Ambient Air Quality Standards.

NAGPRA. Native American Graves Protection and Repatriation Act of 1990.

National Register Site or historic property. Any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian Tribe or Native Hawaiian organization and that meet the National Register criteria.

NEPA. National Environmental Policy Act.

NEZSED. Computer model used to predict sediment yield.

NFMA. National Forest Management Act.

NFS. National Forest System.

NHPA. National Historic Preservation Act.

NMFS. National Marine Fisheries Service.

NOAA. National Oceanic and Atmospheric Administration.

No Action alternative. An alternative that maintains current established trends or management direction.

NPCC. Northwest Power and Conservation Council.

NPT. Nez Perce Tribe.

NRHP. National Register of Historic Places.

NTU. Nephelometric turbidity unit.

PACFISH. Abbreviation for *Environmental Assessment for the Implementation of Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California* (USDA Forest Service and USDI Bureau of Land Management 1995).

Particulate matter. Small particles suspended in the air and generally considered pollutants.

Palustrine. Nontidal wetlands that are dominated by trees, shrubs, persistent or nonpersistent emergent, mosses, or lichens. May also include wetlands without vegetation, wetlands with water depths less than 2 m, and wetlands with salinity of less than 0.5 ppm.

Planform metrics. Form of the river as seen from above.

Plant community. A group of individual plants of one or more species growing in a specific area in association with one another and with a complex of other plants and animals.

PM. Particulate matter.

Predator. An animal that lives by preying on other animals.

Project area. Area of analysis for proposed project.

Proposed action. In terms of National Environmental Policy Act, the project, activity, or action that a federal agency intends to implement or undertake and that is the subject of an environmental analysis.

Q_x. Describes the amount of water in a stream (*CFS*) based on a return interval described in years (x). The return interval is calculated by statistical analysis of stream flow gage data, regressions, or models. The *recurrence interval* is based on the probability that the given event will be equaled or exceeded in any given year. For example, a Q_2 is a 2-year return interval stream flow and a Q_{50} is a 50-year return interval stream flow.

RDG. River Design Group.

Radius of curvature. At a given point of a curved line (e.g., a meander bend), the radius of a circle that mathematically best fits the curve at that point.

Reach. Any defined length of river. Reaches are usually defined by areas with similar characteristics (slope, sinuosity, entrenchment, substrate size, riparian conditions, etc.).

Recreation Opportunity Spectrum. A system for planning and managing recreation resources that recognizes recreation activity opportunities, recreation settings, and recreation experiences along a spectrum or continuum of settings. The spectrum includes primitive, semi-primitive non-motorized, semi-primitive motorized, and roaded natural.

Recreation site. A discrete area on a Forest that provides recreation opportunities, receives recreational use, and requires a management investment to operate and/or maintain to standard under the direction of an administrative unit in the National Forest System.

Recurrence interval. The interval of time, on average, within which a given discharge will be equaled or exceeded once in any given year. The actual number of years between floods of any given size varies because of the natural variability in the climate. Recurrence interval year (Q_x) is denoted with a subscript number (e.g., Q_{100}).

Restoration (of ecosystems). Actions taken to modify an ecosystem to achieve a desired, healthy, and functioning condition.

Revegetation. The reestablishment and development of self-sustaining plant cover. On disturbed sites, this normally requires human assistance such as seedbed preparation, reseeding, and mulching.

Riparian. Situated on or pertaining to the bank of a river, stream, or other body of water. Normally describes plants of all types that grow rooted in the water table or sub-irrigation zone of streams, ponds, and springs.

Riverine. An area that is adjacent to a stream or river with perennial flow, is underlain with hydric soils developed in fluvial conditions, derives a significant portion of its hydrology from overbank flooding, and is within, at a minimum, the 5-year floodplain area.

RMO. Riparian management objective.

Road decommissioning. Activities that result in the stabilization and restoration of unneeded roads to a more natural state.

Road closure. The administrative order that does not allow specified users in designated areas or on Forest development roads or trails.

Roaded natural. Area characterized by a substantially modified natural environment. Resource modification and utilization practices are to enhance specific recreation activities and to maintain vegetative cover and soil. Sights and sounds of humans are readily evident, and the interaction between users is often moderate to high. A considerable number of facilities are designed for use by a large number of people. Facilities are often provided for specific activities. Moderate densities are provided far away from developed sites. Facilities for intensified motorized use and parking are available. See also *Recreation Opportunity Spectrum*.

ROD. Record of decision.

Runoff. The portion of precipitation that flows over the land surface or in open channels.

Salmonid. Any fish in the Salmonidae family, including salmon, trout, chars, freshwater whitefishes, and graylings.

Scale. In ecosystem management, the degree of resolution at which ecosystems are observed and measured.

Scenic integrity level. A measure of the degree to which the landscape is perceived as whole, complete, or intact. The levels of scenic integrity provide a relative measure of deviation from the characteristic landscape within an area.

Sediment. Solid mineral or organic material that is transported by air, water, gravity, or ice.

Sediment regime. A broad term that embodies the processes of erosion, entrainment, transportation, deposition, and compaction of sediment.

Sediment yield. The total sediment load that leaves a drainage basin (usually measured in tons/acre/year).

Sensitive species. Identified and designated by the USDA Forest Service Regional Forester as species on National Forest System Lands for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers, density, or habitat capability [FSM 2670.5] and that need special management to maintain and improve their status on National Forests and Grasslands, and prevent a need for listing under the Endangered Species Act.

Seral stage. The stage of succession of a plant or animal community that is transitional. If left alone, the seral stage will give way to another plant or animal community that represents a further stage of succession.

SHPO. State Historic Preservation Officer.

SIL. Scenic integrity level.

Sinuosity. Ratio of channel length between two points in a channel to the straight line distance between the same two points. Also can be a ratio of channel length to valley length.

Stage. The water level above some arbitrary point, usually with the zero height being near the river bed.

Succession. The natural replacement, in time, of one plant community with another. Conditions of the prior plant community (or successional stage) create conditions that are favorable for the establishment of the next stage.

Suction dredging. A method of dredging in streams and rivers that uses high-pressure water pumps driven by gasoline-powered engines to remove the gravels to access gold. The use of a suction dredge with an intake nozzle diameter of 4 inches or less is considered recreational dredging. The use of a dredge with an intake nozzle larger than 4 inches is considered a commercial operation.

Susceptibility. In the context of plants, the vulnerability of plant communities to colonization and establishment of invasive plants.

Sympatry. The occurrence of organisms in overlapping geographical areas, but without interbreeding.

Threatened species. Any species likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range, and that has been designated in the *Federal Register* by the Secretary of the Interior as a threatened species.

TMDL. See *Total Maximum Daily Load***.**

Total Maximum Daily Load. A water quality improvement plan for water bodies not found to be meeting water quality standards of the state. A subbasin assessment is conducted to determine which waterbodies do not meet the standards and then TMDLs are assessed at the subbasin level to ensure improvement to the water quality ensues.

Turbidity. The cloudiness or haziness of a fluid caused by individual particles that are generally invisible to the naked eye.

USACE. United States Army Corps of Engineers.

U.S.C. United States Code.

USDA. United States Department of Agriculture.

USDI. United States Department of Interior.

USEPA. United States Environmental Protection Agency.

USFWS. United States Fish and Wildlife Service.

Visual quality objective. A classification based upon variety class, sensitivity level, and distance zone determinations. Each objective describes a different level of acceptable alteration based on aesthetic importance. The degree of alteration is based on contrast with the surrounding landscape.

VQO. See *visual quality objective*.

Water Erosion Prediction Project. Physically based erosion simulation model built on the fundamentals of hydrology, plant science, hydraulics, and erosion mechanics.

Watershed. The entire region drained by a waterway (or into a lake or reservoir). More specifically, a watershed is an area of land above a given point on a stream that contributes water to the streamflow at that point.

WEPP. See *Water Erosion Prediction Project*.

Wetlands. Areas that are permanently wet or are intermittently covered with water. See also *palustrine* and *riverine*.

Wildlife. Mammals, birds, reptiles, amphibians, and invertebrates.

This page was intentionally left blank.

.

Appendix A
Conceptual Drawings of Proposed Stream Restoration Activities

Figures A-1 through A-6 illustrate some of the proposed stream restoration activities for the Meanders (see Table A-1). Because of the number of pages and size of the figures, only selected figures are provided in this appendix. Full versions of the design plans are in the project record; and on the project website under Project Additional Information, at: http://www.fs.fed.us/nepa/fs-usda-pop.php/?project=40648.

Plan views of the proposed action (Alternative 2) include: project area, new channel location, bank structures (large wood, vegetated, sod, and brush fascine), floodplain features (alcove, floodplain depression, side channel, swale), floodplain elevation, temporary haul road, and bypass channel.

Table A-1. Alternative 2 – proposed action.

Figure	Sheet	Description	Features	Location
A-1	2.0	Ortho-photograph of project area.	Project area.	Stations 0+00 to 132+76
A-1a	3.1	Construction Phases 1 and 2	Proposed location and sequence of floodplain and channel construction.	Stations 31+00 to 106+00
A-1b	3.2	Construction Phases 3 and 4. Construction Options 1 and 2.	Proposed location and sequence of construction and revegetation activities.	Stations 0+00 to 132+76
A-2	4.2	Vegetation Preservation and Soil Salvage Plan View	Proposed locations for: staging areas, preservation areas, shrub salvage, sod salvage, and vegetative fill salvage. Proposed channel location and temporary haul road.	Stations 0+00 to 132+76
A-3	5.2	Site Plan	New stream channel. Temporary haul road and bypass channel. End of side channel 1. Beginning of side channel 2.	Stations 35+50 to 55+50
A-4	5.3	Site Plan	New stream channel. Temporary haul road and bypass channel. End of side channel 2.	Stations 55+00 to 74+50
A-5	5.4	Site Plan	New stream channel. Temporary haul road and bypass channel. Beginning and end of side channel 3.	Stations 74+00 to 95+00
A-6	8.7	Floodplain Roughness Detail	Areas to receive floodplain roughness and typical cross sections.	Stations 0+00 to 130+00

This page was intentionally left blank.

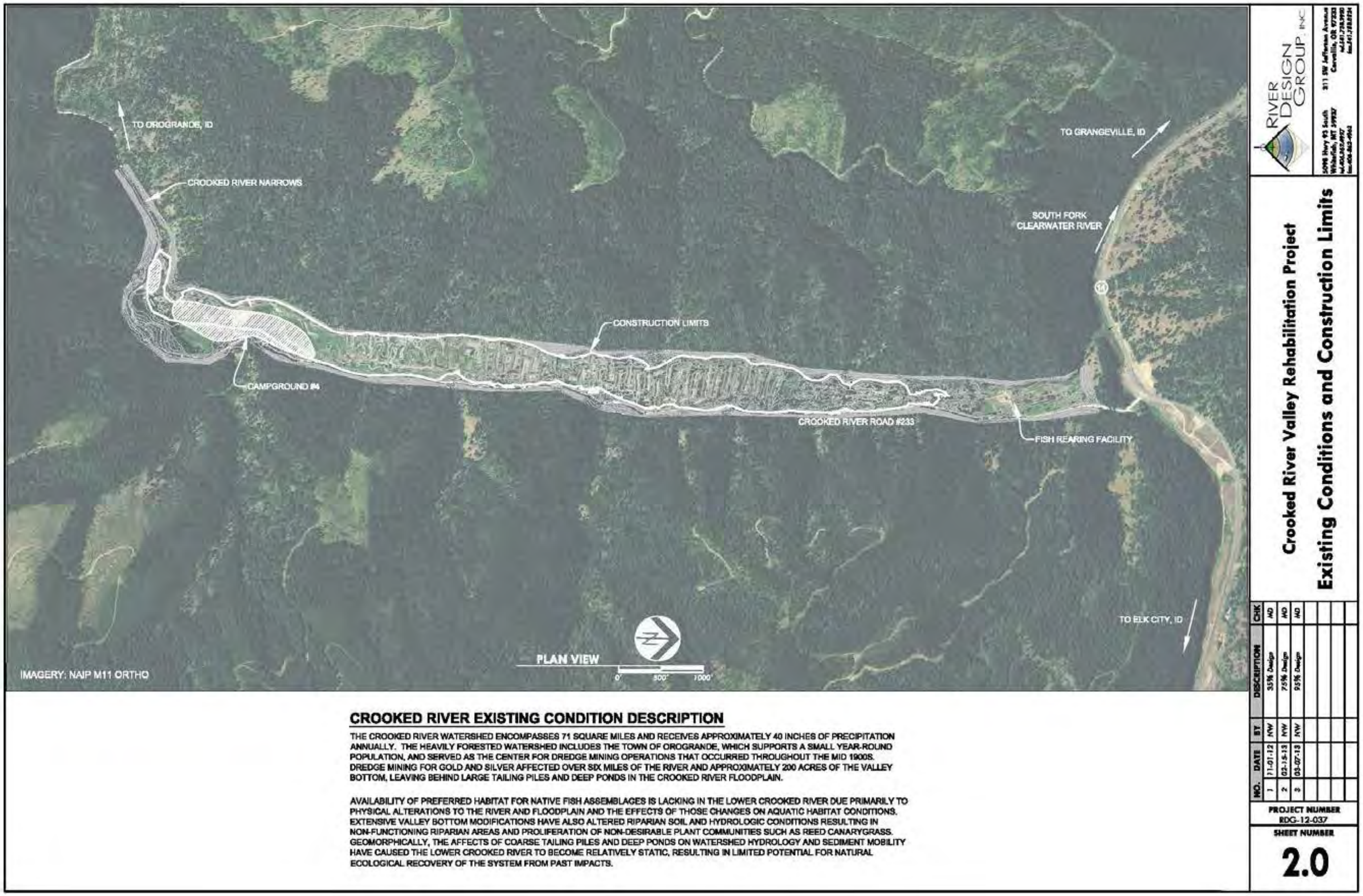
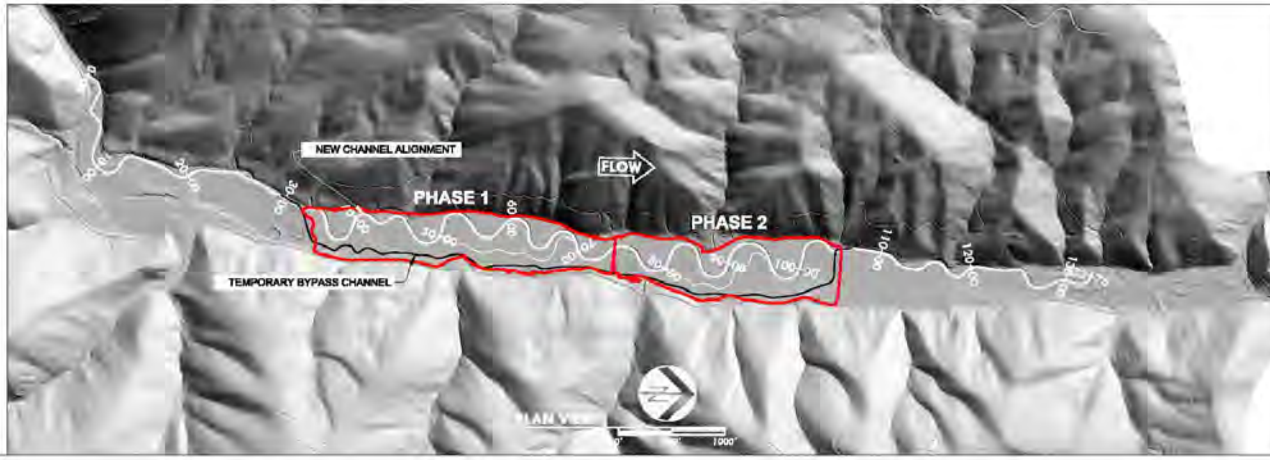


Figure A-1. Ortho-photograph of project area.



PHASE 1

SCOPE

BYPASS CHANNEL CONSTRUCTION BETWEEN BYPASS CHANNEL STATIONS 0+00 AND 40+00. NEW CHANNEL CONSTRUCTION AND FLOODPLAIN GRADING BETWEEN CHANNEL STATIONS 31+00 AND 74+00 INCLUDING GRADING OF SECONDARY FLOODPLAIN FEATURES (SWALES, DEPRESSIONS, WETLANDS AND SIDE CHANNELS).

CONSTRUCTION SEQUENCING

1. MOBILIZE EQUIPMENT
2. ESTABLISH STAGING AREAS AND SITE ACCESS
3. IMPLEMENT RESOURCE MANAGEMENT PLANS INCLUDING WORK AREA ISOLATION, DEWATERING AND EROSION CONTROL
4. CONSTRUCT TEMPORARY BYPASS CHANNEL AND DIVERT FLOW
5. EXECUTE FISH SALVAGE OPERATIONS IN CROOKED RIVER
6. SALVAGE AND STOCKPILE NATIVE MATERIALS
7. COMPLETE EARTHWORK AND GRADING FOR FLOODPLAIN AND CHANNEL
8. STAGE BACKFILL MATERIAL FOR TEMPORARY BYPASS CHANNEL RECLAMATION
9. REMOVE SEASONAL RESOURCE PROTECTION MEASURES AND SEASONAL STREAM CROSSINGS.
10. PERFORM SITE RECLAMATION, SITE CLEANUP AND DEMOBILIZATION

QUANTITIES

ITEM	QUANTITY
BYPASS CHANNEL EXCAVATION	10,500 CUBIC YARDS
EARTHWORK	49,400 CUBIC YARDS
MATERIALS SALVAGE	17 ACRES

MATERIALS

ITEM	QUANTITY
RIVERBED FILL	7,800 CUBIC YARDS
FLOODPLAIN FILL	50,400 CUBIC YARDS
VEGETATIVE FILL	6,100 CUBIC YARDS

PHASE 2

SCOPE

BYPASS CHANNEL CONSTRUCTION BETWEEN BYPASS CHANNEL STATIONS 40+00 AND 80+00. NEW CHANNEL CONSTRUCTION AND FLOODPLAIN GRADING BETWEEN CHANNEL STATIONS 74+00 AND 106+00 INCLUDING GRADING OF SECONDARY FLOODPLAIN FEATURES (SWALES, DEPRESSIONS, WETLANDS AND SIDE CHANNELS).

CONSTRUCTION SEQUENCING

1. MOBILIZE EQUIPMENT
2. ESTABLISH STAGING AREAS AND SITE ACCESS
3. IMPLEMENT RESOURCE MANAGEMENT PLANS INCLUDING WORK AREA ISOLATION, DEWATERING AND EROSION CONTROL
4. CONSTRUCT TEMPORARY BYPASS CHANNEL AND DIVERT FLOW
5. EXECUTE FISH SALVAGE OPERATIONS IN CROOKED RIVER
6. SALVAGE AND STOCKPILE NATIVE MATERIALS
7. COMPLETE EARTHWORK AND GRADING FOR FLOODPLAIN AND CHANNEL
8. STAGE BACKFILL MATERIAL FOR TEMPORARY BYPASS CHANNEL RECLAMATION
9. REMOVE SEASONAL RESOURCE PROTECTION MEASURES AND SEASONAL STREAM CROSSINGS
10. PERFORM SITE RECLAMATION, SITE CLEANUP AND DEMOBILIZATION

QUANTITIES

ITEM	QUANTITY
BYPASS CHANNEL EXCAVATION	12,700 CUBIC YARDS
EARTHWORK	60,700 CUBIC YARDS
MATERIALS SALVAGE	15 ACRES

MATERIALS

ITEM	QUANTITY
RIVERBED FILL	6,200 CUBIC YARDS
FLOODPLAIN FILL	61,500 CUBIC YARDS
VEGETATIVE FILL	5,200 CUBIC YARDS

RIVER DESIGN GROUP INC.

Crooked River Valley Rehabilitation Project

Construction Phasing Plan

NO.	DATE	BY	DESCRIPTION	CHK
1	02-01-12	NW	35% Design	MD
2	03-15-13	NW	75% Design	MD
3	05-07-13	NW	95% Design	MD

PROJECT NUMBER RDG-12-037

SHEET NUMBER 3.1

Figure A-1a. Construction Phases 1 and 2.

PHASE 3

SCOPE

BANK TREATMENTS AND FLOODPLAIN ROUGHNESS BETWEEN CHANNEL STATIONS 31+00 AND 106+00. NEW CHANNEL ACTIVATION.

CONSTRUCTION SEQUENCING

1. MOBILIZE EQUIPMENT
2. ESTABLISH STAGING AREAS AND SITE ACCESS
3. IMPLEMENT RESOURCE MANAGEMENT PLANS INCLUDING WORK AREA ISOLATION, DEWATERING AND EROSION CONTROL
4. STAGE NATIVE MATERIALS AND INSTALL INSTREAM STRUCTURES
5. PLACE FLOODPLAIN LARGE WOODY DEBRIS AND GRADE FLOODPLAIN MICROTOPOGRAPHY
6. DE-ACTIVATE TEMPORARY BYPASS CHANNEL AND ROUTE FLOW INTO NEW CHANNEL
7. EXECUTE FISH SALVAGE OPERATIONS IN TEMPORARY BYPASS CHANNEL
8. REMOVE SEASONAL RESOURCE PROTECTION MEASURES AND SEASONAL STREAM CROSSINGS
9. PERFORM SITE RECLAMATION, SITE CLEANUP AND DEMOBILIZATION

QUANTITIES

ITEM	QUANTITY
LARGE WOOD STRUCTURE TYPE 1	38 STRUCTURES
LARGE WOOD STRUCTURE TYPE 2	2,895 LINEAR FEET
VEGETATED SOIL LIFT TYPE 1	230 LINEAR FEET
VEGETATED SOIL LIFT TYPE 2	1,445 LINEAR FEET
SOD AND BRUSH FASCINE TYPE 1	3,445 LINEAR FEET
SOD AND BRUSH FASCINE TYPE 2	925 LINEAR FEET
FLOODPLAIN ROUGHNESS	32 ACRES

MATERIALS

ITEM	DIMENSIONS	QUANTITY
LARGE LOGS	15-20 FT LENGTH, 15-18 INCH DIA., ROOTWAD ATTACHED	304 LOGS
MEDIUM LOGS	20-25 FT LENGTH, >12-15 INCH DIA., ROOTWAD ATTACHED	691 LOGS
SMALL LOGS	8-12 FT LENGTH, 6-12 INCH DIA., ROOTWAD OPTIONAL	4,013 LOGS
BRUSH	6-12 FT LENGTH, 3-6 INCH DIA., LIMBS/ROOTS ATTACHED	8,820 PIECES
COIR FABRIC	13.1 FT X 83 FT ROLL	22 ROLLS
COIR LOGS	10 FT LENGTH X 12 INCH DIA.	180 LOGS
CUTTINGS	6-8 FT LENGTH X <1 INCH DIA.	20,000 CUTTINGS
SOD MATS	3 FT WIDE X 8 FT LONG X 1 FT THICK MATS	23,200 SQ FT
STREAMBANK FILL	N/A	8,100 CUBIC YARDS
VEGETATIVE FILL	N/A	500 CUBIC YARDS

PHASE 4

SCOPE

BYPASS CHANNEL RECLAMATION, FLOODPLAIN ROUGHNESS AND UPLAND FLOODPLAIN GRADING INCLUDING GRADING OF SECONDARY FLOODPLAIN FEATURES (SWALES, DEPRESSIONS, WETLANDS AND SIDE CHANNELS) BETWEEN CHANNEL STATIONS 31+00 AND 106+00.

CONSTRUCTION SEQUENCING

1. MOBILIZE EQUIPMENT
2. ESTABLISH STAGING AREAS AND SITE ACCESS
3. IMPLEMENT RESOURCE MANAGEMENT PLANS INCLUDING WORK AREA ISOLATION, DEWATERING AND EROSION CONTROL
4. COMPLETE EARTHWORK AND GRADING FOR TEMPORARY BYPASS CHANNEL RECLAMATION
5. PLACE FLOODPLAIN LARGE WOODY DEBRIS AND GRADE FLOODPLAIN MICROTOPOGRAPHY
6. REMOVE RESOURCE PROTECTION MEASURES AND STREAM CROSSINGS
7. PERFORM SITE RECLAMATION, SITE CLEANUP AND DEMOBILIZATION

QUANTITIES

ITEM	QUANTITY
EARTHWORK	40,000 CUBIC YARDS
FLOODPLAIN ROUGHNESS	12 ACRES

MATERIALS

ITEM	DIMENSIONS	QUANTITY
SMALL LOGS	8-12 FT LENGTH, 6-12 INCH DIA., ROOTWAD OPTIONAL	700 LOGS
BRUSH	8-12 FT LENGTH, 3-6 INCH DIA., LIMBS/ROOTS ATTACHED	2,100 PIECES
GENERAL FILL	N/A	42,300 CUBIC YARDS
VEGETATIVE FILL	N/A	6,400 CUBIC YARDS

OPTION 1

SCOPE

FLOODPLAIN GRADING AND HABITAT STRUCTURES BETWEEN CHANNEL STATIONS 0+00 AND 31+00.

QUANTITIES

ITEM	QUANTITY
EARTHWORK	14,600 CUBIC YARDS
LARGE WOOD STRUCTURE TYPE 1	10 STRUCTURES
FLOODPLAIN SURFACE ROUGHNESS TREATMENTS	4 ACRES

MATERIALS

ITEM	DIMENSIONS	QUANTITY
LARGE LOGS	15-20 FT LENGTH, 15-18 INCH DIA., ROOTWAD ATTACHED	80 LOGS
MEDIUM LOGS	20-25 FT LENGTH, >12-15 INCH DIA., ROOTWAD ATTACHED	40 LOGS
SMALL LOGS	8-12 FT LENGTH, 6-12 INCH DIA., ROOTWAD OPTIONAL	200 LOGS
BRUSH	8-12 FT LENGTH, 3-6 INCH DIA., LIMBS/ROOTS ATTACHED	600 PIECES
STREAMBANK FILL	N/A	900 CUBIC YARDS
GENERAL FILL	N/A	14,600 CUBIC YARDS

OPTION 2

SCOPE

FLOODPLAIN GRADING AND HABITAT STRUCTURES BETWEEN STATIONS 106+00 AND 129+00.

QUANTITIES

ITEM	QUANTITY
EARTHWORK	48,100 CUBIC YARDS
LARGE WOOD STRUCTURE TYPE 1	10 STRUCTURES
FLOODPLAIN SURFACE ROUGHNESS TREATMENTS	14 ACRES

MATERIALS

ITEM	DIMENSIONS	QUANTITY
LARGE LOGS	15-20 FT LENGTH, 15-18 INCH DIA., ROOTWAD ATTACHED	80 LOGS
MEDIUM LOGS	20-25 FT LENGTH, >12-15 INCH DIA., ROOTWAD ATTACHED	40 LOGS
SMALL LOGS	8-12 FT LENGTH, 6-12 INCH DIA., ROOTWAD OPTIONAL	700 LOGS
BRUSH	8-12 FT LENGTH, 3-6 INCH DIA., LIMBS/ROOTS ATTACHED	2,100 PIECES
STREAMBANK FILL	N/A	900 CUBIC YARDS
FLOODPLAIN FILL	N/A	23,800 CUBIC YARDS
VEGETATIVE FILL	N/A	9,000 CUBIC YARDS

RIVER DESIGN GROUP INC

Crooked River Valley Rehabilitation Project

Construction Phasing Plan

NO.	DATE	BY	DESCRIPTION	CHK
1	02-01-12	NW	35% Design	AD
2	02-15-13	NW	75% Design	AD
3	03-07-13	NW	95% Design	AD

PROJECT NUMBER RDG-12-037

SHEET NUMBER **3.2**

Figure A-1b. Construction Phases 3 and 4, Options 1 and 2.

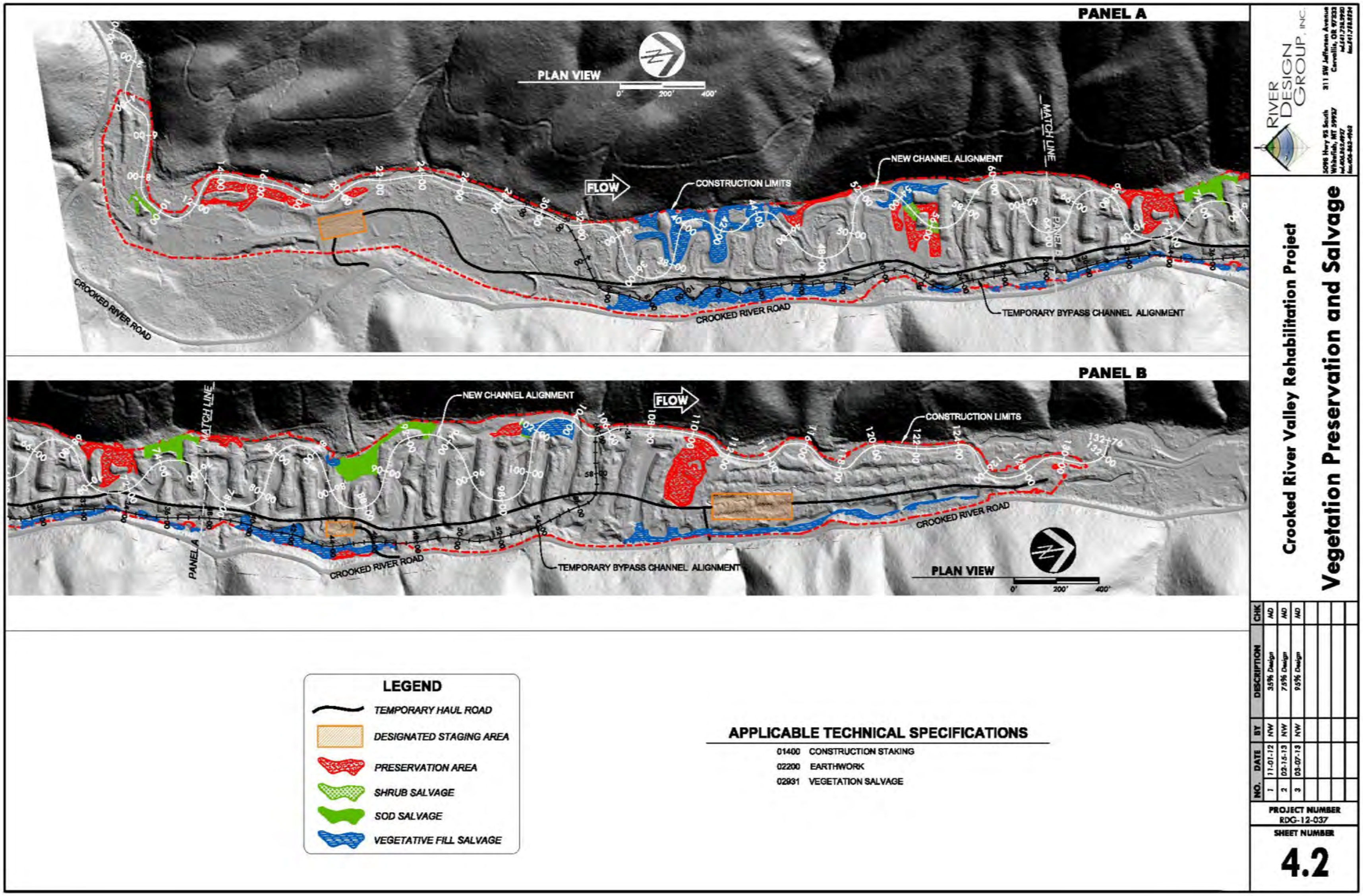
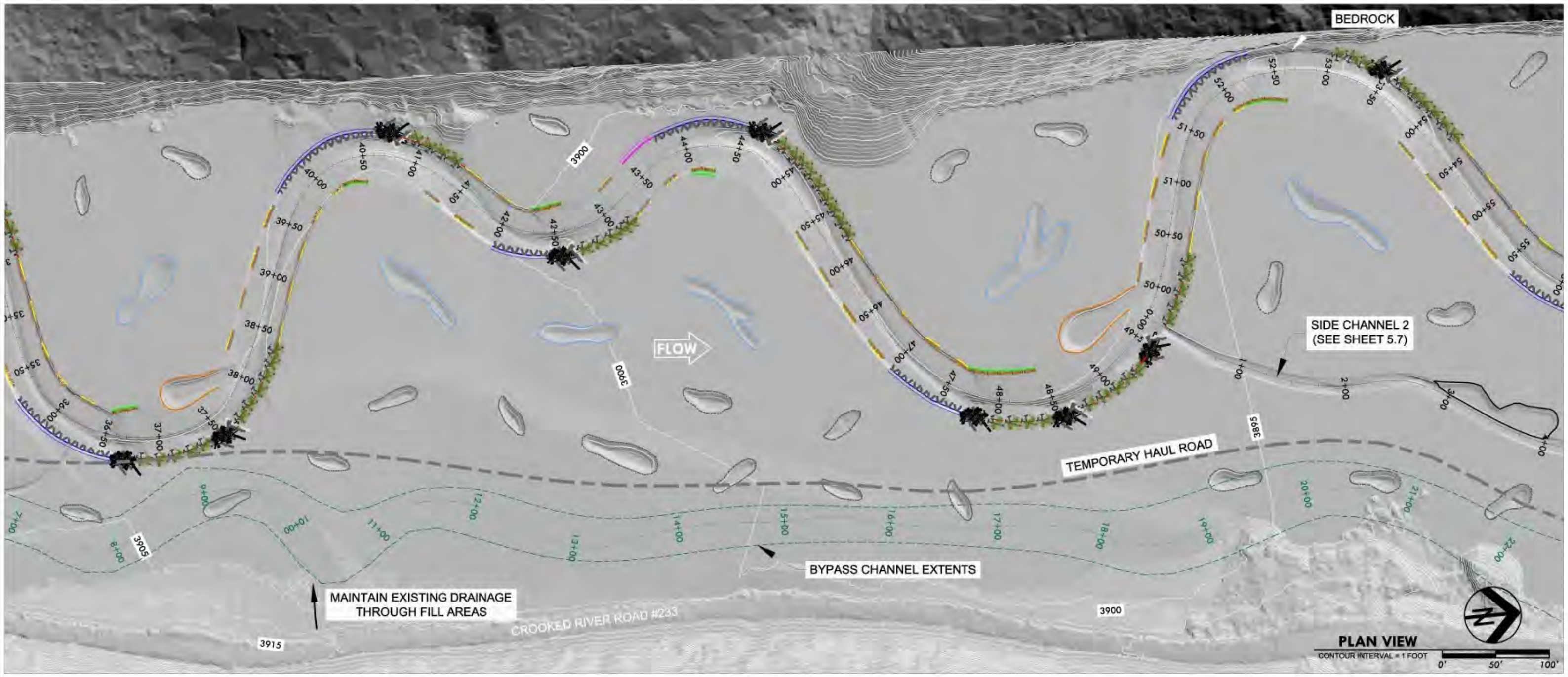


Figure A-2. Vegetation preservation and soil salvage plan view.



LEGEND

BANK STRUCTURES

- LARGE WOOD STRUCTURE TYPE 1 (LWST 1)
- LARGE WOOD STRUCTURE TYPE 2 (LWST 2)
- VEGETATED SOIL LIFT TYPE 1 (VSLT 1)
- VEGETATED SOIL LIFT TYPE 2 (VSLT 2)
- SOD AND BRUSH FASCINE TYPE 1 (SBFT 1)
- SOD AND BRUSH FASCINE TYPE 2 (SBFT 2)

FLOODPLAIN FEATURES

- ALCOVE
- FLOODPLAIN DEPRESSION
- SIDE CHANNEL WETLAND
- SWALE

LEFT BANK STRUCTURE SCHEDULE

STATION START	STATION END	STRUCTURE
36+50	36+80	SBST 2
38+20	39+70	SBST 1
39+70	40+60	VSLT 2
40+60	40+80	LWST 1
40+80	41+40	LWST 2
41+40	42+20	SBST 1
42+20	42+60	SBST 2
43+10	43+30	SBST 1
43+45	43+80	VSLT 1
43+80	44+50	VSLT 2
44+50	44+70	LWST 1
44+70	45+85	LWST 2
45+85	47+60	SBST 1
47+60	48+40	SBST 2
50+00	51+50	SBST 1
51+50	52+30	VSLT 2
53+00	53+30	LWST 2
53+30	53+60	LWST 1
53+60	54+35	LWST 2
54+35	56+20	SBST 1

RIGHT BANK STRUCTURE SCHEDULE

STATION START	STATION END	STRUCTURE
35+70	36+55	VSLT 2
36+55	36+75	LWST 1
36+75	37+40	LWST 2
37+40	37+70	LWST 1
37+70	38+40	LWST 2
38+40	40+20	SBST 1
40+20	40+50	SBST 2
41+20	42+00	SBST 1
42+00	42+40	VSLT 2
42+40	42+70	LWST 1
42+70	43+20	LWST 2
43+20	44+00	SBST 1
44+00	44+30	SBST 2
45+50	47+00	SBST 1
47+00	47+70	VSLT 2
47+70	47+90	LWST 1
47+90	48+45	LWST 2
48+45	48+75	LWST 1
48+75	49+35	LWST 2
49+35	49+60	LWST 1
49+70	50+35	LWST 2
50+35	52+10	SBST 1
52+10	52+60	SBST 2
54+00	55+60	SBST 1

CHANNEL GRADING SCHEDULE

STATION	TYPICAL XS	STATION	TYPICAL XS
36+40	RIFFLE	47+80	POOL
36+65	POOL	48+00	RUN
36+90	RUN	48+25	RUN
37+20	RUN	48+45	POOL
37+40	POOL	48+70	POOL
37+65	POOL	48+90	RUN
38+40	RIFFLE	49+15	RUN
40+20	RIFFLE	49+35	POOL
40+70	POOL	49+60	POOL
41+60	RIFFLE	50+35	RIFFLE
42+20	RIFFLE	52+10	RIFFLE
42+50	POOL	52+40	POOL
43+20	RIFFLE	52+65	RUN
44+00	RIFFLE	53+05	RUN
44+60	POOL	53+30	POOL
45+85	RIFFLE	53+55	POOL
47+60	RIFFLE	54+35	RIFFLE

REFER TO SHEET 8.0 FOR DIMENSIONS

APPLICABLE TECHNICAL SPECIFICATIONS

01400	CONSTRUCTION STAKING
01560	ENVIRONMENTAL CONTROLS
02160	SITE PREPARATION
02200	EARTHWORK
02931	VEGETATION SALVAGE
05001	CHANNEL AND FLOODPLAIN FILL

RELATED DRAWINGS

ITEM	SHEET #
LWST 1	8.5
LWST 2	8.6
VSLT 1	8.1
VSLT 2	8.2
SBFT 1	8.3
SBFT 2	8.4
RIFFLE	8.0
RUN	8.0
POOL	8.0

RIVER DESIGN GROUP, INC

5098 Hwy 93 South
Whitefish, MT 59937
tel.406.862.4927
fax.406-862-4963

311 SW Jefferson Avenue
Corvallis, OR 97333
tel.541.738.2920
fax.541.758.8524

Crooked River Valley Rehabilitation Project

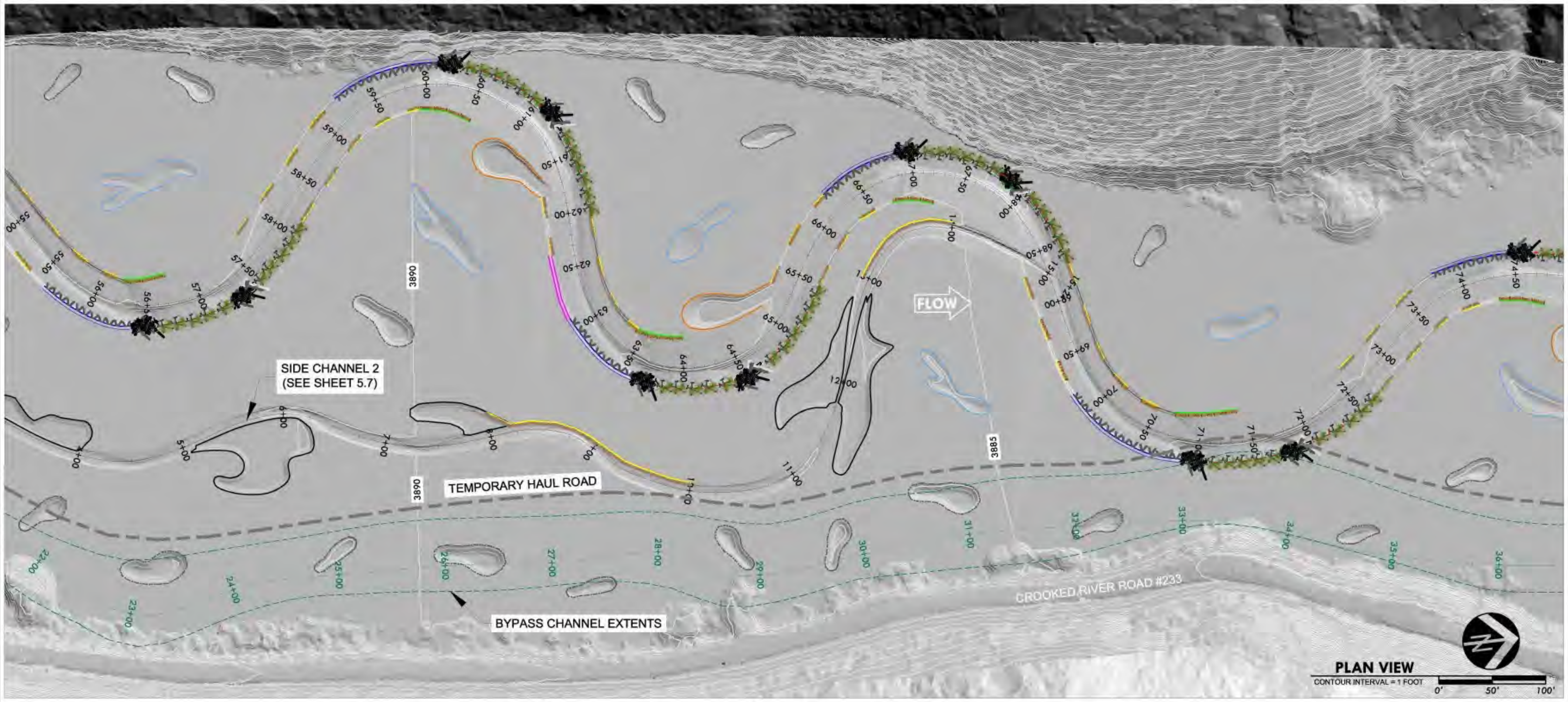
Site Plan

NO.	DATE	BY	DESCRIPTION	CHK
1	11-01-12	NW	35% Design	MD
2	02-15-13	NW	75% Design	MD
3	03-07-13	NW	95% Design	MD

PROJECT NUMBER
RDG-12-037

SHEET NUMBER
5.2

Figure A-3. New stream channel. Temporary haul road and bypass channel. End of side channel 1. Beginning of side channel 2.



LEGEND

BANK STRUCTURES

- LARGE WOOD STRUCTURE TYPE 1 (LWST 1)
- LARGE WOOD STRUCTURE TYPE 2 (LWST 2)
- VEGETATED SOIL LIFT TYPE 1 (VSLT 1)
- VEGETATED SOIL LIFT TYPE 2 (VSLT 2)
- SOD AND BRUSH FASCINE TYPE 1 (SBFT 1)
- SOD AND BRUSH FASCINE TYPE 2 (SBFT 2)

FLOODPLAIN FEATURES

- ALCOVE
- FLOODPLAIN DEPRESSION
- SIDE CHANNEL WETLAND
- SWALE

LEFT BANK STRUCTURE SCHEDULE

STATION START	STATION END	STRUCTURE
56+20	56+70	SBST 2
57+70	59+20	SBST 1
59+20	60+10	VSLT 2
60+10	60+30	LWST 1
60+30	61+00	LWST 2
61+00	61+30	LWST 1
61+30	62+05	LWST 2
62+05	63+40	SBST 1
63+40	64+00	SBST 2
65+30	66+20	SBST 1
66+20	66+85	VSLT 2
66+85	67+05	LWST 1
67+05	67+70	LWST 2
67+70	68+00	LWST 1
68+00	68+70	LWST 2
68+70	70+70	SBST 1
70+70	71+40	SBST 2
72+60	73+80	SBST 1
73+80	74+45	VSLT 2

RIGHT BANK STRUCTURE SCHEDULE

STATION START	STATION END	STRUCTURE
55+60	56+35	VSLT 2
56+35	56+55	LWST 1
56+55	57+20	LWST 2
57+20	57+50	LWST 1
57+50	58+15	LWST 2
58+15	59+90	SBST 1
59+90	60+50	SBST 2
61+80	62+35	SBST 1
62+35	62+90	VSLT 1
62+90	63+55	VSLT 2
63+55	63+75	LWST 1
63+75	64+40	LWST 2
64+40	64+70	LWST 1
64+70	65+50	LWST 2
65+50	66+70	SBST 1
66+70	67+25	SBST 2
68+70	69+80	SBST 1
69+80	70+85	VSLT 2
70+85	71+05	LWST 1
71+05	71+70	LWST 2
71+70	72+00	LWST 1
72+00	72+70	LWST 2
72+70	74+30	SBST 1

CHANNEL GRADING SCHEDULE

STATION	TYPICAL XS	STATION	TYPICAL XS
56+20	RIFFLE	64+40	POOL
56+45	POOL	64+65	POOL
56+70	RUN	65+35	RIFFLE
57+00	RUN	66+70	RIFFLE
57+20	POOL	66+95	POOL
57+45	POOL	67+20	RUN
58+15	RIFFLE	67+50	RUN
59+90	RIFFLE	67+70	POOL
60+20	POOL	67+95	POOL
60+45	RUN	68+70	RIFFLE
60+75	RUN	70+70	RIFFLE
61+00	POOL	70+95	POOL
61+25	POOL	71+20	RUN
62+05	RIFFLE	71+50	RUN
63+40	RIFFLE	71+70	POOL
63+65	POOL	71+95	POOL
63+90	RUN	72+70	RIFFLE
64+20	RUN	74+30	RIFFLE

REFER TO SHEET 8.0 FOR DIMENSIONS

APPLICABLE TECHNICAL SPECIFICATIONS

01400	CONSTRUCTION STAKING
01560	ENVIRONMENTAL CONTROLS
02160	SITE PREPARATION
02200	EARTHWORK
02931	VEGETATION SALVAGE
05001	CHANNEL AND FLOODPLAIN FILL

RELATED DRAWINGS

ITEM	SHEET #
LWST 1	8.5
LWST 2	8.6
VSLT 1	8.1
VSLT 2	8.2
SBFT 1	8.3
SBFT 2	8.4
RIFFLE	8.0
RUN	8.0
POOL	8.0

RIVER DESIGN GROUP, INC.

5098 Hwy 93 South
Whitefish, MT 59937
tel.406.862.4927
fax.406-862-4963

311 SW Jefferson Avenue
Corvallis, OR 97333
tel.541.738.2920
fax.541.758.8524

Crooked River Valley Rehabilitation Project

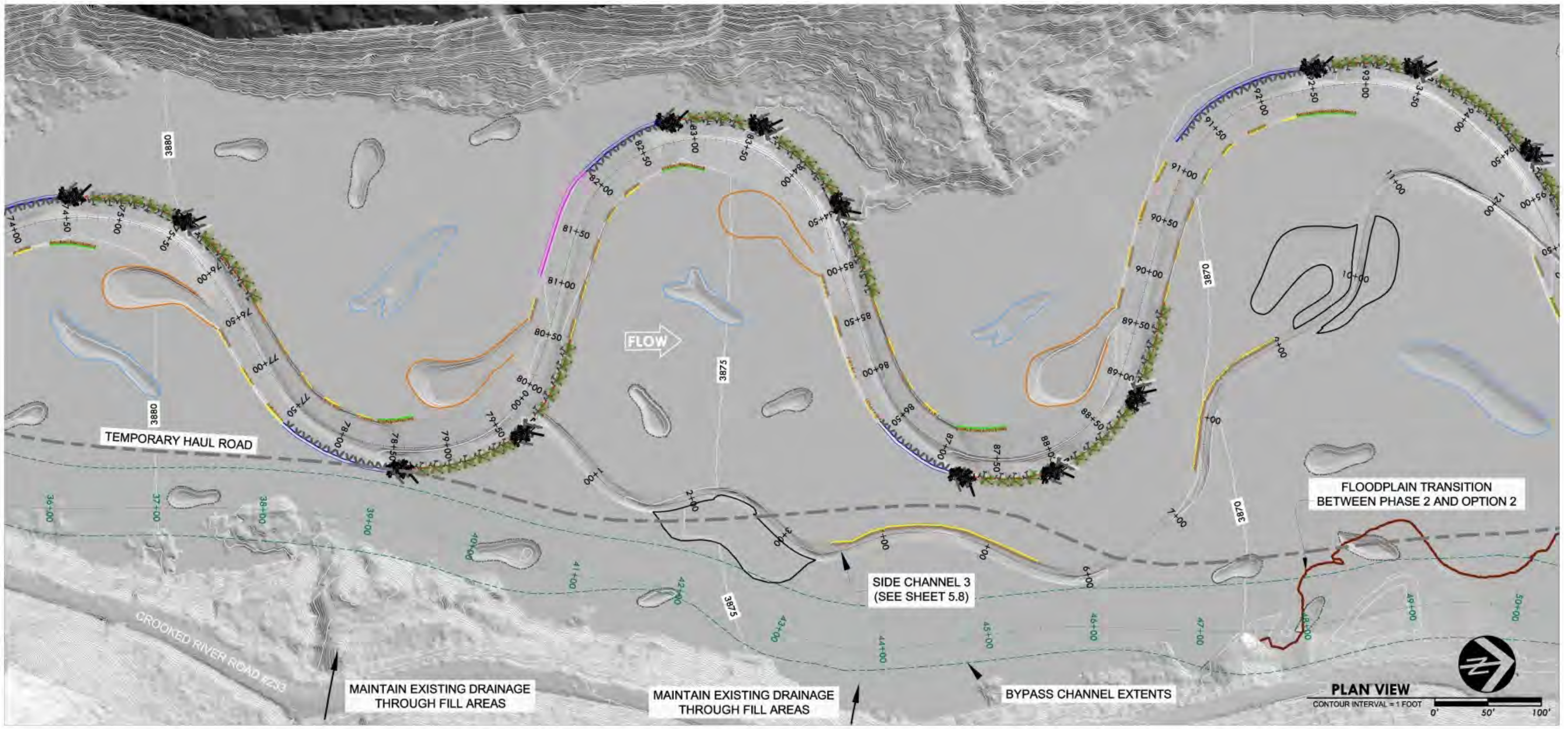
Site Plan

NO.	DATE	BY	DESCRIPTION	CHK
1	11-01-12	NW	35% Design	MD
2	02-15-13	NW	75% Design	MD
3	03-07-13	NW	95% Design	MD

PROJECT NUMBER
RDG-12-037

SHEET NUMBER
5.3

Figure A-4. New stream channel. Temporary haul road and bypass channel. End of side channel 2.



LEGEND

BANK STRUCTURES

- LARGE WOOD STRUCTURE TYPE 1 (LWST 1)
- LARGE WOOD STRUCTURE TYPE 2 (LWST 2)
- VEGETATED SOIL LIFT TYPE 1 (VSLT 1)
- VEGETATED SOIL LIFT TYPE 2 (VSLT 2)
- SOD AND BRUSH FASCINE TYPE 1 (SBFT 1)
- SOD AND BRUSH FASCINE TYPE 2 (SBFT 2)

FLOODPLAIN FEATURES

- ALCOVE
- FLOODPLAIN DEPRESSION
- SIDE CHANNEL WETLAND
- SWALE

LEFT BANK STRUCTURE SCHEDULE

STATION START	STATION END	STRUCTURE
74+45	74+65	LWST 1
74+65	75+45	LWST 2
75+45	75+75	LWST 1
75+75	76+45	LWST 2
76+45	78+30	SBST 1
78+30	78+70	SBST 2
80+60	81+00	SBST 1
81+00	82+00	VSLT 1
82+00	82+70	VSLT 2
82+70	82+90	LWST 1
82+90	83+45	LWST 2
83+45	83+75	LWST 1
83+75	84+35	LWST 2
84+35	84+65	LWST 1
84+65	85+35	LWST 2
85+35	87+00	SBST 1
87+00	87+60	SBST 2
89+60	91+20	SBST 1
91+20	92+45	VSLT 2
92+45	92+65	LWST 1
92+65	93+30	LWST 2
93+30	93+60	LWST 1
93+60	94+50	LWST 2

RIGHT BANK STRUCTURE SCHEDULE

STATION START	STATION END	STRUCTURE
74+30	74+80	SBST 2
76+50	77+50	SBST 1
77+50	78+45	VSLT 2
78+45	78+65	LWST 1
78+65	79+50	LWST 2
79+50	79+80	LWST 1
79+90	80+50	LWST 2
80+50	82+60	SBST 1
82+60	83+10	SBST 2
85+00	86+40	SBST 1
86+40	87+10	VSLT 2
87+10	87+30	LWST 1
87+30	87+85	LWST 2
87+85	88+15	LWST 1
88+15	88+75	LWST 2
88+75	89+05	LWST 1
89+05	89+75	LWST 2
89+75	92+30	SBST 1
92+30	92+90	SBST 2

CHANNEL GRADING SCHEDULE

STATION	TYPICAL XS	STATION	TYPICAL XS
7455	POOL	8460	POOL
7480	RUN	8535	RIFFLE
7515	RUN	8700	RIFFLE
7545	POOL	8720	POOL
7570	POOL	8740	RUN
7645	RIFFLE	8765	RUN
7830	RIFFLE	8785	POOL
7855	POOL	8810	POOL
7880	RUN	8830	RUN
7920	RUN	8855	RUN
7950	POOL	8875	POOL
7975	POOL	8900	POOL
8050	RIFFLE	8975	RIFFLE
8260	RIFFLE	9230	RIFFLE
8280	POOL	9255	POOL
8300	RUN	9280	RUN
8325	RUN	9305	RUN
8345	POOL	9330	POOL
8370	POOL	9360	POOL
8390	RUN	9390	RUN
8415	RUN	9420	RUN
8435	POOL	9450	POOL

REFER TO SHEET 8.0 FOR DIMENSIONS

APPLICABLE TECHNICAL SPECIFICATIONS

01400	CONSTRUCTION STAKING
01560	ENVIRONMENTAL CONTROLS
02160	SITE PREPARATION
02200	EARTHWORK
02931	VEGETATION SALVAGE
05001	CHANNEL AND FLOODPLAIN FILL

RELATED DRAWINGS

ITEM	SHEET #
LWST 1	8.5
LWST 2	8.6
VSLT 1	8.1
VSLT 2	8.2
SBFT 1	8.3
SBFT 2	8.4
RIFFLE	8.0
RUN	8.0
POOL	8.0

NO.	DATE	BY	DESCRIPTION	CHK
1	11-01-12	NW	35% Design	MD
2	02-15-13	NW	75% Design	MD
3	03-07-13	NW	95% Design	MD

RIVER DESIGN GROUP, INC.
5098 Hwy 93 South, Whitefish, MT 59937
311 SW Jefferson Avenue, Corvallis, OR 97333

Crooked River Valley Rehabilitation Project

Site Plan

PROJECT NUMBER RDG-12-037

SHEET NUMBER 5.4

Figure A-5. New stream channel. Temporary haul road and bypass channel. Beginning and end of side channel 3.

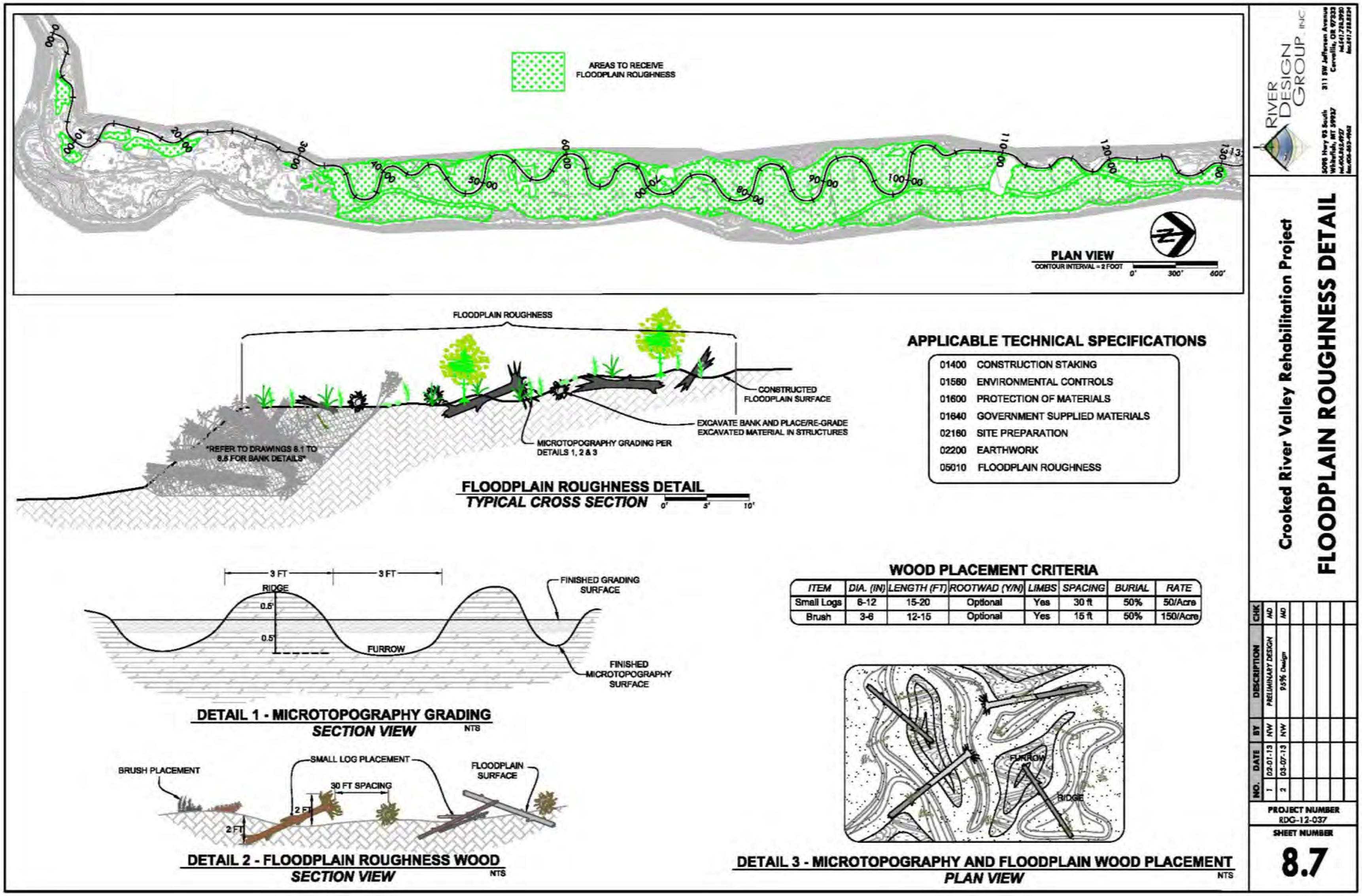


Figure A-6. Areas to receive floodplain roughness and typical cross sections.

Appendix B
Clean Water Act – Section 404(b)(1) Analysis

Introduction

As the lead agency, the Nez Perce – Clearwater National Forests is proposing the Crooked River Valley Rehabilitation project to improve fisheries habitat in Crooked River by restoring stream and floodplain functions, restoring instream fish habitat complexity, and improving water quality, on the Red River Ranger District. In cooperation with the Nez Perce Tribe, Bonneville Power Administration, and U.S. Army Corps of Engineers, the Forest Service is preparing the Crooked River Valley Rehabilitation Environmental Impact Statement (EIS), which will evaluate different alternatives for meeting the purpose of the project. At the end of the National Environmental Policy Act (NEPA) process, a Final EIS will be prepared, and the Deciding Official of the Forest Service will select an alternative for implementation in the Record of Decision.

As part of this EIS process, the Forest Service will be preparing a Section 404(b)(1) Practicability Analysis to provide information to U.S. Army Corps of Engineers to assist the Corps with a permit decision under Section 404 of the Clean Water Act. The purpose of the analysis is to ensure that the Least Environmentally Damaging Practicable Alternative (LEDPA) is carried forward for detailed study in the Final EIS.

This appendix will be prepared for the Final EIS.

This page was intentionally left blank.

Appendix C
Cumulative Effects

Summary – Past, Ongoing, and Foreseeable Activities

Past, present, and reasonably foreseeable future actions were considered for each resource to determine the cumulative effects associated with implementing the Crooked River Valley Rehabilitation project. The spatial extent of the cumulative effects analysis area and the activities considered vary for each resource analyzed. They are discussed by resource in Chapter 3. Existing conditions are a result of past and current activities in the analysis area. Past management activities and their potential effects as well as current practices are briefly described below. Detailed information and larger-scale maps are in the project record.

A full summary of past and ongoing activities is in the project record. One source of information that was used to identify activities to be considered in cumulative effects analysis is the *American and Crooked River Final EIS and ROD* (USDA Forest Service 2005). This document provided a detailed summary of past and ongoing activities in the Crooked River and American River watersheds. Another source is the *South Fork Clearwater River Landscape Assessment* (USDA Forest Service 1998). Forest records were queried to determine the amount and location of historic timber harvest, past wildfires, prescribed burns, pre-commercial thinning, road construction, and decommissioning in Crooked River.

Figure 1-1 (in Chapter 1) is a vicinity map of the project area. Figures C-1 and C-2 display the project area, analysis area boundaries, and some ongoing and future, foreseeable actions considered in cumulative effects analysis.

Table C-1 provides a summary of subwatershed and project area information. Past, present, and reasonably foreseeable activities that have occurred and may occur in the project area or cumulative effects areas have been considered by various resources, as presented in Table C-2. Table C-2 includes a summary of activities, including: road management, trail management, recreation, access management, timber harvest, pre-commercial thinning, wildfires, prescribed fires, watershed and fish habitat improvement projects, weed management, mining, and grazing activities. These projects may contribute to existing and future conditions. Table C-2 is organized by resource activity, time (past, present, ongoing, and future foreseeable activities), and area. Resource activities are summarized by two areas: the Crooked River Valley Rehabilitation (CRVR) project area and the Crooked River watershed (which is also the Orogrande Community Protection project area). Depending on the activities and resource area, effects may be addressed in Chapter 3.

Table C-3 provides a more detailed description of several future foreseeable actions.

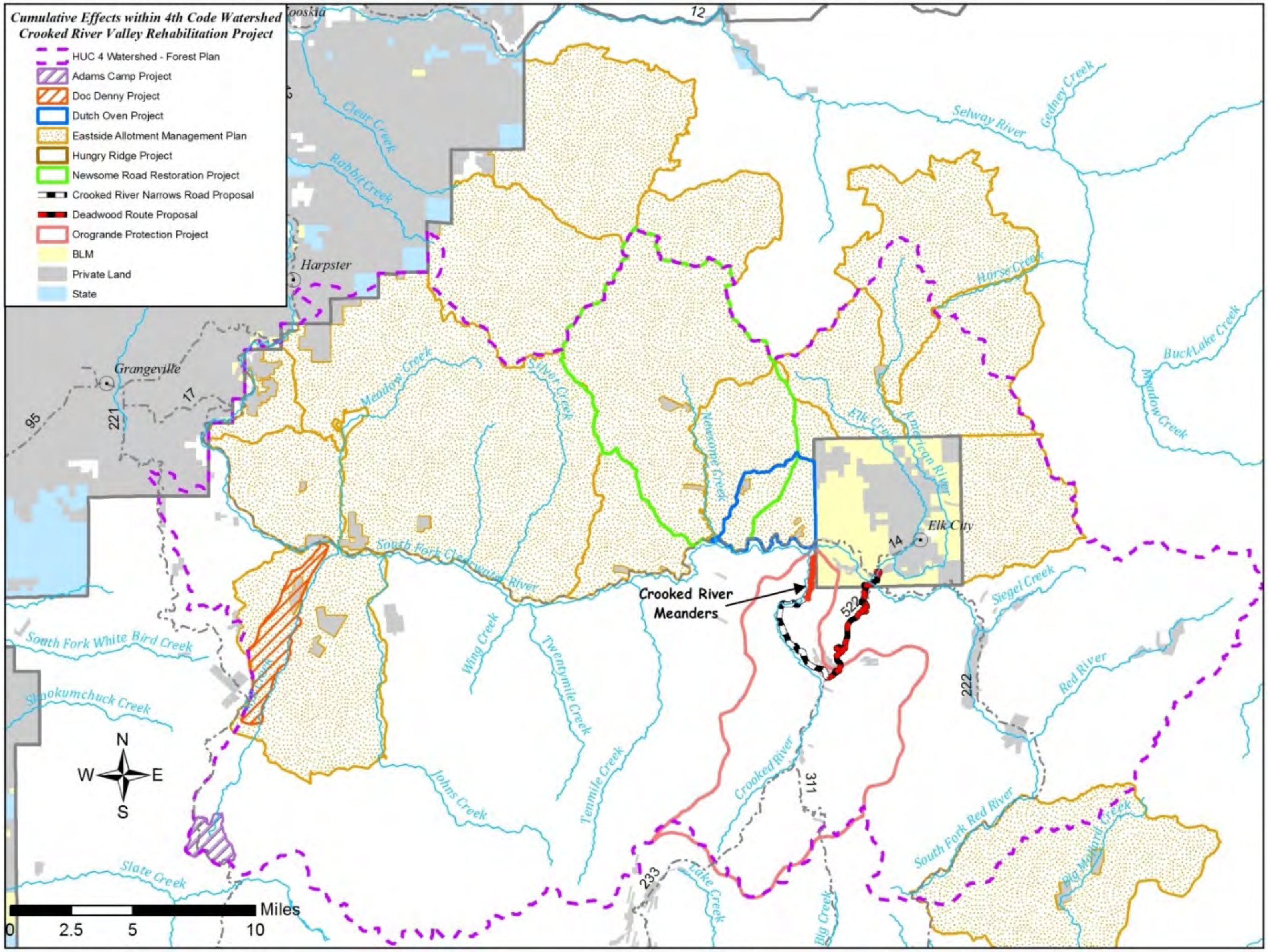


Figure C-1. Map of projects and boundaries considered in cumulative effects analysis.

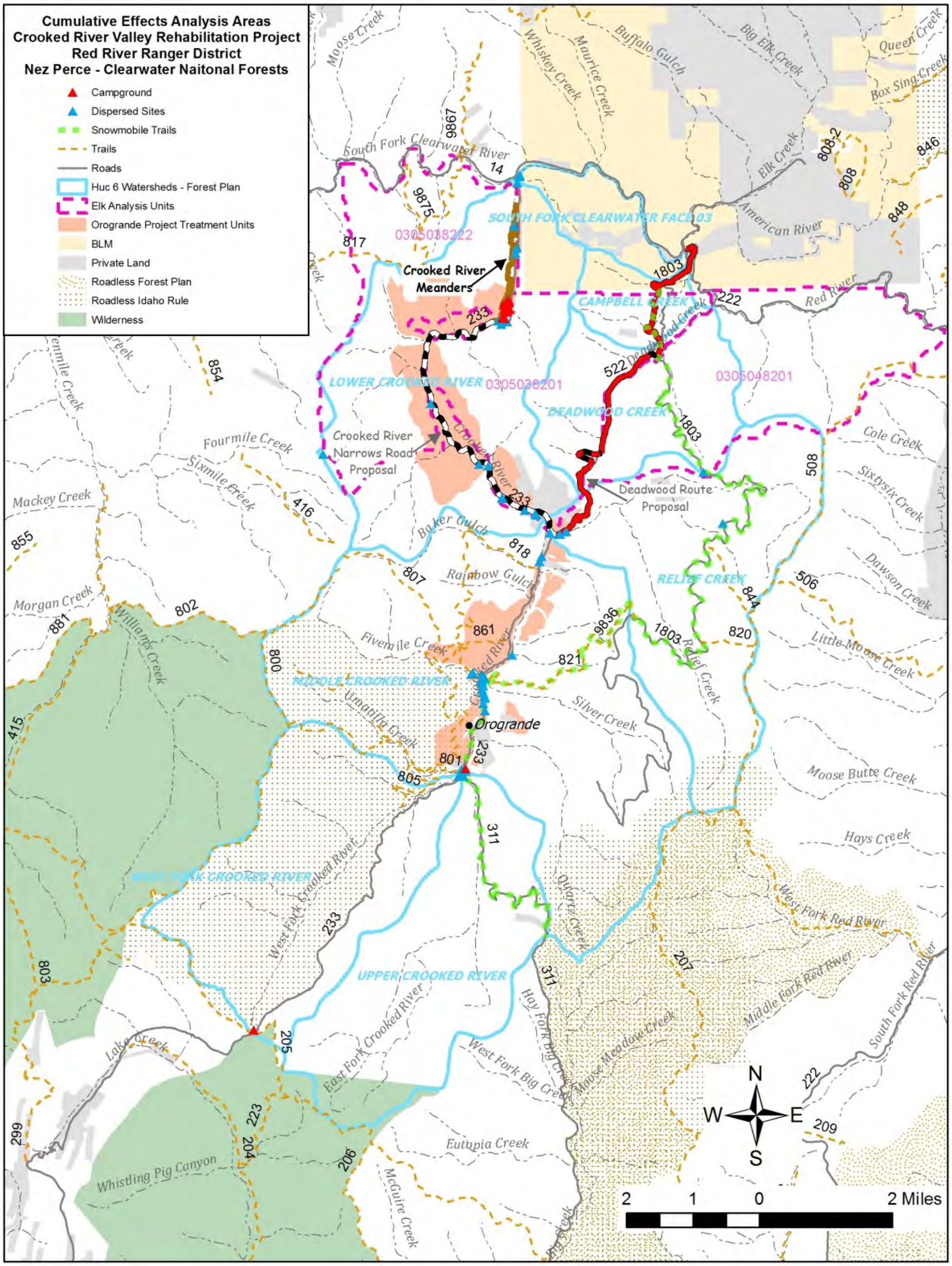


Figure C-2. Map of present, ongoing, and future foreseeable actions considered in cumulative effects analysis.

Table C-1. Subwatershed descriptions and project areas.

Forest Plan Prescription Subwatershed Name	Hydrologic Unit Code (HUC Level)	Number	Acres	Part of Crooked River Valley Rehabilitation Project Area?	Part of Crooked River Watershed[1]?
South Fork Clearwater River	**4th**	**17060305**	**515,838**	**Yes**	**Yes**
South Fork Clearwater River Face 03	6th	170603050399	1,210	Yes	No
Crooked River	***5th***	***1706030503***	***44,160***	***Yes***	***Yes***
Lower Crooked River	6th	170603050301	9,487	Yes	Yes
Relief Creek[2]	6th	170603050303	7,475	Yes[2]	Yes
Middle Crooked River	6th	170603050304	14,449	No	Yes
Upper Crooked River	6th	170603050305	6,667	No	Yes
West Fork Crooked River	6th	170603050306	7,541	No	Yes
Red River[2]	***5th***	***1706030504***	***99,200***	***Yes[2]***	***No***
Deadwood Creek[2]	6th	170603050422	3,961	Yes[2]	No
Campbell Creek[2]	6th	170603050425	1,146	Yes[2]	No

[1] Crooked River Watershed is the same as the proposed Orogrande Community Protection project area.

[2] These watersheds were considered in the cumulative effects analysis areas related to the future proposed Crooked River Narrows Road Improvement Project. Activities in these watersheds are displayed in Figure C-2 and Table C-2 and listed as in the Crooked River Valley Rehabilitation (CRVR) project area.

Table C-2. Past, present, ongoing, and future foreseeable actions considered in cumulative effects analysis.

Action	Past	Present	Future
Road Management (See project record for map.)	The current road system has developed over time. Many roads were built in association with past mining or timber harvest activities. Most recent road work as part of the American and Crooked River Project FEIS/ROD (2005). Actions including 4.9 miles of temporary road construction and 56.6 miles of road reconditioning. The American and Crooked River Project has completed: 13.28 miles of road decommissioning; 5.06 miles of watershed road improvement; 11 miles of soil restoration; 9.26 acres of soil restoration; and 3.9 miles of instream improvement.	Road maintenance activities include clearing vegetation from road surfaces, shoulders and ditches; and leveling the road surface to enhance drivability and drainage. Various levels of maintenance of roads in the project area. Forest Service roads and trails are maintained for summer use. Culvert replacement at Fivemile Creek and Road 233 to provide aquatic organism passage is planned for 2014. Fivemile Pond grate removal is planned for 2014.	Continued maintenance of roads by Forest Service and Idaho County Road Department. Proposed Crooked River Narrows Road Improvement project, 2022–2025. Proposed Action – Alternative B would re-align and reconstruct about 3.5 miles of Road 233 to reduce sources of sediment through the Narrows. Reconstruct the existing road to provide turnouts, provide a wider road base where possible (up to 16 feet), provide a buffer between the road and the river, gravel the road surface, and provide a stable road base. Remove bedrock from the hillside through blasting and excavation, riprapping sections of the roadway, install new cross drains, providing a road ditch, re-surfacing, and planting vegetation along disturbed streambanks. Excess material from reconstruction would be placed to improve Road 233 subgrade from the Narrows to Relief Creek. See Figure C-2 above and description in Table C-3 below.

<table>
<tr><th>Action</th><th>Past</th><th>Present</th><th>Future</th></tr>
<tr>
<td>Road Management
(Continued)</td>
<td><u>Within the CRVR project area:</u>
Roads: 86.9 miles of road have been constructed and 11.1 miles have been decommissioned. Road 233 is under Idaho County right-of-way that includes maintenance for public access for 12.1 miles. Road currently maintained in winter to Orogrande.
<table>
<tr><th>Decade</th><th>Const.</th><th>Decom.</th></tr>
<tr><td>1890–1899</td><td>12.0</td><td></td></tr>
<tr><td>1920–1929</td><td>0.1</td><td></td></tr>
<tr><td>1940–1949</td><td>2.3</td><td></td></tr>
<tr><td>1950–1959</td><td>0.1</td><td></td></tr>
<tr><td>1960–1969</td><td>17.6</td><td></td></tr>
<tr><td>1970–1979</td><td>17.8</td><td></td></tr>
<tr><td>1980–1989</td><td>31.4</td><td></td></tr>
<tr><td>1990–1999</td><td>5.3</td><td></td></tr>
<tr><td>2000–2009</td><td>0.0.</td><td>3.0</td></tr>
<tr><td>2010–present</td><td>0.0</td><td>8.1</td></tr>
<tr><td>Total</td><td>86.9</td><td>11.1</td></tr>
</table>
</td>
<td>See text above.</td>
<td>See Proposed Crooked River Narrows Road Improvement project above.

See Table C-3 and Figure C-2.</td>
</tr>
<tr>
<td></td>
<td><u>Within Crooked River watershed:</u>
Roads: 127.5 miles of road have been constructed and 12.5 miles have been decommissioned.
<table>
<tr><th>Decade</th><th>Const.</th><th>Decom.</th></tr>
<tr><td>1890–1899</td><td>12.1</td><td></td></tr>
<tr><td>1920–1929</td><td>0.1</td><td></td></tr>
<tr><td>1930–1939</td><td>6.1</td><td></td></tr>
<tr><td>1940–1949</td><td>5.7</td><td></td></tr>
<tr><td>1950–1959</td><td>5.6</td><td></td></tr>
<tr><td>1960–1969</td><td>19.4</td><td></td></tr>
<tr><td>1970–1979</td><td>21.2</td><td></td></tr>
<tr><td>1980–1989</td><td>52.6</td><td></td></tr>
<tr><td>1990–1999</td><td>4.7</td><td></td></tr>
<tr><td>2000–2009</td><td>0.0</td><td>12.2</td></tr>
<tr><td>2010–present</td><td>0.0</td><td>0.3</td></tr>
<tr><td>Total</td><td>127.5</td><td>12.5</td></tr>
</table>
</td>
<td>See text above.</td>
<td>Orogrande Community Protection project. Approximately 7 miles of temporary road construction, and use of 1 mile of non-system road.

2014–2019.

See Figure C-2 above and Table C-3 below.</td>
</tr>
</table>

Action	Past	Present	Future
Trail Management (See Figure C-2 and project record for map.)	**<u>Within the CRVR project area:</u>** Trails: 0.1 miles. Trail SNO-1803. One snowmobile trail is seasonally groomed for use on Road 1803. **<u>Within Crooked River watershed:</u>** Trails: 54.7 miles. Trails 205, 508, 800, 801, 818, 807,805, 820, 821, 844, 851, 870, 871, SNO-311, SNO-9836 The American and Crooked River project planned and implemented 2.2 miles of recreation and trail improvements, 8.1 acres of recreation and trail improvements, 1.0 miles of access change for vehicle use, and 1.6 miles of access change from road to trail.	Various levels of maintenance of trails in the project area. Forest Service trails are maintained for summer use, with the exception of snowmobile trails. **American and Crooked River project.** Watershed improvements including up to: 17.5 miles of road decommissioning; 17.2 miles of watershed road improvements.	Continued maintenance of trails by Forest Service as funding is available. Nez Perce Forest travel plan project DRAMVU is proposing to designate motorize use on roads and trails. Motorized access for dispersed camping and parking is proposed from existing access within 300 feet of roads and 0 to 300 feet of trails. Decision is expected in 2014; implementation in 2015.
Access Management Roads Trails Areas	See Road Management and Trail Management above.	See Road Management and Trail Management above.	Depending on the alternative selected in the FEIS/ROD, the DRAMVU project decision would: eliminate cross-country travel on the Nez Perce – Clearwater National Forests by permitting motorized use on designated roads and trails, except snowmobiles; implement seasonal closures on some roads and trails in Management Area 16 (Elk and Deer Winter Range) and 21 (Moose Winter Range), and other areas; add up to five new trail connectors to create loop opportunities; identify motorized access for dispersed camping from roads and trails; eliminate motorized use on some roads and trails to minimize resource damage, reduce conflicts; and provide a full array of recreation opportunities.

Action	Past	Present	Future
Developed and Dispersed Recreation (See Figure C-2 and project record for map.)	Public camping, hunting, fishing, hiking, firewood cutting, mushroom gathering, and berry picking are recreational activities on the forest. Dispersed recreation sites have become established as sites are used. **Within the CRVR project area:** 2 – Rustic developed campgrounds adjacent to Crooked River: Crooked River Campground 3 and 4 1 – Developed self-guided tour: "Gold Rush Loop Tour" 30 **–** Dispersed recreation sites **Within the Crooked River watershed:** 5 – Campgrounds: Crooked River Campgrounds 3 and 4, Fivemile, Orogrande, and Orogrande Summit 1 – Cabin (Jerry Walker) 1 – Airstrip (Orogrande) 1 – Fishing pond (Fivemile) 1 – Developed self-guided tour: "Gold Rush Loop Tour" 58 **–** Dispersed recreation sites	Continued recreational activities by the public on trails and at developed and dispersed recreational sites. Recreation site maintenance at developed campgrounds and trails by Forest Service, as funding is available or accomplished by cooperative agreements or state grants.	Nez Perce Forest travel plan project DRAMVU is proposing to designate motorize use on roads and trail. Motorized access for dispersed camping and parking is proposed from existing access within 300 feet of roads and 0 to 300 feet of trails. Decision is expected in 2014; implementation in 2015. Proposed Crooked River Valley Rehabilitation project would close Campground 3 and 4 from use during project implementation (2015–2021). This would also limit fishing access to Crooked River in the project area. Up to 13 dispersed recreational sites would be impacted in the short term. Proposed Crooked River Narrows Road Improvement project would restrict use on Road 233 seasonally during construction and limit access on the Gold Rush Loop Tour during implementation (2022–2025). Up to 12 dispersed recreational sites would be impacted in the short term. Proposed Orogrande Community project could have a short-term impact on up to nine developed recreation sites and 53 dispersed recreational sites during implementation (2014–2019).

<table>
<tr><th>Action</th><th>Past</th><th>Present</th><th>Future</th></tr>
<tr>
<td>Timber Harvest
(See project record for map.)</td>
<td>Past timber harvest by decade. Most recent harvest as part of the American and Crooked River FEIS/ROD (2005). Up to 2,122 acres of hazardous fuel reduction will occur, using timber harvest in the Crooked River watershed.

<u>Within CRVR project area</u>: Approximately 4,555 acres of timber harvest on NFA lands since the 1950s.
<table>
<tr><th>Decade</th><th>Acres</th></tr>
<tr><td>1950–1959</td><td>58</td></tr>
<tr><td>1960–1969</td><td>572</td></tr>
<tr><td>1970–1979</td><td>1,345</td></tr>
<tr><td>1980–1989</td><td>1,175</td></tr>
<tr><td>1990–1999</td><td>946</td></tr>
<tr><td>2000–2009</td><td>400</td></tr>
<tr><td>2010–present</td><td>59</td></tr>
<tr><td>Total</td><td>4,555</td></tr>
</table>
<u>Within Crooked River watershed (Orogrande project area)</u>: Approximately 6,762 acres.
<table>
<tr><th>Decade</th><th>Acres</th></tr>
<tr><td>1960–1969</td><td>78</td></tr>
<tr><td>1970–1979</td><td>2,157</td></tr>
<tr><td>1980–1989</td><td>2,300</td></tr>
<tr><td>1990–1999</td><td>941</td></tr>
<tr><td>2000– 2009</td><td>1,285</td></tr>
<tr><td>2010–present</td><td>1</td></tr>
<tr><td>Total</td><td>6,762</td></tr>
</table>
</td>
<td>All but 13 acres of harvest-related burning has been completed. American River Stewardship contract is completed (FACTS Fuels Data). There are 2 units remaining in Crooked River Stewardship Contract; Unit 29 is 3 acres, and Unit 28 is 10 acres. Planned to be accomplished in the summer of 2013.

Eastside Township (BLM/FS) is being implemented near the CRVR project area.</td>
<td>Orogrande Community Protection project. Prescribed fire (up to 1,009 acres) and mechanical treatment (up to 3,045 acres) to create fuel breaks on USFS lands adjacent to private property. Approximately 7 miles of temporary road construction, and use of 1 mile of non-system road.

2014–2019

See Figure C-2 above and Table C-3 below.</td>
</tr>
</table>

<table>
<tr><th>Action</th><th>Past</th><th>Present</th><th>Future</th></tr>
<tr>
<td>Wildfires
(See project record for map.)</td>
<td>Wildfires have been documented by the Forest Service since 1908 on the Nez Perce National Forest. The McGuire fire burned in the upper Crooked River watershed in 2012.

<u>Within CRVR project area:</u>
Approximately 8,059 acres.

<table>
<tr><th>Decade</th><th>Acres</th></tr>
<tr><td>1900–1909</td><td>7,980</td></tr>
<tr><td>1910–1919</td><td>60</td></tr>
<tr><td>2000–2009</td><td>19</td></tr>
<tr><td>Total</td><td>8,059</td></tr>
</table>

<u>Within Crooked River watershed:</u>
Approximately 21,523 acres.

<table>
<tr><th>Decade</th><th>Acres</th></tr>
<tr><td>1900–1909</td><td>9,614</td></tr>
<tr><td>1910–1919</td><td>60</td></tr>
<tr><td>1920–1929</td><td>272</td></tr>
<tr><td>1940–1949</td><td>1735</td></tr>
<tr><td>1990–1999</td><td>80</td></tr>
<tr><td>2000–2009</td><td>3,279</td></tr>
<tr><td>2010–present</td><td>6,483</td></tr>
<tr><td>Total</td><td>21,523</td></tr>
</table>
</td>
<td>Effects from the 2012 McGuire wildfire are still present in the headwaters of Crooked River.</td>
<td>Wildfire occurrence cannot be predicted.</td>
</tr>
</table>

Action	Past	Present	Future
Weed Management	Integrated weed management under the guidelines of the Upper Clearwater River Cooperative Weed Management Area (USDA Forest Service 1998, 2008) and the Nez Perce National Forest Noxious Weed Control EA (USDA Forest Service 1988).	Continued treatment by Forest Service and Idaho County following the Nez Perce Forest – Noxious Weed Management Control EA – DN/FONSI including Terms and Conditions of the Biological Opinions from NOAA–Fisheries and FWS (USDA-Forest Service 2013b draft) through the Integrated Weed management plan.	Continued treatment by Forest Service and Idaho County following the EA and Integrated Weed management plan. CRVR project area would be treated to reduce the spread of invasive species as identified following implementation (2015–2025).
Grazing	Three allotments have been grazed in the past: Ten-Twenty Mile, Deadwood, and Penmon Hill. **Within the CRVR project area:** Ten-Twenty Mile, Deadwood, and Penmon Hill allotments are currently closed. **Within the Crooked River watershed:** Ten-Twenty Mile and Penmon Hill allotments are currently closed.	No current grazing of livestock in the CRVR project area or Crooked River watershed. Figure C-1 displays the actively grazed or vacant allotments within the South Fork Clearwater River watershed.	No proposed grazing of livestock in the CRVR project area or Crooked River watershed. Figure C-1 displays the Eastside Allotment Management Planning project area and actively grazed or vacant allotments within the South Fork Clearwater River watershed.

Action	Past	Present	Future
Mining (See project record for maps.)	Historic mining activities: Gold discovered in Elk City 1861. Activities included: placer mining (suction dredging) and hardrock mining. **<u>In CRVR project area</u>**: Extensive dredge mining in 1930s to 1950s in and along Crooked River. There are no patented mining claims in the project area. **<u>Within Crooked River watershed</u>**: There have been significant historic mining activities and there are numerous patented and unpatented mining claims in and around the Orogrande area.	Mineral claim annual assessment work can include the following types of activities: gold panning, sluice box, adit, or open pit. Access is provided on existing roads or trails or via non-motorized methods. Suction dredging is closed in Crooked River, and closed in South Fork Clearwater River (see Chapter 3, Mineral Resources). There are five plans of operation (POOs) proposed for minerals exploration on file with the Forest Service; however, there is no decision to implement at this time. **<u>Within CRVR project area</u>:** There are no patented mining claims in the project area. Unpatented claims include: Meanders – 3 placer and ~24 lode mineral claims within 6 quarter sections. 1 proposed POO. Narrows (Alt B) – 10 placer and ~96 lode mineral claims within 12 quarter sections. 1 proposed POO. **<u>Within Crooked River watershed</u>:** Multiple lode and placer claims, including both patented and unpatented claims.	**Proposed Premium Exploration Drill POO**. The Red River Ranger District proposes to approve Premium Exploration's proposal to conduct exploratory drilling in the Crooked River and Deadwood area of the Red River Ranger District at a total of 171 drill sites (2014–2016). **Proposed Gold Zone Exploration Drill POO** on lode claim. Proposal for drilling at 22 sites (On the Rose #1 – #5 Claims, Aevrie M, Aislin M, and Ainsley M Claims) in the Deadwood Creek subwatershed (2014–2015). **Proposed Frank Peck/Pasadena Exploration POO**. Surface exploration at two sites (one on the Frank Peck Claim and one on the Pasadena Claim) in the Middle Crooked River subwatershed (2014–2015). **Proposed Velocity/Orogrande Exploration Drill POO** on claims "A15, A18, A20, A21, A22, and A26" at one site per claim in the Middle Crooked River subwatershed (2014–2015). **Proposed Champion, Panama #1 and Panama #2 POO**, on claims in the Middle Crooked River subwatershed (2014–2017). **<u>In CRVR project area</u>**: Premium – 67 sites. Gold Zone – 22 sites. **<u>In Crooked River watershed</u>**: Premium – 104 sites. Peck/Pasadena – 2 sites. Velocity/Orogrande – 6 sites. Champion/Panama – 2 sites. Reclamation planned at 9 mine sites with American and Crooked River FEIS/ROD.

Action	Past	Present	Future
Watershed Improvement or Fish Habitat Improvements	As part of the South Fork Clearwater River Habitat Enhancement project, installation of fish habitat structures was completed in Crooked River channel in 1980s (see Figure C-3). Dredge piles were removed from the floodplain, and grass, sedges, and trees planted. The tight meanders remain unchanged. The Native Material Inventory completed in 2012 identified the following type of structures that were installed and are still in place: weirs, rock and boulder weirs, deflectors, random boulders, and anchored large woody debris structures. (River Design Group and Geum 2012). The Forest Service led efforts to improve aquatic habitat for threatened and endangered fish species by reconnecting several dredge ponds with the river and removing approximately 30,000 cubic yards of cobble tailings (RDG 2012 – Mining Claim Inventory). To implement the American River–Crooked River decision, through the Crooked River Stewardship contract, the following activities have been implemented: 13.28 miles of road decommissioning; 5.06 miles of watershed road improvement; 11 miles of soil restoration; 9.26 acres of soil restoration; 3.9 miles of instream improvement. Includes East Fork (2010) and Mainstem Relief (2007) culvert replacements. Through the 5-mile to Orogrande contract: 0.7 miles of instream improvement has been completed.	No projects are ongoing.	Crooked River Valley Rehabilitation Project proposed in this EIS (see Chapters 1 and 2 and Appendix A). **Alternative 2** proposes to rehabilitate the lower 2 miles of Crooked River. This alternative would rehabilitate approximately 115 acres of floodplain by moving dredge tailings, reconstructing approximately 7,400 feet of new stream channel, installing woody bank treatments, constructing more than 2,700 feet of side channels, creating conditions for 64 acres of wetlands, and replanting the valley bottom with native plant communities. 2015–2021.

Figure C-3. Past Crooked River channel restoration (1980s), within the Crooked River Valley Rehabilitation project area.

Table C-3. Detailed description of future foreseeable activities in the project area.

Project Name	Project Description	Summary Location Proposed Implementation Date
Proposed Premium Exploration Drill Plan	The Red River Ranger District proposes to approve Premium Exploration's proposal to conduct exploratory drilling in the Crooked River and Deadwood area of the Red River Ranger District at a total of 171 drill sites. Each drill site would encompass a surface area of approximately 30 feet by 50 feet. A maximum of two holes would be drilled at each site. These holes are anticipated to be 3 inches in diameter but may be up to 6 inches in diameter, depending on equipment availability, and would be drilled using a self-contained, self-leveling, and track-mounted drill rig. A sump approximately 3 feet wide, 3 to 4 feet deep, and approximately 20 feet long would be dug at each site to contain drill fluid and to allow drill cuttings to settle out. Drill fluid is composed of water and a clay derivative. Water for the drill rig would be brought in from off site in a truck or trailer-mounted tank. Each site would be reclaimed and each drill hole would be filled and plugged when work at that site is completed before moving on to the next drill site. In the Deadwood area, most of the drill sites are adjacent to or on existing roads. Three sites are adjacent to Forest Road 522 (Deadwood Road), and are located on turnouts, which could be used as drill pads to minimize surface disturbance and allow the passage of traffic at the same time. Two sites would require overland travel to access, and up to two sites could require some minor road reconstruction, with a maximum of approximately ¼ mile of low standard temporary road construction to access drill sites. These roads would be recontoured, seeded, and mulched after completion of drilling. In the Crooked River area, most of the drill sites are adjacent to or on existing roads or old road templates that would require no work other than clearing of deadfall to access the site. Some minor widening of the road surface may be required at some of the sites for drill pads, depending on the orientation of the drill rig. Three sites would require overland travel to access, and one site would require some minor road reconstruction (approximately ¼ mile). All appropriate BMPs for water quality standards and State of Idaho BMPs for mining would be followed. In addition, standard mitigation measures have been developed for mining and would be implemented as appropriate. A reclamation plan would be developed for this project. The bond would be calculated in an amount to cover all reclamation costs and would be posted by the claimant before the operating plan would be approved.	The Red River Ranger District proposes to approve Premium Exploration's proposal to conduct exploratory drilling in the Crooked River and Deadwood area of the Red River Ranger District at a total of 171 drill sites. Crooked River watershed, including Lower Crooked River, Middle Crooked River, Relief Creek, West Fork Crooked River, and Upper Crooked River. Red River watershed, including Deadwood Creek watershed. 2014–2016. 2 years to implement.

<table>
<tr><th>Project Name</th><th>Project Description</th><th>Summary
Location
Proposed Implementation Date</th></tr>
<tr><td><u>Proposed</u>
Orogrande Community Protection Project</td><td>The Red River Ranger District is proposing a fuel reduction project to help protect the community of Orogrande, Idaho, from wildfire.

This project would create fuel breaks on National Forest System lands adjacent to private property and emergency evacuation routes using a combination of prescribed burning and mechanical treatments. Prescribed fire only would be used on about 2,491 acres; and hand and mechanical treatment on approximately 1,009 acres. Hand and mechanical treatments would remove dead and live trees in the understory and overstory, and prune residual trees. Merchantable trees would be removed as products. Mechanical treatments would be followed by prescribed burns to further reduce fuel loading. Approximately 7 miles of temporary road construction would be needed to access treatment areas, including construction of approximately 2 miles of temporary road in the West Fork Roadless Area. Also, approximately 1 mile of existing (drivable) non-system road use would also occur in this roadless area.

We would maintain desired conditions with periodic under burns every 10–20 years (depending on monitoring results) to remove ladder fuels. For public safety and to facilitate operations, roads within the project area, including Crooked River Road 233, might be intermittently closed to the public while we implement the proposed action.

<table>
<tr><th rowspan="2">Method</th><th rowspan="2">Prescription</th><th colspan="2">Alt 2</th><th colspan="2">Alt 3</th></tr>
<tr><th>Acres</th><th>Percent</th><th>Acres</th><th>Percent</th></tr>
<tr><td>Hand Thin</td><td>Thin</td><td>472</td><td>13</td><td>472</td><td>13</td></tr>
<tr><td>Precommercial Thin</td><td>Thin</td><td>163</td><td>5</td><td>163</td><td>5</td></tr>
<tr><td>Prescribed Burn</td><td>Burn</td><td>2491</td><td>70</td><td>2491</td><td>70</td></tr>
<tr><td>Skyline</td><td>Regeneration</td><td>217</td><td>6</td><td>66</td><td>2</td></tr>
<tr><td>Tractor</td><td>Regeneration</td><td>125</td><td>3</td><td>70</td><td>2</td></tr>
<tr><td>Tractor, Ground Cable</td><td>Thin</td><td>115</td><td>3</td><td>115</td><td>3</td></tr>
<tr><td>Helicopter</td><td>Thin/regeneration</td><td>0</td><td>0</td><td>206</td><td>6</td></tr>
</table>
Trees and/or fuels removed from this project may be used as woody debris for the Crooked River Valley Rehabilitation project.

Project webpage: http://www.fs.fed.us/nepa/nepa_project_exp.php?project=28021</td><td>Orogrande Community Protection project. Prescribed fire (up to up to 2,491 acres) and mechanical treatment (up to 1,009 acres) to create fuel breaks on USFS lands adjacent to private property. Up to 342 acres of regeneration cuts are proposed. Approximately 7 miles of temporary road construction, and use of 1 mile of non-system road.

Crooked River watershed, including Lower Crooked River and Middle Crooked River.

2014–2019.

Contract awarded.

3 to 4 years to implement.</td></tr>
</table>

Project Name	Project Description	Summary Location Proposed Implementation Date
Proposed Crooked River Valley Rehabilitation Project (Proposed in this EIS)	This project was proposed to the public in the Crooked River Valley Rehabilitation, Notice of Intent (NOI) to prepare an environmental impact statement (EIS) and scoping letter, in December of 2013. For more details see Chapter 2, Appendix A, and the project record. The Red River Ranger District proposes to improve fish habitat within the Crooked River watershed. Alternative 1 – No Action. Alternative 2 – Proposed Action, proposes to rehabilitate the lower 2 miles of Crooked River. This alternative would rehabilitate approximately 115 acres of floodplain by moving dredge tailings, reconstructing approximately 7,400 feet of new stream channel, installing woody bank treatments, constructing more than 2,700 feet of side channels, creating conditions for 64 acres of wetlands, and replanting the valley bottom with native plant communities. See more details in Chapter 2 and Appendix A. Project webpage: http://www.fs.fed.us/nepa/nepa_project_exp.php?project=40648	Proposed Crooked River Valley Rehabilitation project would rehabilitate the lower 2 miles of Crooked River. Crooked River watershed, including Lower Crooked River, Middle Crooked River, and Relief Creek. 2015–2021. 6 years to implement.

Project Name	Project Description	Summary Location Proposed Implementation Date
<u>Proposed</u> Crooked River Narrows Road Improvement Project	This project was proposed to the public in the Crooked River Valley Rehabilitation, Notice of Intent (NOI) to prepare an environmental impact statement (EIS) and scoping letter, in December of 2013. In December of 2014, the Narrows Road component of the project was removed from consideration in this EIS by the deciding official. For more details see Summary – Public Involvement, Chapter 2 – Alternatives Eliminated from Detailed Study; Chapter 4 – Summary of Crooked River Valley Rehabilitation Planning Process and Timeline; and the project record. In the future, the Forest will complete a separate NEPA analysis and decision for this project. The Red River Ranger District proposes to improve fish habitat within the Crooked River watershed. Draft alternatives to be considered include the following: Alternative A – No Action. Alternative B – Proposed Action proposed to re-align and reconstruct up to 4 miles of Road 233 to reduce sources of sediment through the Narrows. Reconstruct the existing road to provide turnouts, provide a wider road base where possible (up to 16 feet), provide a buffer between the road and the river, gravel the road surface, and provide a stable road base. Remove bedrock from the hillside through blasting and excavation, riprapping sections of the roadway, install new cross drains, providing a road ditch, re-surfacing, and planting vegetation along disturbed streambanks. Excess material from reconstruction would be placed to improve Road 233 subgrade from the Narrows to Relief Creek. **(This alternative is considered a future foreseeable action in the cumulative effects analysis in this EIS; Great West Engineering (2013); more details are in the project record).** Alternative C – Deadwood Reroute proposes to improve up to 2 miles of Road 1803 and approximately 5 miles of Road 522 by grading and resurfacing. Alternative C also includes constructing and decommissioning about 1 mile of road to improve drivability. This alternative would convert approximately 3.5 miles of Road 233 (from the mile post 2.6 south) to a non-motorized trail.	Proposed Crooked River Narrows Road Improvement Project would re-align and reconstruct up to 4 miles of Road 233 to reduce sources of sediment through the Narrows. Crooked River watershed, including Lower Crooked River, Middle Crooked River, and Relief Creek. Red River watershed, including Deadwood Creek and Campbell Creek (Alternative C only). Estimated 2022–2025. 3 years to implement.

Appendix D
Proposed Project-Specific Forest Plan Amendments

Amendment Description and Finding of Non-Significant Amendments

Two Forest Plan amendments are proposed under the 2012 Planning Rule (36 CFR 219). The transition provisions of the rule (219.17) allow for amendments to existing plans to proceed under the prior planning rule. Plan amendments may be initiated, completed, and approved under the provisions of the prior planning rule for 3 years after May 9, 2012. Since these two amendments are proposed as project-specific amendments only for the Crooked River Valley Rehabilitation project, they are subject to the public notification requirements of 36 CFR 218.

The Responsible Official has evaluated the following analysis and has concluded that the proposed amendments described in detail below do not constitute a significant amendment to the Nez Perce National Forest Plan, also known as the Forest Plan (USDA Forest Service 1987a, as amended).

The following is provided to disclose the proposed amendment text and effects analysis of the proposed Forest Plan amendments. The proposed amendments are project-specific for the Crooked River Valley Rehabilitation project.

This appendix is organized based on the following proposed amendments:

- Soil Resources:
    - Forestwide Standard #2.
- Cultural Resources:
    - Forestwide Standards #2 and #4.
    - Management Area 3 – Cultural Resource Standard #4.

Soil Resources

NEZ PERCE NATIONAL FOREST
LAND AND RESOURCE MANAGEMENT PLAN
AMENDMENT NO. X (PROPOSED)

PROJECT-SPECIFIC AMENDMENT TO SOIL QUALITY STANDARD #2
FOR THE CROOKED RIVER VALLEY REHABILITATION PROJECT AREA

The purpose of this amendment is to allow the Forest Service to implement restoration activities in the Crooked River Valley Rehabilitation project activity area that currently exceed Forest Plan – soil quality standard #2.

The goal of the Nez Perce Forest Plan Standards is to meet the National Forest Management Act where management actions will not produce substantial or permanent impairment of the productivity of the land (16 USC 1604(g)(3)(E)(i)).

To prevent permanent impairment to productivity, the Nez Perce National Forest soil quality standards (Forest Plan, page II-22, USDA Forest Service 1987a) control the areal extent of detrimental soil disturbance impact by management activities. Soil quality standard #2 currently reads as follows:

> *"A minimum of 80 percent of any activity area shall not be detrimentally compacted, displaced, or puddled upon completion of activities. This direction does not apply to permanent recreation facilities and other permanent facilities such as system roads."*

Standard #2 prevents management from further degrading areas with already poor conditions but does not provide for the restoration and rehabilitation actions of the magnitude needed for the Crooked River Valley Rehabilitation project. The current conditions have mining tailings that remain in a departed condition across the project area after 70 years for regrowth.

This project-specific amendment would exempt the Crooked River Valley Rehabilitation project from Forest Plan Soil quality standard #2 in order to facilitate the restoration of productivity in the project area.

*** End of Amendment ***

Analysis of Factors

Soil Standard #2 (Forest Plan, page II-22) would be exempted with a project-specific Forest Plan Amendment for Alternative 2 of the Crooked River Valley Rehabilitation project, in the project activity area, on the Red River Ranger District. The amendment would allow valley rehabilitation activities to proceed in areas with extensive pre-existing detrimental soil conditions.

Timing: The amendment applies only to the activities proposed in the Crooked River Valley Rehabilitation project, and therefore applies only for the duration of those restoration actions. The temporal scope of the amendment is therefore limited.

Location and Size: The proposed Forest Plan amendment would affect implementation of activities within the Crooked River Valley Rehabilitation project activity area. The project area and activity area are about 115 acres and located in: T29N, R7E, Sections 25 and 36; and T28N, R7E, Section 1 (Boise Meridian), 5 miles west of Elk City, Idaho. The project activity area represents less than 0.01 percent of the total 2,274,146 acres of National Forest System land in the Nez Perce National Forest. The area affected is therefore limited.

Goals, Objectives, and Outputs: The Forest Plan goal for soils is to maintain soil productivity and minimize any irreversible impacts to soil resources. The Forest Plan objective for soils is to maintain soil productivity and minimize soil erosion through the application of best management practices, careful riparian area management, use of fish/water quality drainage objectives, and soil and water resource improvement projects.

This amendment is fully consistent with the goals and objectives of the Nez Perce Forest Plan because the amendment would allow activities to restore areas currently unproductive to a productive state. These activities would respond directly and indirectly to the Forest Plan goal and objective for soils. The activities would not inhibit achievement of the Forest Plan goal/objective.

This is a project-specific amendment to the Forest Plan – Soil quality standard #2 for lands in the Crooked River Valley Rehabilitation project activity area. This project-specific amendment would allow the Crooked River Valley Rehabilitation project to proceed despite the fact that the project activity area currently exceeds the 20% compacted, displaced, or puddled soils standard.

Management Perspective: Amendment of Forest Plan – Soil quality standard #2 is specific and applicable only to the Crooked River Valley Rehabilitation project activity area. This amendment does not apply to activities occurring outside the Crooked River Valley Rehabilitation project area. The proposed change would occur on less than 0.01 percent of the Forest; as a result, there would be no measurable change to goods and service produced in the total forest planning unit (2,274,146 acres, Forest).

For the riverine environment of the Crooked River project, the natural recovery rate was limited to water’s edge environments after the historic dredge mining. Under natural circumstances, the deposition of fine soil materials from episodic (100- to 1000-year return interval) events is needed to approach the reference conditions for this environment prior to mining. The active restoration advances the recovery timeframe to less than 50 years.

Purpose and Need of Amendment

Purpose

The purpose of this amendment is to allow activities to occur in the project activity area with greater than 20 percent detrimental soil disturbance.

Need

Past placer mining and harvest activities have altered soils conditions in the Crooked River Valley Rehabilitation project activity area. The current Forest Plan standards and the Forest Service Region 1 soil quality guidelines provide direction to maintain soil productivity. The proposed amendment would exempt the project from Forest Plan – Soil quality standard #2, allowing for activities to occur on areas with greater than 20% soil detrimental disturbance, as long as soil improvement activities are implemented.

Based on the current condition, a project-specific Forest Plan amendment is needed for Alternative 2 to allow for restoration and soil restoration activities to occur in the Crooked River Valley Rehabilitation project activity area.

Direct, indirect, and cumulative impact of amendment

Direct and indirect effects

No Action Alternative

Alternative A would not exempt the project from Forest Plan – Soil quality standard #2. Soil conditions in the Crooked River Valley Rehabilitation project activity area would remain detrimentally disturbed. No soil improvement activities would occur.

Action Alternative

Alternative 2 is evaluated in this analysis, and would exempt the Crooked River Valley Rehabilitation project from Forest Plan – Soil quality standard #2. This alternative would not adjust the goals, objectives, or outputs as described in the Forest Plan. This amendment would allow the Crooked River Valley Rehabilitation project to proceed despite the fact that the project activity area currently exceeds the 20% compacted, displaced, or puddled soils standard. The amended standard would be applied to the project activity area.

The amendment would allow restoration, including soil improvement activities, to proceed in areas with extensive pre-existing detrimental soil conditions. The amendment takes into account the amount of existing detrimental soil disturbance, and allows the flexibility to achieve multiple resource objectives while showing an upward trend in net soil conditions.

Proposed activities for the Crooked River Valley Rehabilitation project include soil remediation to achieve a net improvement in the project activity area, which has past soil disturbance. Soil improvement objectives are to increase water infiltration, increase soil productivity, reduce potential for weed invasion, and stabilize bare slopes. Actions include a combination of decompacting soils, recontouring to slope, and/or adding organic matter, including large woody material. These activities would establish a quicker improving trend for soil conditions, advancing tree growth and vegetation establishment.

On the project-specific scale, the proposed activities in Alternative 2, for the Crooked River Valley Rehabilitation project would move the site from 65% detrimental condition toward less than 5% in 20 years (see Chapter 3, Soil Resources).

This project-specific amendment applies to the Crooked River Valley Rehabilitation project activity area over approximately 6 years. The temporal scope of the amendment is therefore limited.

Cumulative effects

In the past, three timber harvest projects on the Nez Perce National Forest amended the Forest Plan – Soil standard #2:

- Amendment 30 – Meadow Face Stewardship Pilot Project (USDA Forest Service 2008). 15 units.
- Amendment 33 – Red Pines Project (USDA Forest Service 2006). 10 units. 547 acres.
- Amendment 37 – Lodge Point Commercial Thin Project (USDA Forest Service 2011a). 7 or 8 units.

Two future foreseeable projects propose amendments to the Forest Plan – Soil standard #2. Each proposal is for a project-specific amendment to adopt the Regional Soil quality standards (15%).

- Clear Creek Restoration project (USDA Forest Service 2013c), which proposes an amendment for less than 2% of forest to harvest timber on 3 units exceeding 20% detrimental soil disturbance (19 units exceed 15%).
- Eastside Allotment Management Planning project (USDA Forest Service 2009, proposed action), which proposes an amendment on less than 2% (43,935 acres) of the forest on two allotments exceeding 20% (3 allotments exceed 15%).

Past amendments have led to a net improvement of productivity on the forest. The results of this project, and future foreseeable projects, would also lead to a net improvement in productivity across the Nez Perce Forest, within each activity area. The prior successes combined with the restorative actions of this project indicate that no adverse cumulative effects would prevent the Nez Perce National Forest from meeting NFMA.

Cultural Resources

NEZ PERCE NATIONAL FOREST
LAND AND RESOURCE MANAGEMENT PLAN
AMENDMENT NO. X (PROPOSED)

PROJECT-SPECIFIC AMENDMENT TO:
CULTURAL RESOURCE STANDARDS #2 AND #4 AND
MANAGEMENT AREA 3 – CULTURAL RESOURCE STANDARD #4
FOR THE CROOKED RIVER VALLEY REHABILITATION PROJECT AREA

The purpose of this amendment is to allow the Forest Service to implement restoration activities in the Crooked River Valley Rehabilitation project area, which contains one eligible cultural resource site that meets the National Register Criteria for Historic Places.

The goal of the Forest Plan is to identify and protect cultural properties that are considered eligible for the National Register of Historic Places. These properties are considered historic properties (36 CFR 800.16(l)(1)) and must be protected, avoided, or mitigated, during federal undertakings.

The Nez Perce National Forest Plan – Cultural resource standards #2 and #4 (Forest Plan, page II-17) and Management Area 3 standard #4 (Forest Plan, page III-9) apply to lands in the Crooked River Valley Rehabilitation project area (USDA Forest Service 1987a).

Cultural Resource standard #2 currently reads as follows:

> "Sites will be evaluated and protected on a site-by-site basis unless larger areas such as historic or prehistoric districts are involved."

Cultural Resource standard #4 currently reads as follows:

> "Protect and preserve National Register and National Register-eligible cultural resources."

Management Area 3 – Cultural Resource standard #4 currently reads as follows:

> "Protect National Register or eligible sites from deterioration or destruction."

Cultural Resource standards #2 and #4 and Management Area 3 – Cultural resource standard #4 direct the Forest to identify and prevent management from damaging historic or National Register–eligible cultural resources, but does not provide for the rehabilitation actions of the magnitude needed for the Crooked River Valley Rehabilitation project. The project area includes one eligible site (SHC-32).

This project-specific amendment would exempt the Crooked River Valley Rehabilitation project (site SHC-32 in the project area), from Forest Plan – Cultural resource standards #2 and #4, and Management Area 3 – Cultural resource standard #4 in order to facilitate the rehabilitation of the Crooked River Valley.

*** End of Amendment ***

Analysis of Factors

The Crooked River Valley Rehabilitation project would be exempt from Cultural Resource standards #2 and #4 (Forest Plan, page II-17) and Management Area 3 – Cultural Resource standard #4 through this project-specific Forest Plan Amendment. The proposed amendment would allow rehabilitation activities to proceed on one cultural resource site identified as a National Register–eligible site. The amendment takes into account the amount and type of cultural resource sites, and the Forest has consulted with the Idaho State Historic Preservation Office (SHPO). This amendment allows other resources objectives to be met while still meeting the protection requirements of the National Historic Preservation Act (NHPA) through mitigation.

Timing: The amendment applies only to the Crooked River Valley Rehabilitation project, and therefore applies only for the duration of those restoration actions (approximately 6 years). The temporal scope of the amendment is therefore limited. Future projects would follow the current Forest Plan standard, until the Forest Plan is revised.

Location and Size: The proposed Forest Plan amendment would affect implementation of activities at one cultural property that meets National Register Criteria in the Crooked River Valley Rehabilitation project area (SHC-32; see Chapter 3, Cultural Resources section). The project area is approximately 115 acres, and is located in: T29N, R7E, Sections 25 and 36; and T28N, R7E, Section 1 (Boise Meridian), 5 miles west of Elk City, Idaho. The project area represents less than 0.01 percent of the total 2,274,146 acres of National Forest System land in the Nez Perce National Forest. The area affected is therefore limited.

Goals, Objectives, and Outputs: Forest Plan Goal 11 is to locate, protect, and interpret significant prehistoric, historic, and cultural resources. The Forest Plan objective for cultural resources is to inventory, evaluate, and, where appropriate, protect prior to land-disturbing activities. And, as appropriate, cultural resources would be interpreted for the public.

The objectives set forth in the Forest Plan for cultural resources would not be altered. The goal to locate, protect, and interpret significant prehistoric, historic, and cultural resources would still be met. All cultural resources in the project area have been located.

The Forest Plan objective is for cultural resources to be inventoried, evaluated, and, where appropriate, protected prior to land-disturbing activities. As appropriate, cultural resources will be interpreted for the public. All cultural resources in the project area have been inventoried, several sites would be protected, and interpretation signs would be installed as a part of this project. The intent of the objective would be met.

The cultural resource inventory found many dredge mining tailings. The tailings resulted from extensive dredging operations conducted by the H&H Mining Company, which operated a Yuba manufactured dredge along the lower Crooked River from 1938–1942. The dredge piles of the lower 2 miles are morphologically distinct. Their U-shaped pattern reflects the technology employed by bucket-line dredges which pivot around a central anchor-spud. The resulting architecture of the dredge piles is directly reflective of this unique mining technology.

Proposed activities for the Crooked River Valley Rehabilitation project include removal of these dredge piles and reconstruction of the stream, channel, and floodplain using this material. In order to move the historic dredge piles with the Crooked River Valley Rehabilitation project, an amendment to Cultural Resource standards #2 and #4; and Management Area 3 – Standard #4 is needed.

Management Perspective: Amendment of Forest Plan – Cultural Resource standards #2 and #4 and Management Area 3 – Standard #4 is specific or applicable only to the Crooked River Valley Rehabilitation project area. This amendment does not apply to activities occurring outside the Crooked River Valley Rehabilitation project area. The proposed change would occur on less than 0.01 percent of the Forest; as a result, there would be no measurable change to goods and services produced in the total forest planning unit (2,274,146 acres, Forest) prior to completion of the Forest Plan revision. This amendment allows other resources objectives to be met while still meeting the protection requirements of the NHPA, through the applied design and mitigation measures.

The proposed amendment does not alter the multiple-use goals and objectives for long-term land and resource management. With this amendment, additional projects or activities that will contribute to achievement of the management prescription would be completed.

The amendment would allow the management area boundaries within the project area to be altered. The project area currently includes Management Areas 3 and 10. The amount of Management Area 3 would be reduced by the rehabilitation activities to reconstruct Crooked River and the floodplain. The amount of Management Area 10 would increase through the construction of the new floodplain and upland areas. It is a project-specific amendment that would allow actions that would contribute to the achievement of Management Area10 objectives and meet objectives of Management Area 3 that were expected from these management areas.

Purpose and Need of Amendment

Purpose

The purpose of this amendment is to allow activities to occur on one site identified as a National Register–eligible site.

Need

Past placer mining and harvest activities have altered the ground conditions in the Crooked River Valley Rehabilitation project area. The current Forest Plan standards and Management Area 3 standards provide direction to identify and protect National Register–eligible sites. The proposed amendment would not apply Forest Plan Cultural Resource standards #2 and

#4 or Management Area 3 – Cultural Resource standard #4, allowing for activities to occur on cultural resource sites.

Based on the current condition, a project-specific Forest Plan amendment is needed for Alternative 2 to allow for restoration and for cultural resource interpretation of cultural sites to occur in the Crooked River Valley Rehabilitation project area.

Direct, indirect, and cumulative impact of amendment

Direct and indirect effects

No Action Alternative

Alternative 1 would not exempt the project from Forest Plan – Cultural resource standards #2 and #4 or Management Area 3 – Cultural resource standard #4. Known cultural resource sites in the Crooked River Valley Rehabilitation project area would remain unchanged.

Alternative 1 would not amend the Forest Plan.

Action Alternative

Alternative 2 is evaluated in this analysis, and would require a Forest Plan amendment for Cultural Resources standards #2 and #4 and Management Area 3 – Cultural Resource standard #4. This alternative would not adjust the goals, objectives, or outputs described in the Forest Plan. This amendment would allow the Crooked River Valley Rehabilitation project to proceed despite the fact that the project area contains one cultural resource site that is eligible for the National Register and would be disturbed. The project would be exempt from applying these standards to the Crooked River Valley Rehabilitation, in the project area. This alternative would move toward the goals, objectives, and standards for fish.

The amendment would allow restoration, including retention of representative historic dredge piles and interpretation of the site, to proceed in areas that possess one National Register–eligible site (SHC-32). The amendment takes into account the full inventory of cultural resources that has been completed and allows for other resource objectives to be met, and implementation of mitigation measures.

Proposed activities in the Crooked River Valley Rehabilitation project include removal and re-distribution of historic dredge mine tailings. A complete inventory for existing cultural resources was completed and is documented in the Crooked River Archaeological Survey (Desert West Environmental 2013a). Mitigation for the proposed adverse effect to cultural resources includes:

- Thoroughly photograph, document, and map historic dredge piles that are proposed for removal.
- Retain a representative sample of dredge piles for public interpretation.
- Construct a three-panel interpretive sign related to the history of dredge mining on the Crooked River.

- Record the historic Gnome village.
- Perform a social business history related to the economic contribution made by historic dredge mining operations to the local central Idaho economy.

The National Historic Preservation Act (NHPA) of 1966 (16 USC 470; as amended) requires federal agencies to take into account their actions on historic properties. The required regulatory review of effects resulting from federal undertakings is found in Section 106 of the Act, and has been codified in 36 CFR 800 Part B. The mitigation proposed for site SHC-32 meets the intent of the NHPA when the Idaho Historic Preservation Officer concurs on the proposed mitigation package.

This project-specific amendment applies to the Crooked River Valley Rehabilitation project area. The Forest would be exempt from applying Cultural Resource standards #2 and #4 and Management Area 3 – Standard #4 at cultural resource site SHC-32. The temporal scope of the amendment is therefore limited.

Cumulative effects

There have been no past Forest Plan amendments for Forest Plan – Cultural Resource standards #2 and #4 or Management Area 3 – Standard #4.

There are no cumulative effects with the proposed amendment to the Forest Plan. The amendment is project specific and limited in time.

Appendix E
Best Management Practices for Mercury Collection from Restoration Activities in Crooked River

Background

Mercury is a naturally occurring element in the environment that has several forms. Metallic mercury is a shiny, silver-white, odorless liquid. Metallic mercury (inorganic mercury and its compounds) enters the air from mining and manufacturing activities and from burning coal and waste. It has also been added to the environment from historic gold mining activities. Although mercury was not used in dredge mining in the upper South Fork Clearwater, there is a small potential to find this element during restoration activities. Soil and water samples have been collected in the project area by the U.S. Geologic Survey, Idaho Department of Environmental Quality, and the Nez Perce Tribe over the past 10 years to test for mercury. Thus far, mercury either has not been detected or levels have been considered non-significant based on Idaho's Water Quality Standards.

Collection

During floodplain and stream channel reconstruction, mercury may be found by the contractor. If this occurs, work in the immediate vicinity will stop and every reasonable effort will be made to contain the material in such a manner that it will not reach surface or groundwater. The mercury will be transferred into a vapor-proof, sturdy, unbreakable container by the fish biologist or qualified personnel to be safely stored and disposed of or recycled. Rubber, nitrile, or latex gloves will be kept on site and used when handling mercury to prevent adverse health impacts from mercury exposure to the skin. Depending on the amount collected, the mercury can either be poured directly into a container or an eye dropper can be used to transfer the residual mercury beads to the container. A secondary, unbreakable container will be used when storing and transferring mercury from the project site to an approved disposal site. If clothing or other items come into contact with mercury, they should be considered contaminated. Contaminated clothes and shoes brought may release mercury vapors. The recommended practice is to properly dispose of contaminated clothing and shoes.

The fish biologist or qualified personnel on site will notify Idaho State Communication Center at (800) 632-8000 or (208) 846-7610 if an amount greater that what is contained in a thermometer is found. The amount and location of mercury will be documented, even if less than what is contained in a thermometer, and reported to the Idaho Department of Environmental Quality, Lewiston Field Office. Any other mercury data collection during implementation of the project will be documented and shared with the Idaho Department of Environmental Quality.

Transportation

Transporting the secondary container of mercury from the field or mining collection site to the disposal site or temporary storage site should be done in a manner that does not compromise the containers. It is suggested that the secondary container of mercury be placed in a secure location in the vehicle so that the container does not tip over. This will minimize shifting or sliding during sudden stops or turns. Containers should be transported in the back of a pick-up truck or in a car trunk.

Storage

Mercury and mercury wastes (items contaminated by mercury) should be put in a vapor-proof, sturdy, unbreakable container and stored in secondary containment, such as a second, larger unbreakable container. Anything that touched the liquid mercury should be considered contaminated. Contaminated clothes and shoes may release mercury vapors after touching the element. The recommended practice is to properly dispose of contaminated clothing and shoes. The container should be labeled: "DANGER Toxic Mercury – DO NOT OPEN."

Mercury Waste Management/Recycling

Mercury will be disposed of at one of the following companies. The handing, treatment, and disposal or recycling practice of the facility will be verified prior to transporting mercury to the facility.

Company	Phone Number
Able Clean-up Technologies	(509) 466-5255
Environmental Management Solutions	(208) 895-0326
H2O Environmental Services	(208) 343-7867
Safety Kleen	(208) 234-4002
Specialty Environmental Services	(208) 327-9977

Risk Assessment

Additional mercury monitoring may be required in the project area if significant amounts of mercury are found.

Appendix F
References

This is a list of the references and literature cited that were used to prepare the DEIS. Additional information may be found in the project planning record, located at the Forest Supervisor's Office for the Nez Perce – Clearwater National Forests in Grangeville, Idaho, or on the project webpage at http://www.fs.fed.us/nepa/nepa_project_exp.php?project=40648.

Aubry, K. B., and Jeffrey C. Lewis. 2003. "Extirpation and reintroduction of fishers (*Martes pennanti*) in Oregon: implications for their conservation in the Pacific states." *Biological Conservation* 114(1): 79–90.

Baldigo, Barry P. 1986. *Crooked River and In-Situ Toxicity Results*. Lockheed Engineering and Management Services Company. Las Vegas, NV.

Bash, J., C. Cerman, and S. Bolton. 2001. *Effects of Turbidity and Suspended Solids on Salmonids*. Center for Streamside Studies, University of Washington. 74 pp. http://www.wsdot.wa.gov/research/reports/fullreports/526.1.pdf

Batt, P. E. 1996. *Governor Philip E. Batt's Idaho Bull Trout Conservation Plan*. State of Idaho, Office of the Governor, Boise, ID. 133 pp.

Bisson, P. A., and R. E. Bilby. 1982. "Avoidance of Suspended Sediement by Juvenile Coho Salmon." *North American Journal of Fisheries Management*. 4: 371–374. http://www.fs.fed.us/pnw/lwm/aem/docs/bisson/1982_bisson_avoidance_of_suspended_sediment.pdf

Bolander, P., and A. Yamada. 1999. *Dust Palliative Selection and Application Guide*. 9977 1207-SC\TDC. USDA Forest Service, San Dimas Technology and Development Center, San Dimas, CA. 20 pp. Available online at: http://www.fs.fed.us/eng/pubs/html/99771207/99771207.html.

Buskirk, S. W., and L. F. Ruggiero. 1994. American marten. Pages 7–37 in L.F. Ruggiero, K. B. Aubry, S. W. Buskirk, L. J. Lyon, and W. J. Zielinski. *The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine in the western United States*. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. Gen. Tech. Rep. RM-254.

Bustard, D. R., and D. W. Narver. 1975. "Aspects of the winter ecology of juvenile coho salmon (*Oncoryhnchus kisutch*) and steelhead trout (*Salmo gairdneri*)." *Journal of the Fisheries Research Board of Canada.* 32: 667–680.

Byrne, A. 1994. *Steelhead supplementation studies – Annual Performance Report*. Idaho Department of Fish and Game, Boise, ID.

Cederholm, C. J., R. E. Bilby, P. A. Bisson, T. W. Bumstead, B. R. Fransen, W. J. Scarlett, and J. W. Ward. 1997. "Response of juvenile coho salmon and steelhead to placement of large woody debris in coastal Washington stream." *North American Journal of Fisheries Management.* 17: 947–963.

Clapperton, M. J. 2006. *Managing the soil as a habitat*. Agriculture and Agri-Food Canada, Lethbridge Research Centre, Lethbridge, Alberta, Canada. 4 pp.

Clark, K. and J. Harris. 2011. *Clearwater River Subbasin Climate Change Adaptation Plan*. Nez Perce Tribe Water Resources Division, Model Forestry Policy Program and Cumberland River Compact. Sagle, ID. pp. 41–46.

Clarkin, K., A. Conner, M. J. Furniss, B. Gubernick, M. Love, K. Moynan, and S. Willson Musser. 2003. *National Inventory and Assessment Procedure for Identifying Barriers to Aquatic Organism Passage at Road-Stream Crossings*. USFS San Dimas Technology Development Center. San Dimas, CA.

Clear Creek Hydrology and North Wind. 2004. *Newsome Creek Feasibility Study*. Final Report. Volume I. Prepared for Nez Perce National Forest, Grangeville, ID, by Clear Creek Hydrology, Inc., Bozeman, MT, and North Wind, Inc., Idaho Falls, ID, in cooperation with Nez Perce Tribe, Lapwai, ID.

Cline, R., G. Cole, W. Megahan, R. Patten, and J. Potyondy. 1981. *Guide for Predicting Sediment Yields from Forested Watersheds*. Ogden, UT. U.S. Department of Agriculture, Forest Service, Northern and Intermountain Region and Intermountain Forest and Range Experiment Station. 42 pp.

Close, D. A., M. Fitzpatrick, H. Li, B. Parker, D. Hatch, and G. James. 1995. *Status Report of the Pacific Lamprey (*Lampetra Tridentata*) in the Columbia River Basin*. U.S. Department of Energy, Bonneville Power Administration, Project Number 94-026.

Cochnauer, Tim, and Christopher Claire. 2001. *Evaluate Status of Pacific Lamprey in the Clearwater River Drainage, Idaho*. 2001 Annual Report, Project No. 200002800.

Cochnauer, Tim, and Christopher Clair. 2002. *Evaluate Status of Pacific Lamprey in the Clearwater River Drainage, Idaho*. 2002 Annual Report, Project No. 200002800.

Cochnauer, Tim, and Christopher Claire. 2003. *Status and Distribution of Pacific Lamprey (*Lampetra Tridentata*) in Idaho*. Idaho Department of Fish and Game.

Columbia River DART. 2013. Columbia Basin Research, University of Washington. Available from: http://www.cbr.washington.edu/dart

Columbia River Inter-Tribal Fish Commission (CRITFC)

2013. "Lamprey Restoration." Website accessed at: http://www.critfc.org/advocacy/lamprey-restoration/

1996. *The Columbia River Anadromous Fish Restoration Plan of the Nez Perce, Umatilla, Warm Springs and Yakama Tribes*. Prepared by CRITFC 1995, printed in 1996.

Conners, A. 2003. *Road Decommissioning Program Monitoring Report*. Unpublished Internal Report. Region 1, Clearwater NF, Orofino, ID. 13 pp.

Conroy, B., and K. Thompson. 2011. *The Implementation Guide to Appendix A of the Nez Perce National Forest Plan*. Unpublished report on file with the Nez Perce – Clearwater National Forests. 34 pp.

Council on Environmental Quality (CEQ). 2005. CEQ Memorandum to the Heads of Federal Agencies Regarding Guidance on the Consideration of Past Actions in Cumulative Effects Analysis. June 24.

Cowardin, Lewis M., Virginia Carter, Francis C. Golet, and Edward T. LaRoe. 1992. *Classification of Wetlands and Deepwater Habitats of the United States*. FWS/OBS-79/31. December 1979. Reprinted 1992. USDA-FWS, Office of Biological Services, Washington, D.C. 142 pp.

Crawford, R. C. 1980. *Ecological investigations and management implications of six northern Idaho endemic plants on the proposed endangered and threatened lists*. Unpublished MS Thesis. University of Idaho, Moscow, ID.

Desert West Environmental

2013a. *Crooked River Archaeological Survey*. Report on file at the Nez Perce National Forest Supervisor's Office, Grangeville, ID. FOIA Exempt.

2013b. *A Functional Analysis and Business History of Bucket-Line Dredge Operations; Lower Crooked River, Idaho*. Ogden, UT.

Digital Atlas of Idaho. 2013. Digital Atlas of Idaho: Idaho's natural history online. Available online at http://imnh.isu.edu/digitalatlas/index.htm. (Accessed: July and August 2013).

Doyle, Jacob. Biological Technician, Nez Perce – Clearwater National Forests. 2012. Personal communication about plant inventory in 2012 with Stephen J. Hiebert, Rangeland Management Specialist.

Egerton-Warburton, L., R. C. Graham, and P. F. Hendrix. 2005. *Soil ecosystem indicators of post-fire recovery in the California chaparral*. Final report to the National Commission on Science for Sustainable Forestry. NCSSF Research Project C4.1. 36 pp.

Elliot, W., D. E. Hall, and S. R. Graves. 1999. "Predicting sediment from forest roads." *Journal of Forestry*. 97(8): 23–29.

Elliot, W. J., R. B. Foltz, and C. H. Luce. 1995. "Validation of the Water Erosion Prediction Project (WEPP) model for low-volume forest roads." *Proceedings of the Sixth International Conference on Low-Volume Roads*. Washington, D.C.: Transportation Research Board. 178–186.

Elliot, W. J., R. B. Foltz, and M. D. Remboldt. 1994. "Predicting sedimentation from roads at stream crossings with the WEPP model." Paper No. 947511. Presented at the 1994 ASAE International Winter Meeting. St. Joseph, MI: ASAE.

Elliot, W., D. E. Hall, and S. R. Graves. 1999. "Predicting sediment from forest roads." *Journal of Forestry*. 97(8): 23–29.

Elsensohn, Sister M. Alfreda. 1971. *Pioneer Days in Idaho County – Volume Two.* Canton Printers, Caldwell, ID.

Eviner, V. T., M. K. Firestone. 2007. "Mechanisms determining patterns of nutrient dynamics." In M. Stromberg, J. Corbin, and C. D'Antonio (eds), *Ecology and management of California grasslands*. pp. 94–106.

Fertig, W., and H. Marriott. 1993. Field survey for *Astragalus paysonii* (Payson's milkvetch) and *Draba borealis* (boreal draba), Bridger-Teton NF Final Report. Wyoming Natural Diversity Data base, Laramie. 23 pp.

Flanagan, D. C., and S. J. Livingston (eds.). 1995. *USDA-Water Erosion Prediction Project: User Summary*. NSERL Report No. 11. USDA-ARS National Soil Erosion Research Laboratory, West Lafayette, IN. 47097–1196.

Ford, M. J. (ed). 2011. Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-NWFSC-113, 281 pp.

Fraser, D. F., and R. D. Cerri. 1982. "Experimental evaluation of predator-prey relationships in a patchy environment: consequences for habitat use patterns in minnows." *Ecology*. 63: 307–313.

Geum Environmental Consulting. 2012. *Crooked River Valley Rehabilitation Project Wetland Delineation Report*. Prepared for USDA Forest Service, Nez Perce – Clearwater National Forests. September. 166 pp.

Graham, R. T., A. E. Harvey, M. F. Jurgensen, T. B. Jain, J. R. Tonn, and D. S. Page-Dumroese. 1994. *Managing coarse woody debris in forests of the Rocky Mountains*. Res. Pap. INT-RP-477. USDA Forest Service, Intermountain Research Station. 13 pp.

Great West Engineering. 2013. *Lower Crooked River Narrows Road Relocation Study, Alternative 5 submittal*. Prepared for Nez-Perce Clearwater NF. 11 pp.

Greenlee, J. 1997. *Cypripedium fasciculatum* Conservation Assessment. USDA Forest Service, Region 1, Lolo National Forest. Missoula, MT.

Grier, C. C., K. M. Lee, N. M. Nadkarni, G. O. Klock, and P. J. Edgerton. 1989. *Productivity of forests of the United States and its relation to soil and site factors and management practices: A Review*. USDA Forest Service, Pacific Northwest Research Station, General Technical Report, PNW-GTR-222, Portland, OR. 51 pp.

Hammer, Samantha. 2009 and 2010. Unpublished data in GIS database. Available at Nez Perce National Forest, Grangeville, ID.

Harvey, A. E., M. F. Jurgensen, M. J. Larsen, and R. T. Graham. 1987. *Decaying organic materials and soil quality in the inland northwest: a management opportunity*. USDA Forest Service, Intermountain Research Station, General Technical Report INT-255. Ogden, UT. 20 pp.

Hillman, T. W., J. S. Griffith, and W. S. Platts. 1987. "Summer and winter habitat selection by juvenile Chinook salmon in a highly sedimented Idaho stream." *Transactions of the American Fisheries Society*. 116: 185–195.

Horton, T. R., T. D. Burns, and V. T. Parker. 1999. "Ecotmycorrhizal fungi associated with Arctostaphylos contribute to Psuedotsuga menziesii establishment." *Can. J. Bot*. 77: 93–102.

Hrodey, P. J., B. J. Kalb, and T. M. Sutton. 2008. "Macroinvertebrate community response to large-woody debris additions to small warmwater streams." *Hydrobiologia*. 605:193–207.

Hughes, C. 2013. Unpublished report of claims from BLM data 2012. Available at Nez Perce National Forest, Grangeville, ID.

Idaho County. 2013. Joe Bonn, USFS Forest Engineer, personal communication with Gene Meinen, Idaho County Road Manager, Grangeville, ID. July 25.

Idaho Department of Environmental Quality (IDEQ)

2013. Idaho Water Quality Standards and Wastewater Treatment Requirements (IDAPA 58.01.02). 180 pp. Accessed July 28, 2013. Available online at: http://adminrules.idaho.gov/rules/current/58/0102.pdf.

2011. *Idaho Champion Group Lode and Pacific Group Lode Claims; Preliminary Assessment and Site Inspection Report*. Grangeville, ID.

2009. *Idaho Department of Environmental Quality Working Principles and Policies for the 2008 Integrated (303[d]/305[b]) Report*. May 22, 2009. Idaho Department of Environmental Quality, Boise, ID. 608 pp. Available online at: http://www.deq.idaho.gov/media/457998-integrated_report_2008_final_entire.pdf

1998. *1998 303(d) List*. State of Idaho Department of Environmental Quality. 496 pp.

Idaho Department of Environmental Quality (IDEQ) and U.S. Environmental Protection Agency (EPA). 2003. *South Fork Clearwater River Subbasin Assessment and Total Maximum Daily Loads*. State of Idaho, Boise, ID.

IDEQ, Nez Perce Tribe, and U.S. Environmental Protection Agency (IDEQ et al). 2004. *South Fork Clearwater River Subbasin Assessment and TMDLs*. Idaho Department of Health and Welfare, Boise, ID. 276 pp. +App.

Idaho Department of Fish and Game (IDFG)

2012. *Idaho Supplementation Studies: Brood Year 2009 Cooperator Report*. IDFG Report number 12-13. pp. 32–33.

2011. *Idaho Supplementation Studies: Brood Year 2008 Cooperator Report*. IDFG Report number 11-19. pp. 14–16.

2010a. GIS layer – Wildlife observations, on file at the Nez Perce – Clearwater National Forests.

2010b. *Idaho Supplementation Studies: Brood Year 2007 Cooperator Report*. IDFG Report number 10-14. pp. 16–22.

2005. *Idaho comprehensive wildlife conservation strategy*. Idaho Conservation Data Center, Idaho Department of Fish and Game, Boise, ID. Available online at: http://fishandgame.idaho.gov/cms/tech/CDC/cwcs.cfm

Idaho Department of Lands (IDL). 2013. Best Management Practices. State of Idaho, Idaho Department of Lands. Available online at: http://www.idahoforests.org/bmp.htm

Idaho Department of Water Resources (IDWR)

2013a. Recreational Mining Permits information. Available at: https://www.idwr.idaho.gov/WaterManagement/StreamsDams/Streams/DredgingPermit/DredgingPermit.htm

2013b. Channel Stream Alteration by Recreational Mining. Map of streams open entire year or partial year to Recreational Dredging. Available at: http://maps.idwr.idaho.gov/RecMining/

IDEQ, Nez Perce Tribe, and U.S. Environmental Protection Agency. 2004. *South Fork Clearwater River Subbasin Assessment and TMDLs*. Idaho Department of Health and Welfare, Boise, ID. 276 pp. +App.

Independent Scientific Advisory Board (ISAB)

2007. *Climate Change Impacts on Columbia River Basin Fish and Wildlife*. Document No. ISAB 2007-2. Northwest Power and Conservation Council, Portland, OR. http://www.nwcouncil.org/library/isab/isab2007-2

2011. *Columbia River Food Webs: Developing a Broader Scientific Foundation for Fish and Wildlife Restoration*. Document No. ISAB 2011-1. Northwest Power and Conservation Council, Portland, OR. January 7.

Jackson, A. D., P. D. Kissner, D. R. Hatch, B. L. Parker, D. A. Close, M. S. Fitzpatrick, and H. Li. 1996. *Pacific Lamprey Research and Restoration Annual Report 1996*. Annual report to Bonneville Power Administration, Project Number 94-026.

Jackson, A. D., D. R. Hatch, D. A. Close, and H. Li. 1997. *Pacific Lamprey Research and Restoration Annual Report 1997*. Annual report to Bonneville Power Administration, Project Number 1994-026, BPA Report DOE/BP-39067-3. January.

James, J. J., B. S. Smith. E. A. Vasquez, and R. L. Sheley. 2010. “Principles for ecologically based invasive plant management.” *Invasive Plant Science and Management*. 3: 229–239.

Jette, C., J. Connett, and J. P. McCaffrey. 1999. *Biology and biological control agents of yellow starthistle*. USDA, Forest Service. FHTET-98-17. April.

Keinath, Doug, and Matt McGee. 2005. Boreal Toad (*Bufo boreas boreas*): A technical conservation assessment. [Online.] USDA Forest Service, Rocky Mountain Region. pp. 27–30. Available at: http://www.fs.fed.us/r2/projects/scp/assessments/borealtoad.pdf Accessed November 27, 2013.

Kiefer, R. B., and J. N. Lockhart. 1992. *Idaho Habitat and Natural Production Monitoring: Part II*. Fisheries Research Station, Idaho Department of Fish and Game. Project Number 91-73, Contract Number DE-BI79-91-BP21182.

Kirchner, J. W., R. C. Finkel, C. S. Riebe, D. E. Granger, J. L. Clayton, J. G. King, and W. F. Megahan. 2001. “Mountain erosion over 10 yr, 10 k.y., and 10 m.y. time scales.” *Geology*. 29: 591–594.

Kujala, Q. J. 1993. *Winter habitat selection and population status of pine marten in southwest Montana*. M.S. Thesis, Montana State University, Bozeman, MT. pp. xi and 51 (of 58 pp. total).

Lacey, J. R., C. B. Marlow, and J. R. Lane. 1989. "Influence of spotted knapweed (Centaurea maculosa) on surface runoff and sediment yield." *Weed Technology*. 3(4): 627–631.

Lane, L. J., M. Hernandez, and M. Nichols. 1997. "Processes controlling sediment yield from watersheds as functions of spatial scale." *Environmental Modeling & Software*. 12(4): 355–369.

Leege, T. 1984. *Guidelines for Evaluating and Managing Summer Elk Habitat in Northern Idaho*. Idaho Department of Fish and Game Wildlife Bulletin No. 11, Boise, ID.

Lewis, R. S., R. F. Burmester, E. H. Bennett, and D. L. White. 1990. *Preliminary Geologic Map of the Elk City Region, Idaho County, Idaho*. Technical Report 90-2. Idaho Geological Survey, University of Idaho. Moscow, ID. 5 pp.

Lichthardt, J. J. 1999. *Action Plan for sensitive plant species on the Clearwater National Forest (Draft)*. Report to the Clearwater National Forest SO, Orofino, ID. Idaho Dept. of Fish and Game, Conservation Data Center, Boise, ID.

Lloyd, R. A., K. A. Lohse, and TPA Ferré. 2013. "Influence of road reclamation techniques on forest ecosystem recovery." *Front. Ecol. Environ*. 11(2): 75–81.

Mann, H., and P. Von Lindern. 1988. *Water Quality Status Report No. 80 for Crooked River, Idaho County, Idaho, 1987*. Prepared for Idaho Department of Health & Welfare, Division of Environmental Quality, Water Quality Bureau. Boise, ID. 39 pp.

Matthews, G. M., and R. S. Waples. 1991. Status review for Snake River spring and summer Chinook salmon. NOAA technical memorandum NMFS F/NWC-200. Seattle, WA. U.S. Department of Commerce, NOAA Fisheries.

McCelland, D. E., R. B. Foltz, W. D. Wilson, T. W. Cundy, R. Heinemann, J. A. Saurbier, and R. L. Schuster. 1997. *Assessment of the 1995 and 1996 Floods and Landslides on the Clearwater National Forest: Part 1 Landslide Assessment*. A Report to the Northern Regional Forester. Clearwater National Forest. 74 pp.

Meyer, G. A., J. L. Pierce, S. H. Wood, and A. J. T. Jull. 2001. "Fire, storms, and erosional events in the Idaho batholith." *Hydrological Processes*. 15: 3025–3038.

Molina, R., T. R. Horton, J. M. Trappe, and B. G. Marcot. 2011. "Addressing uncertainty: How to conserve and manage rare or little known fungi." *Fungal Ecology*. 4: 134–146.

Montana Field Guide. 2013.

Western Pearlshell – *Margaritifera Falcata*. Montana Natural Heritage Program. Retrieved on August 7, 2013, from http://FieldGuide.mt.gov/detail_IMBIV27020.aspx

Western Toad — *Anaxyrus boreas*. Montana Natural Heritage Program and Montana Fish, Wildlife and Parks. Retrieved on November 27, 2013, from http://FieldGuide.mt.gov/detail_AAABB01030.aspx

Montana/Idaho Airshed Group. 2010. *Montana/Idaho Airshed Group Operating Guide*. Airshed Group Executive Board reviews the Operational Guide annually. Members include: state, federal, tribal and private member organizations. Missoula, MT. 60 pp. Available online at: http://smokemu.org/docs/20100601OpsGuide.pdf.

Mullan, J. W., A. Rockhold, and C. R. Chrisman. 1992. "Life Histories and Precocity of Chinook Salmon in the Mid-Columbia River." *The Progressive Fish-Culturist* 54: 25–28.

National Marine Fisheries Service, USDC-NOAA. 2011. *Draft Snake River Steelhead Recovery Plan – Chapter 5. Clearwater River MPG Steelhead Status and Recovery*. http://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/recovery_planning_and_implementation/snake_river/current_snake_river_recovery_plan_documents.html

National Marine Fisheries Service (NMFS). 2000. *Guidelines for Electrofishing Waters Containing Salmonids Listed under the Endangered Species Act.* NMFS, Portland, OR. 5 pp.

NatureServe. 2013. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, VA. Available online at: http://www.natureserve.org/explorer. (Accessed: July and August 2013).

NCASI (National Council for Air and Stream Improvement). 2004. *Effects of heavy equipment on physical properties of soils and on long-term productivity: a review of literature and current research*. Technical Bulletin NO. 887. Research Triangle Park, NC: National Council for Air and Stream Improvement, Inc. 90 pp.

Nelson, J. M. 1996. "Predictive Techniques for River Channel Evolution and Maintenance." *Water, Air and Soil Pollution*. v. 90, pp. 321–333.

Nez Perce Tribe (NPT)

2013a. "Pacific Lamprey Restoration Project." Nez Perce Tribe, Department of Fisheries Resources Management. Website, accessible at: http://www.nptfisheries.org/ResidentFish/ResidentFishProjects/RF000002.aspx

2013b. Unpublished heavy metals monitoring data. Nez Perce Tribe office, Grangeville, Idaho.

NMFS and USDI Fish and Wildlife Service (FWS).

2013 draft. *Biological Opinions for Nez Perce National Forest Noxious Weed EA*. Unpublished report available at: Nez Perce – Clearwater National Forests Office, Grangeville, ID.

1998. *Matrix of Pathways and Indicators of Watershed Condition for Chinook, Steelhead, and Bull Trout*. Local adaptation for the Clearwater Basin and Lower Salmon. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Environmental and Technical Services Division, Habitat Conservation Branch.

NOAA (National Oceanic and Atmospheric Administration) Fisheries

2014. *Endangered Species Act Section 7(a)(2) Consultation Supplemental Biological Opinion. Consultation on Remand for Operation of the Federal Columbia River Power System.* NOAA Fisheries Log Number: NWR/2013/9562. Date Issued: January 17, 2014.

2010. *Endangered Species Act Section 7(a)(2) Consultation Supplemental Biological Opinion. Supplemental Consultation on Remand for Operation of the Federal Columbia River Power System, 11 Bureau of Reclamation Projects in the Columbia River Basin and ESA Section 10(a)(1)(A) Permit for Juvenile Fish Transportation Program*. NOAA Fisheries Log Number: F/NWR/2010/02096. Date Issued: May 20, 2010.

2008. *Endangered Species Act Section 7(a)(2) Consultation Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation. Consultation on Remand for Operation of the Federal Columbia River Power System, 11 Bureau of Reclamation Projects in the Columbia Basin and ESA Section 10(a)(I)(A) Permit for Juvenile Fish Transportation Program* (Revised and reissued pursuant to court order, NWF v. NMFS, Civ. No. CV 01-640-RE, D. Oregon). NOAA Fisheries Log Number: F/NWR/2005/05883. May 5.

Northwest Power and Conservation Council (NPCC). 2005. *Clearwater River Subbasin Management Plan*. In Columbia River Basin Fish and Wildlife Program. Portland, OR.

Platts, W. S. 1974. "Geomorphic and aquatic conditions influencing salmonids and stream classification with application to ecosystem classification." Billings, MT: U.S. Department of Agriculture, Forest Service, SEAM Project. 404 pp.

Platts, W. S., W. F. Megahan, and G. W. Minshall. 1983. "Methods for evaluating stream, riparian and biotic conditions." Gen. Tech. Rep. INT-138. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station, 70 pp.

Rachael, Jon. 2011. *Project W-170-R-34, Progress Report, Elk, Study I, Job 1, July 1, 2010 to June 30, 2011*. Boise, ID.

Rieman, B. E., and J. D. McIntyre. 1993. *Demographic and Habitat Requirements for Conservation of Bull Trout*. U. S. Department of Agriculture, Forest Service, Intermountain Research Station, Ogden, UT. http://www.fs.fed.us/rm/pubs_int/int_gtr302.pdf

River Design Group (RDG)

2013a. *Crooked River Temperature Summary*. Prepared for Nez Perce–Clearwater NF. Grangeville, ID. 9 pp.

2013b. *Hydraulic Modeling and Habitat Mapping for Existing Conditions*. Prepared for Nez Perce–Clearwater NF. Grangeville, ID. 44 pp.

2012. *Mining Claim Inventory: Crooked River Valley Rehabilitation Design*. Submitted to USDA Forest Service, Nez Perce–Clearwater National Forests. October. 59 pp.

2013. *Hydraulic Modeling and Habitat Mapping for Existing Conditions*. Submitted to USDA Forest Service, Nez Perce-Clearwater National Forests. May 14, 2013.

River Design Group and Geum Environmental Consulting. 2012. *Native Materials Inventory: Crooked River Valley Rehabilitation Design*. Submitted to USDA Forest Service, Nez Perce–Clearwater National Forests. October. 23 pp.

River Design Group, Geum Environmental Consulting, and TerraGraphics Environmental Engineering (RDG et al.)

2013a. *Final Design Report: Crooked River Valley Rehabilitation Design*. Contract # AG-02RC-C-0038. March. 145 pp. + appendices.

2013b. *75% Design Drawings for Crooked River Valley Rehabilitation Design*. Contract # AG-02RC-C-0038. Prepared for Nez Perce – Clearwater NF. Grangeville, ID. 45 pp.

2012. *Design Criteria Report: Crooked River Valley Rehabilitation Design*. Contract # AG-02RC-C-0038. September. 73 pp. + appendices.

Robichaud, P. R. 1996. *Spatially-varied erosion potential from harvested hillslopes after prescribed fire in the interior northwest*. Ph.D. dissertation. Moscow, ID, University of Idaho.

Rogers, M. B. 2003. "Woody debris and macroinvertebrate community structure of low-order streams in Colville National Forest, Washington." Master's Thesis, Washington State University, Pullman, WA. 93 pp.

Rosgen, D., and H. L. Silvey. 1996. *Applied River Morphology, Wildland Hydrology, Pagosa Springs, CO*. USLC Catalog No. 96-60962.365.

Samson, F. B. 2006. *Habitat Estimates for Maintaining Viable Populations of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, Pileated Woodpecker, American Marten, and Fisher*. USDA Forest Service. Missoula, MT. Version June 6, 2006.

Siddall, P. 1992. *South Fork Clearwater River Habitat Enhancement: Nez Perce National Forest*. Nez Perce National Forest. Prepared for Bonneville Power Administration.

Sommer, T., D. McEwan, and R. Brown. 2001. "Factors affecting chinook salmon spawning in the lower Feather River." In *Contributions to the biology of Central Valley salmonids,* R. L. Brown, ed. California Department of Fish and Game Fish bulletin 179. pp. 269–297.

South Fork Clearwater River Watershed Advisory Group. 2006. *South Fork Clearwater River TMDL Implementation Plan*. April. 104 pp.

State of Idaho

2006. IDAPA 20.02.01, "Rules Pertaining to the Idaho Forest Practices Act."

1993. IDAPA 37.03.07, "Stream Channel Alteration Rules."

Story, M., and T. Dzomba. 2005. *Smoke NEPA Guidance: Describing Air Resource Impacts from Prescribed Fire Projects in NEPA documents for Montana and Idaho in Region 1 and Region 4*. U.S. Department of Agriculture, Forest Service, Missoula, MT. 30 pp. Available online at: http://www.fs.fed.us/air/documents/Smoke%20NEPA_2005_Nov.pdf

Thurow, R. 1987. *Evaluation of the South Fork Salmon River Steelhead Trout Fishery Restoration Program*. Lower Snake River Fish and Wildlife Compensation Plan. Job Completion Report, Contract No 14-16-0001-86505. Idaho Department of Fish and Game.

Toweill, D. 2011. *Project W-170-R-34, Progress Report, Moose, Study I, Job 6, July 1, 2010 to June 30, 2011*. Boise, ID.

Tysdal, L. M., W. J. Elliot, C. H. Luce, and T. A. Black. 1999. "Modeling Erosion from Insloping Low-Volume Roads with WEPP Watershed Model." *Transportation Research Record*. Washington, D.C.: Transportation Research Board, National Research Council. 2(1652): 250–256.

United States Department of Agriculture – Forest Service (USDA Forest Service)

2013a draft. *Orogrande Community Protection Project Environmental Assessment*. USDA-FS, Northern Region, Nez Perce – Clearwater National Forests, Grangeville, ID. Information available online at: http://www.fs.fed.us/nepa/nepa_project_exp.php?project=28021

2013b draft. *Biological Assessment – Herbicide Treatment of Invasive and Noxious Weeds on the Nez Perce National Forest (2013-2022)*. Unpublished document available at: Nez Perce – Clearwater National Forests Office, Grangeville, ID.

2013c. *Clear Creek Integrated Restoration Project – Draft EIS*. USDA-Forest Service, Nez Perce – Clearwater National Forests, Moose Creek Ranger District, Kooskia, ID. Available online at: http://www.fs.fed.us/nepa/nepa_project_exp.php?project=38021

2012. *National Best Management Practices for Water Quality Management on National Forest System Lands*. Volume 1: National Core BMP Technical Guide. FS-990a. USDA Forest Service.

2011a. *Lodge Point Commercial Thin Project – Environmental Assessment (EA) and Decision Notice/Finding of No Significant Impact(DN/FONSI)*. USDA-Forest Service, Nez Perce National Forest, Moose Creek Ranger District, Fenn, ID. EA, 125 pp.; Decision, 44 pp.

2011b. Region 1 Sensitive Species list. Fish, Wildlife and Plants. USDA, Forest Service, Northern Region, Missoula, MT. Available online at: http://fsweb.r1.fs.fed.us/wildlife/wwfrp/TESnew.htm.

2010a. *Washington Office Forest Service Manual*, Chapter 2550 – Soil Management Supplement. USDA Forest Service, Washington Office. 20 pp.

2010b. *Forest Service Manual* (FSM 7700). USDA, Forest Service, Washington, D.C. 24 pp.

2009. *Eastside Allotment Management Planning Project – Proposed Action-2009* . USDA-Forest Service, Nez Perce – Clearwater National Forests, Salmon River and Red River Ranger Districts, Grangeville, ID. Available online at: http://www.fs.fed.us/nepa/nepa_project_exp.php?project=37842

2008. *Meadow Face Stewardship Pilot Project. Final Supplemental Environmental Impact Statement and Record of Decision*. USDA-FS, Northern Region, Nez Perce National Forest, Clearwater Ranger District, Grangeville, ID. FEIS – 150 pp., plus appendices; ROD – 39 pp., plus attachments.

2007a. *Final Environmental Impact Statement, Northern Rockies Lynx Management Direction, Volume 1*. Northern Region, Missoula, MT. March. 534 pp.

2007b. *Northern Rockies Lynx Management Direction Record of Decision*. Northern Region, Missoula, MT. March. 71 pp.

2006. *Red Pines Project. Final Environmental Impact Statement and Record of Decision*. USDA-FS, Northern Region, Nez Perce National Forest, Grangeville, Idaho. FEIS – 371 pp., plus appendices; ROD – 45 pp., plus attachments.

2005a. *American and Crooked River Project Final Environmental Impact Statement and Record of Decision*. USDA-FS, Northern Region, Nez Perce National Forest, Grangeville, ID.

2005b. *Forest Service Manual 2670*, "Threatened, Endangered and Sensitive Plants and Animals."

2001. *Forest Service Manual*, FSM 2000 – National Forest Resource Management, Supplement No. R1 2000-2001-1, Noxious Weed Management. Effective date May 14, 2001. Northern Region (Region 1), Missoula, MT.

1999a. *Forest Service Manual,* R-1 Supplement 2500-99-1. Soil Management, Soil Quality Monitoring. USDA Forest Service, Intermountain Region, Missoula, MT. 6 pp.

1999b. *South Fork Clearwater River Biological Assessment*. U.S. Department of Agriculture, Forest Service, Nez Perce National Forest, Grangeville, ID.

1998. *South Fork Clearwater River Landscape Assessment*. USDA-FS, Northern Region, Nez Perce National Forest, Grangeville, ID. 297 pp. Available online at: Summary, 16 pp.: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5107441.pdf

Volume 1 – Narrative, 224 pp.: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5364179.pdf

Volume 2 – Maps, 57 pp.: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5364176.pdf

1998 to 2012. Weed Inventories. FACTS data base at Nez Perce National Forest, Grangeville, ID.

1995a. Per Forest Service Manual File Code 2670/1950, August 17, 1995; Streamlining Biological Evaluations and Conclusions for Determining Effects to Listed, Proposed and Sensitive Species.

1995b. *Nez Perce National Forest Plan, Amendment 20 (PACFISH).* U.S. Department of Agriculture, Forest Service, Nez Perce National Forest, Grangeville, Idaho.

1995c. *Forest Service Manual*, Series 2000 – National Forest Resource Management, WO Amendment 2000-95-5, Noxious Weed Management. Effective November 29, 1995.

1988a. *Nez Perce National Forest Noxious Weed Decision Notice and Finding of No Significant Impact (DN/FONSI) and Environmental Assessment*. USDA Forest Service, Nez Perce National Forest, Grangeville, ID.

1988b. *Soil and Water Conservation Practices Handbook*. FSH 2509.22. USDA Forest Service, Region 1/Region 4. 71 pp.

1987a. *Nez Perce National Forest Land and Resource Management Plan*, as amended. USDA-FS, Northern Region, Nez Perce National Forest, Grangeville, ID. 174 pp. + appendices. Available online at: http://www.fs.usda.gov/detail/nezperceclearwater/landmanagement/planning/?cid=stelprdb5404075

1987b. *Nez Perce National Forest Land and Resource Management Plan Final Environmental Impact Statement and Record of Decision*. USDA-FS, Northern Region, Nez Perce National Forest, Grangeville, ID. Available online at: http://www.fs.usda.gov/detail/nezperceclearwater/landmanagement/planning/?cid=stelprdb5404075.

1987c. *Terrestrial Ecosystem Unit Survey*. USDA Forest Service, Northern Region, Nez Perce national Forest, Grangeville, ID.

1974. *Forest Hydrology. Part II: Hydrologic Effects of Vegetation Manipulation*. Missoula, MT. 229 pp.

United States Department of Interior – Environmental Protection Agency (USDI-EPA). 2013. Idaho Small Suction Dredge Mining General Permit. Maps of areas allowing suction dredging or excluded from small suction dredging. Accessed on 9/12/13 at: http://yosemite.epa.gov/r10/water.nsf/npdes+permits/idsuction-gp

United States Department of Interior – Fish and Wildlife Service (USDI-FWS)

2010. *Best Management Practices for Pacific Lamprey*. Compiled by: J. Brostrom, C. Luzier, and K. Thompson. http://www.fws.gov/pacific/Fisheries/sphabcon/Lamprey/index.cfm

2002. *Draft Bull Trout Recovery Plan, Chapter 16*. Clearwater River. Region 1, U.S. Fish and Wildlife Service, Portland, OR. http://www.fws.gov/pacific/bulltrout/Recovery.html

USACE. 2010. U.S. Army Corps of Engineers. Hydrologic Engineering Center River Analysis System Version 4.1.0.

USDA Forest Service and USDI Bureau of Land Management. 1995. *PACFISH – Decision Notice/Finding of No Significant Impact. Environmental Assessment for the Interim Strategies for Managing Anadromous Fish-producing Watersheds in eastern Oregon and Washington, Idaho, and portions of California. USDA Forest Service and USDI Bureau of Land Management*. February.

USDA Forest Service and USDI Fish and Wildlife Service. 2006. *Occupied mapped lynx habitat amendment to the Canada Lynx conservation agreement*. USFS Agreement #00-MU-110115600-013. Missoula, MT. Unpublished. 18 pp.

Winston, Rachael. 2012. *Spotted Knapweed Biological Control Assessment for the Clearwater Basin*. MIA Consulting.

Wondzell, S. M., and J. G. King. 2003. “Postfire erosional processes in the Pacific Northwest and Rocky Mountain regions.” *Forest Ecology and Management*. 178(1-3): 75–87.

Wright, D. G., and G. E. Hopkey. 1998. *Guidelines for Use of Explosives in or Near Canadian Fisheries Waters*. Canadian Technical Report of Fisheries and Aquatic Sciences 2107. http://www.dfo-mpo.gc.ca/habitat/role/141/1415/14155/explosives-explosifs/index-eng.asp

Executive Orders, United States Code, Code of Federal Regulations, Public Laws

33 CFR 332, Compensatory Mitigation for Losses of Aquatic Resources. *Code of Federal Regulations*. Authority: 33 U.S.C. 401 et seq.; 33 U.S.C. 1344; and Public Law 108–136. Source: 73 FR 19670. April 10, 2008.

36 CFR 60. National Register of Historic Places. Parks, Forests, and Public Property. *Code of Federal Regulations*.

40 CFR 32, V § 1508.7. Cumulative Effects. Council on Environmental Quality. Protection of the Environment. *Code of Federal Regulations* online at http://www.access.gpo.gov/nara/cfr/cfr-table-search.html#page1.

50 CFR 17. "Endangered and Threatened Wildlife and Plants." *Code of Federal Regulations*. U.S. Fish and Wildlife Service, Department of the Interior. http://www.fws.gov/pacific/bulltrout/pdf/BTCHFR101810.pdf

50 CFR 600.920. Magnuson-Stevens Fishery Conservation and Management Act. *Code of Federal Regulations*. Public Law 94-265. As amended through October 11, 1996. An act to provide for the conservation and management of the fisheries, and for other purposes.

59 FR 32, 1994. Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Population and Low-Income Populations. *Federal Register*. Presidential Documents. W. J. Clinton. February 16. pp. 7629–7631.

64 FR 25. 1999. Executive Order 13112 of February 3, 1999. Invasive Species. *Federal Register*. W. J. Clinton. pp. 6183–6186.

65 FR 7346. "Endangered and Threatened Species; Extension of Comment Periods and Notice of Additional Public Hearings for Proposed Rules Governing Take of West Coast Chinook, Chum, Coho and Sockeye Salmon and Steelhead Trout." *Federal Register*. Department of Commerce, National Oceanic and Atmospheric Administration. pp. 7346–7347.

70 FR 216. Travel Management; Designated Routes and Areas for Motor Vehicle Use. *Federal Register*. Department of Agriculture, Forest Service. Final rule. November 9, 2005. pp. 68264–68291.

78 FR 23. 2013. Endangered and Threatened Wildlife and Plants; Threatened Status for the Distinct Population Segment of the North American Wolverine Occurring in the Contiguous United States. *Federal Register*. Department of the Interior, Fish and Wildlife Service. February 4. pp. 7863–7890.

16 U.S.C. 1A § 470 et seq. National Historic Preservation Act, as amended. Historic Sites, Buildings, Objects, and Antiquities. United States Code online accessible at: http://www.gpoaccess.gov/uscode/browse.html.

16 U.S.C. § 1531 et seq.159. Endangered Species Act of 1973.

American Indian Religious Freedom Act of 1978.

Archaeological Resources Protection Act of 1979 (ARPA) (43 CFR 7).

Clean Air Act (CAA), as amended. (P.L. 88-206 77, Stat. 401). United States Congress. Washington, D.C. 1963.

Clean Water Act (also known as Federal Water Pollution and Control Act), Section 303 (33 U.S.C. 26 § 1251 et seq.) and Section 404(b)(1) Guidelines (40 CFR 230).

Endangered Species Act of 1973, as amended. Public Law 93-205. 16 U.S.C. 35 § 1531 et seq. http://www.epw.senate.gov/esa73.pdf.

Executive Order 11990, "Protection of Wetlands," 1977.

Executive Order 11988, "Floodplain Management," 1977.

Executive Order 12875, "Enhancing the Intergovernmental Partnership."

Executive Order 12866, "Regulatory Planning and Review."

Executive Order 12898, "Environmental Justice."

Executive Order 13007, "Indian Sacred Sites." Executive Order 13084, "Consultation and Coordination with Indian Tribal Governments."

Executive Order 13084, "Consultation and Coordination with Indian Tribal Governments."

Executive Order 13112, "Invasive Species," February 3, 1999.

Forest and Rangeland Renewable Resources Planning Act of 1974.

National Environmental Policy Act (42 U.S.C. 4321 et seq.), January 1, 1970.

National Historic Preservation Act of 1966 (36 CFR 800).

National Forest Roads and Trails Act of October 13, 1964, as amended (16 U.S.C. 532–538).

National Forest Management Act (16 U.S.C. 1600–1614, August 1974, as amended 1976, 1978, 1980, 1981, 1983, 1985, and 1990), August 1974. Implementing regulations at 36 CFR 219.

Native American Graves Protection and Repatriation Act of 1990 (43 CFR 10).

Public Law 93–629. 1975. The Federal Noxious Weed Act of 1974. 88 Stat. 2148. Enacted January 3, 1975.

Religious Freedom Restoration Act of 1993 (P.L. 103141).

Secretarial Order 3175, November 8, 1993, "Departmental Responsibilities for Indian Trust Resources," Office of the Secretary, Washington, D.C.

Treaties

USA and Nez Perce Tribe. Treaty of June 9, 1855, 12 Stat. 957.

Court Decisions

Idaho v. Forest Service, No. CV 99-611-N-EJL, slip op. at 3 [D. Idaho Sept. 8, 2000]

Klamath Tribes v. U.S., 24 Ind. Law Rep. 3017, 3020 [D. Or. 1996]

Lands Council v. Powell, 395 F.3d 1019, 1037 (9th Cir. 2005)

U.S. v. Washington, 384 F. Supp. 312, 339-40, 403 [W.D. Wash. 1974]

This page was intentionally left blank.

Index