Draft Coeur d'Alene Basin Restoration Plan and Environmental Impact Statement

U.S. Department of Agriculture
Forest Service

U.S. Department of the Interior
Bureau of Land Management
Fish and Wildlife Service

On behalf of the Coeur d'Alene Basin Natural Resource Trustees

Coeur d'Alene Tribe

Idaho Department of Environmental Quality

Idaho Department of Fish and Game

U.S. Bureau of Land Management

U.S. Fish and Wildlife Service

U.S. Forest Service

Note: We make every effort to create documents that are accessible to individuals of all abilities; however, limitations with our word processing programs may prevent some parts of this document from being readable by computer-assisted reading devices. If you need assistance with this document, please contact Jo Christensen, Idaho Panhandle National Forests, at 208-765-7417.

Coeur d'Alene Basin
Draft Restoration Plan and
Environmental Impact Statement

Benewah, Kootenai, Shoshone, Latah, and Clearwater Counties, Idaho

Participating Agencies

USDA Forest Service, Region 1, Missoula, Montana
USDI Fish and Wildlife Service, Pacific Region, Portland, Oregon
USDI Bureau of Land Management, Idaho State Office, Boise, Idaho
Coeur d'Alene Tribe, Plummer, Idaho
Idaho Department of Fish and Game, Coeur d'Alene, Idaho
Idaho Department of Environmental Quality, Coeur d'Alene, Idaho

Responsible Officials:

Leanne Marten, Regional Forester, Region 1 Forest Service, Missoula, Montana

Robyn Thorson, Regional Director, USFWS, Pacific Region; Authorized Official, Department of the Interior

For Information Contact:

Jo Christensen, Restoration Biologist (208-765-7417) or
Jeffrey Johnson, Geologist (208-756-7313)
Idaho Panhandle National Forests
3815 N. Schreiber Way
Coeur d'Alene, Idaho 83815

Comment Period and Process: The 60 day comment period begins with the publication of the Notice of Availability (NOA) in the Federal Register, which is expected to occur on November 10th, 2016. The comment period is expected to close on January 13th, 2017.

Send Comments to:

Website: www.restorationpartnership.org/comments
Email: comments@restorationpartnership.org

U.S. Postal Service mail:
Jo Christensen, Restoration Biologist (208-765-7417) or
Jeffrey Johnson, Geologist (208-756-7313)
Idaho Panhandle National Forest
3815 N. Schreiber Way
Coeur d'Alene, Idaho 83815

Date Comments Must Be Received: January 13, 2017

Summary

Purpose of and Need for Action

Background

For most of the 20th century, mining wastes in the Coeur d'Alene Basin were discharged into the South Fork and mainstem Coeur d'Alene River and its tributaries, or were deposited on lands and eventually migrated into ground and surface waters. Mining-related waste rock, tailings, mine drainage, and contaminated floodplain deposits are continuing sources of metals contamination in the Coeur d'Alene basin. Tailings and contaminated sediments continue to be deposited in the basin, including stream channels, levees, and floodplains, as well as in lakes and wetlands next to the river, and in Coeur d'Alene Lake.

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) provides a means for addressing releases of hazardous substances that may endanger public health and the environment. Monies recovered from a Natural Resources Damages Claim under CERCLA are to be used to "restore, rehabilitate, replace, and/or acquire the equivalent of natural resources and services that have been injured (hereinafter referred to as restoration)." As a result of numerous legal settlements in accordance with the provisions from the CERCLA, the Coeur d'Alene Tribe, and Federal and State governments obtained funds for cleanup and restoration of injured natural resources from parties responsible for the contamination in the Coeur d'Alene Basin.

Purpose and Need

The purpose of the Coeur d'Alene Basin Restoration Plan is to provide a comprehensive strategic framework to guide the restoration of natural resources and their services injured by the release of mining related hazardous substances in the Coeur d'Alene Basin. The plan is also intended to accelerate the recovery of human uses of natural resources lost due to the injury, including natural resource-based uses important to the Coeur d'Alene Tribe. Additionally, because restoration needs exceed available funds, the Plan provides a method to determine how and where to best use limited restoration resources and align projects so that, collectively, they can most effectively work toward restoration of injured natural resources in the Coeur d'Alene Basin.

The Restoration Plan describes an approach to geographically prioritize restoration. The plan articulates a suite of broad major actions intended to restore ecosystem function to selected areas affected by mine waste contamination. Restoration projects carried out under the plan are intended to begin returning natural resources toward their "baseline" condition, which is the "physical, chemical, or biological properties that the injured resources would have exhibited and the services that would have been provided" without the release of hazardous substances.

Public Involvement

Development of the Restoration Plan and Environmental Impact Statement

As part of the process to develop the draft Restoration Plan and environmental impact statement, the U.S. Fish and Wildlife Service, Bureau of Land Management and the Forest Service, on behalf of the Trustee Council, began the formal scoping process by publishing a notice of intent in the Federal Register on June 13, 2013.

Formal scoping for the Draft Coeur d'Alene Basin Restoration Plan was held from June 13 to August 27, 2013 to solicit public comments and potential issues. During this time, there was a substantial amount of outreach to all communities within the restoration planning area as well as related Federal agencies, State and local government agencies, Tribal governments, and a variety of organizations.

Other Opportunities for Public Involvement

The Trustee Council maintains a public Web site with information on the Coeur d'Alene Basin Natural Resource Damage Restoration planning: http://www.restorationpartnership.org.

In addition to public meetings oriented around scoping efforts and DEIS development, the Trustee Council has reached out to potentially affected members of the community through various public events and mechanisms.

Additional public meetings will be held following the release of the draft Restoration Plan and EIS for public review, during the comment period established with the publication of a notice of availability by the EPA in the Federal Register.

Issues

The following significant issues were identified following review of the public comments received during public meetings and other scoping activities, internal review, and the preparation of this DEIS:

Issue #1: How much emphasis should be placed on restoring human services and near term uses of natural resources versus restoring injured natural resources and ecosystems?

Issue #2: Restricting restoration to the Coeur d'Alene Lake basin may not address restoration of injured resources for tribal members due to social-geographic changes that have occurred since the injury.

Additionally, the following issues were identified for key natural resources potentially affected by the alternatives:

Water Quality

What would be the effects of the alternatives on water quality in the planning area?

Vegetation

What would be the effects of the alternatives on the abundance and composition of vegetative communities?

Aquatic Species and Habitat

What would be the effects of the alternatives on the distribution, abundance, and quality of aquatic habitat; and the distribution, abundance, and composition of aquatic species?

Terrestrial Species and Habitat

What would be the effects of the alternatives on the distribution, abundance, and quality of terrestrial habitat; and the distribution, abundance, and composition of terrestrial species?

Resources of Particular Importance to the Coeur d'Alene Tribe

What would be the effects of the alternatives on the abundance and availability of natural resources and services important to the Coeur d'Alene Tribe?

Recreation

What would be the effects of the alternatives on:

- access to recreation opportunities;
- the recreational landscape character; and
- the abundance and diversity of recreational facilities and opportunities?

Socio-Economic Conditions

What would be the effects of the alternatives on:

- employment and income;
- tax revenue; and
- socio-economic conditions derived from natural resources?

Heritage Resources

What would be the effect of the alternatives on the integrity and security of historic properties?

Issues not Carried Forward for Analysis

- Environmental justice
- Risks to sacred sites and other resources of traditional religious or cultural importance to the Coeur d'Alene Tribe
- Greenhouse gas emissions and climate change
- Soils
- Risk to human health

Alternatives, Including the Proposed Action

Alternative 1 – No Action (Natural Recovery)

Under this alternative, no action would be taken to restore natural resources that were inured as a result of the release of mine waste contamination in the Coeur d'Alene Basin.

Alternative 2 – Ecosystem Focus with Additional Human Use Considerations (Proposed Action)

The Ecosystem Focus Alternative is the draft Coeur d'Alene Basin Restoration Plan described in its entirety in Appendix 5. Alternative 2 integrates restoration of injured wetland, stream, and lake ecosystems with approaches that are intended to accelerate the near-term recovery of human uses of natural resources lost due to the injury, including natural resource-based uses unique to the Coeur d'Alene Tribe.

Under Alternative 2, the restoration planning area consists of the land area that drains into Coeur d'Alene Lake, as well as the portion of the upper Spokane River subbasin that occurs in Idaho. Within the planning area, restoration work would primarily be conducted in streams, wetlands, lakes, and in associated riparian areas and floodplains. Restoration would also be considered outside of the Coeur d'Alene Lake Basin only when it occurs in the Hangman Creek watershed within the existing boundary of the Coeur d'Alene Reservation, and it restores lost Tribal services where opportunities to address those lost cultural services in the Basin are very limited, untimely, or do not exist at all.

Alternative 3 – Ecosystem Restoration Focus

Alternative 3 is identical to the proposed action except that no projects would be implemented to directly restore or accelerate the recovery of the human uses of natural resources that were lost as a result of mine waste contamination. Rather, human uses would be indirectly restored, over a longer period of time, and as incidental benefits from projects with an ecological focus.

The geographic extent of restoration under Alternative 3 would likewise be less than under the proposed action. Because no human uses projects would be done, no projects designed to restore human uses unique to the Coeur d'Alene Tribe would be carried out. Thus, the work proposed in Alternative 2 to restore lost Tribal services by working in the Hangman Creek watershed would not occur under Alternative 3.

Design Features Common to Alternatives 2 and 3

The alternatives include design features and measures to protect the following resources while work is occurring:

- Soils
- Hydrology and Water Quality
- Aquatic Species
- Terrestrial Species
- Vegetation
- Heritage and Cultural Resources
- Recreation and Human Uses (Alternative 2 only)

Alternatives Considered but not Carried Forward for Analysis

- Individual Projects
- Off-site Restoration for Tundra Swan
- Defer Restoration until Remediation is Complete
- Approaches Focusing only on Civil Infrastructure Improvements, Economic Development, or Recreation

Summary of Alternatives

Table 1. Comparison of alternatives

Action Topics	Alternative 1 No Action	Alternative 2 Ecosystem Focus with Additional Human Use Considerations	Alternative 3 Ecosystem Restoration Focus	Features Common to Alternatives 2 and 3
Wetlands Restoration	None	Wetlands restoration could occur throughout the restoration planning area.	Wetlands restoration would occur throughout the restoration planning area, **excluding** the upper Hangman Creek watershed.	Restore wetland process and function, including plant diversity and hydrology, to uncontaminated but degraded wetlands. Construct new wetlands on low-gradient uncontaminated sites with adequate water supply and low potential for contamination. Restore wetland process, function, and diversity in conjunction with remediation at contaminated wetlands that have low or controllable risk for recontamination. Decrease waterfowl and wildlife exposure to harmful levels of mine waste contaminants where remediation is cost prohibitive and recontamination risk is high or difficult to control. Protect and preserve healthy functioning wetlands.
Stream Restoration	None	Restoration of streams and rivers could occur throughout the restoration planning area.	Stream restoration could occur throughout the restoration planning area, **excluding** the upper Hangman Creek watershed.	Restore habitat function and processes in stream and riparian habitats injured by mine waste. Protect and restore habitat function and processes in uncontaminated stream and riparian areas that would benefit injured resources. Restore migratory corridors where doing so would benefit injured natural resources.
Lakes Restoration	None	Lakes restoration could occur throughout the restoration planning area	Lakes restoration would occur throughout the restoration planning area, **excluding** the upper Hangman Creek watershed.	Protect and improve water quality in Coeur d'Alene Lake and other Basin lakes to benefit injured aquatic resources. Protect, preserve, and restore lake-margin habitats valuable to fish, waterfowl, and other aquatic species.

Action Topics	Alternative 1 No Action	Alternative 2 Ecosystem Focus with Additional Human Use Considerations	Alternative 3 Ecosystem Restoration Focus	Features Common to Alternatives 2 and 3
Human Uses	None	Projects to restore human uses of injured natural resources could occur throughout planning area Major actions include: • Restore and facilitate recreational and other opportunities associated with the use of restored natural resources. • Enhance opportunities for people to connect to Tribal and non-Tribal cultural resources that contribute to local and regional heritage and sense of place. • Provide targeted scenic improvements to viewsheds. • Promote stewardship of natural resources and support education associated with remediation and restoration.	No projects to restore human uses of injured natural resources would be undertaken anywhere in the planning area, including the upper Hangman Creek watershed.	None. No human services actions considered under Alternative 3

Summary of Primary Effects

For all resources, rate, extent, and likelihood of recovery of conditions towards baseline would be greater under the action alternatives (alternatives 2 and 3) than under the No Action Alternative. Although some resource conditions would slowly improve towards baseline conditions under the No Action Alternative, the action alternatives include measures that address conditions currently inhibiting resource recovery that are unlikely to improve without intervention.

The geographic extent of restoration differs under Alternative 2 and Alternative 3.
Alternative 2 would potentially include restoration in the Hangman Creek watershed, outside of the hydrologic boundaries of the Coeur d'Alene Lake basin. In contrast, under Alternative 3, work would only be done in the Coeur d'Alene Lake basin.

The extent, rate, and likelihood of recovery of ecological conditions towards baseline would likely be greater under Alternative 3 than under Alternative 2.
Under Alternative 3, all project funds would be spent on ecological restoration. In contrast, Alternative 2 allocates up to 10% or approximately $14 million to projects or project components intended to restore human uses of natural resources in the near term while ecosystem restoration proceeds. This portion of funds also potentially includes restoration of natural resources important to the Coeur d'Alene Tribe in the upper Hangman Creek watershed. Because more funds would be spent on ecological restoration under Alternative 3, the extent of ecological restoration would greater under Alternative 3. Subsequently, the rate and likelihood of recovery of ecological conditions towards baseline would likely be greater under Alternative 3 than under Alternative 2.

Alternative 2 would improve and or increase opportunities for human uses of natural resources in the near term, including resources of particular cultural significance to the Coeur d'Alene Tribe.
Alternative 2 includes work focused on restoring human uses of natural resources in the near term while ecosystem restoration proceeds. This includes restoration of resources both in the Coeur d'Alene Lake basin and potentially upper Hangman Creek (outside of the lake basin) to support the traditional subsistence and cultural practices unique to the Coeur d'Alene Tribe. Under Alternative 3, human uses dependent on healthy ecological conditions would slowly recover over time, but Alternative 3 does not include projects that would provide immediate opportunities or enhanced facilities for human uses in the planning area, nor restoration of resources important to the Coeur d'Alene Tribe in the Hangman Creek watershed.

Alternative 2 would restore natural resources significant to Coeur d'Alene Tribe in locations where the resources are more available for Tribal use in traditional subsistence and cultural practices than under Alternative 3.
Alternative 2 potentially includes restoration of culturally important natural resources in Hangman Creek on the tribal reservation, close to current tribal population centers. In contrast, under Alternative 3, all restoration funds would be allocated only to the Coeur d'Alene Basin, which is more distant from tribal population centers.

Alternatives 2 and 3 would create jobs and labor income due to restoration spending. It is expected that each $1 million spent on ecosystem restoration or human services projects would yield 34.3 jobs and $1.2 million in labor income.

Potential changes to tax revenue in the planning area is dependent on visitation and population changes in response to conditions created by the alternatives. The human uses projects proposed under Alternative 2 could increase sales and property tax revenue from recreation- and tourism-related sectors. Improved natural amenities created by both Alternatives 2 and 3 may attract new residents, contributing to increases in property tax revenue.

Contents

Tables

Figures

Chapter 1. Purpose of and Need for Action

1.1 Introduction

The Coeur d'Alene Basin Natural Resource Trustees are developing a plan to guide restoration of Coeur d'Alene River Basin natural resources and the services they provide, which were injured by releases of hazardous materials from historic mining. The Trustees are comprised of the Coeur d'Alene Tribe (Tribe), State of Idaho (State), USDA Forest Service, and USDI (BLM and USFWS), collectively known as the Restoration Partnership . This Partnership was established through a Memorandum of Agreement (MOA) signed in 2012 by the Parties (see Appendix 5 Section 1.4). The Partnership has prepared this draft Restoration Plan and programmatic environmental impact statement (Draft RP/DEIS) to evaluate the effects of the restoration plan in compliance with the National Environmental Policy Act (NEPA), and other relevant laws and regulations.

1.2 Background

Prior to European settlement, the Coeur d'Alene Basin was pristine and inhabited by the indigenous people. For more than 100 years following European settlement, the Coeur d'Alene Basin was one of the most productive silver, lead, and zinc mining areas in the United States, producing 7.3 million metric tons of lead and 2.9 million metric tons of zinc between 1883 and 1997 (Mitchell and Bennett 1983, Long 1998). The majority of mining and mineral processing in the basin occurred along the South Fork of the Coeur d'Alene River and its tributaries (Mitchell and Bennett 1983). The wastes generated by these operations contain hazardous metals, including lead, zinc, cadmium, and arsenic.

For most of the 20th century, mining wastes in the Coeur d'Alene Basin were discharged into the Coeur d'Alene River and its tributaries, or were deposited on lands and eventually migrated into ground and surface waters. Mining products and wastes containing metals were transported by train and other vehicles that spilled and tracked metals along travel routes in the basin. Mining-related wastes were also taken from mine and mill sites or hauled out of floodplain areas for use in other applications throughout the basin, including ballast for railroad lines, materials for street and road surfacing, and concrete aggregate. As a result, mining-related waste rock, tailings, mine drainage, and contaminated floodplain deposits are continuing sources of metals contamination in the Coeur d'Alene Basin (Ridolfi 1998). Tailings and contaminated sediments continue to be deposited in the Coeur d'Alene Basin, including stream channels, levees, and floodplain, as well as in lakes and wetlands next to the river (Campbell et al. 1999a; Campbell 1999b; Box et al. 1996; Fousek 1996; and Rabbi 1994), and in Coeur d'Alene Lake (Woods and Beckwith 1997; Horowitz et al. 1993, 1995a, 1995).

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)[1] provides a means for addressing releases of hazardous substances that may endanger public

[1] Title 42 United States Code [U.S.C.] Section 9601 et seq. Restoration comprises all actions to restore, rehabilitate, replace, and/or acquire the equivalent of injured natural resources as prescribed by law and defined under 42 U.S.C §9607(f)(1).

health and the environment. The Act authorizes State, Tribal, and Federal governments, referred to as "natural resource Trustees" to take legal action against responsible parties for the cleanup and restoration of sites affected by mining waste. The Trustees act on behalf of the public interest in protecting and conserving natural resources. These Trustees may seek monetary damages through a Natural Resources Damages Claim from responsible parties for injury, destruction, or loss of natural resources resulting from releases of hazardous substances. These damages, which are distinct from funding for remediation (also referred to as "cleanup") must be used by the natural resource Trustees to "restore, replace, rehabilitate, and/or acquire the equivalent of"[2] the natural resources that have been injured.

As a result of numerous legal settlements in accordance with the provisions from the CERCLA, the Coeur d'Alene Tribe, and Federal and State governments obtained funds for cleanup and restoration of injured natural resources (such as fish and wildlife habitat, soil and water) from parties responsible for the contamination in the Coeur d'Alene Basin. The U.S. Environmental Protection Agency (EPA) has responsibility for remediation of contamination, including removal and disposal of contaminated soil and sediments. Responsibility for restoration lies with the U.S. Department of Interior (Fish and Wildlife Service and Bureau of Land Management), U.S. Department of Agriculture (Forest Service), State of Idaho (Departments of Fish and Game and Environmental Quality), and the Coeur d'Alene Tribe (Tribe), who are all co-Trustees of the injured natural resources. The NEPA requires Federal Trustee agencies to conduct environmental reviews of proposed actions to consider the potential impacts on the environment. To meet this requirement, the Federal Trustees, working with the State and Tribal Trustees, have prepared this draft environmental impact statement (DEIS) to evaluate the environmental effects of the draft restoration plan. In addition to fulfilling the requirements of the National Environmental Policy Act, this draft restoration plan and DEIS are intended to satisfy the CERCLA and Department of the Interior regulations (43 CFR part 11) requirements for analysis of restoration alternatives and public involvement for all of the co-Trustees.

For additional background materials regarding the injury, litigation, and settlements, see Appendix 5.

1.3 Purpose and Need for Action

Under the CERCLA, monies recovered from a Natural Resources Damages Claim are to be used to "restore, rehabilitate, replace, and/or acquire the equivalent of the services provided by the injured natural resources" (hereinafter called "restoration" unless otherwise noted). The purpose of the Coeur d'Alene Basin Restoration Plan is to provide a comprehensive strategic framework to guide the restoration of natural resources and their services injured by the release of mining related hazardous substances in the Coeur d'Alene Basin. The plan is also intended to accelerate the recovery[3] of human uses as a service provided by natural resources) lost due to the injury, including natural resource-based uses important to the Coeur d'Alene Tribe. Additionally,

[2] Language from regulations on natural resource damage assessments (15 CFR 990.25)

[3] The term "recovery" as used in this Environmental Impact Statement is defined as follows: return of biotic and abiotic conditions, ecosystems, species populations, and associated human services to the condition that would have existed had the release of mine waste not occurred.

because restoration needs exceed available funds, the Plan provides a method to determine how and where to best use limited restoration resources and align projects so that, collectively, they can most effectively work toward restoration of injured natural resources in the Coeur d'Alene Basin.

The Restoration Plan will describe the Trustee's proposed approach to geographically prioritizing restoration, focal species, and technical aspects. The plan will articulate a suite of broad major actions intended to restore ecosystem function to selected areas affected by mine waste contamination. Development of the plan will not directly result in the implementation of restoration. Instead, the plan will identify the broad approach that will guide the identification and implementation of future restoration projects. Restoration projects carried out under the plan are intended to begin returning natural resources toward their "baseline" condition, which is the "physical, chemical, or biological properties that the injured resources would have exhibited and the services that would have been provided" without the release of hazardous substances.

1.4 Compliance with Other Authorities

1.4.1 National Environmental Policy Act

The regulations that guide natural resource damage restoration under the CERCLA[4] state that actions undertaken by Federal Trustees to restore natural resources or services are subject to the National Environmental Policy Act (42 U.S.C. § 4321, et seq.), and the Council on Environmental Quality regulations guiding its implementation (40 CFR Part 1500). The law and its implementing regulations set forth a process of environmental impact analysis, documentation, and public review of Federal actions.

This draft environmental impact statement is being prepared for the broad Federal action of adopting the Restoration Plan. This draft Restoration Plan and environmental impact statement are also intended to expedite and provide a basis for future site-specific projects and the subsequent preparation of environmental analysis documents to support those projects. Some projects may not require further site-specific environmental analyses. Other projects may have site-specific environmental analyses completed prior to proposal submittal. For projects requiring site-specific analyses, potential mechanisms include environmental impact statements, supplemental environmental impact statements, environmental assessments with findings of no significant impacts, determinations of NEPA adequacy, and categorical exclusion. The level of environmental analysis needed for each project will be determined commensurate with the types of activities proposed. Using the concepts developed in the draft restoration plan and associated environmental impact statement, future environmental review will focus on site-specific issues and impacts and will incorporate by reference the relevant aspects of this document.

[4] 15 C.F.R. § 990.23

1.4.2 Other Authorities

In addition to the requirements of the CERCLA and National Environmental Policy Act, requirements of other laws may apply to implementation of the Restoration Plan. The Trustees will ensure compliance with all authorities applicable to restoration projects. Whether and to what extent an authority applies to a particular project depends on the location and specific characteristics of a particular project, among other things. For the proposed Restoration Plan, the authorities listed below are examples:

- Executive Order of 1873 Establishing the Coeur d'Alene Tribe Reservation
- Endangered Species Act (16 U.S.C. §§ 1531 et seq.)
- National Historic Preservation Act (16 U.S.C. §§ 470 et seq.)
- Federal Water Pollution Control Act (Clean Water Act, 33 U.S.C. §§ 1251 et seq.)
- Clean Air Act (42 U.S.C. §§ 7401 et seq.)
- Migratory Bird Treaty Act (16 U.S.C. §§ 703-712)
- Fish and Wildlife Coordination Act (16 U.S.C. §§ 661-666c)
- Idaho Stream Channel Protection Act (Title 42 Idaho Code, Chapter 38)
- Idaho Environmental Protection and Health Act (Title 39 Idaho Code)
- Idaho Lake Protection Act (Title 58 Idaho Code, Chapter 13)
- Idaho Environmental Protection and Health Act (Title 39 Idaho Code)

A complete list of relevant authorities and statues may be found in Appendix 1.

1.5 Public Involvement

1.5.1 Development of the Restoration Plan and Environmental Impact Statement

Under regulations pertaining to the Natural Resources Damage Assessment process, public participation is an important part of restoration planning. Public participation is also required under the National Environmental Policy Act and its implementing regulations.[5] As part of the process to develop the draft Restoration Plan and environmental impact statement, the U.S. Fish and Wildlife Service, Bureau of Land Management and the Forest Service, on behalf of the Trustee Council, began the formal scoping process by publishing a notice of intent in the Federal Register on June 13, 2013 (78 FR 35602).

The Trustees conducted formal scoping for the Draft Coeur d'Alene Basin Restoration Plan from June 13 to August 27, 2013 to solicit public comments and potential issues. During this time, there was a substantial amount of outreach to all communities within the restoration planning area as well as related Federal agencies, State and local government agencies, Tribal governments, and a variety of organizations (Trustees 2013).

[5] 40 C.F.R. §§ 1500-1508

The intent of scoping was to:

- inform the public about the Natural Resource Damage Restoration planning process;
- solicit the public's input on specific resources and areas within their communities that been affected by mine waste contamination; and,
- receive public input on the approaches that should be considered for restoring those resources .

During preparation of the draft restoration plan and environmental impact statement, targeted scoping was conducted to:

- identify significant environmental, socioeconomic, and other issues to be analyzed in the draft restoration plan and environmental impact statement and eliminate nonsignificant issues from detailed analysis;
- identify other environmental review and consultation requirements so they can be integrated with the environmental analysis process (such as historic preservation, endangered species, and other requirements); and
- identify information gaps or other issues potentially affecting the proposed action.

1.5.2 Other Opportunities for Public Involvement

The Trustee Council maintains a public Web site with information on the Coeur d'Alene Basin Natural Resource Damage Restoration planning. This site is updated regularly and provides a forum for the public to access documents and view notices about upcoming public meetings. The site is available at http://www.restorationpartnership.org.

In addition to public meetings oriented around scoping efforts and DEIS development, the Trustee Council has reached out to potentially affected members of the community through various public events and mechanisms. See Appendix 4 for a complete overview of scoping and outreach carried out during development of the draft Restoration Plan and preparation to pare this Environmental Impact Statement.

The Trustee Council will hold additional public meetings after the release of the draft Restoration Plan and EIS for public review, during the comment period established with the publication of a notice of availability by the EPA in the Federal Register. The Trustee Council will review and consider these comments when producing the final restoration plan and EIS.

1.5.3 Administrative Record

This draft restoration plan and EIS references a number of resource documents prepared by and for the Trustee Council as part of the National Environmental Policy Act and Natural Resources Damage Assessment processes. These documents, incorporated by reference into this draft restoration plan and EIS, are part of the administrative record and may be viewed by appointment at the joint offices of the Forest Service and Bureau of Land Management at 3815 Schreiber Way, Coeur d'Alene, ID, 83815.

1.6 Issues

Issues are points of dispute or contention, and areas of concern or uncertainty. In the environmental analysis process, they are further defined as cause-and-effect relationships based on the proposed action or alternatives. Significant issues represent those issues that shape the environmental analysis and those the decision-makers need to consider when selecting an alternative. The following significant issues were identified following review of the public comments received during public meetings and other scoping activities, internal review, and the preparation of this DEIS. These issues were used to develop alternatives to the proposed action, to analyze environmental effects, and to develop project design features.

1.6.1 Issues Identified During Scoping

1.6.1.1 Water Quality

What would be the effects of the alternatives on water quality in the planning area?

1.6.1.2 Vegetation

What would be the effects of the alternatives on the abundance and composition of vegetative communities?

1.6.1.3 Aquatic Species and Habitat

What would be the effects of the alternatives on the distribution, abundance, and quality of aquatic habitat; and the distribution, abundance, and composition of aquatic species?

1.6.1.4 Terrestrial Species and Habitat

What would be the effects of the alternatives on the distribution, abundance, and quality of terrestrial habitat; and the distribution, abundance, and composition of terrestrial species?

1.6.1.5 Native American Rights and Interests

What would be the effects of the alternatives on the abundance and availability of natural resources and services important to the Coeur d'Alene Tribe?

1.6.1.6 Recreation

What would be the effects of the alternatives on:

- access to recreation opportunities;
- the recreational landscape character; and
- the abundance and diversity of recreational facilities and opportunities?

1.6.1.7 Socio-Economic Conditions

What would be the effects of the alternatives on:

- employment and income;
- tax revenue; and
- socio-economic conditions derived from natural resources?

1.6.1.8 Heritage Resources

What would be the effect of the alternatives on the integrity and security of historic properties?

1.6.2 Issues not Carried Forward for Analysis

1.6.2.1 Environmental Justice

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations," directs Federal agencies to consider environmental justice in the analysis of Federal actions. Environmental Justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental and commercial operations or policies. Meaningful involvement means that people have an opportunity to participate in decisions about activities that may affect their environment and/or health.

The Socio-economic Report prepared for this DEIS identified the communities of Smelterville, Plummer, and the Coeur d'Alene Reservation as minority or low-income populations based on CEQ's Environmental Justice criteria (CEQ 1997). During the restoration planning process and preparation of this DEIS, all three communities/populations were provided with the same input and involvement opportunities as other communities not identified as low income and minority populations (see Appendix 4). During scoping, public comments (including input from the three communities) did not identify any potentially adverse effects which would disproportionately affect these communities. Likewise, the analysis of potential effects for other resources (chapter 3 of this document) did not reveal a greater likelihood or increased magnitude of potential effects to natural resources that would adversely affect these communities when compared to other populations. For additional information, see section 3.10 "Socio-economics and Environmental Justice."

1.6.2.2 Risks to Sacred Sites and Other Resources of Traditional Religious or Cultural Importance to the Coeur d'Alene Tribe

The Coeur d'Alene Tribe raised concerns that ground-disturbing restoration projects are proposed to occur within the boundaries of the Reservation as well as elsewhere in the planning area where sacred sites or places of traditional, religious, and cultural importance; areas important for Tribal subsistence practices; or other uses unique to the Tribe may be located. Ground-disturbing projects or disturbance associated with restoration may affect access and resource usability. The locations of these places are generally not shared by the Tribe; however, in general, it can be said that locations near water have special significance to tribes (USFS 2013).

This issue was not analyzed in detail because the proposed action includes mandatory design features that will be carried out at the project level to prevent or minimize immediate or long-term negative effects to the integrity or usability of sites and resources important to the Tribe. Specifically, the Trustees will consult with the Coeur d'Alene Tribe early in the project planning process to identify whether proposed restoration projects are located in areas containing traditional cultural properties or sacred sites, or whether restoration work will impede access to or the quality of culturally important locations (on or off-site), disrupt traditional cultural practices, affect the abundance and diversity of natural resources important to the Tribe, or visually affect culturally important landscapes. In accordance with federal policy, consultation with the Tribe will be early, often, and ongoing during the life of the project. If it appears that adverse effects could occur, the Trustees and the Tribe will determine the measures needed to minimize or avoid impacts. Methods to minimize impacts or issues of concern to the Tribe may include, but are not limited to: additional cultural resource assessment or monitoring, redesigning the project, changing the project footprint, using less intrusive or destructive construction methods, changing the timing of construction (due to traditional ceremonies), or abandoning the project.

1.6.2.3 Greenhouse Gas Emissions and Climate Change

Federal agencies are required to consider the extent to which a proposed action and its reasonable alternatives contribute to climate change through greenhouse gas emissions (CEQ 2014). The restoration activities carried out under this plan would likely include the use of heavy equipment during construction or installation, transport of materials needed for construction, use of small engines such as chainsaws and pumps, and other activities before and following implementation. These activities have the potential to generate greenhouse gas emissions through the use of oil-based fuels. Without site- and project-specific information, which would provide information about the types of equipment and extent of use, there is insufficient information available to determine whether and to what degree greenhouse gas emissions would change under the different alternatives in order to provide information to inform the decision-making process or facilitate a selection between the alternatives. Such an analysis would be more appropriate during environmental analysis conducted for site-specific restoration projects proposed in the future.

1.6.2.4 Soils

The nature and extent of potential effects to soils are site- and project-specific. Impacts that may occur are typically highly localized. Without project- and site-specific information, direct and indirect effects cannot be predicted. Therefore, effects to soils will be deferred to project-level analysis.

1.6.2.5 Risk to Human Health

Implementation of restoration in portions of the planning area could subject restoration workers to hazardous mine waste contaminants. Likewise, projects that provide or enhance recreational access could indirectly result in exposure to off-site contaminants (for example, if the recreating public uses a "clean" recreation facility to access a downstream location that is contaminated). The degree of risk and likelihood of exposure are highly site- and project specific. Without project- and site-specific information, effects of direct and indirect effects cannot be predicted. Therefore, potential effects to human health from potential exposure to contaminants soils will be deferred to project-level analysis.

Chapter 2. Alternatives, Including the Proposed Action

2.1 Introduction

The National Environmental Policy Act, CERCLA, and implementing regulations direct Federal, State, and Tribal Natural Resource Trustees to consider a range of possible restoration alternatives, including a natural recovery alternative with minimal management actions (a "no-action" alternative). Reasonable alternatives are those that substantially meet the agencies' purpose and need.

The regulations implementing the National Environmental Policy Act also state that alternatives considered must restore or enhance the quality of the human environment, and avoid or minimize any possible adverse effects of the agencies' actions upon the quality of the human environment.[6]

Reasonable alternatives are those that substantially meet the agencies' purpose and need.

Under CERCLA the following factors should be considered when comparing and evaluating restoration alternatives:

1. Technical feasibility.
2. The relationship of the expected costs of the proposed actions to the expected benefits from the restoration, rehabilitation, replacement, and/or acquisition of equivalent resources.
3. Cost effectiveness, as that term is used in the CERCLA regulations.[7]
4. The results of any actual or planned response actions.
5. Potential for additional injury resulting from the proposed actions, including long-term and indirect impacts, to the injured resources or other resources.
6. The natural recovery period.
7. Ability of the resources to recover with or without alternative actions.
8. Potential effects of the action on human health and safety.
9. Consistency with relevant Federal, State, and Tribal policies
10. Consistency with relevant Federal, State, and Tribal laws.

[6] 40 CFR § 1500.2 (e)–(f)
[7] 43 CFR 11.82(d))

2.2 Alternatives Considered in Detail

2.2.1 Alternative 1 – No Action (Natural Recovery)

Under this alternative, no action would be taken by the Trustees to restore natural resources that were inured as a result of the release of mine waste contamination in the Coeur d'Alene Basin.

2.2.2 Alternative 2 – Ecosystem Focus with Additional Human Use Considerations (Proposed Action)

The Ecosystem Focus Alternative is the draft Coeur d'Alene Basin Restoration Plan described in its entirety in Appendix 5. Alternative 2 integrates restoration of injured natural ecosystems with approaches that are intended to accelerate the near-term recovery of human uses of natural resources lost due to the injury, including natural resource-based uses unique to the Coeur d'Alene Tribe. Following is a brief overview of the alternative.

2.2.2.1 The Restoration Planning Area

Under Alternative 2, the restoration planning area (henceforth "planning area") consists of the land area that drains into Coeur d'Alene Lake, as well as the portion of the upper Spokane River subbasin that occurs in Idaho. Within the planning area, restoration work would primarily be conducted in streams, wetlands, lakes, and in associated riparian areas and floodplains. At the discretion of the Trustees, restoration would be considered outside of the Coeur d'Alene Lake Basin only when it occurs in the Hangman Creek watershed within the existing boundary of the Coeur d'Alene Reservation, and it restores lost Tribal services where opportunities to address those lost cultural services in the Basin are very limited, untimely, or do not exist at all. Thus, the restoration planning area would encompass both the Coeur d'Alene Basin and the portion of the Reservation as identified above. See Figure 1 (next page).

2.2.2.2 Geographic Prioritization

The restoration needs in the planning area exceed available financial resources. For this reason, the Trustees would prioritize work based on geographic focus areas, ecosystems, and focal resources as discussed in Appendix 5. The following hierarchical strategy has been proposed by the Trustees to identify the priority areas for restoration:

Coeur d'Alene Basin

The Trustees propose that the Coeur d'Alene Basin would be the primary area where work would be conducted. This is where the injuries have taken place and where restoration would have the greatest benefit to injured resources.

Under Alternative 2, the primary restoration planning area consists of the Coeur d'Alene Lake Basin and upper Spokane River; however, due to the extent of contamination in the lower Basin and limited feasibility for comprehensive remediation, opportunities to restore human uses of injured natural resources that are important to the Coeur d'Alene Tribe within the hydrologic boundary of the Basin are limited. Therefore, at the discretion of the Trustees, projects designed to restore lost human uses of injured natural resources important to the Tribe would be considered outside of the Basin in the Hangman Creek watershed, and within the existing boundary of the Coeur d'Alene Reservation.

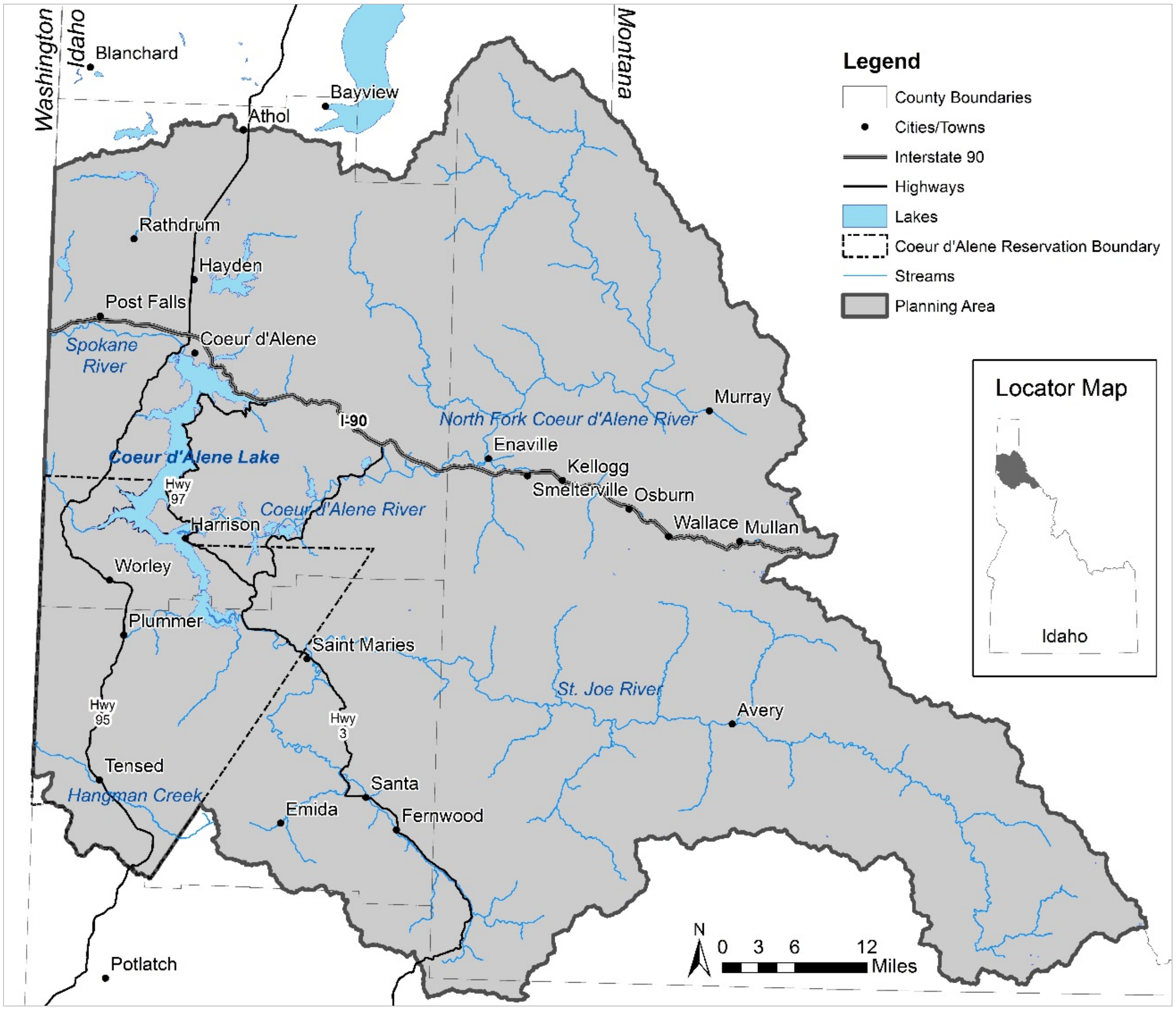

Figure 1. Alternative 2 restoration planning area

Wetland, Stream, and Lake Ecosystems

This alternative identifies the resources within wetland, stream, and lake ecosystems in the Basin as the primary areas for restoration work. Conducting restoration work in these ecosystems would positively impact a wide suite of injured natural resources. Most injuries have occurred in wetlands, streams and lakes ecosystems, and this is where restoration would have the greatest benefit to injured resources.

Focal Resources

The Trustees also propose to use fish and waterfowl, as focal resources in order to identify which of these wetlands, streams, and lakes ecosystems have the most value for injured resources. Using information about these resources' populations, restoration science, and contamination locations would enable the Trustees to determine which areas are the most important for restoration.

Proposed Restoration

Goals and Major Actions

The Trustees propose goals, major actions, strategies, and techniques for restoration of the three types of ecosystems (wetlands, streams, and lakes).

The Trustees also propose to restore human uses of natural resources which are tangible and intangible benefits people derive from the injured natural resources (such as, fishing, hunting, subsistence, scenery, and so forth). These human uses are dependent on clean water, fish, and wildlife, and intact habitat that were injured by the release of mine waste contaminants. While all restoration in the long-term would benefit uses for the local community as well as visitors, the Trustees recognize the importance of connecting people to these uses of natural resources in the near term. As a result, the draft restoration plan includes a goal, major actions, strategies and techniques designed to increase, in the near term, opportunities for and access to the human uses provided by restoration of the natural resources that were injured. The trustees propose to allocate a portion of funds (up to 10 percent) to accomplish this goal.

The following major actions, strategies, and techniques are proposed to restore injured wetlands, streams lakes, and human services.

Wetlands Goal: Restore injured wetland processes, functions, species, habitats, and services.

Major Actions

- Restore wetland process and function, including plant diversity and hydrology, to uncontaminated but degraded wetlands.
- Construct new wetlands on low-gradient uncontaminated sites with adequate water supply and low potential for contamination.
- Restore wetland process, function, and diversity in conjunction with remediation at contaminated wetlands that have low or controllable risk for recontamination.
- Decrease waterfowl and wildlife exposure to harmful levels of mine waste contaminants where remediation is cost prohibitive and recontamination risk is high or difficult to control.
- Protect and preserve healthy functioning wetlands.

Priority Areas

The Trustees would focus wetland and riparian restoration in strategic locations that could support habitat characteristics beneficial to waterfowl and other wetland species. The highest priority for restoration would be areas where waterfowl are abundant and where sediment and water quality are impaired. In the planning area, these are the wetlands and lakes along the Coeur d'Alene River. Wetland restoration outside of these areas would also be considered if there is a high likelihood that waterfowl and other wetland wildlife could be supported as a result of restoration.

The timing and location of priorities would also in part be determined by opportunities to coordinate with cleanup and to enhance habitats following cleanup. The EPA's priorities for cleanup in the Coeur d'Alene River floodplain are Harrison Slough, Killarney Lake, Canyon Marsh, Lane Marsh, Medicine Lake, Cave Lake, Bare Marsh, Anderson Lake, Thompson Lake, and Thompson Marsh (USEPA 2002). Another priority for cleanup is the conversion of agricultural land to wetlands. As more information becomes available regarding sediment movement, those priorities may be refined. Efforts are ongoing between the Trustees, EPA, and others to ensure that cleanup and restoration are coordinated where possible.

Priority areas were divided into three groups, based on waterfowl use, contamination of wetlands, and where restoration is feasible.

Tier 1 priorities are those wetlands that are the highest priority for restoration. Some wetlands and waterbodies in the Coeur d'Alene River floodplain that are next to each other and can be connected by surface flow can be considered wetland complexes. Tier 1 wetland complexes are those that receive high waterfowl use and are contaminated above the threshold that causes injury to waterfowl. Strategies for restoration in Tier 1 areas will depend on the site. For those sites that have a reasonable expectation of minimal recontamination, cleanup and restoration can be done. For those sites in which recontamination cannot be controlled, steps can be taken to reduce exposure to wildlife, including water level and vegetation management. Most Tier 1 wetlands will fall under the major actions dealing with restoration following cleanup or reducing exposure to waterfowl when exposure is high and recontamination cannot be controlled. Properties next to these wetland complexes will be considered part of the complex. Projects done in Tier 1 wetlands should reduce exposure or reduce contamination and restore habitat.

Tier 2 priorities are all other wetlands along the Coeur d'Alene River, lower St. Joe River, lower St Maries River, the bays and backwaters of Coeur d'Alene Lake, and any wetlands along the lower North and South Fork corridors and Lower St. Joe. These areas are either directly affected by mine waste releases or contain valuable wetland resources near the affected wetlands. Projects involving Tier 2 wetlands could fall under any of the major actions outlined above. It is expected that many projects will occur in Tier 2.

Tier 3 priorities are any other wetlands in the Basin, which are primarily uncontaminated. There are likely wetland restoration opportunities outside of the priority areas described above, and those areas will be considered if there is a reasonable expectation that wetland processes and functions important to injured resources can be restored. These will likely be smaller projects.

Strategies and Techniques

Many strategies and techniques are available to restore wetlands in priority areas. The techniques used would depend on a variety of factors, including topography, existing hydrology, vegetation composition, proximity to other wetlands, engineering feasibility, and ability to manage water. Which techniques are used in specific locations would be determined on a project-by-project basis.

Table 2 lists typical approaches that would be used to restore function to wetlands under the draft plan.

Table 2. Strategies and techniques for wetland restoration

Strategies	Techniques
Restore hydrology Water level manipulation Moist soil management Improve habitat structure Topography manipulation Reconnection Convert wetland type Protection Coordinate with cleanup programs	Diking Water control structures Pump water Shallow water excavation Plug ditches Plant desirable vegetation Control noxious weeds and other vegetation Install nest boxes Blasting Island construction Breach levees Cap, flip, or remove contaminated soil Land acquisition Easements Fencing Technical Assistance Joint prioritization

Streams Goal: Protect and restore injured streams and riparian habitats, species, and services.

Major Actions

- Restore habitat function and processes in stream and riparian habitats injured by mine waste.
- Protect and restore habitat function and processes in uncontaminated stream and riparian areas that would benefit injured resources.
- Restore migratory corridors where doing so would benefit injured natural resources.

Priority Areas

The Trustees would focus on stream and riparian areas in strategic areas that are divided into three tiers of priority to geographically focus major stream restoration actions. These tiers are based on the needs of injured native trout, west slope cutthroat trout and bull trout, and would enable restoration of habitat function and processes that would benefit aquatic and riparian communities. The highest priorities for restoration are areas directly injured by mine waste, or areas right next to stream segments contaminated with metals. Locations outside of injured areas would also be considered where restoration activities have the greatest chance of helping injured aquatic and riparian resources. The Trustees would identify and restore migratory corridors that are important for fish to move between contaminated and uncontaminated watersheds and allow for migratory life histories and future recolonization of areas where fishes have previously been extirpated or substantially reduced.

Tier 1 priorities are streams and riparian areas injured by mine wastes or directly adjacent to and ecologically important to those areas. These include injured stream segments and subwatersheds in the South Fork Coeur d'Alene River subbasin, Coeur d'Alene River corridor, and outlying areas with metals contamination such as the Prichard Creek drainage. Metals-contaminated areas are the emphasis of this plan and are the highest restoration priority.

Strategies to restore Tier 1 areas will depend on site-specific conditions. Restoration may take place at the same time cleanup occurs at some sites, after cleanup occurs at other sites, or at unremediated sites where concentrations of metals do not pose unacceptable risks to fish and wildlife.

Tier 1 priority areas also include stream segments such as habitat strongholds and species refugia directly next to injured areas. These include stream segments that are not injured by mine waste but are tributaries to injured waters that harbor adfluvial populations of westslope cutthroat trout (e.g., Coeur d'Alene Lake). These nearby streams will play an important role to ensure remaining native westslope trout populations continue to persist in metals-contaminated areas, and provide a local source of colonizing fish to help reestablish native fisheries in these areas.

The start of restoration projects in Tier 1 priority areas will depend in part on the status and pace of cleanup; therefore, restoration may not begin for more than 10 years at some locations. Due to the effort required to restore highly disturbed remediated areas, projects in Tier 1 areas may be relatively costly. However, the Trustees believe it is very important in Tier 1 areas to restore injured natural resources and their associated services where the injury occurred and they will prioritize these projects when feasible. The Trustees anticipate the largest investment in restoration of streams and riparian areas will occur in Tier 1 areas.

Tier 2 priorities are watersheds and watershed complexes providing spawning, rearing, and other essential habitat for threatened bull trout. These areas occur in the upper St. Joe River subbasin and are important to ensure these fish are not vulnerable to extirpation. Restoring these bull trout habitats will support increasing population trends and expanding distribution of bull trout within their historic range where they were extirpated by the releases of mine waste contamination (USFWS 2014a).

Tier 2 priority areas have the smallest geographic extent, are generally in the best condition, and have the fewest stream restoration needs. However, they encompass the only opportunities for stream restoration in the Basin to benefit areas currently inhabited by bull trout. Consequently, the Trustees place a high priority on these projects but anticipate a smaller investment being needed.

Tier 3 priorities are areas in the Basin neither directly injured by mine waste nor directly adjacent to those areas. These areas primarily occur within the St. Joe River, St. Maries River, and North Fork Coeur d'Alene River watersheds. Tier 3 priorities include areas within bull trout historic range that are currently unoccupied and may serve as bull trout expansion watersheds. In particular, there are restoration opportunities in the St. Joe River subbasin that have the potential for reconnection and population expansion for this species. Tier 3 priorities also include areas that support or could support stronghold habitat for westslope cutthroat trout populations that are genetically pure, are migratory (fluvial or adfluvial), occupy a unique geographic location, and are important to strengthening injured fish resources.

Tier 3 encompasses the largest geographic extent and has a great amount of restoration potential. However, because this tier is the farthest removed from injured areas, projects here have the lowest potential to improve natural resources in injured areas and therefore are the Trustee's lowest priority. Restoration projects will be funded in these areas when they provide unique or timely opportunities, rank highly in our selection criteria, and when such projects provide the greatest cost-effective benefit to injured resources.

Strategies and Techniques

Regardless of where streams occur within the Basin, restoration strategies and techniques would target basic processes that create and sustain aquatic habitats and support biological integrity. Restoration will target short-term and long-term ecological process as follows:

- Long-term processes: Actions designed to restore and support long-term ecological processes would have a primary focus on restoring native streambank, floodplain, and riparian vegetation communities.
- Short-term processes: In some cases, actions (such as direct placement of complex woody debris jams) would be taken to provide habitat-forming elements in the short term to improve conditions while longer-term approaches described above take effect.

Table 3. Strategies and techniques for stream restoration

Strategy	Techniques
Protection	Easements Cooperative management agreements Protective measures such as fencing and traffic control Enhance stewardship through education and outreach Acquisition
Passive Restoration	In lieu of active restoration or rehabilitation, promote stewardship and protection through methods described above. Eliminate or reduce environmental stressors that slow the rate of recovery.
Restore diverse in-stream structure	Place woody debris jams; installed jams should approximate the level of structural diversity, dynamic function, and complexity present in natural debris jams present in reference areas. Use streambank bioengineering and other soft techniques to restore roughness and vegetative structural complexity to banks.
Restore riparian and streambank vegetation	Using reference areas where available, restore mix of native species appropriate for the setting and community type. Use snag creation and riparian silviculture to promote diverse horizontal and vertical structure. Remove undesirable vegetation (noxious weeds). Other noninvasive species may be desirable to plant to achieve short-term objectives such as temporary soil stabilization.

Strategy	Techniques
Restore channel geometry and sinuosity appropriate for the valley setting	Construct/reconstruct channels that approximate the dimensions and migration patterns of geomorphically analogous reference reaches. Install roughness (woody debris, bank toe fascines) on the beds and banks of reconstructed channels to trap sediment to support creation of key aquatic habitats and vegetative communities.
Restore natural resilience of streambanks to erosion and destabilization	Use vegetation-based bioengineering techniques (in lieu of hardening approaches such as rip-rap) to restore vegetative capacity of banks to resist erosion as well as the complex roughness and diverse habitats associated with natural banks. Restore roughness of bank toes using vegetative material such as fascines and woody debris.
Connectivity	Remove or provide passage through physical barriers, such as road crossings, tailings piles, dykes, levees, railroad grades, diversion structures, weirs, and other similar features. Replace culverts with open-bottom structures that facilitate deposition of natural streambed materials. If open-bottom structures are not feasible, culverts should be designed to trap bedload to facilitate passage for all aquatic organisms, including poorly mobile species.

Lakes Goal: Protect and restore injured lake habitats, species, processes, and associated services.

Major Actions

- Protect and improve water quality in Coeur d'Alene Lake and other Basin lakes to benefit injured aquatic resources.
- Protect, preserve, and restore lake-margin habitats valuable to fish, waterfowl, and other aquatic species.

Priority Areas

Coeur d'Alene Lake: Coeur d'Alene Lake is treated as distinct and the highest priority for restoration within Tier 1 due to its unique social and ecological context and regional importance as a resource.

Other Basin Lakes: restoration priority areas for Basin lakes other than Coeur d'Alene Lake were guided by contamination levels and waterfowl and fish use. Other Basin lakes were divided into the following tiers:

- **Tier 2** priorities are lakes or lake complexes with high waterfowl use, and/or native trout populations, and are directly impacted by metals associated with mine waste contamination.
- **Tier 3** priorities are lakes that provide habitat for waterfowl and/or native trout, and are near metals-contaminated sites but may or may not be affected directly by metals.

- **Tier 4** priorities are all other lakes. The Trustees do not anticipate restoration will occur for Tier 4 Lakes due to their distance from metals-contaminated sites, potentially low waterfowl and/or adfluvial trout use, or relatively healthy condition as compared with other tiers. Lakes in this category may be assigned to a higher priority tier if updated information indicates they provide important habitat for focal species or are necessary for the restoration of injured resources.

There are 150 miles of shoreline around Coeur d'Alene Lake alone in addition to shoreline adjacent to the injured Chain Lakes. Restoration needs are therefore expected to exceed available resources. Thus, the following would be used to prioritize lake-margin projects within lakes:

- The highest restoration priority would be areas identified as important for waterfowl and native fisheries.
- Restoration would also be considered where high visibility and access provide demonstration of innovative restoration techniques.
- Projects for near-term human uses benefits would be considered where they overlap with focal resource priorities and demonstration opportunities.

Table 4. Strategies and techniques for lake restoration

Strategy	Techniques
Support the development and refinement tools to predict, measure, and evaluate the effectiveness of lake restoration projects.	Support the data collection to further refinement of the ELCOM/CAEDYM model (ELCOM, Center for Water Research) or other analytical tools. Support long-term water quality trend monitoring in Coeur d'Alene Lake.
Support the design and implementation of source inventories for nutrients relevant to priority lakes.	Support efforts such as Lake Management Plan Section 5.3 Strategic components 1 & 2 - Design and Conduct a Nutrient Source Inventory and prioritize projects based on that inventory.
Increase understanding of nutrient cycling, food web dynamics, metals remobilization and other key processes	Support research such as Lake Management Plan Section 3.1, Special Studies.
Increase public awareness of and engagement with stakeholders of lake conditions and actions they could take to improve lakes water quality.	Support symposia and other stakeholder engagement opportunities. Support education outreach such as the Lake-A-Syst project.
Incorporate lakes water quality considerations into streams and wetlands habitat restoration projects conducted as part of this plan.	See Streams and Wetlands Strategies and Techniques tables.
Use source inventories and nutrient reduction action plans to identify and implement projects that reduce nutrient inputs where relevant to injured natural resources.	Employ techniques in Streams and Wetlands sections. Shoreline revegetation (see below) Partner in cost-share agreements to reduce nutrient inputs from priority sources (improvements to waste water treatment plant discharges, failing septic tanks)

Strategy	Techniques
Restore the vegetation and physical structure of shorelines and near-shore areas.	Plant desirable vegetation Control undesirable vegetation Reshape banks Bioengineering, demonstration projects, etc. Install log and rock structures Move, remove, or improve roads adjacent to shorelines to reduce impacts to surface water and fish habitat.
Protect and preserve shorelines and other lake habitats.	Acquisition Easements Fencing Incorporate resource protective features at recreation sites such as light penetrating boardwalks.
Survey invasive species.	Support ongoing efforts by other entities to detect, identify, and map invasive species presence and distributions. Enlist the public's help to identify and manage nonnatives through supporting education and outreach programs about the potential threats posed to lakeshores from nonnative species.
Prevent the spread and establishment of invasive species.	Ensure restoration produces rapid native species revegetation on disturbed soils Use weed-free soils and fill in lakeshore restoration projects Use native species plants and seed mixes in lakeshore revegetation Support efforts to educate the public about potential threats posed to lakeshores from invasive species and measures they could take to avoid introduction.
Control and/or eradicate invasive species	Support efforts by other entities to reduce the spread of or eliminate invasive species that may affect restoration.

Human Uses of Natural Resources Goal: Restore human uses that were lost due to the injured natural resources. This includes the cultural, recreational, and socioeconomic services that connect both Basin residents and visitors to natural resources and contribute to a community's desired "sense of place."

Human uses are the tangible and intangible benefits people derive from natural resources, and include:

- Ecosystem functions that are essential to human existence such as clean water, flood control, nutrient and sediment filters, and food web dynamics.
- Amenities shaped by individual and community values (including those values unique to Tribal culture), preferences, and demands, and are not necessary for human life, such as recreation opportunities, hunting, fishing, traditional non-subsistence gathering, scenic values, and maintaining a community's sense of place.[8]

[8] Sense of place is the geographic identity and human experience of a place; the where and how an individual—or a community—identifies with and experiences the natural landscape.

Major Actions

- Restore and facilitate recreational and other opportunities associated with the use of restored natural resources.
- Enhance opportunities for people to connect to Tribal and non-Tribal cultural resources that contribute to local and regional heritage and sense of place.
- Provide targeted scenic improvements to viewsheds.
- Promote stewardship of natural resources and support education associated with remediation and restoration.

The Trustees intend to restore the human uses of natural resources. By restoring ecosystem processes, functions, and structures, natural resource-based services that people use are restored as well. However, this restoration may take a long time to be fully accomplished, and recent public comments showed interest in projects that can be completed in the near future to speed recovery of human uses.

To speed up the process of restoring human uses of natural resources, the Trustees would allocate up to 5 percent of the restoration funds to accomplish projects that could be both achieved in a relatively short time and connect humans to natural resource-based services. The CERCLA is clear that if a project only addresses the loss of human uses of natural resource-based services, it must have a close relationship to actual restoration of an injured resource, or at least have a related purpose for taking advantage of the restored resource. Projects that restore human uses must restore those specific uses lost due to contamination released by mining activities in the Coeur d'Alene Basin.

In addition to projects that focus on human uses of injured natural resources, the Trustees recognize that some ecologically driven restoration projects may have a minor component that restores human uses. An example might be a riverbank restoration project that includes improving an existing boat ramp to reduce sediment effects associated with the ramp. In order to support human uses of injured natural resources within ecologically driven projects the Trustees would additionally allocate up to 5 percent of the restoration funds to support these minor human use focused components.

Allocating up to 10 percent of restoration funds (up to 5 percent towards human use focused projects and up to 5 percent towards minor human use focused components of ecologically driven projects) for projects that restore both injured resources and human uses in a relatively short time would represent a direct and significant near-term investment. This approach allows Trustees to respond to public input requesting these types of restoration projects and ensure that restoration addresses the wide range of losses, both human use and ecological, stemming from natural resource injuries in the Basin.

Priority Areas

Priorities for ecosystem restoration are driven largely by the location of injured resources across the landscape and the biological and physical processes that influence them. In contrast, priorities for where human-use projects could be accomplished relatively soon are driven largely by societal values, public input, the constraints of the purpose of this plan, and legal mandates.

During the public comment period, the Trustees received input on local values and desired locations for restoration. Some of the geographic areas and restoration approaches identified as important by the public during scoping included:

- Coeur d'Alene Lake – restore tributaries that flow into the lake that have fish passage barriers
- South Fork Coeur d'Alene River subbasin – to be cost effective, start restoration work upstream of where EPA is doing cleanup
- South Fork Coeur d'Alene River – restore areas along the South Fork Coeur d'Alene River to provide safe public access that could serve as an asset rather than a liability
- North Fork Coeur d'Alene River – restore areas in the North Fork subbasin where there is a high use of rafting and tubing to make access safer for the public and protect existing riparian areas
- Coeur d'Alene River floodplain – restore areas that don't pose a risk to recontamination and could limit human health risks to contamination exposure
- Basin-wide – focus on areas where public access could be enhanced or improved
- Trail of the Coeur d'Alenes – partner on restoration projects along the trail to highlight the area's history
- Hangman Creek watershed- restore areas that provide the Tribe with natural resources and the human services derived from them that are analogous to natural resources and human services lost in the Basin due to mining contamination.

Under alternative 2, the primary restoration planning area consists of the Coeur d'Alene Basin; however, due to the extent of contamination in the lower Basin and limited feasibility for comprehensive remediation, opportunities to restore human uses of injured natural resources that are important to the Coeur d'Alene Tribe within the hydrologic boundary of the Basin are limited. Therefore, at the discretion of the Trustees, projects designed to restore lost human uses of injured natural resources unique to the Tribe would be considered outside of the Basin in the Hangman Creek watershed, and within the existing boundary of the Coeur d'Alene Reservation.

The Trustees value the engagement and input they received from the public and would continue to work with the Basin communities when identifying human-use projects as they relate to natural resource restoration. To better understand the social, economic, cultural, and recreational values of the community, the Trustees would use tools such as surveys, public meetings, and emerging technologies to guide geographic preference based on social values. These methods would provide information needed for decision-makers and researchers to evaluate the social values as they relate to human uses of natural resources. These methods could help facilitate discussions with diverse stakeholders regarding the tradeoffs among different uses in a variety of physical and social contexts.

Strategies and Techniques

Table 5. Strategies and techniques for restoration of human uses

Strategy and background	Techniques
Improve recreational infrastructure at contaminated sites and reduce exposure risks for human health.	Construct or improve access sites and trails Paving, boardwalks or other barriers Partner with EPA, Panhandle Health District, land managers, and others
Improve infrastructure and provide recreational opportunities at uncontaminated sites.	Construct or improve access sites and trails Swimming areas in lakes and rivers Partner with land managers Land acquisition Conservation easements
Improve scenery where doing so meets social and ecological objectives.	Tree and shrub plantings Promote environmental stewardship i.e. "Leave no Trace"
Enhance opportunities to learn about natural resources in the Basin.	Observation blinds Improved access Educational kiosks
Support natural resource educational efforts with other Trustees.	Assist with production of environmental curricula Hands on demonstration projects Outdoor classrooms
Enhance opportunities for people to connect with cultural resources.	Restore, replace, and/or acquire the equivalent of natural resources in order to protect culturally important areas for Tribal and non-Tribal community members Work with Tribal elders and community leaders to develop interpretive programs to increase awareness of important cultural areas Provide for subsistence gathering, hunting and fishing opportunities
Restore lost or degraded Tribal connection to injured natural resources.	Conduct restoration projects near Tribal population centers to encourage and reinforce traditional cultural uses of natural resources Inform Tribal members about uncontaminated areas within the basin suitable for traditional use
Restore wildlife-based recreational opportunities and preserve natural open space.	Interpretive trails Viewing, hunting, fishing, and trapping opportunities

2.2.2.3 Implementation Strategy

The Trustees envision developing strategic workplans to better focus restoration implementation in given time frames. The Trustees would solicit restoration project proposals to achieve the goals discussed above through an open public process. Projects that help fulfill the restoration plan mission, achieve restoration goals, and fit the criteria laid out in the restoration plan would be considered. Proposals would be evaluated according to the selection criteria, and the Trustees would determine which projects would be funded.

Project proposals could be submitted by the Trustees themselves, private citizens, businesses, non-profit organizations, non-Trustee State and Federal agencies, Tribal government, and others. However, proposals must be co-sponsored by at least one of the Trustees for project administration purposes (such as contracting to award funding). Projects could be proposed on any lands in the Basin including private, Tribal, State, Federal, county, and other lands.

The proposal solicitation process would be open to all restoration projects in the Basin. However, the Trustees would also conduct targeted solicitation for specific project types or projects in certain geographic areas and prioritize them for funding based on selection criteria identified in the plan. For example, if a restoration priority is aquatic habitat connectivity in a particular subbasin, the Trustees could solicit projects that remove barriers to fish passage in that area.

Implementation of the proposed restoration should be done in a timely manner that balances multiple variables including, but not limited to, administrative needs and contractor capacities to conduct the work, cost, submission of quality proposals, and unforeseen opportunities. Restoration should also integrate with cleanup by EPA and others in a strategic manner that maximizes cost efficiencies and effectiveness of restoration projects. To achieve this, the Trustees would develop strategic workplans that would identify project types and geographic areas. All projects would be screened against stringent criteria that would ensure each project advances the goals of the restoration plan. All projects would be required to comply with all applicable laws and permitting requirements. Finally, monitoring to measure project success, aid in adaptive management, and guide future restoration would be conducted.

2.2.3 Alternative 3 – Ecosystem Restoration Focus

Alternative 3 is identical to the proposed action except that no projects would be implemented to directly restore or accelerate the recovery of the human uses of natural resources that were lost as a result of mine waste contamination (as described on page 21). Rather, human use services would be indirectly restored, over a longer period of time, and incidental benefits from projects with an ecological focus. Under Alternative 3, no projects would be undertaken to restore and facilitate recreational, educational, and other opportunities associated with the use of restored natural resources.

The geographic extent of restoration under Alternative 3 would likewise be less than under the proposed action. Because no human uses projects would be done, no projects designed to restore human uses unique to the Coeur d'Alene Tribe would be carried out. Thus, the work proposed in Alternative 2 to restore lost Tribal services by working in the Hangman Creek watershed would not occur under Alternative 3 (see Figure 2).

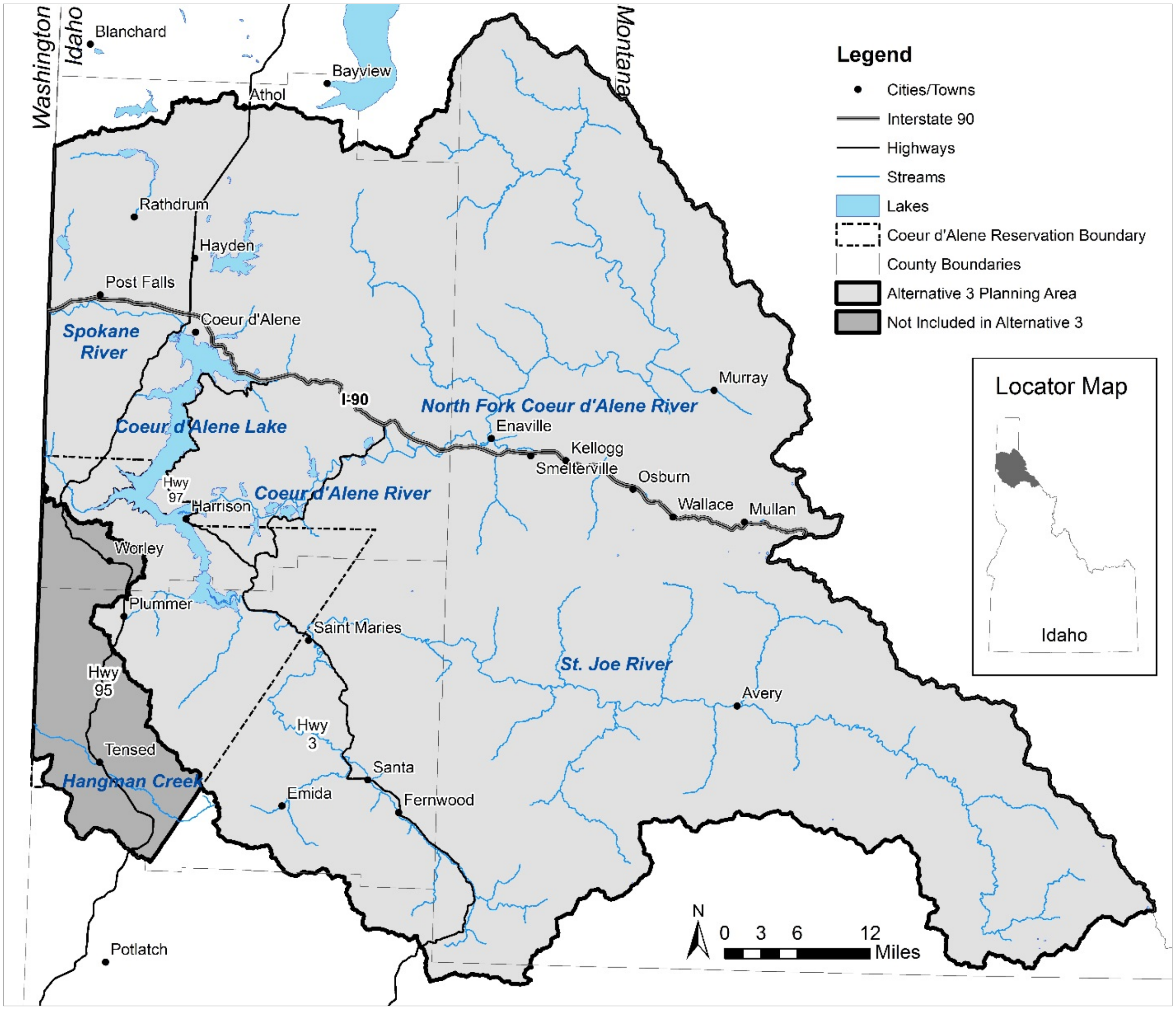

Figure 2. Alternative 3 planning area

2.2.4 Design Features for Alternatives 2 and 3

The Trustees developed the following design criteria to be used during implementation for either Alternatives 2 or 3. The purpose of design criteria is to avoid, minimize, reduce or eliminate potential negative effects of the proposed activities to cultural, physical, and biological resources in the project area. All relevant design criteria would be included in all projects initiated under this environmental impact statement.

2.2.4.1 Soils

- Where soil is disturbed or compacted, take appropriate measures to revegetate or provide other cover on the area that will prevent short-term and long-term soil loss. This can include placing woody debris, brush, or using other erosion control measures to prevent short-term loss until vegetation recovers.
- Equipment and material staging areas would be sited to avoid or minimize adverse impacts.

- Take appropriate measures to block future access to protect sensitive soils during revegetation.

2.2.4.2 Hydrology and Water Quality

- Culverts and bridges should be designed to pass expected peak flow volume as well as expected debris flows and channel changes. Projects carried out on State of Idaho lands, or private lands where the State is designated as the project lead, will be designed to meet or exceed the requirements of the Idaho Forest Practices Act, which requires a 50-year return flow standard. In all other projects, stream-crossing culverts, bridges, or other structures will be designed, where feasible, for 100-year return flow.
- Place sediment control devices such as water bars, slash filters, sediment fences, and other silt-trapping devices in areas determined to have high potential for sediment input into waterbodies during or immediately following construction activities.
- Promptly rehabilitate and stabilize disturbed areas to prevent erosion and sediment inputs to waterbodies. Examples include using vegetation in combination with measures such as slash filters where soils will immediately support seed or plant growth, and use of erosion-control matting or similar approaches for short-term protection.

2.2.4.3 Aquatic Species

- Project proponents and other applicable parties are encouraged to contact Idaho Department of Fish and Game, the Tribe, or the U.S. Fish and Wildlife Service to determine whether federally listed species or other special status species occur in project areas, and to identify ways to avoid or minimize take or adverse effects.
- An aquatic biologist should participate in the design of all projects that may affect threatened and endangered species or other special status species.
- Restoration projects will adhere to the in-water work window and other timing restrictions to protect aquatic species as defined by the Idaho Department of Fish and Game, the Tribe, and the U.S. Fish and Wildlife Service (where applicable). Projects outside of these work windows would require waivers or further compliance actions from one or more of these agencies.
- Design stream crossings to provide passage for all aquatic organisms unless a barrier is otherwise needed to prevent invasion by nonnatives. Also see provisions under "Nonnative Species."
- During project installation, provide in-stream conditions that allow for and maintain connectivity and safe passage of fish.
- When passage above a barrier is provided for aquatic species, analyze any potentially negative interaction including hybridization, disease, competition or predation between native, introduced and/or aquatic nuisance species. If serious consequences are likely, take steps to minimize adverse effects.

2.2.4.4 Terrestrial Species

- Project proponents and other applicable parties are encouraged to contact Idaho Department of Fish and Game, the Tribe, or the U.S. Fish and Wildlife Service to determine whether federally listed species or other special status species occur in project areas, and to identify ways to avoid take or adverse effects.
- Any activities must meet any applicable standards found in a relevant biological opinion or environmental analysis document for those species.
- A wildlife biologist should participate in the design of all projects that may affect threatened and endangered species or other special status species.
- Restoration projects should be designed to prevent increasing wildlife exposure to contaminants (for example, by removing existing protective barriers such as clean soils or dense vegetation or redistributing wildlife to areas where increased exposure to contaminants is a risk).
- In the early stages of restoration project development, determine whether the project site contains sensitive wildlife habitat, unique plant communities, other identified crucial wildlife habitats, or special status wildlife populations. If these resources are located, project designs and implementation plans should identify measures to avoid impacts. Examples of conservation measures that could be included to minimize or avoid impacts to these resources include:
  - Maintain forest stand structure around active bald eagle nests so as to not appreciably alter its quality and character.
  - Restrict or reduce restoration activities (such as construction, vegetation removal, or earth moving) around occupied raptor nests.
  - Minimize or avoid vegetation removal activities during the general nesting season or buffer occupied nests until the nesting process is completed.

2.2.4.5 Vegetation

- When working in areas with suitable habitat for special status plant species, or designated critical habitat for listed plant species, a botanist or other qualified personnel will conduct seasonally appropriate inspections to ensure that important or sensitive species or habitats are not present in or near project areas. If plants are located, the project implementation plans will document and incorporate specific design features to avoid adverse impacts to the plants or their habitats.
- Use native species in restoration projects except when timely reestablishment of a native plant community either through natural regeneration or with the use of native plant materials is not likely to occur. Examples include but are not limited to the following:
  - When urgent conditions exist where it becomes necessary to protect basic resource values (such as soil or slope stability, water quality, and preventing establishment of invasive species).
  - When native plant materials are not available or are not economically feasible.

  - In permanently or highly altered plant communities, such as road cuts, landscaped residential properties, temporary roads that have been closed, and other sites dominated by nonnative, invasive species.
  - Where a specific project objective is to provide replacement foraging and production habitat for wildlife and native species cannot meet that need.
- When nonnative plants must be used as interim plantings prior to the establishment of natives, select only non-persistent plants that will not permanently displace native species or offer serious long-term competition to the recovery of endemic plants.
- Include additional design features to avoid the introduction or spread of invasive plants, including a plan for revegetating disturbed areas. Potentially applicable measures could include the following:
  - Ensure that all equipment entering and leaving project area is clean of invasive plant material, mud, or debris that could transport seeds or plant material.
  - Assure that equipment, vehicles, and materials are not staged in known invasive plant populations.
  - Assure that any materials brought into the project area (clean fill, topsoil, straw, gravel, large wood) are free of invasive plant material.
  - Minimize soil disturbance as part of restoration projects and retain native vegetation to the extent practical.
  - Immediately vegetate bare ground so weeds do not become established

2.2.4.6 Heritage and Cultural Resources

- Projects should comply with 36 CFR 800 to determine: whether a proposed action is an undertaking; area of potential effects (APE), and what steps may be necessary to identify historic properties; and whether the undertaking may occur on or effect historic properties on Coeur d'Alene Tribal lands and, if so, whether the Tribal Historic Preservation Officer (THPO) has assumed the duties of the State Historic Preservation Officer (SHPO).
- As a result of identifying historic properties within the APE, resource professionals meeting the qualifications found in appendix A of 36 CFR Part 61 shall evaluate the significance of those properties. Those findings shall be reported to the Tribal Historic Preservation Officer or State Historic Preservation Officer along with recommendations concerning the project's effect to said properties and allow both officers to concur on those findings. If an adverse effect will occur to an historic property steps will be taken to resolve those effects.
- If historic properties are discovered, or unanticipated effects on historic properties are found, after project consultation with the Tribal Historic Preservation Officer or State Historic Preservation Officer has concluded the Trustees shall make reasonable efforts to avoid, minimize or mitigate adverse effects to said properties.

- Cultural resources important to the Coeur d'Alene Tribe: The Trustees (which includes the Coeur d'Alene Tribe) will work together to identify whether proposed restoration projects are located in areas containing traditional cultural properties or sacred sites, or whether restoration work will impede access to or the quality of culturally important locations (on- or off-site), disrupt traditional cultural practices, affect the abundance and diversity of natural resources important to the Tribe, or visually affect culturally important landscapes. In accordance with Federal policy, consultation by the federal trustees with the Tribe will be early, often, and ongoing during the life of the project. If it appears that adverse effects could occur, the Trustees will determine the measures needed to minimize or avoid impacts. Methods to minimize impacts or issues of concern to the Tribe may include, but are not limited to: additional cultural resource assessment or monitoring, redesigning the project, changing the project footprint, using less intrusive or destructive construction methods, changing the timing of construction (due to traditional ceremonies), or abandoning the project.

2.2.4.7 Recreation and Human Uses (Alternative 2 only)

- Human-use projects that provide access to resources in contaminated environments will use adequate barriers (asphalt, rock, vegetation, boardwalks, fencing) on recreational surfaces and education (such as signage) to keep visitors safe from potential exposure to harmful contaminants.
- Use intelligent site design (such as designated hardened access points, protective fencing, sanitation facilities) to guide access and site use in order to preserve habitats.
- Ensure human-use projects integrate with the existing landscape character type and recreation settings.
- Prior to constructing new recreation facilities or enhancing existing recreation facilities, consider whether resulting changes in use patterns could adversely affect natural resources.

2.3 Alternatives Considered but not Carried Forward for Analysis

Federal agencies are required by the NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating alternatives that were not developed in detail.[9] Technical specialists from Trustee Council member agencies as well as public comments received during scoping provided suggestions for alternative methods and approaches for developing a plan to restore injured resources in the Coeur d'Alene Basin. These approaches and the reasons they were not carried forward for analysis are summarized below.

2.3.1 Individual Projects

During the scoping period, a number of individual projects or site-specific ideas were proposed for inclusion in the draft restoration plan (such as creating a community fishing pond in the Silver Valley, reducing point-source pollution in Black Lake, stabilizing specific segments of the Coeur

[9] 40 CFR 1502.14

d'Alene River, or acquiring selected flood parcels in the lower St. Joe River Basin). These and other individual projects are not evaluated in the draft restoration plan and EIS because the plan is programmatic. Rather than propose specific projects, the purpose of the proposed plan is to provide a strategic framework that would guide the selection of future individual restoration projects in the Basin. As such, individual site-specific projects do not meet the purpose and need.

2.3.2 Off-site Restoration for Tundra Swan

Off-site restoration would include actions conducted by the Trustees outside of the Coeur d'Alene Basin. These actions would be intended to improve the quality of natural resources off-site and/or out-of-kind to address cumulative losses of resources or services over time as a result of the injury. For example, the Trustees considered incorporating off-site restoration in the restoration plan specifically to address injury to tundra swans. This alternative would have allowed for the selection of restoration projects that meet general ecological objectives, but could be conducted in tundra swan breeding and nesting habitat outside the planning area boundary, in Alaska. Although restoration of breeding and nesting habitat in Alaska would produce additional tundra swans, it would not prevent swans (and other waterfowl) from using the lower Coeur d'Alene Basin and dying from exposure to lead-contaminated sediments. Thus, the Trustees determined that the best way to address injury to tundra swans in the Coeur d'Alene Basin and to the swan population as a whole is to reduce losses by reducing the impacts of lead-contaminated habitats.

Finally, conducting off-site restoration primarily designed to benefit tundra swans was not carried forward for analysis because a greater number and variety of injured species and associated ecosystem processes would benefit from restoration carried out on-site, in the affected area. Off-site restoration would primarily benefit injured migratory waterfowl, such as swans.

2.3.3 Defer Restoration until Remediation is Complete

There are uncertainties inherent in the expected results of remediation throughout the Coeur d'Alene Basin, including the final extent of clean water and potential habitats. In some locations, there may be a risk of a restoration project being contaminated if it is built before the completion of remedial actions in the area. Or, restoration projects intended to provide for species recovery may ultimately be unsuccessful because remedial efforts are insufficient to provide adequate water quality. As a result, the Trustees considered deferring restoration until the final results from the cleanup are known so that projects could be targeted to areas where water quality would be known to be suitable for species recovery and survival. The alternative was not selected because:

- There are numerous places to work outside of the contaminated areas slated for remediation that are critical to the ecological recovery of the system where restoration could proceed without knowing the full future results of remediation.

- Integrating restoration planning into the remedial process instead of waiting until remediation is complete could result in cost savings and more expeditious completion of restoration. For example, better integrating cleanup and restoration would help avoid "undoing" a cleanup to achieve restoration goals.
- Remediation and natural attenuation are expected to last decades into the future. However, the Trustees and public want to begin restoration as soon as possible to restore the Basin's lost natural resources and services.

2.3.4 Approaches Focusing on Civil Infrastructure Improvements, Economic Development, or Recreation

A number of approaches were proposed during the scoping period suggesting the Trustees use restoration funds for projects such as maintenance or improvement of civil infrastructure (such as roads, health clinics, community centers, or libraries), general economic development (including increased access to national forest lands for commercial timber production) or the creation of recreational facilities not linked to ecological restoration of the injured natural resources. These approaches were not carried forward for inclusion in an alternative or for analysis because they would not restore the injured resources and, therefore, would not meet the purpose and need. Additionally, these proposals do not meet the requirements of the CERCLA or the court documents memorializing the settlements, which stipulate that monies recovered from a Natural Resources Damages Claim are to be used only for the restoration or replacement of the injured natural resource. To be considered, all restoration actions must demonstrate a strong link to the injuries, giving rise to the original claim for natural resource damages.

2.4 Summary of Alternatives

This section provides a summary comparing the features of each alternative.

Table 6. Comparison of alternatives

Action Topics	Alternative 1 No Action	Alternative 2 Integrated Restoration (Proposed Action)	Alternative 3 Ecosystem Restoration Focus
Geographic extent	Not applicable	Spokane River Basin-expanded description, including Hangman Creek	Hydrologic boundary of the upper Spokane River/Coeur d'Alene Lake Basin only. Upper Hangman Creek watershed excluded.
Wetlands Restoration	None	Wetlands restoration could occur throughout the planning area, including the upper Hangman Creek watershed	Wetlands restoration could occur everywhere except in the upper Hangman Creek watershed.
Stream Restoration	None	Restoration of streams and rivers could occur throughout the planning area, including the upper Hangman Creek watershed	Restoration could occur throughout the planning area except the in upper Hangman Creek watershed.

Action Topics	Alternative 1 No Action	Alternative 2 Integrated Restoration (Proposed Action)	Alternative 3 Ecosystem Restoration Focus
Lakes Restoration	None	Lakes restoration could occur throughout the planning area	Lakes restoration would not occur in the upper Hangman Creek watershed
Human Uses	None	Projects to restore human uses of injured natural resources could occur throughout planning area	No projects to restore human uses of injured natural resources would be undertaken anywhere in the planning area, including the upper Hangman Creek watershed.

Chapter 3. Affected Environment and Analysis of Effects

3.1 Introduction

The purpose of this chapter is to describe the natural and socioeconomic environment of the area potentially affected by the alternatives under consideration. Because this environmental impact statement provides an assessment of environmental, social, and economic issues at a programmatic level and not at the site-specific level, the descriptions of the affected environment presented in this chapter do not provide detailed information about conditions that exist at specific locations. Rather, these descriptions provide the level of detail needed to support the programmatic impact assessment presented below.

The spatial and temporal scale of analysis for direct and indirect effects is described in each resource section and may vary depending on differences in resource distribution or other factors. For cumulative effects, the temporal scale for the analysis is approximately 15 years. Although the duration of effects for many of the actions in the plan is beyond 15 years, this scale was chosen for the cumulative effects analysis because that period is close to the lifespan and average expected duration of effects of many of the widest-ranging plans and programs identified during the cumulative effects analyses. For example, the duration of the 2015 Revision of the Idaho Panhandle National Forest Plan (affecting approximately 49 percent of the planning area) was set as 15 years. The Integrated Resource Management Plan for the Coeur d'Alene Reservation (published in 2012) was set at 20 years. The 2012 Record of Decision Amendment (EPA, 2012) outlines a 30-year timeline for cleanup actions in the Basin and the 2013 Implementation Plan (EPA, 2013) provides further detail on priorities within a 10-year sliding time window. Furthermore, given uncertainties regarding the effects of changing climate, the extent and effectiveness of EPA's remedial activities and other activities in the basin, actions and their effects occurring beyond a period of 15 years were considered speculative.

3.2 Site Description

For the purposes of this DEIS, the broad analysis area or restoration planning area includes the upper Coeur d'Alene River Basin from the Montana border downstream into Coeur d'Alene Lake (including the entire lake drainage area in the watershed) and upper Spokane River to the Idaho-Washington state line (see Figure 1 on page 13). Also included is the portion of the upper Hangman Creek watershed that is located on the Coeur d'Alene Reservation.

The planning area is located primarily in Shoshone, Kootenai, and Benewah Counties. Small portions of Latah and Clearwater Counties occur in the planning area at the headwaters of tributaries of the St. Maries River. A small portion of Bonner County lies on the northern end of the planning area. Population centers include the cities of Coeur d'Alene, Post Falls, and Harrison in Kootenai County; St. Maries and Plummer in Benewah County; and Kellogg, Smelterville, and Wallace in Shoshone County.

Land ownership in the planning area is a mix of private, Federal, State and Tribal parcels. A portion of the Coeur d'Alene Lake Basin lies within the boundaries of the Coeur d'Alene Reservation, while the entire planning area lies within the Tribe's original aboriginal territory. Major individual land managers include the U.S. Forest Service, State of Idaho (including Idaho Department of Lands, Idaho Department Fish and Game, and Idaho Parks and Recreation), the Coeur d'Alene Tribe, Bureau of Land Management, and private timber companies (Figure 3).

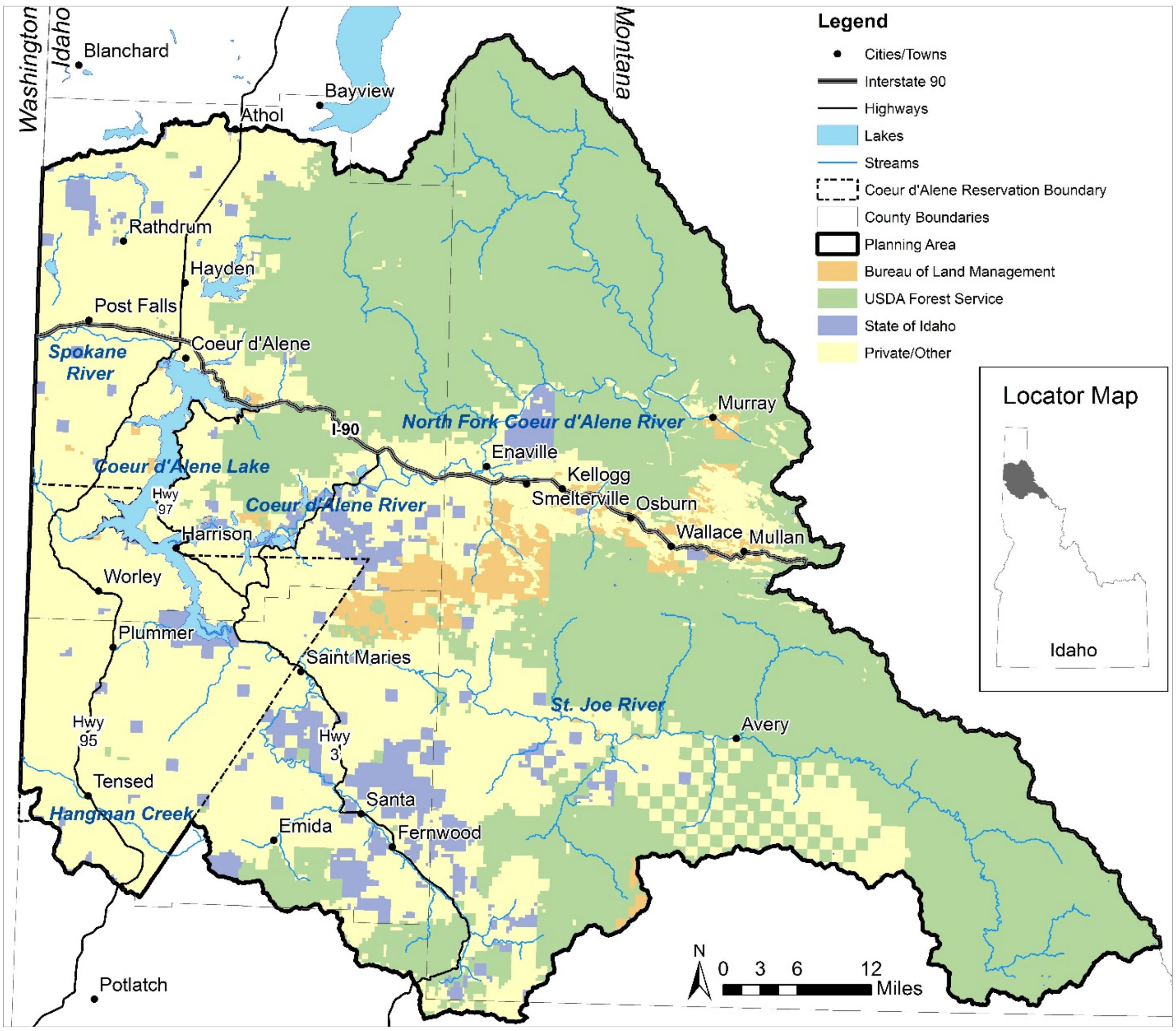

Figure 3. Land ownership in the planning area

3.2.1 Geology and Soils

3.2.1.1 Geology

The planning area incorporates two physiographic provinces of North America: the Northern Rocky Mountain and Columbia Plateau.

The bulk of the planning area is within the Coeur d'Alene Lake Basin in the western part of the Northern Rocky Mountain physiographic province, and consists primarily of a system of northerly trending mountains. The distinct physiographic character of the planning area reflects geologic differences in rock types, structures, and chemical and physical weathering processes. Elevations range from 2,100 feet up to peaks of 7,700 feet. The southwestern portion of the planning area is adjacent to the Palouse Hills and includes low mountains with broad plains related to relatively flat volcanic flows that occurred in the area. The northern portion contains the Purcell Trench, a long narrow valley surrounded by mountains. The northern portion of this valley is well defined and relatively flat because of glacial scouring. Further south it becomes more diffuse and irregular, reflecting deposits left by glacial floodwaters.

The geologic history of the planning area is complex and spans billions of years. The oldest rocks in the planning area are metamorphic and include a series called the Belt Super Group. The Belt Super Group, estimated at over 50,000 feet thick, consists of various sedimentary rocks that have been deeply buried and exposed to heat and pressure. This series, its structural fault systems, and rocks that intruded it, provide the mineral resources of the Coeur d'Alene Mining District, which is centrally located within the planning area.

The southern portion of the Coeur d'Alene Lake Basin includes the St. Joe and St. Maries rivers and contains higher grades of metamorphism related to the intrusive granitic rocks of the Idaho Batholith to the south. These intrusions have resulted in the formation of rock that tends to be less stable than landforms based primarily on Belt meta-sediments. Volcanic flows of Columbia River Basalt cover a part of the western extent of the planning area, including the Coeur d'Alene Reservation. These basalt flows are several thousands of feet thick.

About 100,000 years ago, glaciers formed in southern Canada and began moving southward along main drainages through the planning area. Ice sheets advanced and retreated, scouring Coeur d'Alene and Pend Oreille lakes and leaving thick deposits of sand and gravel. During and following the most recent Ice Age, the streams and rivers of northern Idaho carried a larger volume of water than they do now, enabling them to carry more sediment. The naturally enhanced river flow and the periodic floods scoured out many of the larger river canyons and increased down-cutting and erosion of the rivers and mountains, leaving the landscape that is present today. Runoff is much lower now than during the last glacial event, creating rivers and streams that are undersized compared to the erosional features that they occupy.

Alluvial deposits by glaciers and the floods of glacial Lake Missoula left thick layers of boulders, cobble, and gravel in the outwash plain in the Rathdrum Prairie and the Spokane Valley, creating the highly porous Spokane Valley-Rathdrum Prairie Aquifer that lies under the region. As a result, streams in the Rathdrum Prairie area percolate into the highly porous alluvial substrates and do not maintain surface hydrologic connection to downstream waters (Bashore 1932).

The Hangman Creek watershed is outside of the hydrologic boundaries of the Coeur d'Alene Lake Basin, and is located in the Columbia Plateau physiographic province. The following material describing geology in the Hangman Creek area is excerpted from Washington Department of Ecology 2005 and 2011:

> Headwaters of the Hangman Creek watershed begin in mountains formed by the Idaho Batholith. Hangman Creek then flows through the rolling loess hills of the Palouse region and into an area of basalt cliffs and canyons. In reaches below Rock Creek, Hangman Creek then flows through sedimentary hills of sand, gravel, and cobbles deposited during the ancestral Glacial Lake Missoula floods. Bedrock in the lower watershed is mainly Miocene basalt flows with pockets of Tertiary biotite granite and granodiorite During the Miocene, the basalt flows would periodically dam rivers and form lakes. Material deposited in these lakes formed dense laminated clay and silt deposits that are resistant to erosion. Wind-blown silt (loess) accumulated up to 200 feet over the basalt flows and formed the dune shaped hills. Unconsolidated materials from Glacial Lake Missoula, loess deposits, and the weakly cemented sedimentary rocks of the Latah Formation have produced easily erodible streambanks throughout the Hangman Creek watershed that are highly susceptible to stream erosion.

3.2.1.2 Soils and Sediments[10]

Coeur d'Alene Lake Subbasin (excluding St. Joe)

The landscape surrounding the northern portion of Lake Coeur d'Alene is generally mountainous and heavily timbered. Silt loam is the dominant soil type in this area, with occasional occurrences of stony soils or bare rock. Most of the surface soils in this area are considered highly organic with few occurrences of inorganic clays and silts. Around the southern portion of the lake, silt loam soils are still dominant, though very stony soil types occur in greater amounts than in the north. Surface soils are also predominantly highly organic, with some occurrences of inorganic clays, particularly around Harrison and Windy Bay. Generally, for the entire area surrounding the lake, soils close to the lakeshore are the least susceptible to erosion (from wind and water), and increase in erosion susceptibility farther upland.

Soils of the mountains surrounding upper Coeur d'Alene River are silty and stony podzols developed under predominantly cool conditions and mixed coniferous forest. Soils in these forested hillsides contain 2 to 5 percent organic matter and are described as loamy skeletal, meaning mixed rock fragments with the soil fines having a clay content of 3 to 18 percent. The remainder is silt and sand.

The soils of the lower Coeur d'Alene River floodplain are generally capable of supporting rich wetland and agricultural vegetation. Within the wetland areas, approximately 6 to 17 inches of silt overlays a native layer of silty peat that predates the onset of mining in the South Fork Coeur d'Alene River. Thicker layers of sand are present near and within streams. Hillslope soils consist primarily of variable silt loams with occasional stony deposits. Much of the soils in this area can be susceptible to wind and water-induced erosion, particularly along the floodplain. Soils and

[10] In this document, the term "soils" and "sediments" both refer to all materials developed in place from weathering of parent materials and transported substrates, plus organic materials. The terms "soils" and "sediments" are both used to describe substrate in upland and riparian areas, floodplains, banks, stream and riverbeds, lakebeds, and wetlands of the basin.

sediment in the South Fork Coeur d'Alene River, the mainstem Coeur d'Alene River and its floodplain, and Coeur d'Alene Lake were substantially affected by the release, transport, and deposition of metals originating from mining in the South Fork. In the Silver Valley, the hillslopes above the South Fork Coeur d'Alene River were subjected to many decades of sulfur and metal emissions and deposition from the mining and metallurgical industry (USEPA 2000). Loss of vegetation as a result of the contamination as well as forest fires in the area resulted in high levels of soil erosion and loss from the hillslopes in this part of the planning area (White et al. 2003). Additionally, the following soil and sediment conditions have been documented in this portion of the planning area:

- Soils in the hillsides and drainages adjacent to former mining operations along the South Fork and some of its tributaries (including Canyon, Ninemile, Moon, and Pine Creeks) contain piles of waste rock and jig tailings, which typically contain relatively high metal concentrations (Stratus 2000).
- Riverbeds, banks, and floodplains along the South Fork are covered with contaminated alluvium that is toxic to aquatic life, affects streambank plant growth, and provides a continual source of contamination to downstream areas (Stratus 2000).
- In the mainstem Coeur d'Alene River, low channel gradient combined with seasonal backwater effects created by the hydrologic constriction at the Coeur d'Alene Lake outlet and from operations at the Post Falls Dam reduce flow velocities, resulting in widespread deposition of trace element-contaminated sediments. Sediments containing at least 1,000 parts per million of lead cover as much as 75 percent of the Coeur d'Alene River floodplain, from the confluence of the North and South Forks to the mouth of the river at Coeur d'Alene Lake (Bookstrom et al. 2001).
- In the lower Coeur d'Alene River Basin, approximately 40 square miles or 85 percent of lakebed sediments contain lead concentrations above values considered ecologically harmful (Stratus 2000). According to the Forest Service, 75 million tons of contaminated sediments are estimated to be located in the Coeur d'Alene River floodplain. These contaminants are transported downstream, especially during floods, and are deposited in the bottom of Coeur d'Alene Lake or flow into the Spokane River. According to the U.S. Geological Survey, over 75 million tons of contaminated sediments exist at the bottom of Coeur d'Alene Lake (Horowitz and Elrick 1993).
- Soils along the Spokane River were contaminated with metals associated with mining activities in Idaho at the Bunker Hill Mining and Metallurgical Complex Superfund Site. Downstream of Coeur d'Alene Lake, soils along the river have been identified as potential human and ecological health risks.

The U.S. Environmental Protection Agency is conducting or planning to conduct remedial actions on major sources of contamination within the South Fork Coeur d'Alene River, and East Fork Ninemile and Canyon Creeks (USEPA 2013). Those actions are intended to reduce inputs and downstream transport of metals and ultimately reduce new contributions of contaminants to the soils and sediments of the planning area. EPA is also determining a future remedy in the Lower Basin and has deferred a remedial decision for Coeur d'Alene Lake pending the effective implementation of the Lake Management Plan (USEPA 2015a).

St. Joe River Subbasin

The steep mountain slopes surrounding the upper St. Joe River are generally underlain by silty to silt loam podsolic soils developed under cool and humid conditions. Sandy granitic soils also occur in some areas and volcanic ash deposits are variably found within the soil mantle. The soil mantle is generally thin on slopes, with topsoil and subsoil layers of 3 to 4 inches deep.

Soils in the lower St. Joe River area are similar to others found in the basin, with silt loams being the predominant soil type. Surface soils are primarily composed of organic matter, although a few drainages contain larger percentages of inorganic silts and fine sands. Erosion potential is mostly moderate in this area, except within the highly erodible floodplain.

A high percentage of stream beds and banks in the lower St. Maries River watershed are composed of finer alluvial materials and deposits. This is likely due to the prevalence of underlying geology in the watershed that weathers to fine grained soils (for example, Idaho batholith in the upper watershed; Palouse formation in the western subwatersheds) (Heitanen 1962). Lower in the St. Joe watershed, the mainstem and downstream portions of adjacent tributaries flow through the fine-grained lacustrine deposits of ancient Lake Clarkia and the Miocene Coeur d'Alene lake (USFWS 2002, IDEQ 2003a).

Upper Spokane River and Rathdrum Prairie

The City of Spokane Valley Shoreline Master Program Update (Inventory and Characterization Report; 2010) reported that soils in the valley through which the upper Spokane River flows are dominated by late Pleistocene glacial outburst flood gravels. The majority of the soils within the shoreline jurisdiction are Garrison gravelly loam and Garrison very stony loam, similar to much of the rest of the valley soils. These are gravelly, medium texture, and somewhat excessively drained soils with a typical topsoil depth of between 0 and 15 inches. The ability to retain water is low, ranging between 0.08 to 0.16 inches per inch of soil. The Natural Resources Conservation Service rates the stony loam as difficult to establish vegetation on with a fairly easy rating for the gravelly loam. Neither soil is considered highly erosive.

Soils of the Rathdrum Prairie area formed in loess containing volcanic ash, which overlies extremely fluvio-glacial deposits, and poorly to moderately sorted sand and gravel, with high permeability.

Hangman Creek Watershed

Soils in the upper Hangman Creek watershed above Rock Creek include volcanic ash, silty loess, glacial deposits, alluvium deposited by streams, and material weathered from basaltic, granitic, and metamorphic bedrock (WADOE 2005 and 2011).

3.2.2 Climate

The planning area is influenced by moist maritime air masses from the Pacific Ocean and cold continental air masses moving southward from Canada. Most of the precipitation occurs in the form of snow between October and April, with the greatest amount of precipitation occurring at higher elevations. Summers are usually warm and dry with the exception of convective storms. Monthly air temperatures vary with season and elevation. Minimum air temperatures occur in the months of December and January, and maximum temperatures occur in the months of July and August (NRC 2005).

3.2.2.1 Climate Variability and Projected Change

The following information is summarized and incorporated by reference from the 2010 Comprehensive Climate Change Evaluation Report prepared for the revision of the Forest Plan for the Idaho Panhandle National Forests (USFS 2010). The report compiles and synthesizes scientific information on past and projected trends in regional climate. The area covered by the report encompasses much of the restoration planning area.

Observed Climate Trends

Over the last century, average annual temperatures in northern Idaho and northwestern Montana have increased about 2 degrees Fahrenheit (0.2 degrees per decade). Winter temperatures have increased more than other seasons, and daily minimum (nighttime) temperatures have increased more than daily maximums. Annual precipitation in northern Idaho and northwestern Montana has increased about 12 percent over the last 100 years, with greater increases in the spring and summer than autumn and winter.

Projected Climate Trends

Climate models are unanimous in projecting increasing average annual temperatures over the coming decades in the Pacific Northwest. The average of 20 different climate models using multiple climate simulations projects that annual temperatures will increase 2.2 degrees Fahrenheit by the 2020s and 3.5 degrees Fahrenheit by the mid-21st century, compared to the average for 1970 to 1999. Temperature increases are projected to occur during all seasons, with the greatest increases projected in summer.

Projected changes in Pacific Northwest precipitation are more variable among models, but generally suggest no substantial change in the average annual amount of precipitation from the variability experienced during the 20th century. Most of the models project decreases in summer precipitation, increases in winter, and little change in the annual mean. In many cases, changes in the frequency and magnitude of extreme events (such as droughts and severe fires) will have the most significant and long-lasting consequences for land and resource management and success of restoration.

3.3 Hydrology

This section describes the movement, distribution, supply, and quality of fresh water and the potential effects of the alternatives on channel form and function and water quality.

3.3.1 Affected Environment

The planning area encompasses a large, diverse geographic area and includes the 3,840 square mile Coeur d'Alene Lake Basin (Basin) and the 230 square mile portion of the Hangman Creek watershed on the Coeur d'Alene Reservation. The principle waterbodies in this area are the South Fork Coeur d'Alene River (South Fork), North Fork Coeur d'Alene River (North Fork), mainstem Coeur d'Alene River and its associated lateral lakes and wetlands, Coeur d'Alene Lake, the St. Joe and St. Maries rivers, portions of the upper Hangman Creek watershed, and the upper Spokane River extending from the outlet of Coeur d'Alene Lake to the Idaho-Washington state line. The upper Spokane River watershed includes the geographic area known as the Rathdrum Prairie. The Rathdrum Prairie contains several streams that are not considered as a high priority for restoration due to lack of surface connection to the remainder of the restoration planning area; however, the Rathdrum Prairie includes several wetlands and lakes that are considered as potential restoration sites.

Natural runoff and peak discharge in streams and rivers of the planning area generally occur from April to June during annual snowmelt. Typically, annual spring snowmelt run-off floods tend to be relatively gradual, with low-flow velocities maintained over prolonged time intervals. A large portion of the planning area is located in the rain-on-snow zone, and is susceptible to winter rain-on-snow events that result in rapid snowmelt, producing an abrupt increase over the usual low winter base flows in many streams and rivers in the planning area. Winter rain-on-snow floods are very erosive because they occur when the lake level is down, creating an erosive hydraulic energy differential between the upper river and the lake (Bookstrom 1999).

The Post Falls Dam, located on the Spokane River near the city of Post Falls, Idaho, exerts a major influence on rivers and streams in the lower basin. From December to June of most years, the gates of the dam are open, and the river flows naturally from the outlet of Coeur d'Alene Lake. During the remainder of the year, the dam is closed to maintain water levels in Coeur d'Alene Lake. As a result, there is little current in the river between Mission Flats and the Lake (Berenbrock and Tranmer 2008). Backwater conditions also exist on the St. Joe River up to the town of St. Joe City, Idaho, the lower nine miles of the St. Maries River, and the uppermost eight miles of the Spokane River. Periodically, backwater conditions also occur naturally when run-off events exceed the hydrologic capacity of the Coeur d'Alene Lake outlet.

3.3.1.1 Rivers and Streams

Overview

Channel form and function in the planning area are largely determined by underlying geology, position in the drainage, gradient, valley width, and floodplain characteristics. Following are the primary channel types in the planning area.

Headwater channels are streams arising at the upper parts of planning area watersheds. These are generally 1st to 3rd order streams, characterized by steep stream gradients (over 4 percent), flowing through V-shaped valleys constrained by hillslopes, with narrow floodplains. These are typically streams with boulder-bedrock control. They tend to have step pools, high sediment transport potential, and a relatively low ability to store sediment within the stream channel. These are classified as Rosgen-type A channels (Rosgen 1996).

Transport or transitional channels represent a transition between headwater systems and depositional channels below, occurring at noticeable breaks in valley gradient and width. Where they occur, they are typically classified as Rosgen-type B, tending towards Rosgen-type C when positioned lower in their respective drainages. Reaches in these systems alternate between transport and depositional systems. These channel segments are characterized by wider valleys with more developed floodplains as compared to headwater systems. Width-to-depth ratios are higher than in the upper basin and lower channel gradients allow the deposition of medium to coarse sediments (e.g., gravels and cobbles). Large woody debris plays an important role in channel form and function. Without the natural armoring of the bed and banks that characterizes the headwater streams, streambank and riparian vegetation plays a greater role in maintaining channel dimensions. Likewise, because these channels have higher width-to-depth ratios as compared to the headwaters, they tend to be warmer because they absorb more solar radiation. Streambank and riparian vegetation is therefore an important source of shade as well as habitat.

Mainstem and receiving channels occur lower in the planning area where valleys widen to permit the development of wide alluvial floodplains and broad, widely meandering mainstem channels (primarily Rosgen C and F) with extensive, frequently flooded zones adjacent to the channel. The Coeur d'Alene and St. Joe rivers are the primary examples. These systems display a mix of erosional and depositional characteristics. During the summer, low-velocity conditions from operations at the Post Falls Dam facilitate sediment deposition. During high and over-bank flows, these in-channel sediment deposits are transported to and deposited on wide alluvial floodplains.

The fine sediments in these lower gradient channels make the riverbanks and floodplains susceptible to erosion from both natural hydrologic processes and structural failures. However, riverbank and floodplain vegetation, where present, reinforces sensitive bank soils, and moderates channel migration by reducing streambank erosion, as well as provides habitat for aquatic species.

Current Conditions

Following are summaries of current conditions and function in the primary channels in the planning area.

South Fork Coeur d'Alene River

The South Fork of the Coeur d'Alene River (South Fork) originates near Lookout Pass along the Idaho-Montana border and joins the North Fork Coeur d'Alene River near Enaville, forming the main stem of the Coeur d'Alene River.

As stated in chapter 1, over a century of mining and mineral-processing activities in the Coeur d'Alene Mining District has heavily degraded water quality within the South Fork Coeur d'Alene River. More than 130 million tons of lead, zinc, and silver-sulfide ores were mined from the Coeur d'Alene Mining District (Long 1998). Large quantities of metals-rich tailings were placed directly into and along streams and subsequently transported downstream (Long 1998). Disposal of tailings into streams ceased in 1968, but metals-enriched streambed sediments and abandoned tailings continue to degrade water quality (Clark and Mebane 2014). Metals and sediment are the primary pollutants resulting from mining. Sediment is listed as a pollutant for several stream segments and has many sources including mine-waste piles, development, transportation networks, and mining facilities. Metals and sediment has caused impairment of beneficial uses such as cold water use and is evident in the low diversity and abundance of macroinvertebrates and fish. Although concentrations of metals throughout the South Fork have shown significant decreases since the early 1990s in response to cleanup activities, the rate of decrease has slowed considerably since 2003, especially downstream of Kellogg, Idaho (Clark and Mebane 2014). Currently, the Environmental Protection Agency is conducting cleanup actions within the East Fork of Ninemile Creek, a major source area for metals and sediment, and plans to upgrade and expand a water treatment facility near Kellogg, which may result in additional water quality improvements.

Many channels in the upper South Fork watershed have historically been affected by both natural disturbance (such as the fires of 1910) and human-caused activities (like logging and road building). Historic mining has most profoundly affected channel form and function in many areas of the watershed, and in particular, within Ninemile, Canyon Creek, Pine Creek, and the mainstem South Fork Coeur d'Alene River. Early mining era operations widened valley bottoms and dumped millions of tons of tailings into channels. Changes in valley and channel morphology and the addition of large quantities of sediments resulted in widespread aggradation downstream of mines, oftentimes overwhelming the natural transport capacity of channels. Heavy-metal concentrations in tailings and sediments created phytotoxic conditions on streambanks and floodplains, inhibiting the growth of the vegetation that normally contributes to aquatic habitat and channel stability.

At the town of Wallace, the South Fork valley widens and the channel gradient is reduced. However, within this floodplain, the river is largely constrained by Interstate 90, an abandoned railroad bed (now the Trail of the Coeur d'Alenes), and hardened (rip-rapped) banks within the residential areas (in Silverton and Kellogg) prior to its junction with the North Fork at Enaville. Although remediation work in the basin has resulted in measurable increases in water quality (Clark and Mebane 2014), in some areas these activities have affected channel form and function. For example, near the town of Smelterville, the entire South Fork river channel has been relocated and heavily riprapped to accommodate large mine-waste repositories. Several tributaries to the South Fork have also been channelized and hardened by the placement of repositories (for example, Big Creek) or to eliminate potential channel migration into areas where mine waste contaminants have been removed (such as Grouse and Little Pine Creeks).

A number of tributaries to the South Fork were not affected by mine waste contaminants as extensively as the remainder of the watershed (Placer, Big, Montgomery, and Bear Creeks). However, habitat and species populations in these tributaries have been affected by historic land uses and natural disturbance and may possess elevated levels of fine sediments, increased water temperatures, and reductions in the abundance and quality of pools (IDEQ 2002).

North Fork Coeur d'Alene River

The North Fork Coeur d'Alene River drains a mountainous area of approximately 895 square miles. The North Fork has several large tributaries including the Little North Fork Coeur d'Alene River, and Steamboat, Pritchard, Beaver, Shoshone, and Tepee Creeks. The North Fork contributes about four times as much flow to the mainstem as the South Fork.

Channel morphology in the headwaters of the North Fork are similar to those described above for other headwater streams in the planning area; however, due to watershed size and topographic differences, the upper North Fork watershed contains a more extensive network of substantial, lower-gradient tributaries (less than 4 percent) flowing through wide valleys with developed floodplains (notably Teepee, Beaver, and Pritchard Creeks).

Channels throughout the North Fork watershed have been affected by a long history of timber harvest and wildfire. Initially, flumes, splash dams, and log drives were used to transport trees from the hillside to the mill (Strong and Webb 1970). Since streams and rivers were the primary route to transport timber, the channels, associated floodplains, and riparian areas were severely impacted. In particular, natural log-jams and woody debris, large boulders, and sharp channel bends were removed to facilitate these activities, resulting in straighter, less complex channels. Later, log transport shifted to roads, creating a network of thousands of miles of roads over the next 50 years. The direct and indirect effects of extensive timber harvest and the road network associated with it continue to affect water quality, and channel morphology and function today (Perkins 2007, USFS 2012). Water quality assessments in the North Fork Coeur d'Alene River subbasin have revealed water quality impairments to coldwater aquatic life and salmonid spawning due to sediment, temperature, habitat alterations, and metals (cadmium, copper, lead, nickel and zinc). Most of the assessed streams in the subbasin are considered water quality impaired by one or more pollutants (Stromberg et al. 2013).

Although mining impacts in the North Fork were limited compared to the South Fork watershed, several large placer and underground mining operations occurred in the Prichard, Eagle, and Beaver Creek watersheds, substantially affecting valley and channel morphology. Tailings from these mines have resulted in metals contamination within portions of the North Fork. Cadmium, lead, and zinc exceeded water quality standards and guidelines in Prichard and Eagle Creeks (IDEQ 2001). These metals also exceeded standards in Beaver Creek.

Sediment modeling has been conducted for the North Fork and results demonstrate that the majority of the watershed has sedimentation rates at or above 100 percent background sedimentation rates (IDEQ 2001). Sedimentation rates at this level indicate water quality impairment and current pool volume support the impairment determination. The exception is in portions of the upper North Fork, which have fewer transportation networks. Furthermore, pool volume and fish population data from streams of the upper North Fork indicate full support of the cold water and salmonid spawning uses (IDEQ 2001).

High levels of recreation use along the lower 22 miles, combined with residential land use practices such as clearing and mowing, have resulted in loss of streambank vegetation and subsequent riverbank erosion (Brown et al. 2011).

Coeur d'Alene River

The mainstem Coeur d'Alene River is formed at the confluence of the North and South Forks and flows 36 miles to its mouth at Lake Coeur d'Alene near Harrison, Idaho. The river is connected by surface and subsurface flows to an extensive series of lateral lakes and wetlands on adjacent floodplains between Mission Flats and Harrison.

From the confluence, the river is braided with a bed composed primarily of gravels and cobbles. Near Cataldo, the gradient drops and the river transitions to a low-gradient, meandering channel bound by low alluvial terraces, which are laden with mine waste (Bookstrom et al. 2004). The river valley is 1 to 2 miles wide and the surrounding land is primarily used for agriculture and recreation.

The Cataldo area also marks the upstream extent of influence from Post Falls Dam. In this area, the river is transport-limited and responds to excess sediment loads by widening, depositing bars, or forming multiple channels. Riverbanks in this area are subject to destabilization due to a complex array of interrelated factors. The banks, which are composed primarily of fine sediments, are highly erodible. The establishment of bank-stabilizing vegetation is hindered by both contaminated sediments as well as the pronounced effects of dam operations, which extend the period of time banks and floodplains are inundated with water through most of the growing season. Human influences such as boat-wake erosion and livestock grazing further preclude the establishment of bank-stabilizing vegetation. During high-flow events, exposed banks erode at a high rate (NPPC 2005). In response, various agencies have armored over 28 percent of riverbanks along the lower Coeur d'Alene River (KSSWCCD and IDEQ 2010). By 2015, another 4.3 miles had been stabilized using riprap or riprap in combination with instream barbs. It is known that currently, at least 19 miles of riverbank (or approximately 35% of banks downstream of Cataldo) have been stabilized via hardening methods (Vanderiet 2016).

As the river approaches Coeur d'Alene Lake, numerous wetlands and lakes are located on the wide floodplain, connected by surface and subsurface flows. During floods, large portions of the floodplain are inundated with several large splay areas evident, but the flow of floodwater is complex and varies by location (CH2M Hill 2010).

Water quality within the Coeur d'Alene River from the confluence with the South Fork downstream to its mouth at Coeur d'Alene Lake has also been heavily degraded from upstream mining operations. Cadmium, lead, and zinc concentrations regularly exceed water quality standards within the Coeur d'Alene River (Clark and Mebane 2014). Elevated water temperatures are also a water quality concern resulting from a lack of riparian vegetation and backwater effects from Post Falls Dam. Several tributaries to the Coeur d'Alene River, including Fourth of July, Latour, Fortier, and Rose Creeks, also have elevated temperatures (IDEQ 2011).

St. Joe River

The St. Joe River originates in the St. Joe Mountains on the Idaho-Montana border and flows west into the southern end of Coeur d'Alene Lake. It is the largest tributary to Coeur d'Alene Lake, with over 739 miles of tributary streams, including 78 principle tributaries to the main river (NPPC 2001). In 1987, 66.3 miles of the St. Joe River upstream from Avery were designated under the Wild and Scenic Rivers Act of 1968 (as amended). The upper 26.6 miles were designated as wild, and 39.7 miles from Avery to Spruce Tree Campground were designated as scenic.

The headwater channels of the upper St. Joe River and its upper tributaries originate in valleys that are U-shaped due to the effects of alpine glaciation, permitting the development of relatively unconstrained headwater channels that flow across vegetated floodplains. These channels are primarily low-gradient Rosgen-B channels. Abundant large woody debris from adjacent forested hillslopes provides roughness, disrupts flow, helps create pools, and traps and sorts sediment. Stream channel and riparian processes in the upper St. Joe River and its tributaries have been affected by historic wildfire and mining. In particular, in-channel mining in the headwaters of the St. Joe River in the 1930s substantially affected morphology in several channels in the upper St. Joe watershed. However, compared to conditions elsewhere in the subbasin and the restoration planning area, this area has been minimally altered by human actions.

Tributaries entering the St. Joe downstream from Simmons Creek are likewise predominately Rosgen-B channels, but are higher gradient systems, draining steeper, narrow valleys constrained by hillslopes.

These tributaries are generally bound by boulder and bedrock substrates. Low width-to-depth ratios and dense riparian cover help maintain cool stream temperatures. Channel bed features such as steps, boulders, and large woody debris are an important structural element throughout these channels; however, unlike conditions in the upper St. Joe, many of these systems have been affected by past management actions such as removal of in-stream large woody debris during the 1970s, riparian timber harvest, and the construction of streamside road systems which has interrupted the supply of instream large woody debris (L. Hawdon, USFS, pers. comm. 11-12-2015).

The mainstem St. Joe River is primarily a Rosgen C channel throughout its length, with the exception of reaches constrained by canyon walls (Tumbledown and Skookum Canyons), where it assumes the characteristics of a Rosgen B channel. The main river widens progressively as the river flows westward towards the city of St. Maries. The upstream influence of the Post Falls Dam occurs near the town of St. Joe City, Idaho where the river transitions from a Rosgen C to a low-gradient Rosgen F channel, meandering through a broad floodplain. Here, backwatering during the growing season followed by a pronounced drawdown inhibit the growth of bank-stabilizing vegetation. Riparian and riverbank vegetation have also been affected by land uses such as livestock grazing, road and railroad construction, and recreational and residential development. Without vegetation, fine-textured soils in the lower river and floodplain are highly erodible, and large sections of riverbank have been destabilized by boat wake as well as structural failure. In response, a variety of entities has armored riverbanks in the lower reaches of the St. Joe. In 2004, 12 percent of riverbanks along the lower St. Joe were armored, primarily with rock (Dawson et al. 2004). Since then, this figure has probably substantially increased. By 2004, approximately 21 miles of riverbank (approximately 66% of banks) along the St River from St Maries to St Joe City had been hardened (Nelson 2016).

In its lower reaches, the river flows through a series of lateral lakes (Benewah, Round, Chatcolet, and Hidden lakes) that are connected to Coeur d'Alene Lake throughout most of the year due to operations at the Post Falls Dam.

The St. Joe River was not subjected to large-scale mining operations, but mineral extraction, primarily placer mining, has occurred at some sites throughout the watershed. Minor grazing impacts occurred in the watershed in the past, but is now restricted to the lower river valley. Some watersheds within the subbasin have sustained appreciable timber harvest; Mica, Marble, and Fishhook Creeks, in particular, were logged heavily in the past (IDEQ 2003b). Logging companies initially used the waterways as the log transport system and a system of log flumes, splash dams, and log drives was used to move logs to downstream mills. Clearcutting also occurred in some areas. Despite large-scale timber harvest, impacts from old road systems and logging are not widespread (IDEQ 2003b).

Primary water quality concerns within the St. Joe subbasin include sediment, temperature, nutrients, bacteria, and dissolved oxygen (IDEQ 2003b). The sediment in the subbasin is primarily from road encroachment and crossings as a result of the extensive transportation network. Elevated stream temperatures are a result of degraded riparian conditions, which reduce shading. Temperature data indicates that all streams assessed exceed at least one of the temperature standards for beneficial uses. Nutrients and bacteria come mainly from livestock, while dissolved oxygen is also affected by discharge of oxygen-demanding materials, which originate from livestock waste. Despite these water quality concerns, the St. Joe subbasin water quality data indicate most streams are able to fully support cold water beneficial uses, with the exception of several tributaries within Marble Creek (IDEQ 2003b).

St. Maries River

The St. Maries River is the largest tributary to the St. Joe River and originates in the Clearwater Mountains, near the Shoshone-Clearwater County border in Idaho. Topography in the watershed tends to be more rounded, and with less relief, than the remainder of the Coeur d'Alene Basin. Headwater channels in the St. Maries watershed primarily flow through narrow valleys and are primarily high-gradient, hillslope constrained Rosgen A and B channels with narrow floodplains and low width-to-depth ratios, and are armored by boulder-bedrock beds and banks (IDEQ 2003a).

After the junction of the west and middle forks of the river, the mainstem assumes a Rosgen C-channel morphology and meanders down a low gradient, wide valley. As the river approaches the town of St. Maries, it transitions to a Rosgen F, meandering through a wide floodplain with lateral wetlands. Fine grained sand and silts are the predominant particle size in this lower reach (IDEQ 2003a).

The prevalence of banks composed of fine-grained sediments increases their susceptibility to erosion. Sensitive streambanks combined with historic land uses that have reduced the abundance of bank-stabilizing riverbank vegetation have contributed to wide channels and large width-to-depth ratios in the lower watershed, resulting in warmer stream temperatures. Other land uses (such as timber harvest, grazing, placer recovery of garnets and gold, residential development) have impaired water quality. Streams in the subbasin are impaired by sediment, temperature, habitat alteration, nutrients, bacteria, and dissolved oxygen. The lower 9 miles of the St. Maries River is also subject to the backwater effect from the Post Falls Dam.

Other land uses (timber harvest, grazing, placer recovery of garnets and gold, residential development) have impaired water quality. Water quality concerns are primarily sediment, temperature, nutrients, bacteria, and dissolved oxygen. Sources of these impairments are generally the same as the St. Joe River discussed above. Within the St. Maries watershed, impairment of cold water aquatic life has upstream to downstream gradient, which generally indicates full support of aquatic life in the headwaters, but not in the downstream reaches of both the tributaries and the mainstem (IDEQ 2003a).

Spokane River

The Spokane River forms at the outlet of Coeur d'Alene Lake, flows a short distance before passing over the Post Falls Dam, and then crosses the Washington-Idaho state line, which forms the western boundary of the planning area. Flow in the Spokane River depends on dam operations at Post Falls and snowmelt at higher elevations.

The reach of the Spokane River from the mouth of the lake to the Post Falls Dam is the most heavily developed in the planning area. The low gradient channel is lined with riverfront homes and is heavily used during the summer by recreational boaters. Armored riverbanks are common in this area. Below Post Falls Dam to the Idaho-Washington border, the river bed is rocky with cobble and boulders. Channel characteristics consist of unembedded boulder substrate, stable banks and direct connections with the Spokane Valley Aquifer (NPPC 2004). This reach is lacking in fine sediment due to the interception of smaller sediments by Coeur d'Alene Lake and the Post Falls Dam (City of Spokane Valley 2010). This stretch of the river has much less development than the reach above Post Falls Dam. Impaired water quality conditions (increased levels of nutrients, temperature, and metals) experienced in Coeur d'Alene Lake also influence downstream conditions in the Spokane River (NPPC 2001).

Hangman Creek

Hangman Creek is a tributary to the Spokane River. It originates near Sanders, entering Washington at the town of Tekoa, and flows into the Spokane River in Spokane, Washington. Only the portion of Hangman Creek watershed that is located in the Coeur d'Alene Reservation is included in the planning area. This incorporates 320 square miles acres of the upper Hangman Creek watershed, and includes the upper 21.7 miles of mainstem Hangman Creek as well as tributaries that include Rose, and Rock Little Hangman, Moctilimne (a tributary of Little Hangman), Mission, Lolo, Tensed, Sheep, Smith, Mineral, Nehchen, Indian and North Fork Rock Creeks.

Limited stream flow data are available for upper Hangman Creek. Natural rain-on-snow events combined with the effects of historic land management practices such as tiling, grazing, road-building, widespread removal of vegetation, and reduced water storage (caused by widespread wetland conversion), have resulting in a flashy hydrologic cycle in upper Hangman Creek and throughout the watershed (WADOE 2008 and 2011).

Channel morphology in the planning area is strongly influenced by underlying geology. In the upper watershed, channel morphology is controlled by bedrock, and channels are predominately narrow, steep, constrained by hillslopes, and tend to exhibit a step-pool morphology (typically Rosgen A and B types) (Kinkead and Firehammer 2011). The lower reaches of tributaries and mainstem Hangman Creek flow through the Palouse geological segment, where streambanks and adjacent hillslopes are composed of easily erodible material. Correspondingly, in this area, land use practices that removed soil-stabilizing vegetation combined with a flashy hydrological cycle have resulted in the conversion of Rosgen C channels to deeply incised and poorly sinuous Rosgen F and G channel types (Kinkead and Firehammer 2011). Surveys conducted between 2004 and 2007 documented low abundance of large woody debris (an important habitat component) in mainstem Hangman Creek as well as lower reaches of tributaries Sheep and Mission Creeks.

Water quality has been impaired by agriculture, grazing, development, transportation networks, and timber harvest. Primary water quality concerns include sediment, temperature, and bacteria. Sediment has been determined to be in excessive quantities that has impaired cold water aquatic life. Elevated temperatures are a result of lack of shading. Although the source of bacteria is unknown, possible sources include livestock and septic systems. Lack of flow may also be a problem within the watershed, particularly in headwater reaches. Some streams may cease to flow for part of the summer and low flow increases bacteria concentrations and stream temperatures (IDEQ 2007).

3.3.1.2 Lakes and Wetlands

Overview

The dynamic and broad floodplains of the St. Joe and Coeur d'Alene rivers are occupied by a complex array of stream and river channels, floodplain ponds created by annual scour, and riparian and wetland habitats, all of which may be connected seasonally or permanently to the Coeur d'Alene Lake or other system lakes. Numerous other streams and lakes in the planning are associated with wetland systems, including the St. Maries River, and tributaries to Coeur d'Alene Lake (such as Lake Creek), Hangman Creek, and Hayden and Hauser lakes on the Rathdrum Prairie.

The wetlands in the planning area are characterized by diverse moisture regimes and include: seasonally flooded systems where surface water is present for extended periods but absent later in the growing season; semi-permanent wetlands, where surface water persists throughout the growing season in most years and saturation of soils persists after the water table drops; and, permanently flooded wetlands where water covers the land surface throughout the year. Within these categories, wetlands are further characterized by their association with the lakes and rivers of the planning area, water depths, and unique vegetation communities associated with them.

Current Conditions

Following is an overview of the most prominent lakes and wetlands systems in the restoration planning area that represent the highest priority for restoration under Alternatives 2 and 3 (that is, Lake and Wetland Priority Tiers 1-3), or are considered for restoration of lost cultural services unique to the Coeur d'Alene Tribe (such as in the Hangman Creek watershed).

Coeur d'Alene Lake

Coeur d'Alene Lake is the largest lake in the planning area and the second-largest lake entirely in Idaho. The 150-mile perimeter of this naturally fed lake includes four hydrologically connected shallow lakes (Chatcolet, Round, Hidden, and Benewah lakes) on its southern end. Together, these function as a single waterbody. Ninety percent of the inflow to Coeur d'Alene Lake is delivered by the Coeur d'Alene and St. Joe rivers (Woods and Beckwith 1997) and the lake serves as the base elevation for the principle streams and rivers in the planning area. Coeur d'Alene Lake outflows to the Spokane River. Water levels in the lake are seasonally controlled by Post Falls Dam. Depending on dam levels, the lake complex covers an area of approximately 30,000 to 32,000 acres.

Coeur d'Alene Lake and its related resources have suffered significant injury to sediments, surface water, and aquatic biota, due to contaminated sediments and water from mine wastes that continue to be transported/deposited from upstream sources. See Geology and Soils section 3.2.1 for details. These contaminants are transported downstream (especially during floods), are deposited in the bottom of Coeur d'Alene Lake, and flow into the Spokane River.

Other human activities around the basin, such as logging, farming, wastewater treatment and residential development contribute sediments and nutrients (phosphorous and nitrogen) into the lake, often as a result of natural events such as snow, rain, and floods. Most streams contributing flow to the lake have been listed as impaired by sediment, metals, or temperature (IDEQ 2011). Coeur d'Alene Lake regularly exceeds ambient water quality criteria for lead, zinc, and cadmium at various times and locations during the year, which suggests the lake is not fully protective of aquatic life. In low oxygen conditions, nutrients and metals in the lake interact in ways that could cause significant further injury to the lake and its related resources.

Physical features and ecological function of Coeur d'Alene Lake have also been significantly affected by altered lake levels and changes in the rate of annual recession (lowering) of water levels caused by operations at the Post Falls Dam. These effects are most apparent in the shallow southern portion of the lake and adjacent near-shore areas and in the lower reaches of the St. Joe River and Coeur d'Alene River. Here, an additional 13,500 acres of shallow water areas created during the summer by the dam warm sooner than deep-water areas, and significantly increase the overall volume of warm water in Coeur d'Alene Lake. Larger areas of the lake now violate regulatory criteria for temperature for longer periods throughout the year (Coeur d'Alene Tribe 2012). Large areas of shallow, open water created by the Post Falls Dam have contributed to the formation of larger wind-generated waves with greater energy acting over longer periods of time that erode Lake shorelines, riverbanks, and floodplains. Due to delayed recession, soils adjacent to the lake are saturated to a higher elevation for longer periods, profoundly altering near-shore and wetland plant communities and killing or preventing cottonwood trees and other soil-stabilizing vegetation from regenerating, thus allowing further erosion (Coeur d'Alene Tribe 2005).

The Chain Lakes and Adjacent Wetlands

Between Cataldo and Coeur d'Alene Lake, the Coeur d'Alene River meanders through a broad floodplain ranging from ¼ to 1¾ miles in width, and drains into Coeur d'Alene Lake at Harrison. Within the broad deltaic floodplain of the lower river lie a series of wetlands (with depths up to 5 feet) and lateral lakes (with depths exceeding 20 feet). The lateral lakes range in size from less than 85 acres to over 600 acres (Ridolfi 1993). The lake series includes Anderson, Black, Blue, Bull Run, Cave, Killarney, Medicine, Rose, Swan, Thompson, and Porter lakes. An extensive network of wetlands also lies in the floodplain, most prominently Thompson, Lane, and Campbell Marshes. Lakes and wetlands within the floodplain are hydrologically connected through surface and subsurface flows from the mainstem channel (Berenbrock and Tranmer 2008). Most of the lakes and wetlands are connected to the river by natural and manmade surface channels that have been deepened or widened by dredging in the past (IDFG 2014). These surface-connecting channels convey water to the river, and during higher river flows, may convey floodwater into the lakes and wetlands. During high river flows, many lakes and wetlands within the floodplain are regularly inundated, but the floodwater pathways are complex and vary by location. In some areas, backwater from Coeur d'Alene Lake contributes to overbank flows from the main channel, while other areas may be inundated with water from tributaries and localized groundwater increases behind the levees.

Surface waters and sediments in the floodplain lakes and wetlands of the lower Coeur d'Alene River and many of the Chain Lakes and surrounding wetlands contain concentrations of metals sufficient to injure the wildlife and aquatic biological resources dependent on those systems. The only wetlands and lateral lakes in the lower basin that do not receive frequent deposits of contaminated sediments (Lane Marsh and Black Rock Slough), but still may pose a threat to wildlife from past flood events, are those located south of the railroad embankment, which forms a semi-protective levee (Bookstrom et al. 2004), including. Additionally, remediation and restoration actions at the nearly 400-acre Schlepp Agriculture to Wetland Conversion Project have reduced concentrations of lead.

In addition to metals contamination, water quality in the Chain Lakes has been affected by sediment and nutrient loading from on-site sources and tributaries, resulting in increased aquatic plant growth and low dissolved oxygen concentrations, both of which decrease habitat quality (Peters and Vitale 1998). Many tributaries contributing flow to the Chain Lakes are impaired by temperature, sediment, and nutrients (Lillengreen et al. 1993 and 1996, IDEQ 2011).

Wetlands of Upper Hangman Creek

Historically, extensive riparian wetlands were present along upper Hangman Creek where valley width permitted the development of extensive floodplains. These floodplains were characterized by moist soil conditions associated with a high water table and regular flooding during peak flows (Green 2008). Agricultural development combined with other activities that caused channel down-cutting and lowered floodplain water tables have caused the loss of an estimated 21,417 acres (91 percent) of wetlands on the Coeur d'Alene Reservation, with the majority being in Hangman Creek (Coeur d'Alene Tribe 2007).

Other Lakes and Wetlands

The majority of restoration actions will likely occur within the lakes and wetlands of the lower Coeur d'Alene and St. Joe rivers and Coeur d'Alene Lake described above due to the strong connection to injured resources in those areas. However, restoration may also be conducted in wetlands and lakes that are not hydrologically connected by surface water to major drainages within the Coeur d'Alene Basin or are distant from injured areas. This may include wetlands and lowland lakes located within the Rathdrum Prairie, wetlands within the St. Maries River watershed, and more remote, high-elevation lakes within the surrounding mountains.

Wetlands within the St. Maries River watershed and Rathdrum Prairie are not contaminated by metals pollution, but may be degraded by other pollutants, or generally be in a degraded state. Rathdrum Prairie wetlands have been heavily impacted by residential development and agriculture. These wetlands primarily occur along the foothills of the surrounding mountains and are associated with lake margins such as Hauser, Twin, Chilco, and Hayden lakes. These wetlands range in size from less than 1 acre to nearly 250 acres and are primarily seasonally flooded wetlands. Within the St. Maries River watershed, wetlands are generally confined to the floodplain and function as riverine emergent wetlands that are semi-permanent or seasonally flooded. The majority of wetlands within the St. Maries River floodplain have been heavily impacted due to agricultural practices and other land practices.

Lakes in this "other" category range from large 3,900-acre Hayden Lake to small unnamed high-elevation lakes only a few acres in size. Lakes on the Rathdrum Prairie are not connected to Coeur d'Alene Basin river systems by surface water flow. Many of the low-elevation lakes within this priority category have been impacted by development and other land practices. Nutrients are the primary water quality concern for most of these lakes. While eutrophication of lakes (the enrichment of a lake by nutrients) is a natural process, surrounding land uses that result in excessive nutrient and sediment loading speed up the process. Nutrient sources include development along the lakeshore, agriculture, livestock, and land use along tributaries. Nutrient loading may reduce recreational use and cause illness as a result of algal blooms. For example, total phosphorous loads within Fernan Lake have greatly increased, resulting in blue-green algae blooms that generally occur during late summer and fall. Algae blooms have reduced water clarity and caused unsightly, thick, green algal mats along shorelines. In addition, some algal species identified in Fernan Lake produce toxins that are capable of causing illness and death to animals as well as illness to humans. These toxins may also affect fish and other aquatic life within the lake (IDEQ 2013).

3.3.2 Analysis of Effects – Hydrology

3.3.2.1 Spatial and Temporal Scale

The analysis of effects to hydrology looked at both short- and long-term effects of proposed restoration, both at the scale of the project site and beyond (where relevant). Short-term effects could occur over hours, days, or possibly weeks during the active construction phase, depending on project type. Short-term effects are primarily localized to the project construction area or a finite distance downstream. Long-term effects are the result of changes in stream channel and floodplain morphology and associated processes. Long-term effects could be at multiple spatial scales: project site, a reach of river or complex of wetlands, or across major portions of the planning area. Finally, the analysis compares the effect of each alternative on the rate, extent, and likelihood of recovery of injured water quality

3.3.2.2 Analysis Assumptions

Application of Design Features

Projects carried out under Alternatives 2 and 3 will incorporate the protect design features specified in section 2.2.4. Where a range of design features may be applied, the likely range of effects will be discussed in the analysis.

Concentrations of Mine Waste Contaminants

Concentrations of mine waste contaminants in surface waters within the planning area will gradually decrease due to natural attenuation and the effects of the Environmental Protection Agency's remedial actions over the life of the restoration plan (for the purpose of this analysis, estimated at 25 years), although it is not likely they will decrease below measurable amounts.

Climate Change

According to the Comprehensive Climate Change Evaluation Report (USFS 2010), project trends due to climate change in the Pacific Northwest (including northern Idaho) that are relative to hydrology and water quality include:

- Decreased spring snowpack
- Snowmelt occurring earlier in the spring
- Decreasing summer base flows

3.3.2.3 Alternative 1 – No Action

Direct and Indirect Effects

In this alternative, there would be no short-term direct effects to rivers, streams, and lakes because no work would be done.

Long term indirect effects may include a slower rate and less likelihood of recovery of the physical features that maintain stream channel and lakeshore function as well as water quality in rivers, streams, and lakes than under Alternatives 2 and 3, where extensive restoration is proposed. Under this alternative, many of the channel forming processes addressed in Alternative 2 and 3 would not be initiated, or would take many decades, if not centuries, to recover without restoration intervention.

Cumulative Effects

Because there would be no direct and indirect effects under this alternative to combine with the effects of other past, present, and future foreseeable actions, there would not be any cumulative effects.

3.3.2.4 Alternative 2 – Ecosystem Focus With Additional Human Use Considerations (Proposed Action)

Under Alternative 2, up to 10 percent of available restoration funds would be allocated to near-term expenditures for project and project components that specifically target restoration of human uses of natural resources. This would include restoring natural resources important to the Coeur d'Alene Tribe in the upper Hangman Creek watershed on the Coeur d'Alene Reservation.

Direct and Indirect Effects

Effects to Stream Channel Form and Function

The following long-term indirect effects to stream channels would be expected from the restoration approaches considered under Alternative 2.

- **Restoration of Balanced Rates of Sediment Transport and Deposition:** Projects that restore vegetative cover to channel margins reduce inputs of sediment. Restoration of site-appropriate channel geometry and system planform (shape of a river as viewed from above) contribute to a balance between sediment transport and deposition. The removal or replacement of undersized culverts and bridges with structures designed to pass expected flow volumes without constriction helps downstream routing of sediment and debris, eliminates excess sediment deposition at the structure inlet, and reduces channel-scouring high-velocity flows at the outlet. Alternative 2 proposes a range of sizes for instream structures, accommodating 50- to 100-year flows. Structures designed for the 100-year flow would pass debris over a wider range of flow volumes as well as reduce the likelihood of upstream deposition and downstream bed scour.

- **Restoration of Processes that Create and Maintain Diverse Bedforms Appropriate for the Setting:** Projects that restore physical features such as woody debris jams provide roughness elements that interact with hydraulic forces and sediment to maintain stable longitudinal profiles (shape and slope of a riverbed) while creating a diverse array of water depths and physical bed features such as step- and riffle-pool sequences, point-bars, and undercut banks.

- **Reconnection of Incised Channels to Floodplains:** Projects that elevate the base elevation of streambeds and restore connection to floodplains help restore key hydro-geomorphic processes including energy dissipation, routing of overland and side-channel flows, sediment storage, maintenance of seasonal and perennial wetlands, and extension of late-season base flow.

Effects to Water Quality

Equipment operating in and adjacent to aquatic habitats in lakes and streams may directly affect water quality. Soil disturbance during construction may temporarily increase turbidity. Construction activities that disturb soils or sediments contaminated by metals may also temporarily increase contaminant concentrations in adjacent surface waters. Releases of metals and sediment would likely be short term and highly localized due to the application of standard design features that prevent or reduce the duration or extent of releases (see section 2.2.4). Likewise, the release of soil or sediment into aquatic habitats following construction activities would be minimized by design features including post-construction stabilization of soils affected by construction, and appropriate restoration of affected plant communities.

The factors primarily responsible for reducing water quality and beneficial uses in the planning area are sediment, temperature, metals, and nutrients. Levels of dissolved oxygen also influence waters on the margins of planning area lakes and stratified portions of the impounded river reaches. The following indirect and long-term effects to the influence of these factors on water quality would be expected from restoration actions:

Sediment

- Projects that restore vegetation to riparian areas, wetlands, floodplains, streambanks, and lakeshores stabilize soils susceptible to movement, reducing or preventing inputs of fine sediments (including those upland sediment sources) that increase turbidity and sedimentation.
- Downstream transport of sediment, excessive turbidity, and sedimentation of aquatic habitats would be reduced by restoration techniques that restore the sediment-filtering and storage features of wetlands and stream channels (such as improving the extent and vegetation composition of wetlands, adding large woody debris to stream channels, restoring vegetation on channel margins and in floodplains, or reconnecting channels to floodplains).
- Some projects may result in longer-term releases of sediment while accomplishing restoration objectives. For example, removing long-established weirs, splash dams, or undersized culverts that have trapped sediment upstream may initiate head-cutting that erodes and releases long-accumulated bed materials until a stable longitudinal profile is re-established. These releases would primarily be associated with higher flow events and could potentially extend for several years depending on the amount of accumulated sediment.
- Projects that increase recreational use in or adjacent to aquatic and riparian habitats may increase sediment delivery if use patterns decrease soil-stabilizing vegetation.

Temperature

Projects that increase shade-producing vegetation help reduce water temperatures in aquatic habitats. Likewise, restoring channel geometry to forms that absorb less sunlight (for example, from shallow and wide to narrow and deep channels) or reconnecting channels to floodplains, which facilitates surface and groundwater exchange, also contributes to reducing water temperatures.

Nutrients

Human activities throughout uplands in the planning area (such as logging, farming, wastewater treatment, and residential development) release nutrients into the stream network. Restoration proposed under Alternative 2 would have the following effects on the release and transport of nutrients:

- Riparian buffers and wetland vegetation have been shown to be effective in controlling nonpoint source pollution by absorbing and storing excess water, nutrients, and other and pollutants that would otherwise flow into aquatic habitats, reducing water quality (USEPA 1995, USDA 1997, USEPA 2015b). Restoration projects that restore or enhance vegetation communities adjacent to aquatic habitats reduce the likelihood of nutrient inputs into aquatic habitats.
- Excess nutrients often bond to soil particles (Hawes and Smith 2005). The nutrient-loaded sediment contained in surface runoff then flows to the nearest waterbody and is deposited. Restoration actions described previously that reduce sediment inputs and increase sediment storage reduce the likelihood that nutrients will be introduced into aquatic systems.
- Alternative 2 also proposes a variety of unspecified future actions that could limit the input of nutrients into waters in the planning area based on the results of ongoing and future nutrient inventories, but these actions are not sufficiently developed to evaluate at this time.

Metals

Restoration projects that increase stability of riverbank and floodplain soils would reduce the potential for the introduction of metals into the water column from contaminated beds, banks, and floodplains.

Dissolved Oxygen

Low levels of dissolved oxygen are pervasive along the southern portions of Coeur d'Alene Lake, lower portions of the St. Joe and Coeur d'Alene rivers, and portions of the Chain Lakes. A variety of interrelated factors are responsible for low levels of dissolved oxygen including increases in stream and lake temperatures caused by dam operations and other factors, reduction of streamflow velocity by operations at Post Falls Dam, high concentrations of nutrients, and decomposition of extensive aquatic macrophyte beds. Restoration actions previously discussed that reduce inputs of nutrients and temperatures in aquatic habitats contribute to increases in concentrations of dissolved oxygen.

Recovery of Water Quality towards Baseline

Alternative 2 differs from Alternative 1 and Alternative 3 in terms of the rate, extent, and likelihood of recovery of water quality to baseline (Note: the physical form and function of stream channels and other aquatic habitats were not designated as "injured" during the Natural Resource Damage Assessment process although these features contribute to the recovery of injured water quality).

Alternative 2 includes a variety of actions that address the delivery and transport of pollutants or restoration of properly functioning stream channels, increasing the likelihood of recovery and the potential rate of change under Alterative 2 faster than no action. Also, up to 10 percent of available restoration funds would be allocated to projects or project components intended to restore human uses of natural resources in the near term while ecosystem restoration proceeds. As a result, the extent and likelihood of recovery of water resources under Alternative 2 could be up to 10 percent less than under Alternative 3. However, unlike Alternative 3, Alternative 2 includes the Hangman Creek watershed. As a result, Alternative 2 would affect hydrology and water quality in the Hangman Creek watershed whereas Alternative 3 would not.

The extent of water quality recovery can be evaluated at various scales ranging from measurable changes in pollutants at the local scale, reach scale, or beyond, extending to the scale of the planning area. It is important to note that the Hangman watershed and Rathdrum Prairie systems have no surface hydrologic connection to the remainder of the planning area. Thus, water quality changes in and the Coeur d'Alene Lake Basin are independent.

Although the approaches proposed in Alternative 2 would positively contribute to water quality at the local project scale or downstream reach scale (for example, by reducing sediment inputs from eroding banks or reducing solar radiation), effects to water quality would likely not be measurable beyond the reach scale. Exceptions might include the grouping of a large number of projects in a single subwatershed where collective improvements may produce measurable improvements at the downstream extent of that watershed, or, if restoration eliminates an extremely significant point source contributor.

Important drivers affecting water quality at the scale of the planning area include widespread watershed land uses (such as extensive residential development, point sources of pollution, or the effects of Post Falls Dam) that are beyond the scope of Alternative 2 to directly or indirectly address. Likewise, the continued availability, transport, and delivery of contaminants will continue, irrespective of restoration carried out under Alternative 2, until natural processes and the results of remediation combine to produce measurable improvements. As a result, improvements in indicators such as water temperature, dissolved oxygen, and concentrations of nutrients and metals as a result Alternative 2 would likely not be measurable in the downstream receiving waters of the planning area (such as the lower Coeur d'Alene and St. Joe rivers and Coeur d'Alene Lake).

Cumulative Effects

The temporal scope of the cumulative effects analysis for hydrology is approximately 15 years, as described in section 3.1.

Spatial and Temporal Scope

The broad geographic scope of the cumulative effects analysis for hydrology is the boundary of the restoration planning area, although for some elements, cumulative effects may only be measurable and meaningful at a small spatial scale. Several areas within the planning area are functionally isolated from one another. For example, the St. Joe/St. Maries River system flows independently from the Coeur d'Alene system into Coeur d'Alene Lake. The upper Hangman Creek watershed drains into the Spokane River below the remainder of the planning area and below several dams and two natural migration barriers, and is thus functionally isolated.

Wetlands and streams in the Rathdrum Prairie do not have surface connection to waters elsewhere in the planning area. As a result, there is no mechanism for effects from actions in each of the separate regions of the planning area to combine with effects from elsewhere to contribute to cumulative effects. Thus, the cumulative effects to hydrology and water quality described in this section should be considered as limited to the separate watersheds where the effects occur.

Effects of Past and Present Actions

The effects of past and present actions on hydrology (including channel and lake form and function) and water quality are evident in the existing conditions today. Therefore, they are described in the existing condition description of the "Affected Environment" section.

Effects of Reasonably Foreseeable Actions

Reasonable foreseeable actions are described in Appendix 2. Among this group of actions, activity types particularly relevant to hydrology and water quality include actions that affect:

- Rate and amounts of inputs of sediment, nutrients, metals, and other pollutants.
- Vegetation, especially riparian and aquatic vegetation affecting the stability and function of streambanks and lakeshores; stream temperature; inputs of sediments and nutrients; and chemical processes related to the decay of aquatic vegetation.
- Hardening or other influences to channel processes such as migration and the form and function of natural riverbanks and lakeshores.
- Construction and management of transportation networks including placement or maintenance of structures such as culverts and bridges.

Potential Cumulative Effects

The short-term effects of actions considered under Alternative 2 could contribute to cumulative effects to water quality and to the form and function of aquatic systems if actions are clustered together within too small an area and in too brief a time period (spatial and temporal "crowding"), resulting in an overlap of effects. There is little likelihood that the short-term impacts of restoration actions proposed under Alternative 2 could combine with similar effects of other actions to create cumulative effects. The short-term effects of Alternative 2 associated with construction activities (increased turbidity and sedimentation due to construction-related activities) are expected to be short lived and highly localized, so there is little likelihood of overlap. Furthermore, Alternatives 2 and 3 include a provision wherein the Trustees would reduce the risk of additive effects by coordinating the timing and nature of ground-disturbing restoration projects with actions in the vicinity of the project being carried out by others. This coordination would also minimize the need for disturbing an area more than once.

The majority of restoration actions that address the physical form and function of stream channels would produce effects that are long lasting, but impacts would be highly localized and would not contribute to a cumulative effect.

The restoration actions proposed in Alternative 2 are specifically designed to improve water quality, including reducing sediment and nutrient inputs, filtering and trapping entrained sediment, and protecting or reducing stream temperature. Projects that restore vegetation to streambanks and lakeshores contribute to long-term reductions in pollutants and water temperatures. As such, the projects considered in Alternative 2 have the potential to contribute to a net cumulative improvement in water quality in the locations in which they are constructed as well as in downstream areas. The likelihood of measurable cumulative effects throughout the planning area is uncertain. Where numerous projects are clustered in smaller subwatersheds (6^{th}-code level), combined with the restorative and remediation efforts of others, measurable cumulative improvements in water quality may occur at the subwatershed scale. Likewise, restoration and remedial actions that remove a major point-source contributor of pollutants may produce a measurable impact. However, due to the magnitude of pervasive countervailing influences in the basin combined with limited resources of the restoration plan to address all problems, it is unlikely that cumulative effects of the actions in Alternative 2 would contribute to measurable cumulative effects in the furthest downstream receiving waterbodies in the in the planning area (such as at Coeur d'Alene Lake or in the Spokane River).

3.3.2.5 Alternative 3 – Ecosystems Focus

The following are the key differences between Alternative 2 and Alternative 3 relevant to hydrology:

- **Ecosystem Focus:** Under Alternative 3, 100 percent of restoration funds would be allocated to ecosystem restoration, in contrast to Alternative 2, which uses up to 10 percent of funds, or up to approximately $14 million, for projects or project components intended to restore human uses of injured natural resources in the near term (to potentially include measures such as recreation, and environmental education, or natural resources services important to the Coeur d'Alene Tribe). Thus, under Alternative 3, up to an additional $14 million (approximate) would be spent on ecosystem restoration, resulting in increased recovery of ecosystem processes.
- **No Human Uses Project Effects:** Because no near-term projects or project components would be specifically targeted under Alternative 3 to restore human uses, effects to hydrologic processes and water quality from these projects would not occur.
- **Geographic Area:** Under Alternative 3, restoration work would be carried out only in the Coeur d'Alene Lake Basin and the upper Spokane River. No work would be performed in the upper Hangman Creek watershed. Thus, there would be no effects, either beneficial or adverse, to stream channels, wetlands, or to water quality in the upper Hangman watershed.

Direct and Indirect Effects

The direct and indirect effects of Alternative 3 would be identical to Alternative 2 except that those effects would be restricted to the Coeur d'Alene Lake Basin as described above. No effects would occur in the upper Hangman Creek watershed

Under Alternative 3, no funds would be allocated to projects or project components intended to restore human uses of natural resources. Likewise, no funds would be allocated to restoring hydrologic processes, channel form and function, and water quality in the upper Hangman watershed. As a result, the magnitude of benefits to those elements would be greater in the

Coeur d'Alene Basin because all resources will be focused there. The magnitude of effects to aquatic species hydrology and water quality with greater spending on ecosystem restoration under Alternative 3 is difficult to predict. Because the amount represents 10 percent of available funds for restoration, it could be considered that the benefits of restoration to hydrologic processes and water quality under Alternative 3 could theoretically be up to 10 percent greater than Alternative 2.

Cumulative Effects

The mechanisms for cumulative effects described for Alternative 2 would be the same under Alternative 3; however, no cumulative effects would occur in the upper Hangman Creek watershed because no projects would be done there. Cumulative effects would be limited to the Coeur d'Alene Lake Basin.

3.4 Aquatic Species and Habitat

3.4.1 Affected Environment

Historically, native salmonids and a wide variety of other aquatic species were abundant throughout the lakes and streams of the planning area. Westslope cutthroat trout were the most widely distributed salmonid in the Coeur d'Alene Lake Basin. Open migratory corridors, both within and among tributary streams, larger rivers, and lake systems facilitated the expression of diverse life histories. Resident, fluvial, and adfluvial forms of westslope cutthroat trout were all historically present within the basin (Behnke and Wallace 1986). Bull trout were also historically widely but intermittently distributed throughout the basin (Fields 1935; Maclay 1940) but because historic data are lacking, it is unknown (other than adfluvial) which life histories were present. Neither westslope cutthroat nor bull trout were historically found in the Hangman watershed; rather, the stream supported resident and fluvial redband trout, steelhead and Chinook salmon. (WADOE 2008; A. Vitale 2015, pers. comm., 2 Sept.). Abundant trout populations throughout the planning area historically supported an important subsistence fishery for the Coeur d'Alene Tribe (Peters and Vitale 1998).

In addition to fishes, a variety of other aquatic species historically inhabited lotic and lentic habitats throughout the planning area, including macroinvertebrates, amphibians, and aquatic reptiles. Other aquatic species commonly present with ecological and cultural significance included crayfish, and freshwater mussel (Harper et al. 2002).

Primary effects to aquatic species and their habitats in the portions of the restoration planning area directly affected by mine waste contamination have been widely documented in Stratus 2000 (incorporated by reference) and are only briefly summarized here:

- Fishes and other aquatic species were substantially affected by elevated concentrations of metals, which are highly toxic to aquatic life, particularly in the South Fork and mainstem Coeur d'Alene rivers, and in tributaries to the South Fork such as Canyon and Ninemile Creek. In the 1930s, heavy metal concentrations (cadmium and zinc) were so high that little life existed in the South Fork Coeur d'Alene River downstream of Wallace (Ellis 1940).
- Concentrations of metals in the South Fork Coeur d'Alene River, Canyon Creek, and Ninemile Creek continue to exceed chronic and acute water quality criteria for the protection of aquatic life and are sufficient to cause behavioral abnormalities, reduced growth, and death of salmonids.
- High concentrations of trace metals in surface waters in combination with physical barriers such as tailings dams, waste dumps, and diversions blocked migratory corridors between habitats required by fishes to complete critical stages in their life cycle or to escape from contaminated waters into streams unaffected by mine waste to the extirpation of adfluvial bull trout in the Coeur d'Alene River basin by blocking migration routes between rearing habitat in Coeur d'Alene Lake and spawning habitats in tributaries of the Coeur d'Alene River.

- Physical habitat for fishes and other aquatic species was also substantially affected. Waste dumps and tailings placed in stream channels contributed to channel instability and intermittency in some stream reaches. Contaminated floodplain soils inhibited the recovery and growth of streambank and riparian vegetation, reducing stream shading, contributions of critical food web nutrients, and key habitat forming elements such as overhanging vegetative cover and down woody debris.

Aquatic species and habitat throughout the planning area were also historically affected by factors in addition to the release and deposition of mine waste contaminants. These factors continue to influence populations and habitat to the present day and include logging, road building, agriculture, residential development, the construction of the Post Falls Dam, and the introduction of nonnative species (NPPC 2005).

3.4.1.1 Current Conditions

The planning area currently provides habitat for 14 native and 19 non-native fish species (Appendix 3. Bull trout (listed as threatened under the Endangered Species Act) are present and the planning area contains 30 stream reaches or tributaries comprising 510 miles and 31,125 aces of lake surface area that have been designated by the U.S. Fish and Wildlife Service as critical habitat for the fish (USFWS 2010).

In addition to fishes, a variety of other aquatic species inhabit lotic and lentic habitats throughout the planning area. In addition to macroinvertebrates and mollusks, ten species of amphibians and two aquatic reptile inhabit the planning area (Beck et al 1998). The most widely distributed and abundant pond breeding amphibian is the long-toed salamander, followed by the spotted frog, Pacific treefrog, western toad, and the non-native bullfrog. The most widely distributed and abundant stream dwelling amphibian is the tailed frog, followed by the Idaho giant salamander. The Coeur d'Alene salamander is also widely dispersed in the planning area, and nearly half of the known locations for Coeur d'Alene salamanders are within the St. Joe and Coeur d'Alene River drainages (Cassier et al. 1994). Aquatic reptiles are represented by the native painted turtle and non-native red-eared slider. See Appendix 3 for a list of aquatic species present in the planning area, along with a summary of habitat associations, distribution in the basin, and special designations.

Following is a summary of current species distribution, abundance and habitat conditions in the planning area, grouped by geographic area, with an emphasis on the focal species of the analysis (westslope cutthroat and bull trout).

South Fork Coeur d'Alene River Watershed

Aquatic Species

The abundance and diversity of aquatic species in the South Fork Coeur d'Alene River and its tributaries reflect a complex history of natural disturbance (such as periodic floods and the fires of 1910) and human-caused influences such as timber harvest and the development of transportation infrastructure. Legacy effects from mining, in particular from contamination, continue to affect the distribution, abundance, and movement of westslope cutthroat trout as well as other aquatic species in streams where mine waste contamination was deposited.

Long-term water quality monitoring has shown concentrations of metals have decreased in streams throughout the Coeur d'Alene River system since the early 1990s although metals remain elevated (Clark and Mebane 2014). Beginning in 2006, surveys performed by Idaho Department of Fish and Game indicated that westslope cutthroat trout are currently widely distributed in the South Fork, suggesting improvements in water and habitat quality are allowing a modest recovery; however, observed densities of the fish were low and only two cutthroat over 12 inches were observed in 28 sampling transects along the entire South Fork (IDFG 2013). Long-term monitoring data collected for the Coeur d'Alene Basin Environmental Monitoring Plan continues to show overall aquatic species richness is reduced in the metals-affected areas of the South Fork, and sculpins (a species particularly sensitive to metals) are still largely absent (CH2M-Hill and URS Corp. 2001; USFWS 2007 and 2015). Furthermore, metals concentrations within tissues of cutthroat and benthic macroinvertebrates collected in the South Fork continue to be elevated and are significantly higher compared to reference samples collected in the North Fork Coeur d'Alene River (USFWS 2007 and 2015). Water quality due to mine waste continues to preclude the return of fishes to affected reaches of Canyon and Ninemile Creeks.

Within the South Fork Coeur d'Alene River watershed, channels upstream from areas influenced by mine waste contamination support populations of native cutthroat trout (South Fork from Mullan; upper Ninemile and East Fork Ninemile Creeks; upper Canyon Creek above Burke). Likewise, numerous tributaries to the South Fork provide habitat for westslope cutthroat trout, as well as nonnative brook trout. These include Placer, Big, and Pine Creeks and several small drainages such as Grouse and Meyer Creeks. However, the ability of these fishes to support the recovery of populations in areas affected by mine waste is likely limited by water quality and physical barriers related to mine waste contamination and barriers due to transportation infrastructure.

Habitat

The quality of the aquatic and riparian habitat along many of the upper basin streams where mining activities have occurred remains severely degraded. Surveys conducted by the U.S. Fish and Wildlife Service in 2005 (USFWS 2006) on mining-impacted streams in the South Fork watershed noted:

- The abundance of streambank and floodplain shrubs and trees were greatly reduced in streams where mining activities occurred, resulting in low to zero percent canopy cover and overhanging vegetation, resulting in poor shading of the water column as well as the capacity to contribute nutrients to aquatic food webs; and
- Affected channels were characterized by a lack of undercut banks (undercut banks require healthy vegetation communities to create and maintain) and lack of down woody debris (a primary habitat-forming element in mountain streams).

Surveys by the Idaho Department of Environmental Quality also noted low residual pool volumes in the South Fork watershed due to mine waste and sediment from other sources (IDEQ 2002).

Improvements in water and habitat quality within the East Fork of Ninemile Creek are expected following ongoing work by the Environmental Protection Agency to remove mine waste from the stream channel and riparian areas, following the planting of streambank and riparian vegetation.

The South Fork Coeur d'Alene River as well as the lower reaches of several tributaries have been confined and straightened by extensive highway and other transportation infrastructure and remedy-protection precluding the eventual formation of ecologically important vegetated floodplains and banks. Much of the river lacks structure such as large wood to scour pools and provide the complex cover required by native salmonids. Lack of structure also reduces the capacity of these systems to trap sediment, enabling the future colonization of ecologically important cottonwoods and willows (IDFG 2013).

North Fork Coeur d'Alene River Watershed

Aquatic Species

Most waters of the North Fork Coeur d'Alene watershed were not subject to release or deposits of mine waste contamination (exceptions described below). Although the North Fork system has been adversely affected by a long history of forest management and other influences (Strong and Webb 1970, IDEQ 2001, Perkins 2007), aquatic habitat and species populations there are closer to reference conditions than elsewhere in the Coeur d'Alene River subbasin (Stratus 2000, NPPC 2004). As a result, the North Fork system represents a stronghold for westslope cutthroat trout and other native species due to the relative abundance, presence of diverse life histories, greater presence of open migratory corridors, and amount of intact habitat relative to elsewhere in the Coeur d'Alene River basin.

The most widespread species in the North Fork is the westslope cutthroat trout. Resident, fluvial, and adfluvial life histories are present although adfluvial fish represent only a tiny fraction of the population (DuPont et al. 2008). Long-term monitoring by Idaho Department of Fish and Game indicate that cutthroat trout densities have increased since 1973 and the watershed now supports what is considered to be one of Idaho's premier trout fisheries (IDFG 2013). The presence of migratory forms of cutthroat trout in the North Fork system are important to the return and recovery of populations in injured areas. Because migratory populations of fish are more likely to stray between streams than resident populations (Horowitz 1978, Rieman and MacIntyre 1993), the migratory trout in the North Fork would likely provide the colonists to support the recovery of populations in the South Fork as conditions there improve.

Nonnative rainbow trout and brook trout are present in the system, particularly in the river reaches and tributaries below Prichard Creek. Although the potential for hybridization with rainbow trout is often considered a threat to the persistence of native cutthroat trout (Allendorf and Leary 1998, Muhlfeld 2009), where both rainbow trout and hybrid trout are common in the lower North Fork system, genetics assessments by Idaho Department of Fish and Game indicate that the cutthroat trout population in the drainage as a whole shows little introgression (IDFG 2013). Brook trout are commonly considered a threat to the persistence of westslope cutthroat trout (Fausch 1988, 1989, Behnke 1992, McIntyre and Rieman 1993); however, currently brook trout are neither abundant nor widely distributed in the North Fork watershed (IDFG 2013).

Historically, the North Fork supported populations of bull trout (MaClay 1940). Bull trout were sporadically documented up to 1998 between the South Fork Coeur d'Alene River and Teepee Creek (Apperson et al. 1988; Ed Lider, USFS, pers. comm. 2001 in USFWS 2002), the fish is considered to have been functionally extirpated from within the North Fork system due to habitat conditions related to the water quality effects of land management (such as timber harvest and road building) combined with the effects of mine waste contamination along the adfluvial migration route to Coeur d'Alene Lake. Portions of the North Fork system have thus been designated as critical habitat for bull trout (USFWS 2010), and the watershed is considered as a potential site for reintroduction and recovery of the fish by the U.S. Fish and Wildlife Service.

Habitat

Although the North Fork Coeur d'Alene River system represents a stronghold for native westslope cutthroat trout, the following have been identified as factors contributing to adverse effects to aquatic habitat and fish populations in the watershed:

- High stream temperatures combined with lack of coldwater refugia habitats such as floodplains and side channels);
- Road crossings and culverts blocking organism passage;
- Sedimentation from high road densities, stream crossings, and other features;
- Habitat alteration due to removal of riparian and streambank vegetation; and
- High recreation pressure, particularly along the lower North Fork Coeur d'Alene River.

Additionally, although the North Fork experienced limited release and deposition of mine waste contaminants relative to the South Fork, placer and hardrock mining in the Prichard and Beaver Creek drainages flowing into the North Fork Coeur d'Alene River released heavy metals and resulted in miles of streambed and floodplain being turned over by dredging operations. Adult cutthroat trout abundance in Prichard Creek is thought to be limited due to subsurface flows resulting from dredge deposits and elevated concentrations of heavy metals (DuPont et al. 2008).

Coeur d'Alene River

Aquatic Species

Currently, the mainstem Coeur d'Alene River contains a diverse community of fishes, reflecting seasonal influences and the diverse aquatic habitat conditions provided by the complex network of wetland and lake habitats adjacent to the river in the lower section.

Fish communities in the Coeur d'Alene River are structured by changes in flow patterns, stream temperature, metals contamination, migratory behavior, and inter-species interactions. The free-flowing section of river is generally composed of lotic-associated, cold-water species such as native westslope cutthroat trout and whitefish; and nonnative rainbow and brook trout, and kokanee and chinook salmon (DuPont et al. 2008). The backwatered segment is dominated by nonnative cyprinid and centrarchid fishes, including brown bullhead, black crappie, bluegill, pumpkinseed largemouth bass, and smallmouth bass. Northern pike are also present (Gidley et al. 2012). Fish species composition and abundance also varies seasonally due to spawning (such as upstream spawning migration of chinook salmon from Coeur d'Alene lake to free-flowing sections of the river and its tributaries) and temperature (for example, coldwater species such as whitefish may be found in the lower river during periods of cooler water temperatures while during the same time, warmwater species may seek higher temperatures in the adjacent Chain Lakes (Gidley et al. 2012).

The Coeur d'Alene River system once supported a healthy adfluvial cutthroat trout population (Stratus 2000) and a widely distributed population of bull trout (Maclay 1940). Adult bull trout and cutthroat trout in the Coeur d'Alene subbasin historically migrated from the Lake Coeur d'Alene up through the mainstem to spawning areas in tributaries, while juveniles migrated downstream to the lake to grow and mature (Parametrix 2003). In 1932, following the release of mine waste contaminants into the South Fork system upstream, only two live fish were found in the mainstem Coeur d'Alene River from its mouth to the confluence of the North and South Forks (Ellis 1940).

Decades later, following ongoing remediation work upstream combined with natural attenuation, water quality has improved to the point where there is now a thriving westslope cutthroat trout fishery in the free-flowing section of the Coeur d'Alene River, with surveys showing high densities of cutthroat trout (Fredericks et al. 2002, DuPont 2008). Face drainages such as French Gulch, Skeel Gulch, and Latour Creek support migratory trout populations in the lower river (NPPC 2005). However, water quality conditions related to metals and flooding by Post Falls Dam continues to limit use of the mainstem by fluvial trout originating in the North Fork system (DuPont et al. 2008).

The mainstem Coeur d'Alene River no longer supports bull trout. Incidental occurrences have been reported (two bull trout were reportedly caught by anglers in Black Lake in 1998 (Jim Fredericks, IDFG, pers. comm, 1998 in USFWS 2002), but the fish is considered to have been functionally extirpated from the Coeur d'Alene River (USFWS 1998, USFWS 2002).

Habitat

Concentrations of dissolved metals in the water column have been reduced since the early 1990s, but few improvements have been made since 2003, and natural river function and habitat for native cutthroat in the Coeur d'Alene River have been and continue to be altered by a variety of other factors. Flooding of the lower river by the Post Falls Dam has substantially altered hydrologic function and formation of key habitats for native biological communities of the lower Coeur d'Alene River. Riverbanks along the lower river are in poor condition due to the presence of contaminated sediments and other land uses that preclude the establishment of the natural vegetative communities that support aquatic food webs, provide habitat essential to all life stages of native trout, and provide shade that moderates stream temperatures. The widespread placement of rock to stabilize eroding banks further precludes the eventual development of vegetated riverbanks.

An exception to generally poor riverbank habitat in the Coeur d'Alene River has been noted in the free-flowing segment between the South Fork and the Cataldo Mission boat ramp. This reach of river provides cool water during the summer; it has more pools and deeper water than anywhere in the watershed, it has the widest and most undisturbed floodplains with the lowest gradient, and the warmest winter temperatures making it ideal overwinter habitat (DuPont et al. 2008)

Lateral Lakes and Wetlands

Within the broad deltaic floodplain of the lower Coeur d'Alene River lies a series of lateral lakes connected to extensive wetlands. The depth and extent of the lakes and wetlands are dependent on annual flooding as a result of overbank flows in the Coeur d'Alene River and operations of the Post Falls Dam (Berenbrock and Tramner 2008). The entire floodplain, including all wetlands and lakes, has a deep sediment layer contaminated by metals. The only wetlands and lateral lakes in the lower basin that do not receive frequent deposits of contaminated sediments are those located south of the historic railroad embankment (now Trail of the Coeur d'Alenes), which forms a protective levee (Bookstrom et al. 2004). Much of the area is part of the State of Idaho's Coeur d'Alene River Wildlife Management Area and Idaho Department of Fish and Game actively controls water levels in many of the habitats to maximize benefits for consumptive fish and wildlife and recreation resources (IDFG 2014).

The fish species community in the lateral lakes and adjacent wetlands are dominated by nonnative, warm-water species, including smallmouth and largemouth bass, black crappie, bluegill yellow perch, pumpkinseed, and northern pike. Mobile species move among the interconnected lakes, wetlands, and river seasonally, depending on water depth and temperature. Even in the summer months, the wetlands may be occupied by fish, including bullhead, tench, and juvenile centracrchid fishes (T. Kiser, USFWS, pers. comm. 9-11-2015). Idaho Department of Fish and Game has designated the lateral lakes as a warmwater fishery. Blue and Anderson Lakes are managed for trophy and quality bass, respectively, while the remainder of the lakes are maintained for year-round consumptive fisheries on warmwater species.

Surveys conducted by Bauer (1975) for the Idaho Department of Fish and Game documented westslope cutthroat trout were present in tributaries that drain into the lakes, including the following: Thompson Creek (tributary to Thompson Lake); Blue Lake Creek (tributary to Blue Lake); Fortier Creek (tributary to Cave Lake); Evans Creek (tributary to Medicine Lake); Robinson, Canary, and Clark Creeks (combine to flow into Medicine Lake via a drainage ditch); and Rose Lake Creek (tributary to mainstem Coeur d'Alene River but empties into Rose Lake via a slough during high water). Adfluvial fish were reported in Willow, Evans, and Clark Creeks, which are tributaries to the interconnected Medicine and Cave lakes. Apperson et al. (1988) reported that Evans Creek had among the highest densities of resident cutthroat trout in the Coeur d'Alene River drainage.

Bull trout are not currently present in the Chain Lakes and associated wetlands although in 1998, anglers caught two adult bull trout in Black Lake (Jim Fredericks, IDFG, pers. comm, 1998 *in* USFWS 2002).

In addition to fishes, the wetlands and lakes of the area support several amphibians and two species of turtles.

The abundance of fishes in the lateral lakes and wetlands (albeit primarily nonnatives) suggests that mine waste contaminants are not limiting nonnative fish abundance. Recent investigations by the U.S. Fish and Wildlife Service as part of the Coeur d'Alene Basin Environmental Monitoring Plan has shown fish in these areas are exposed to and accumulate significant amounts of metals, likely through both aqueous and dietary pathways. However, it is unclear to what degree metals exposure and accumulation is limiting fish abundance within the lateral lakes and wetlands (USFWS 2016). High summer temperatures and habitat changes due to the influence of Post Falls Dam combined with the abundance of competitive and predatory nonnative fishes substantially limits these areas as potential habitat for native westslope cutthroat trout. Adfluvial trout migrating out from natal habitats in tributary streams must pass through the extensive shallow vegetated sloughs and vegetated margins of the lateral lakes that are occupied by pike and other predatory species in order to reach deeper-water rearing habitats in the lateral lakes or, potentially, Coeur d'Alene Lake. Northern pike have been shown to consume substantial numbers of cutthroat trout in the Coeur d'Alene Basin via predation (Rich 1992, Walrath et al. 2015). Other non-native species may affect populations of westslope cutthroat trout and/or bull trout through competition or predation.

Coeur d'Alene Lake

Aquatic Species

Historically, Coeur d'Alene Lake played a key role in the life histories of native adfluvial salmonids in the basin. Westslope cutthroat and bull trout spawned and reared in upstream rivers and streams in the Coeur d'Alene and St. Joe River Basins, and then migrated to the lake to rear, feed, and grow. Abundant native fisheries supported the Coeur d'Alene Tribe, which relied heavily on the Lake and its tributaries for subsistence fisheries. Trout from the Lake also served as a major source of protein to early settlers and miners and were commonly sold in local markets (Stratus 2000).

Bull trout were historically abundant in the Coeur d'Alene Lake subbasin but little information exists describing the historic fishery in detail. Adfluvial, fluvial, and possibly resident life histories were present within the area (Jeppson 1960; Mallet 1969; Rankel 1971; Mauser 1972). Large adfluvial bull trout were described as abundant in the lake and provided an extremely important subsistence fishery to the Tribe (Walker 1977). Bull trout, estimated to weigh as much as 20+ pounds, were caught from canoes in winter and early spring (Scott 1968).

Adfluvial westslope cutthroat and bull trout populations migrating between the Coeur d'Alene River system and the lake were largely eliminated with the decline in water quality associated with hard-rock mining in the South Fork Coeur d'Alene drainage (Ellis 1940). At the same time, other land uses throughout the Coeur d'Alene and St. Joe rivers as well as in direct tributaries to the lake, including cumulative impacts from dams, land management practices, and transportation networks reduced the abundance, availability, and quality of spawning, rearing, and migratory habitats. The migratory life histories of these fishes rendered them more susceptible to population declines than resident forms because migratory behaviors exposed them to a wider variety of stressors resulting from degraded habitat conditions across larger geographic areas.

Currently, Coeur d'Alene Lake is occupied by 24 fish species (10 of which are native) (Chip Corsi, IDFG, pers. comm. 9-6-2016). The fish community is composed of a diverse mixture of warm, cool, and coldwater species occupying both nearshore and pelagic habitats. Lake margins also provide habitat for amphibians and aquatic reptiles.

Native fish species include bull trout, westslope cutthroat, and mountain whitefish, but these native populations have been largely replaced with nonnative fishes that provide a regionally popular sport-fishery, primarily for kokanee and Chinook salmon. Popular nonnative nearshore fisheries include largemouth and smallmouth bass, yellow perch, black crappie, bullhead species, and northern pike. Both the State and Tribe have fisheries management programs. The State of Idaho manages the fishery with an emphasis on native fish conservation, while providing a diversity of harvest fishing opportunity focused on non-native species. The Tribe has a strong emphasis on management that promotes conservation and recovery of adfluvial westslope cutthroat trout and other native species within the lake. The presence of nonnative and predatory fish (such as northern pike) have affected the abundance and survival of adfluvial cutthroat trout. For example, Rich (1992) reported that migratory westslope cutthroat trout comprised up to 45 percent of the biomass of dietary items of northern pike in the Coeur d'Alene Lake system. More recently, dietary analyses indicate that northern pike may annually consume approximately 50% of adult cutthroat trout in localized areas (Walrath et al. 2015). These rates of predation likely explain the low rates of adult return (i.e., < 2%) that have been reported for juvenile cutthroat trout that out migrate to Coeur d'Alene Lake.

Bull trout are still present in the lake but in extremely low abundance compared to historical population levels. Currently, the lake provides migratory, feeding, and overwintering habitat for bull trout spawning in the upper portions of the St. Joe River and several tributaries. Bull trout have also sporadically been documented in lake-face Wolf Lodge Creek (Jim Fredericks, IDFG, pers. comm. 2011a) and Fighting and Wolf Lodge Creeks (NPPC 2005). These fish were likely exhibiting straying behavior and seeking foraging habitat and/or coldwater refugia. Coeur d'Alene Lake is a central component of the Coeur d'Alene Lake Basin core area identified by the Bull Trout Recovery Plan (USFWS 2015). This core area includes the Spokane River from Post Falls Dam to Coeur d'Alene Lake, the lake itself, and the entire lake drainage area. Within the core area, a total of 510.5 miles of stream and 31,152 acres of lakes are designated as critical habitat (USFWS 2010).

Habitat

Coeur d'Alene Lake provides a variety of habitat types for aquatic species, including relatively shallow, vegetated lake margins (including littoral and limnetic zones), steep, rocky shorelines where few aquatic plants exist, and open water (pelagic) areas. Habitat conditions for aquatic species in the lake (particularly the focal species of the plan, westslope cutthroat and bull trout) have been shaped, and continue to be shaped, by the effects of over a century of land uses in its surrounding watershed as well current influences within the lake.

The primary habitat factors affecting the long-term viability and recovery of adfluvial westslope cutthroat and bull trout populations within the lake include backwater and associated conditions from Post Falls Dam and degraded water quality. At times, the backwater effects from Post Falls Dam create conditions unfavorable for migration of juvenile salmonids entering the lake. The backwater slows river velocity, increases temperatures, decreases dissolved oxygen, and creates habitat conditions favorable to nonnative predators. Elevated water temperatures within the upper 32 feet of the lake's water column exceed the optimum range for westslope cutthroat during summer months (Peters and Vitale 1998) as well as bull trout (who are highly sensitive to temperature and are particularly intolerant of temperatures above 15º C (Fraley and Shepard 1989). The southern portion of the lake and migratory corridors within the lower portions of the St. Joe and Coeur d'Alene rivers have low dissolved oxygen concentrations, which may constrain suitable habitat. Excess nutrients may change the trophic condition of the lake, cause algal blooms, deplete oxygen in the benthic zone, and cause the release of metals from sediments.

The extent of the impact of metals as a limiting factor on aquatic communities in Coeur d'Alene Lake is unclear however injuries to benthic macroinvertebrates and zinc inhibition to phytoplankton productivity has been documented (Stratus 2008). Information on metals exposure to fish and benthic macroinvertebrates within the lake is very limited, especially on the bioavailability of sediment-bound metals to benthic fauna. Differences in benthic macroinvertebrate communities have been observed between the more metals-contaminated northern portion and the less contaminated southern portion below the Coeur d'Alene River (URS Greiner and CH2MHILL 2001). Laboratory studies have confirmed zinc concentrations within the lake are sufficient to cause behavioral modifications among fishes, including avoidance, which may reduce their ability to use preferred habitats and inhibit migration. Laboratory toxicity thresholds for bull trout were compared to Coeur d'Alene Lake water quality data and provide a clear indication that metal concentrations exceed lethality thresholds for early life stages of bull trout (Stratus 2000). However, these early life stages would probably not be exposed under natural conditions because bull trout rear within upper basin streams. Widespread metals pollution within the lake does not appear to be a major limiting factor on either pelagic or littoral fisheries (Peters and Vitale 1998, USEPA 2001), but data are limited. However, metals accumulation within fish tissues has resulted in consumption advisories (IDHW 2003). A statewide mercury advisory is also in place for smallmouth and largemouth bass (DHW 2016). Consumption advisories due to elevated metals have diminished the capacity of the fishery to provide ecosystem services including subsistence and recreational consumption.

St. Joe/St. Maries River System

The St. Joe/St. Maries River system subbasin was not subjected to substantial mine waste contamination. The proposed action (Draft Restoration Plan) designated portions of the area as a Tier 2 Priority for aquatic restoration (watersheds and watershed complexes that provide spawning, rearing, and other essential habitat for threatened bull trout), or where restoration may support increasing population trends and expansion of bull trout within their historic range. Additionally, because adfluvial populations of westslope cutthroat and bull trout in the St. Joe/St. Maries system and the Coeur d'Alene system are not independent of each other (IDFG 2013), adfluvial fishes from the St. Joe/St. Maries system may eventually help support the recovery of adfluvial trout and bull trout populations reduced by mine waste contamination in the Coeur d'Alene River system.

Aquatic Species

Currently, the St. Joe/St. Maries subbasin is occupied by a mix of native and nonnative fish assemblages. Lower in the watershed, where stream gradients are reduced and warmer stream temperatures prevail, conditions favor nonnative, warmwater species, but native westslope cutthroat trout remain the most widespread and abundant species in the system. Resident, fluvial, and adfluvial cutthroat trout are present in both the St. Joe and St. Maries river systems.

Changes in fishing rules over the past four decades in combination with improving habitat has provided what is now one of Idaho's premier trout fisheries (IDFG 2013). In the St. Maries watershed, cutthroat populations are depressed in the mainstem, although most tributaries contain more robust populations. In other areas, non-native brook trout have displaced cutthroat trout from much of their historic habitats, (e.g., Alder Creek watershed) (Firehammer et al. 2013).

Bull trout were historically more widespread in both the St. Joe and St. Maries systems (Maclay 1940; Fields 1935). They are believed to be functionally extirpated from the St. Maries River system, although individual bull trout may occasionally and sporadically be found (Fredericks pers comm. 2011b). Currently, the upper St. Joe River watershed contains the only known local spawning populations of bull trout in the Coeur d'Alene Lake Basin core area.

Based on telemetry work, Idaho Department of Fish and Game (2013) reports that virtually all of the bull trout in the St. Joe River are adfluvial although the U.S. Fish and Wildlife Service (2002) reports that fluvial life forms are present. These fish spawn and rear almost entirely in headwater tributaries of the St. Joe River watershed (primarily Medicine, Wisdom, California, and the upper St. Joe River (L. Hawdon, USFS, pers comm. 8-17-2016), and then migrate the length of the St. Joe River to Coeur d'Alene Lake for adult rearing and overwintering habitat (USFWS 2002). Although the primary natal streams are the upper St. Joe streams mentioned above, bull trout may sporadically use many of the accessible areas of the St. Joe watershed during migration to Coeur d'Alene Lake.

Habitat

Although the St. Joe/St. Maries system serves as a native salmonid stronghold in the planning area due to the presence of bull trout (in the St. Joe) and diverse life histories of cutthroat trout, legacy effects from past and current land use continue to affect the abundance and distribution of native salmonids in the watershed. Previous timber harvest, the development of transportation infrastructure, agriculture, placer mining, livestock grazing, and recreational development in riparian areas and floodplains continue to affect habitat abundance and quality. The riverbank and floodplain vegetation on the lower St. Joe River has been particularly altered by widespread placement of riprap and residential and recreational development. Surveys along the lower St. Joe River indicated that recreational properties typically were altered habitats with little riparian vegetation present dominated by grass lawns leading up to the shoreline and overwater structures (docks) and boat houses common (Normandeau Associates 2012).

Barriers to up- and downstream passage for migratory fishes exist throughout the St. Joe and St. Maries systems. Road-crossing culverts create barriers to upstream migration of fishes and are sporadically distributed throughout the St. Joe/St. Maries system. Warmer waters also pose a physiological barrier to the migration of coldwater salmonid species. Unfavorably high temperatures in may create thermal barriers that limit or halt migrations. Such barriers may cause habitat fragmentation, disrupt migration patterns, and isolate smaller populations from the overall population (Sauter et al. 2001).

Changes in water quality and habitat conditions have affected the lower St. Joe River, which is an obligate migratory corridor for all adfluvial bull and westslope cutthroat trout moving between

Coeur d'Alene Lake and elsewhere in the watershed. Habitat and water quality associated with the effects of operations at Post Falls Dam has favored populations of nonnative predatory fishes such as bass and northern pike, increasing predation risk for bull and cutthroat trout migrating through the lower river corridor. Normandeau Associates (2012) did not document consumption of bull trout by northern pike in a portion of the lower St. Joe River, but studies elsewhere have documented that northern pike have consumed large numbers of migratory cutthroat elsewhere in the in the Coeur d'Alene system (Walrath et al. 2015, Rich 1992), indicating a potential threat exists.

The lower St. Joe River meanders across a wide alluvial valley and includes wetland and lake habitats. Intact marshes and wet meadows occur further upstream where they fill old meander scars and depressions in the valley bottom (IDFG 2005). Within the lower portions of the St. Joe subbasin several lakes are present including Chatcolet, Round, Benewah, Hidden, and Hepton lakes. Round and Chatcolet lakes are two shallow-water lakes that were created entirely by flooding from Post Falls Dam. These lakes are dry during the drawdown period and wetted at full pool. Benewah, Hidden, and portions of Chatcolet are three shallow southern chain lakes of the St. Joe River. These lakes were separated from the Coeur d'Alene Lake System until the completion of Post Falls Dam (Peters and Vitale 1998).

The majority of fish species within the lakes consist of nonnative species with yellow perch and largemouth being the most abundant. Large-scale suckers are the most abundant native species and few westslope cutthroat use the shallow portions of the lakes due to low dissolved oxygen and elevated water temperatures (Peters and Vitale 1998).

Extensive wetland complexes are present within the southern portion of Coeur d'Alene Lake, the marsh-dominated Round Lake, and the mouth and historic delta islands of the St. Joe River. The "River that flows through the Lakes" is a unique feature of the lower St. Joe River. Here the river flows between two natural levees that are surrounded by Benewah, Chatcolet, Round, Hidden, and Coeur d'Alene lakes.

Most of the wetlands along the lower St. Joe River have been converted to agricultural-related uses and the river is constrained by levees within many areas that were constructed to protect agricultural lands from flooding disrupting the natural hydrology.

The St. Maries River valley immediately upstream of the confluence with the St. Joe River is a wide wetland complex similar to the lower portions of the St. Joe floodplain. Where the St. Joe and St. Maries rivers meet, there has been extensive drainage for agriculture and impacts to historical wetlands from the urban development of the town of St. Maries. Backwater sloughs and oxbow ponds are present. Although the lower Saint Maries River has a levee system, the whole valley can flood during extreme flood events.

The fish communities associated with wetlands, backwater sloughs, and oxbows along the lower St. Joe and St. Maries rivers are dominated by nonnative warm water spiny-rayed species due to elevated water temperatures and low dissolved oxygen.

Spokane River

Aquatic Species

Prior to the construction of the Post Falls Dam in 1906, a 40 foot high natural falls blocked upstream fish passage of fish from the Spokane River to Lake Coeur d'Alene. The Post Falls Dams does not have a facility permitting upstream passage of fishes. Currently, the Spokane River above Post Falls Dam and the falls functions as an extension of Coeur d'Alene Lake, with the same species assemblages as described in the Coeur d'Alene Lake section above.

Downstream of the dam, riverine conditions exist for the remainder of the river reach in the planning area. During peak summer months, river temperatures in the river below the dam reflect the warmer surface temperatures on Coeur d'Alene Lake. Thus, westslope cutthroat trout as well as native redband, and rainbow and brown trout are present in very low abundance. Species more tolerant of higher summer temperatures that use higher gradient habitat, such as smallmouth bass and brown trout are present. Historical analysis documents high densities of rainbow trout through the 1980s (Bennett and Underwood 1988) and that bull trout were present at low densities in the upper Spokane River and individual bull trout may be sporadically present, originating from upstream in Coeur d'Alene Lake (NPPC 2004).

Habitat

The primary conditions affecting the abundance and survival of trout in the upper Spokane River are high water temperatures and low primary productivity (IDFG 2013). Residential development is prevalent and continues to increase throughout the river corridor.

Upper Hangman Creek Watershed

Upper Hangman Creek is a tributary to the Spokane River. It is not in the Coeur d'Alene Basin so fish species and habitat were not subject to release of mine waste contamination. The portion of Hangman Creek proposed for restoration consists of the reach that lies within the Coeur d'Alene Reservation boundary. The Hangman restoration area includes mainstem upper Hangman Creek and tributaries such as Mission, Sheep, and Indian Creeks.

The following sections describing current species and habitat conditions in the upper Hangmen Creek watershed are excerpted from Kinkead and Firehammer (2011), Peters et al. (2003), and Coeur d'Alene Tribe (2007).

Aquatic Species

Fish communities in the upper Hangman Creek drainage are a mix of native and nonnative species. Native species include redband trout (both fluvial and resident life forms are present; A. Vitale pers. comm9-22-2015), speckled dace, redside shiner, longnose sucker, northern pikeminnow, and sculpin. Nonnatives present include cutthroat trout (planted in the 1980s), rainbow trout (hatchery stocked), cutthroat-rainbow hybrids, fathead minnow, pumpkinseed, and tench.

The redband trout present in Hangman Creek are genetically distinct remnant populations and are primarily restricted to tributaries such as Indian, Mission, and Sheep Creeks as well as other tributaries east of the boundaries of the Reservation. Overall densities of redband trout are low across the upper Hangman watershed.

Habitat

Highest densities of redband trout have been found in forested reaches where habitat surveys indicated there is greater canopy cover, lower percentage of fines in riffles, and greater amounts of woody debris (as in Indian Creek and upper Sheep and Mission Creeks). Lower densities were associated with reaches where agriculture predominated, such as downriver reaches of Sheep and Mission Creeks and mainstem Hangman Creek. Forested reaches also maintained cooler summer water temperatures (likely due to the presence of canopy cover), making them more suitable for incubation and rearing than the agricultural reaches.

Kinkead and Firehammer (2011) also reported that "tributaries in the northern part of the Hangman Creek watershed that were heavily impacted by agriculture (Andrew Springs, Lolo, Tensed, and Rock Creeks) either lacked water during baseflow periods or displayed dissolved oxygen profiles that would be insufficient to support salmonids. Low flow (standing pools) and attendant low levels of dissolved oxygen were also documented repeatedly in monitored reaches of Mission, Sheep, and South Fork of Hangman subwatersheds. Furthermore, lower reaches of Nehchen Creek were repeatedly found to be intermittent during summer periods over the reporting period, and is considered critical given that large redband trout have been found to ascend this tributary during spring migratory periods and that they may be using lower reaches as spawning habitat."

3.4.2 Analysis of Effects – Aquatic Species and Habitat

3.4.2.1 Analysis Area

The analysis area for aquatic species and habitat is encompassed by the boundaries of the planning area illustrated in Figure 1 on page 13. The area includes isolated "sink" drainages on the Rathdrum Prairie such as Lewellen, Sage, and Lost Creeks. They are not connected to the Spokane-Coeur d'Alene system via surface flow, discharging instead directly into the Rathdrum Aquifer. As a result, there is no mechanism for aquatic habitat and species populations in these streams to contribute to, or be affected by, restoration and recovery of injured resources in the remainder of the planning area. Although restoration of lakes and wetlands may occur in the Rathdrum Prairie (benefitting migratory species such as waterfowl) disconnected streams in this area are considered a low priority for restoration.

3.4.2.2 Spatial and Temporal Scale

The impact analysis for aquatic habitat and species examines the effects of each programmatic alternative in both the short and long term based on the categories of foreseeable on-the-ground actions that would likely occur. Short-term effects to habitat and species could occur over hours, days, or possibly weeks during the active construction phase, depending on project type. Long-term effects are the result of changes in habitat-forming processes that occur from actions proposed in the alternatives. Short-term effects would primarily be localized to the project-construction area, while long-term effects could be at multiple spatial scales: a project site, a reach of river or complex of wetlands, or across major portions of the planning area.

In addition to short- and long-term effects, the analysis considers the effect of each alternative on recovery of injured aquatic habitats and species towards baseline conditions, which is defined as conditions that would exist without the presence of contaminants. The analysis compares the rate, extent, and likelihood of recovery to baseline conditions among the three alternatives considered.

3.4.2.3 Analysis Assumptions

Changing Climate

Climate change, as discussed in section 3.2.2, will continue to affect stream temperatures, run-off timing and amount, duration and extent of surface flow, and other factors that affect habitat for aquatic species.

Application of Design Features

Projects carried out under Alternatives 2 and 3 will incorporate the design features specified in section 2.2.4. Where a range of design features are recommended, the resultant effects will be discussed in the analysis.

Focal Species

The species analysis focuses on the potential effects the alternatives would have on native trout, and native amphibians. The species not specifically discussed would experience effects within the range of those presented. This is supportable because (1) the species not discussed occupy the same waters and habitats. In particular, westslope cutthroat trout have the widest distribution in the planning area; (2) the fish species discussed have migratory life histories, making them sensitive to management actions designed to affect migratory corridors; and (3) the species discussed, particularly bull trout and amphibians, are highly sensitive to changes in habitat quality and are considered indicators of ecosystem health. These species were further selected because they are sensitive bio-indicators of aquatic ecosystem health (Fraley and Shepard 1989, Hecnar and M'Closkey 1996, Adam et al. 2001).

3.4.2.4 Alternative 1 – No Action

Direct and Indirect Effects

There would be no effects in this alternative because no work would be done. Indirect effects over the longer term may include a slower rate and less likelihood of recovery of injured aquatic habitat and species populations to baseline than under Alternatives 2 and 3, where extensive restoration is proposed.

Rate of Recovery

The rate of recovery of many aquatic habitats and species in the planning area (and particularly in the Coeur d'Alene River Basin and downstream lake) is dependent on the rate and effectiveness of remediation and natural attenuation to reduce concentrations of metals, and achieve the eventual deposition of clean sediments throughout the basin. These processes are expected to take many decades. In addition to clean water, many aquatic species depend on specific habitat conditions to fulfill their life histories and successfully reestablish populations. Thus, the rate of recovery of aquatic species in the planning area would also be regulated by the rate at which key habitats recover.

Many of the vital habitats required for species recovery are created and maintained by vegetation. For example, vegetation provides shade and cools water temperatures, intercepts pollutants, maintains appropriate stream channel dimensions and regulates meander patterns, contributes to aquatic food webs, creates instream spawning and rearing habitat, and provides breeding habitat for amphibians.

Without active restoration to accelerate recovery of plant communities, aquatic habitats that are dependent on vegetation would recover more slowly than under Alternatives 2 and 3, which propose extensive vegetative restoration (see “Vegetation” section 3.6). In addition, direct habitat restoration to improve interim conditions while vegetative communities mature to full ecological function would not be performed (for example, placing habitat-forming large woody debris in stream channels within immature forests). As a result, under the no-action alternative, the rate of recovery of aquatic species that depend on these habitats would be substantially slower than under Alternatives 2 and 3.

Other conditions affecting the abundance and quality of aquatic habitats are also expected to recover at an extremely slow rate under the no-action alternative as compared with Alternatives 2 and 3. For example:

- In highly altered stream channels, or where channel incision has lowered ground water tables, reestablishment of appropriate channel geometry and planform, formation of ecologically important inset floodplains or natural aggradation to the level of historic floodplains may take many decades or centuries depending on site conditions;
- Natural processes may take decades to remove or eliminate the adverse influence of man-made features blocking channel migration, floodplain connection, and species movement corridors (such as perched culverts, historic road grades, tailings piles, berms, and levees).

Extent of Recovery

Under the no-action alternative, fewer habitats and species populations would return to or make progress towards baseline than under Alternatives 2 or 3, especially in contaminated areas. Even if concentrations of metals in contaminated areas are reduced due to remediation or natural attenuation, the abundance and diversity of aquatic species populations are unlikely to return to baseline without restoration intervention to restore important habitat processes and remove barriers. In particular, bull trout populations are not expected to recover in the Coeur d’Alene River system without the initial restoration that increases local populations in the St. Joe (where colonists will likely originate) or restores the abundance and quality of receiving habitats in the Coeur d’Alene System.

Likelihood of Recovery

As described previously, habitat-forming plant communities are not likely to recover to baseline without active restoration intervention. Where metals contamination is reduced sufficiently to support aquatic species, the likelihood of recovery to baseline populations in some areas without restoration intervention is low. For example, if migratory barriers are not removed among and between contaminated and non-contaminated habitats, there is a low likelihood that species would successfully migrate to and recolonize injured areas. Individual species such as western pearlshell mussel (*Margaterifera falcata*) would likely not recover without active restoration that restores not only processes that create the microhabitats they require, but also restores movement corridors for primary host fish (like cutthroat trout) upon which they depend to colonize new areas or repopulate historic habitats (Watters 1996, Vaughn et al. 2009).

Effects to Federally Listed Species

There would be no short-term direct or indirect effects to bull trout resulting from the no-action alternative because no work would be done. There would be no adverse impacts on listed species or their critical habitats under the no-action alternative, nor would there be any long-term, indirect beneficial impacts such as would occur under Alternatives 2 and 3.

Cumulative Effects

Under the no-action alternative, no work would be done that would contribute to cumulative effects.

3.4.2.5 Alternative 2 – Ecosystem Focus With Additional Human Use Considerations (Proposed Action)

Under Alternative 2, up to 10 percent of available restoration funds would be allocated to projects or project components intended to restore human uses of natural resources in the near term while ecosystem restoration proceeds. This would include restoring natural resources important to the Coeur d'Alene Tribe in the upper Hangman Creek watershed on the Coeur d'Alene Tribal reservation which is unique to this Alternative.

Direct and Indirect Effects

Short-term Effects

Equipment operating in and adjacent to aquatic habitats may directly affect soils on the margins of aquatic habitats, water quality, and aquatic and riparian plant communities. Wetland creation or enhancement projects in particular may require extensive excavation and soil disturbance. Adverse direct impacts may include temporary increases in erosion associated with soil disturbance and subsequent increases turbidity. These effects would likely be short term (hours or days, during construction) and highly localized due to the application of standard design features that prevent or reduce the duration or extent of sediment releases, require post-construction stabilization of soils affected by construction, and appropriate restoration of affected plant communities (see section 2.2.4). Federal, State, and Tribal laws and regulations pertaining to aquatic species and water quality, as well as applicable consultation and regulatory terms and conditions would be followed to limit or prevent adverse direct impacts to soils and water quality.

Projects in or adjacent to aquatic habitats, whether lakes, wetlands, or streams, would also likely result in direct disturbance to aquatic species. Construction activities may cause mobile species such as fishes to leave the project area but they are expected to return shortly after completion. Restoration projects in streams are not expected to directly affect spawning fish, eggs, or alevins because projects would include design features to avoid physical disturbance of redds and sedimentation of spawning beds, and would adhere to timing restrictions as determined for each project. Wetlands projects are not expected to affect amphibian breeding because these projects would be constructed during drier periods (late summer or fall), outside the spring breeding season. However, late summer or early fall ground-disturbing projects on floodplains and along wetland margins could adversely affect amphibians such as long-toed salamanders that are moving through these areas during annual migrations from aquatic to upland habitats.

Species movements may be directly affected by construction activities. Short-term blockages to movement would be associated with projects such as culvert replacements or other installations requiring dewatering or diversion during construction. However, projects that include installation of levees to block surface flow of contaminated waters, or placement of stream barriers to prevent upstream invasion by nonnative fishes, could result in immediate and long term changes to aquatic species movements and to the composition of species communities beyond the barrier.

Long-term Effects to Habitat

Actions that Alter Wetland Hydrology

This includes a variety of actions to manipulate soil moisture, water depths and hydroperiod as well as the creation of new wetlands (such as conversion of agricultural lands). Effects to habitat include:

- Increases in the abundance of wetlands and wetlands habitat with the conversion of dry habitats (like pastures) to wetland habitats;
- Increases in the surface area of existing wetlands and associated habitats;
- A shift in the range of the water depths present in a wetland or the duration of various depths from manipulating water levels (depending on the morphology of the shorelines).
- A shift in plant species composition and vegetative habitat structure based on tolerance to increased water depths or duration of saturation (for example, a shift from emergent to sub-emergent species, or elimination of species intolerant of long-term saturation).

Actions that Restore Channel Geometry

Actions to restore the appropriate geometry or shape of channels and remove mine waste materials may affect aquatic habitat in channels. Effects include:

- Changes in distribution, elevation, and duration of surface flow in channels and permanent or seasonal water levels in floodplain wetlands;

- Reconnection of channels to floodplains, restoring access to side channels and other floodplain refugia habitats during high flows;
- Narrowing of over-widened channels, reducing the proportion of shallow-water habitats such as riffles and increasing the abundance of deeper water habitats such as pools and glides; and
- Formation of a natural dynamic equilibrium between sediment transport and deposition, preventing excessive aggradation or erosion.

Actions that Create Roughness

Approaches that place or increase roughness in channels may profoundly affect the abundance and quality of aquatic habitat. Effects include:

- Reductions in velocities, resulting in the trapping and sorting of sediments including spawning gravel as well as fine organic material that contributes to aquatic food webs;
- Formation of pools from diverting flow against channel beds (scour pools) or creation of backwater dam pools; and
- Increases in habitat complexity and cover.

Removal or Replacement of Undersized Culverts and Bridges

Undersized stream crossing structures affect aquatic habitats both upstream and downstream. At high flows, the culvert creates a backwater, and excess bed material is deposited in the channel upstream. With receding flows, the bed and banks erode through or around the deposition. The result is either a chronically unstable channel bed or increased bank erosion (Saldi-Caromile et al. 2004).

Removal or replacement of undersized, channel-constricting stream crossing structures with properly sized stream crossing structures allows the re-formation and maintenance of appropriate channel dimensions and facilitates the downstream routing of ecologically important woody debris and sediment. Additionally, removing or replacing undersized structures lessens the risk that these they may become plugged with debris, resulting in diverted streamflow onto roads, washing out of a road prism, and excessive amounts of roadbed sediment flowing into aquatic habitats.

Because a range of design features would be applied to the removal or replacement of stream crossing structures in the proposed action, there would likely be a range of effects from proposed projects. Generally, the risks of physical failure and subsequent effects to channel form and habitat increase the more a structure constricts the channel and floodplain (WADFW 2003). Culverts and bridges sized to pass the 100-year return flow would likely function over a wider range of flow volumes, more effectively route habitat-forming woody debris, and pose less risk of flow constriction and downstream scour, upstream plugging, and failure than culverts sized to pass a 50-year flow standard (Furniss et al. 1997 and 2008; Tumeo and Pavlick 2011).

Actions that Restore Aquatic and Riparian Vegetative Communities

Projects that restore the abundance and diversity of aquatic and riparian vegetation communities adjacent to stream, wetland, or lake habitats would have a wide range of long-term effects on aquatic habitat, including:

- Protecting and improving water quality (see "Water Quality" section);
- Providing a source of habitat-forming large woody structure, increasing aquatic habitat complexity and cover, developing pools, and trapping and sorting spawning gravel;
- Protecting streambank and riparian soils, reducing flow- and wave-induced bank erosion on lakeshores and streambanks, and allowing the creation of stable undercut;
- Maintaining appropriate channel dimensions and regulating the migration of channels across floodplains;
- Supporting aquatic food webs by contributing organic matter and terrestrial insects;
- Providing key breeding, sheltering, and feeding habitats for aquatic invertebrates and amphibians along the margins of lakes, wetlands, and slow-moving streams; and
- Maintaining protected migration corridors for amphibians with a terrestrial life phase.

Projects that Restore Human Uses of Injured Natural Resources

Projects that increase human uses of streams and riparian areas may indirectly affect aquatic habitat abundance and quality in or adjacent to project areas by affecting plant abundance and diversity and soil stability. Alternative 2 includes design features designed to prevent or minimize the effects of increased recreational use of aquatic habitats; however, human uses of aquatic and riparian habitats in the planning area is expected to increase due to the provision of new recreational facilities, the enhancement of existing facilities, and the projected effects of climate change and population increases. Recommended design features may not adequately protect all aquatic habitats from the effects of increased access and recreation use.

Long-term Effects to Species

Restoration projects that manipulate habitat-forming processes as described above have the potential to affect the abundance, distribution, and composition of the aquatic species associated with those habitats. The following summarizes the primary long-term effects to native aquatic species from those habitat changes, with an emphasis on native trout and amphibians.

Changes in Species Abundance

Changes in habitat conditions would affect the abundance and distribution of species within the immediate area where projects are implemented. In the proposed action, geographic priorities for restoration are based on locations important for westslope and bull trout, so these species will likely be a primary beneficiary of the work. However, as described previously, westslope cutthroat trout have a wide distribution and occupy many of the same waters and habitats as other species, so projects that restore habitat-forming processes for native trout will likely benefit co-occurring organisms that are dependent on similar habitat types (such as nonnative salmonids).

Changing the abundance and distribution of species within the immediate area where projects are implemented is expected to result in eventual increases in the abundance of species in portions of the planning where restoration has not been conducted. The proposed action includes identifying, protecting, and enhancing existing population strongholds for native trout combined with the restoration of migratory corridors between and among these areas. The ecological outcome of implementing a coordinated strategy of habitat restoration that reconnects species strongholds is an increase in population abundance and distribution across a wider geographic area than merely a local project area. This approach is supported by island biogeography theory that suggests existing stronghold populations and the core habitat they depend on can become the source for maintaining and strengthening the abundance and distribution of future populations (MacArthur and Wilson 1967). Population size and stray rate also affect the likelihood of dispersal among salmonids. Large populations or high stray rates result in relatively more individuals seeking new habitats, creating self-sustaining spawning populations in other reaches of the same watershed or in entirely different watersheds (Pess et al. 2007). The presence of migratory forms of native trout in the planning area is important to the redistribution of fish across the planning area, including recovery of populations in contaminated areas. Because migratory populations of fish are more likely to stray between streams than resident populations (Horowitz 1978, Rieman and MacIntyre 1993), migratory westslope cutthroat trout would likely provide colonists that may reestablish populations in areas affected by metals when conditions there improve.

Projects in the upper Hangman watershed would provide benefits to redband trout similar to those described for cutthroat and bull trout elsewhere in the analysis. These projects would contribute to restoring a culturally important fishery for the Tribe but would not contribute to recovery of native trout or other aquatic species populations in the planning area because Hangman Creek drains outside of the hydrologic boundaries of the remainder of the planning area.

Changes in Species Assemblages

Restoration projects that alter the composition of habitats may likewise alter the species community composition and biotic interactions. For example:

- Changes in hydroperiods associated with wetland water level manipulations may change the composition of the species communities associated with those habitats. For example, changes from ephemeral to permanent hydroperiods may favor fish and disfavor amphibians (Shea and Chesson 2002).
- Removal of migration barriers could allow invasion by nonnative species not previously present (see below).
- Changes in habitat conditions could alter predator-prey relationships. For example, restoration of dense vegetation to low gradient streambanks could provide hiding areas for predators of native salmonids, such as northern pike (Muhlfeld et al. 2008); disturbance associated with wetlands construction may initially enhance conditions for predators of native amphibians such as bullfrogs (Shea and Chesson 2002).

Changes in Distribution

Projects that remove migratory barriers would alter the spatial distribution of species across the planning area. Creation of new wetlands or improving wetland conditions may facilitate fish distribution into these habitats. Open migratory pathways are essential to support the movement of organisms into areas where species were previously extirpated by metals contamination. Restoration of open migratory networks would also increase survival and abundance of native trout and other aquatic species when projects restore access to high quality habitats necessary for fulfill life histories or to access refugia. This includes opening both longitudinal migration corridors (upstream and downstream throughout drainage networks) and lateral corridors (to valuable side channel and floodplain habitats). The importance of lateral movements was particularly demonstrated by work in the North Fork Coeur d'Alene River by Dupont et al. (2008) and Stevens and Dupont (2011) that demonstrated that access to available cold-water floodplain habitats was a primary factor affecting the abundance of westslope cutthroat trout in the lower watershed.

Where removal of barriers involves the replacement of undersized or poorly design culverts, the effectiveness of projects in restoring migratory corridors for a full range of aquatic organisms or life stages, and the likelihood that that passage will be provided for aquatic organisms over the full range of flow conditions, depends on a variety of factors including the size of the crossing structure and the range of flow conditions the structure is designed to accommodate. In contrast to culverts designed to a minimum 50-year flood standard, culverts designed to a minimum 100-year flood standard will pass a wider range of flows without creating hydraulic conditions that affect organism passage (such as excessive velocity and turbulence within the structure, debris accumulations blocking passage through the inlet, and excessive constriction that leads to the formation of barrier-forming downstream scour pools and "perched" outlets) (Baker and Votapka 1990, Hendrickson et al. 2008, WADFW 2009).

Although restoring open movement corridors facilitates the full expression of migratory life histories of target species (native trout), removal of blockages could also allow nonnative aquatic species not previously present to invade new areas. Conversely, constructed barriers to movement could reduce the risk of invasion by nonnatives into habitats where they are not currently present, but reduce the ability of migratory life forms to express their life history.

Recovery of Populations toward Baseline

Alternative 2 differs from the no-action alternative in terms of the rate, extent, and likelihood of recovery of species populations to baseline.

Rate of Population Recovery

While full return of species populations in contaminated areas aeas is tied to the sufficient reduction in metals concentrations, restoration would improve vegetation and other habitat-forming conditions more quickly than with no action, accelerating the rate of return toward baseline abundance and distribution when water quality allows. Removal of migration barriers and restoration of migratory corridors would permit species to return more quickly to habitats formerly occupied before release of metals than with no action.

Even with restoration of habitats and removal of migratory barriers across the landscape, several decades may be required for recovery of baseline species community composition and diversity. Mobile species or species with migratory life histories (such as fluvial or adfluvial salmonids) are expected to reestablish populations in habitats more quickly than species not prone to dispersal or that are characterized by short movements (such as sculpin). Frogs with high juvenile dispersal rates or salamander species with terrestrial adults tend to disperse widely and quickly (Funk et al. 2005; Lanoo 2005) compared to species such as the Coeur d'Alene salamander, which is extremely territorial and secondary and may require many decades to pioneer new habitats (Mathis 1989).

Extent of Population Recovery

The extent of recovery can be measured in the number of populations recovered or the number of species restored to historic habitats and baseline abundance. Alternative 2 would also result in a greater extent of population recovery than no action due to restoration of key habitats. However, in Alternative 2, up to 10 percent of available restoration funds would be allocated to projects or project components intended to restore human uses of natural resources in the near term and not specifically habitat. As a result, the extent of population recovery under Alternative 2 is expected to be less than Alternative 3.

Restoration proposed in Alternative 2 would be the most effective in restoring local species populations where the primary factor limiting those species is habitat condition or migratory barriers. Response of native fishes is less likely to be measurable in portions of the planning area where habitats and communities are strongly influenced by factors outside the scope of the restoration to address. These factors include the widespread presence and relative abundance of predatory nonnative fish species such as northern pike, profound effects of altered hydrologic regimes due to the operations at the Post Falls Dam, and, the complicating effects of basinwide contaminants and water quality nutrient influences on bio-chemical reactions in Coeur d'Alene Lake.

Likelihood of Population Recovery

Alternative 2 provides a greater likelihood that populations will recover than the no-action alternative because it targets conditions currently inhibiting population recovery that are highly unlikely to improve without restoration intervention. These include:

- Physical barriers that will likely not be removed or modified by natural processes, including many of the structures and other features blocking migration of aquatic species (such as perched culverts, historic road grades, and tailings piles).
- Invasive species communities creating monocultures. These require active intervention to restore native plant and animal species. For example, reed canary grass, which forms dense monocultures that block aquatic species movement and creates conditions toxic to amphibians due to the accumulation of alkaloids, requires aggressive management to eliminate and to prevent further spread.

- Stream channels lacking the large woody structure that creates and sustains habitat for salmonids. These conditions require an immediate supply of large wood to restore habitat-forming processes while early-seral riparian vegetation communities develop into late-seral conifer stands that will naturally contribute large woody debris.

Finally, Alternative 2 increases the likelihood that aquatic populations will sustain recovery over the long term by connecting a strategic network of anchor habitats with stronghold populations to injured areas. The strongholds will provide a long-term source of colonists as well as refugia habitats to sustain recovering populations in contaminated area, increasing the likelihood that recovering populations will persist into the future.

Direct and Indirect Effects to Federally Listed Species

Under Alternative 2, restoration projects would be carried out in areas occupied by the threatened bull trout as well as in occupied and designated critical habitat for bull trout in Coeur d'Alene Lake, the mainstem Coeur d'Alene River, sections of the North Fork Coeur d'Alene River and selected tributaries, and in the St. Joe River and selected tributaries.

Direct effects would be similar as described for other aquatic species. Effects to bull trout would be minimized through selective scheduling of the construction period and implementation of protective design features. Federal laws and regulations protection of federally listed fish species and critical habitat would be followed, as well as applicable terms and conditions developed from the Endangered Species Act section 7 consultation process with the U.S. Fish and Wildlife Service.

The potential beneficial and adverse indirect effects of restoration actions proposed in Alternative 2 described for other aquatic species are also applicable to bull trout. At the scale of the planning area, Alternative 2 would provide an overall benefit to the recovery of bull trout in the Coeur d'Alene Basin core area. Alternative 2 places high priority on restoration of areas important for the recovery of bull trout, including the upper St. Joe watershed, Coeur d'Alene Lake, and the Coeur d'Alene River. Furthermore, the specific restoration strategies and techniques proposed would directly improve the condition of the majority of the primary constituent elements of bull trout critical habitat where projects are implemented (Table 7).

Table 7. Effects of proposed restoration on primary constituent elements of bull trout critical habitat

Primary Constituent Element (summarized from USFWS 2004)	Effects of Restoration Actions under Alternative 2
Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) to contribute to water quality and quantity and provide thermal refugia.	At larger spatial scales, hyporheic flow is regulated by factors outside the scope of this alternative to address (such as valley morphology and underlying geology). However, where underlying conditions permit, the alternative contains a suite of actions such as reconnecting channels to sub-irrigated floodplains and increasing channel planform complexity that create head gradients facilitate hyporheic exchange
Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and foraging habitats.	Restoration of open migratory corridors by removing man-made migratory barriers is a major action of the proposed action.

Primary Constituent Element (summarized from USFWS 2004)	Effects of Restoration Actions under Alternative 2
An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.	Proposed work includes extensive restoration of streambank and riparian vegetation to support aquatic food webs as well as restoration of aquatic habitat complexity and water quality, contributing to abundant and diverse aquatic invertebrate populations.
Complex aquatic environments, and processes that establish and maintain these aquatic environments, with features such as large wood, side channels, pools, undercut banks and unembedded substrates, to provide a variety of depths, gradients, velocities, and structure.	Restoration of the processes that create and maintain complex aquatic habitats are a specific major emphasis of the plan, including interim placement of large woody debris; restoration of riparian vegetative communities to ensure future supplies of large wood; and restoration of vegetated streambanks to support formation of stable undercut banks.
Water temperatures ranging from 2 °C to 15 °C (36 °F to 59 °F), with adequate thermal refugia available for temperatures that exceed the upper end of this range.	Alternative 2 identifies improvement of water quality, including temperature, as a major action, and proposes extensive restoration of shade-producing vegetative communities as well as identification and protection of thermal refugia.
In spawning and rearing areas, substrate of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the year and juvenile survival	Alternative 2 identifies a variety of strategies and techniques to restore the processes necessary for trapping, sorting, and storing sediments necessary to support spawning and rearing as well as to reduce inputs of sediment that impair spawning habitats.
A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges. Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.	Alternative 2 proposes no actions that would affect overall water budgets within the planning area. Altered hydrographs created by operations at the Post Falls Dam will likely continue. However, restoration of channel features that moderate the effects of high flows on bull trout (e.g., deep pools, complex cover, connected floodplains) and maintain or enhance low-flow habitats (e.g., appropriate channel dimensions and abundant, deep residual pools)
Sufficiently low levels of occurrence of nonnative predatory (e.g., northern pike, smallmouth bass); interbreeding or competing species (e.g., brook trout) that, if present, are adequately temporally and spatially isolated from bull trout.	The plan proposes no specific actions to directly reduce the number of nonnative predatory fishes in the planning area; population management of these species is the jurisdiction of the IDFG and Coeur d'Alene Tribe. Some proposed projects under this Alternative could create additional hiding cover for species such as northern pike.

Cumulative Effects

Spatial and Temporal Scope

The temporal scope is approximately 15 years, as described in section 3.1. The broad geographic scope of the cumulative effects analysis area for aquatic habitat and species is the boundary of the restoration planning area, although for some elements, cumulative effects may only be measurable and meaningful at a smaller spatial scale. Additionally, portions of the planning area are functionally isolated from one another. For example, the upper Hangman Creek watershed drains into the Spokane River below the remainder of the planning area, and below several dams, and is thus functionally isolated. As a result, there is no mechanism for effects from actions in the Hangman Creek area regions of the planning area to combine with effects from elsewhere to contribute to cumulative effects.

Past, Present, and Reasonably Foreseeable Actions

The effects of past and present actions on aquatic habitat and species are evident in the existing conditions today; therefore, they are discussed in the existing condition description of the "Affected Environment" section.

Reasonably foreseeable actions are described in Appendix 2. Among this group of actions, activity types particularly relevant to aquatic habitat and species include actions that affect:

- Water quality, including suspended sediment, temperature, metals, and nutrients;
- Vegetation, especially riparian and aquatic vegetation;
- Connectivity in aquatic networks;
- Species management that favors or enhances populations of fishes which may prey on and/or compete with native trout.

Cumulative impacts to aquatic species and habitat would arise when the effects of restoration projects considered under Alternative 2 overlap with other actions in time and space.

Potential Cumulative Effects

The short-term effects of actions proposed under Alternative 2 could contribute to cumulative effects to aquatic habitat and species if actions are clustered together within too small an area and in too brief a time period (spatial and temporal "crowding"), resulting in an overlap of effects. There is little likelihood that the short-term impacts of restoration actions proposed under Alternative 2 could combine with similar effects of other actions to create cumulative effects at scales beyond the immediate project vicinity. The short-term effects of Alternative 2 associated with construction activities are expected to be short-lived and highly localized, so there is little likelihood of overlap. Furthermore, Alternatives 2 and 3 include a provision wherein the Trustees would reduce the risk of additive effects by coordinating the timing and nature of ground-disturbing restoration projects with actions in the vicinity of the project being carried out by others. This coordination would also minimize the need for disturbing an area more than once.

Most of the long-term effects to aquatic habitat from actions proposed in Alternative 2 (summarized above) are considered beneficial. The primary long-term effects from these actions, when added to the effects of other past, present, and reasonably foreseeable future actions, would be a net cumulative benefit to aquatic habitat and species.

Projects that restore physical habitat and function would produce benefits that would primarily be localized to the area within the project footprint (for example, a project that restores woody debris to a segment of a stream would primarily affect habitat in the project reach; altering water levels in a wetland would affect habitat only within that wetland; restoring a vegetated lake margin would improve habitat only along that section of lakeshore). As such, these projects would not likely contribute to cumulative effects beyond the project scale. In contrast, the movement of water through the planning area creates a mechanism for the site-level effects to water quality to combine with the effects of other actions to create a cumulative impact to water quality (an important element of aquatic habitat). These effects are described in the water quality section (section 3.3.2, page 59).

While there is not a mechanism for localized habitat improvement projects to combine to contribute to cumulative habitat impacts beyond the site scale, many of the species that use these habitats are migratory. Thus, restoration of key habitats in the planning area combined with the restoration work of others would contribute toward establishing a synergistic network of habitats linked by migratory corridors and produce cumulative beneficial effects to the migratory species that depend on them. Numerous other entities in the planning area are actively planning restoration of aquatic habitat and processes in the planning area. In addition to the ongoing work of the Environmental Protection Agency, the Idaho Panhandle National Forests, Bureau of Land Management, Coeur d'Alene Tribe, Idaho Department of Fish and Game, and others are pursuing an active program of watershed restoration in areas upstream and adjacent to the aquatic systems considered in Alternative 2. Overall, native fish populations are expected to increase throughout the planning area as a result of cumulative improvements in the quality of habitats and improved mobility that facilitates both recolonization of injured historic habitats and access to high quality habitat outside injured areas.

As described previously, in some areas of the planning area, nonnative species may currently limit the abundance and distribution of native fishes and amphibians. Restoration projects that remove barriers and subsequently provide access for nonnative species into areas where they were previously not present would potentially contribute to a substantial adverse cumulative effect. These effects would be most profound in portions of the planning area where the current distribution of nonnatives is patchy and historic barriers have protected streams from invasion by nonnatives. Allowing nonnative species to expand in previously unoccupied areas would contribute to a substantial cumulative effect. In the lower Coeur d'Alene River Basin, Chain lakes, and Lake Coeur d'Alene, nonnative species are already extremely abundant and widespread, so projects that provide access to nonnatives in this area to habitats they have previously been excluded from would represent a minimal percentage increase overall of nonnative species distribution in that area. However, because there are portions of the watershed currently occupied by only native species, movement of nonnatives into those areas would have individually substantial effects.

Projects that alter the timing or depth of water may adversely affect species such as amphibians, by altering habitat suitability or indirectly favoring species (such as fish or nonnative bullfrogs) that prey on amphibians. This may result in decreases in amphibian abundance or elimination of those species at the site scale; however, it is not expected to result in widespread cumulative declines of those species. The amphibians primarily affected are species that are widely distributed and relatively abundant throughout the planning area (such as long-toed salamander) in areas not expected to be affected by restoration projects under Alternative 2.

Projects designed to improve human uses of natural resources or project components that provide recreational access to aquatic and riparian habitats could result in human-related degradation to habitat conditions at these sites. As described previously, effects to aquatic habitat would be localized, and design features would reduce the likelihood or extent of these effects. These projects represent only a small fraction of the projects proposed under

Alternative 2. As a result, any indirect adverse effects to habitat that may occur are not expected to contribute to adverse cumulative effects.

While the cumulative effect of all actions considered under the restoration plan would be expressed as increased aquatic species populations as a result of beneficial habitat improvements, the same stream and riparian conditions contributing those improvements would be subjected to a variety of influences and the effects of other actions outside the scope of this plan. Many of those actions may produce a counteracting effect which may reduce or even neutralize the benefits to habitat and species populations that would occur under Alternative 2. For example, the pervasive effects of operations of the Post Falls Dam will continue to impede natural habitat-forming processes in the lower Coeur d'Alene, St. Maries, and St. Joe rivers and along the margins of Coeur d'Alene Lake, thus limiting the extent and magnitude of potential cumulative benefits from habitat restoration. In absence of substantial management changes that reduce populations and associated threats from nonnative species, restoration of habitat conditions in areas where those influences occur will have a limited effect on the abundance or recovery of native species. In the portions of the planning area where metals are present, the time required for remediation and or natural attenuation will continue to limit metals-sensitive species

The effects of projected climate changes include increasing summer and winter air temperatures, with subsequent effects to the timing and magnitude of runoff and subsequent reductions in summer base-flow. The restoration actions considered in Alternative 2 would not result in effects to air temperatures or the timing or magnitude of runoff, so there is no potential for restoration actions to combine with the effects of climate change to result in cumulative effects. It is important to note, however, that the restoration actions proposed in Alternative 2 restore the key physical and ecological processes considered necessary to increase the resilience of watersheds and species to climate change, including actions that contribute to reduced stream temperatures, provide cool water refugia habitat, and physical and ecological features that moderate the adverse effects of high flows (such as connected floodplains, protective vegetation, and instream complex habitat).

3.4.2.6 Alternative 3 – Ecosystems Focus

The following are the key differences between Alternative 2 and Alternative 3 relevant to aquatic habitat and species:

- **Ecosystem Focus:** Under Alternative 3, 100 percent of restoration funds would be allocated to ecosystem restoration, in contrast to Alternative 2, which uses up to 10 percent of funds, or up to $14 million for projects or project components intended to restore human uses of natural resources in the near term (recreation, environmental education, or natural resources services important to the Coeur d'Alene Tribe) while ecosystem restoration proceeds. Thus, under Alternative 3, up to an additional $14 million would be spent on ecosystem restoration, resulting in increased recovery of habitat and dependent species.

- **No Human Uses Project Effects:** Because no projects or project components would be done in the near term to directly address human uses of natural resources, effects to aquatic species from these projects would not occur. For example, no recreation enhancement projects would occur, so there would be no indirect effects to aquatic species from increased access or recreation use of aquatic systems.
- **Geographic Area:** Under Alternative 3, restoration work would be carried out only in the Coeur d'Alene Lake Basin and the upper Spokane River (including the Rathdrum Prairie). No work would be performed in the upper Hangman Creek watershed. Thus, species found only in Hangman Creek (such as redband trout) would not be affected, either positively or negatively.

Direct and Indirect Effects

The direct and indirect effects of Alternative 3 on aquatic species and habitats would be identical to Alternative 2 except that those effects would be restricted to the Coeur d'Alene Lake Basin and upper Spokane River, as described above. There would be no direct or indirect effects to species or habitat in the upper Hangman watershed.

The rate, extent, and likelihood of population recovery would likely be greater under Alternative 3 than no action or Alternative 2 because more ecosystem restoration would be done under this alternative. The magnitude of effects to aquatic species due to the approximately $14 million-dollar-restoration difference in spending between Alternatives 2 and 3 is difficult to predict. Because the amount represents up to 10 percent of available funds for restoration, it could be considered that the ecological benefits of restoration under Alternative 3 could theoretically be up to 10 percent greater than Alternative 2.

Effects to Federally Listed Species

Effects to bull trout under Alternative 3 would be similar to those described under Alternative 2.

Cumulative Effects

The cumulative effects of actions considered under Alternative 3 would be similar to those described for Alternative 2, with the following exception: no restoration would be carried out in the upper Hangman watershed, so there would be no direct or indirect effects to contribute to cumulative effects there.

3.5 Terrestrial Species and Habitat

3.5.1 Affected Environment

The analysis area for terrestrial species and their habitat is encompassed by the boundaries of the planning area as illustrated in Figure 1 on page 13. The analyses for terrestrial species and habitat will include both avian and mammal communities but will primarily focus on wildlife species that have the following characteristics:

- Species that are highly sensitive to changes in riparian, wetland, and lake habitat conditions making them suitable indicators of ecological health;
- Species that are found throughout the planning area in most riparian, wetland, and lake habitats where proposed restoration actions will occur;
- Species that are protected under the Migratory Bird Treaty Act, the Endangered Species Act, or other relevant regulation or policies;
- Species that have special status based on agency designation (Idaho Department of Fish and Game species of greatest conservation need, Bureau of Land Management Type 1 or 2 special status species, or Forest Service sensitive species);
- Species that have been directly and profoundly injured as a result of releases of contaminants from mining and mineral processing operations;
- Species that are culturally important to the Coeur d'Alene Tribe and other local communities; and
- Species that provide culturally and economically valuable consumptive and non-consumptive recreational opportunities within the planning area.

Appendix 3 includes a list of special status species that may occur within the planning area, as well as their general distribution and habitat association.

The planning area is large and diverse, encompassing over 3,840 square miles. However, restoration projects will be located primarily in habitats that have been impacted by contamination and these areas are largely limited to rivers, creeks, lakes, wetlands, and their associated riparian habitats in the geographic areas described earlier in section 3.2. The planning area is located within the Pacific Flyway for migratory waterfowl and provides important habitat for a diverse assemblage of wildlife species. Over 280 bird species use the planning area and numerous mammals, reptiles, and amphibians have been documented (Ridofli 1993). An abundance of lakes, wetlands, and riverine and riparian habitats provide reproductive, feeding, and resting habitats and migratory corridors for these avian and mammalian communities.

Primary effects to wildlife species and their habitats in the portions of the planning area directly affected by mine waste contamination have been widely documented. Stratus (2000) summarized findings regarding the wildlife resource conditions in the Coeur d'Alene Basin that have resulted from exposure to hazardous metals released from mining and mineral processing facilities:

- Sufficient concentrations of hazardous substances exist in food and habitat components to expose wildlife resources. Hazardous substances are transported from the South Fork Coeur d'Alene River Basin in surface water, soil, and sediment to the lower Coeur d'Alene River Basin.
- Hazardous substances in sediments are accumulated in plants, invertebrates, fish, mammals, and birds that are consumed by other species of birds and mammals in the Coeur d'Alene River Basin. Food chain exposure is an important pathway for lead and other metals in the Coeur d'Alene River Basin and concentrations are sufficient within forage and prey to cause injury.
- Ingestion of lead-contaminated sediments is the primary pathway and cause of injuries to migratory birds in the Coeur d'Alene Basin. Injury studies described in Stratus (2000) were designed to explicitly assess whether observed deaths and sublethal injuries were caused by other agents, including lead artifacts (shot and sinkers), disease (aspergillosis, avian cholera), or other factors (trauma).
- The results of field investigations and controlled laboratory experiments demonstrate that death, physiological malfunctions, and physical deformation injuries to wildlife of the Coeur d'Alene River Basin have occurred and continue to occur as a result of exposure to lead in Coeur d'Alene River Basin sediments. Adverse effects that have been caused by lead exposure and have been observed in migratory birds in the field include death; physiological malfunctions, including changes in parameters related to impaired blood formation and impaired growth; and physical deformations, including gross and histopathological lesions.

In portions of the planning area, native vegetation that is necessary to provide structure, food, and cover for numerous wildlife species has been impaired and is unable to grow because of high levels of contamination in soils. These impaired habitats have low diversity, are often dominated by nonnative or invasive species that can better withstand the harsh soil conditions, are structurally less diverse, and in many instances do not adequately provide the necessary habitat components for many wildlife species.

Wildlife species and habitat throughout the planning area are also affected by other human-caused factors in addition to the release of mine waste contaminants. These factors, which continue to influence populations, include transportation networks, agriculture, residential development, hydropower, and invasive species (NPCC 2005). These threats are described in more detail in the sections below.

3.5.1.1 Federally Listed Species

There are three federally listed terrestrial wildlife species in Northern Idaho: Grizzly bear (*Ursus arctos horribilis*), Canada lynx (*Lynx canadensis*), and woodland caribou (*Rangifer tarandus*).

Grizzly bears are a wide ranging omnivore that can move large distances in a relatively short time period. Grizzly bears use a wide range of habitats and tend to move to different elevations as plant food and prey resources become available. Grizzly bear habitat needs are largely driven by the search for food, mates, cover, security, and den sites. Avalanche chutes are important to bears during spring, summer, and autumn (Waller and Mace 1997 and McLellan and Hovey 2001). Brush fields and areas where timber has been harvested are also frequented by bears throughout the year. Grizzly bear habitat selection is negatively influenced by vehicular traffic (Mace et al. 1996; Waller and Servheen 2005) and at times nonmotorized foot traffic (Mace and Waller 1996), both of which can displace grizzly bears.

The planning area was included in the historic range for grizzly bears. However, grizzly Bear recovery areas have not been designated within the restoration planning area (USDI Fish and Wildlife Service, 2000), nor was the planning area included in the Bitterroot grizzly bear evaluation area in the *Grizzly Bear Recovery Plan Supplement: Bitterroot Ecosystem Recovery Plan Chapter* (USDI Fish and Wildlife Service, 1996). The closest points of the planning area to occupied grizzly bear recovery zones are Selkirk Recovery Zone (> 30 miles); Cabinet-Yaak Recovery Zone (> 10 miles); Northern Continental Divide Recovery Zone (> 50 miles). The planning area borders the Bitterroot Recovery Zone; however, this recovery zone is unoccupied (USDI Fish and Wildlife Service 2000).

While there is no grizzly bear population currently occupying the planning area, the area is capable of being reached by individual dispersing or transient bears on an infrequent basis.

According to the Lynx Conservation Assessment and Strategy (Interagency Lynx Biology Team 2013), lynx habitat occurs in mesic coniferous forests that experience cold, snowy winters and provide a prey base of snowshoe hare. In the northern Rockies, lynx habitat generally occurs between 3,500 and 8,000 feet of elevation, and primarily consists of lodgepole pine, subalpine fir, and Engelmann spruce. It may consist of cedar-hemlock in extreme northern Idaho, northeastern Washington and northwestern Montana, or of Douglas-fir on moist sites at higher elevations in central Idaho. It may also consist of cool, moist Douglas-fir, grand fir, western larch and aspen when interspersed in subalpine forests. Dry forests do not provide lynx habitat.

Lynx habitat containing the appropriate cover type and structural components are mapped as Lynx Analysis Units (LAU). Within the boundary of the planning area, approximately 204,060 acres are contained in LAUs, all of which are in the St. Joe watershed. No critical habitat for lynx recovery is designated within the planning area. A search of the Idaho Fish and Game Wildlife Observation Data Center Database yielded no recent verified sightings or documentation of Canada lynx within the planning area. The Coeur d'Alene Tribe has had two lynx detections east of Hayden Lake and another in the upper St. Joe near Avery as part of their forest carnivore research. Most of the lands within the planning area would be used as transitional habitat if a lynx were moving from one area of suitable habitat to another.

Woodland caribou prefer old growth, high elevation forest where lichen communities are abundant and accessible (Servheen and Lyon 1989). There is no suitable habitat for woodland caribou in the planning area and there are no observations of woodland caribou within the Idaho Fish and Game Conservation Database (IDFG 2015); there is no designated critical habitat for caribou recovery in the planning area. The planning area is located over 30 miles from the Selkirk Mountain caribou recovery area.

3.5.1.2 Habitat Types, Associated Wildlife Species, and Current Conditions

Restoration activities will primarily occur in lakes, wetlands, and riparian communities. These community types are differentiated by the predominant vegetation species, and particularly, the moisture tolerance of the dominant vegetation species. The vegetation associated with impacted habitats is discussed extensively in section 3.6.

This section will discuss the type of habitats and the associated wildlife species that would be impacted by the alternatives described in section 2.2. In addition, the current condition of the habitat within each of the geographic areas will also be summarized.

General Riparian Habitat

The proposed action describes three categories of habitat that will be the focus of restoration activities: wetlands, lakes, and streams. The riparian zone is the transitional area between the aquatic environment (lakes, streams, and wetlands) and the terrestrial upland environment. This zone provides critical connectivity between upland and aquatic habitats for plant and animal species. The riparian zone regulates the flow of energy and materials between the terrestrial and aquatic environments, and supports rich assemblages of plant and animal species (Moseley and Bursik 1994; Lyon and Sagers 1998). Riparian habitats are important areas for wildlife and provide areas for breeding, rearing, feeding, resting, and hiding and are important corridors for migration. The lush vegetation community found in the riparian zone can also aid in thermoregulation during extreme hot or cold temperatures.

Breeding bird densities increase in riparian corridors (Darveaux et al. 1995). Migratory and resident passerine bird species that have been found within lower elevation riparian floodplains within the planning area include Bullock's oriole, yellow warbler, willow flycatcher, northern waterthrush, and American redstart. Forest-dwelling bird species that may be found in first-order stream riparian corridors and adjacent forest stands include species such as Hammond's flycatcher, golden-crowned kinglet, and black-capped chickadee. The U.S. Fish and Wildlife Service has documented 59 species of songbirds within riparian habitat in the North Fork, South Fork, and Coeur d'Alene Lake subbasins following standardized guidelines established by the Institute for Bird Populations (DeSante et al. 2010).

Raptors known to use riparian habitat within the planning area include red-tailed hawk, great-horned owl, bald eagle, northern harrier, and western screech owl. Short-eared owls have also been documented outside of the breeding season within the planning area. They are known to use both wetlands and agricultural lands for foraging and nesting. Six pairs of bald eagles currently nest along the Coeur d'Alene River and some of these nests have been active for over 20 years. Several active eagle nests also occur along the St. Joe River. The lower portions of the river basins and Coeur d'Alene Lake are also an important wintering area for bald eagles migrating south from Canada. Many of these birds use these areas for foraging and perching. Migrating eagles begin arriving in mid-November to take advantage of spawning kokanee as a food source. Eagle numbers normally peak in mid-December and decline through the end of March. There is a robust osprey population throughout the mainstem portions of the St. Joe and

Coeur d'Alene rivers due to the abundant productive fish bearing rivers, lakes, and open marshes. Ospreys readily nest on a variety of structures including live and dead trees, power poles, pilings, and nesting platforms erected for Canada geese, as well as specifically for ospreys.

Riparian habitats are important to many species of mammals throughout the planning area. Riparian corridors within the planning area provide feed, cover and migratory corridors for ungulate species such as moose, elk, white-tailed deer, and mule deer. Wetland habitats also provide lush vegetation that is preferred by moose during the summer months, while riparian habitat provides browse such as willow species for ungulates throughout the year and particularly during winter months. Mammals such as beaver, muskrat, mink, and river otter are found within wetland, lake, and riparian habitats throughout the planning area. Muskrat pushups and beaver lodges also provide waterfowl nest sites.

Carnivores and omnivores that use riparian habitats in the planning area include fisher, black bear, mountain lion, bobcat, and coyote. Small mammal numbers and species richness is higher is riparian habitats compared to adjacent upland habitats (Doyle 1990). Small mammals such as the dusky shrew, deer mouse, and the meadow vole are found throughout the planning area in both forested and non-forested landscapes. Red squirrels, and flying squirrels use cavities in snags found along the uplands that border riparian habitat in the planning area. Bats also use riparian habitats for foraging. Adjacent riparian and upland forests provide foraging and roosting habitat as well (Adams 2003).

Development, agriculture, transportation networks, timber harvest, mining, and hunting all occur within the planning area and all of these activities may potentially impact riparian and wetland-dependent wildlife populations. In some cases, the impacts are beneficial. Farming, for example, benefits ungulates like white-tailed deer and elk; turkeys also use the fields for foraging. On the other hand, harvest of hay can result in mortality of ground nesting birds and white-tailed deer fawns. Human developments can fragment habitat and inhibit movement of wildlife. Most of these impacts occur adjacent to the proposed restoration sites, but the impacts make the less developed land within the restoration area more valuable and necessary to wildlife. Human activities within the planning area have and will continue to influence the current state of wildlife within the planning area.

The characteristics that make riparian habitat so valuable for wildlife also make these areas highly desirable for use by humans. Human impacts on a landscape are often concentrated within the floodplain of rivers and streams and along the shoreline of lakes where the vegetation is productive, the topography is more easily developed, extremes in climate are moderated, and transportation is facilitated by waterbodies and gentler topography. Riparian habitat throughout the planning area has been degraded by development, transportation networks, agriculture, hydropower, timber harvest, invasive species, and mining (NPCC 2005). Land use activities as well as natural events such as floods and wildfire that reduce the extent, heterogeneity, and complexity of riparian habitats within the floodplain tend to result in the loss of certain riparian wildlife species and a decline in wildlife species richness (Jones and Hansen 2009).

Recent modelling evaluated riparian habitat condition within subbasins of the planning area. The condition of Idaho Department of Fish and Game wetland and riparian habitats was estimated using the Idaho Landscape-scale Level 1 Wetland Assessment Tool (Murphy et al.

2012). This method using Geographic Information System (GIS) data classifies potential riparian habitat into condition classes based on a statewide landscape integrity model. The landscape integrity model combines statewide GIS layers of land use and disturbances known to affect wetland and riparian condition and function (weighted for their relative impact on these habitats) into one landscape integrity layer at a 30-square-meter pixel resolution (however, it is important to note that metals pollution was not taken into account for this model; see Figure 4).

A summary of the current distribution and condition of wetland, lake and stream habitats and their associated wildlife species in the planning area is provided below. Following each section is a description of the distribution and condition of that habitat type grouped by subbasin.

Lake Habitats and Species

Of the 1.9 million acres within the planning area, 5 percent consist of designated wetlands with nearly half those acres being lacustrine habitat, which is primarily deepwater habitat (Jankovsky-Jones 1999). Lacustrine habitats are permanently flooded areas with water too deep to support vegetation. Much of the lacustrine habitat in the planning area is bordered by palustrine wetlands, which will be discussed in a separate section.

Of the numerous lakes within the planning area, 30 are included under the four tiers of restoration priorities outlined in the proposed action. Some of these lakes are quite small (Dismal Lake) and others are quite large (Coeur d'Alene Lake). The majority of restoration projects will likely be implemented along the Chain Lakes of the Lower Coeur d'Alene River and Coeur d'Alene Lake. Approximately 12 separate lacustrine waterbodies are present downstream of Cataldo. Some lakes, such as Blue Lake and Black Lake, have little adjacent wetland area while others, such as Swan Lake and Rose Lake, are fringed by wetlands on most of their perimeters.

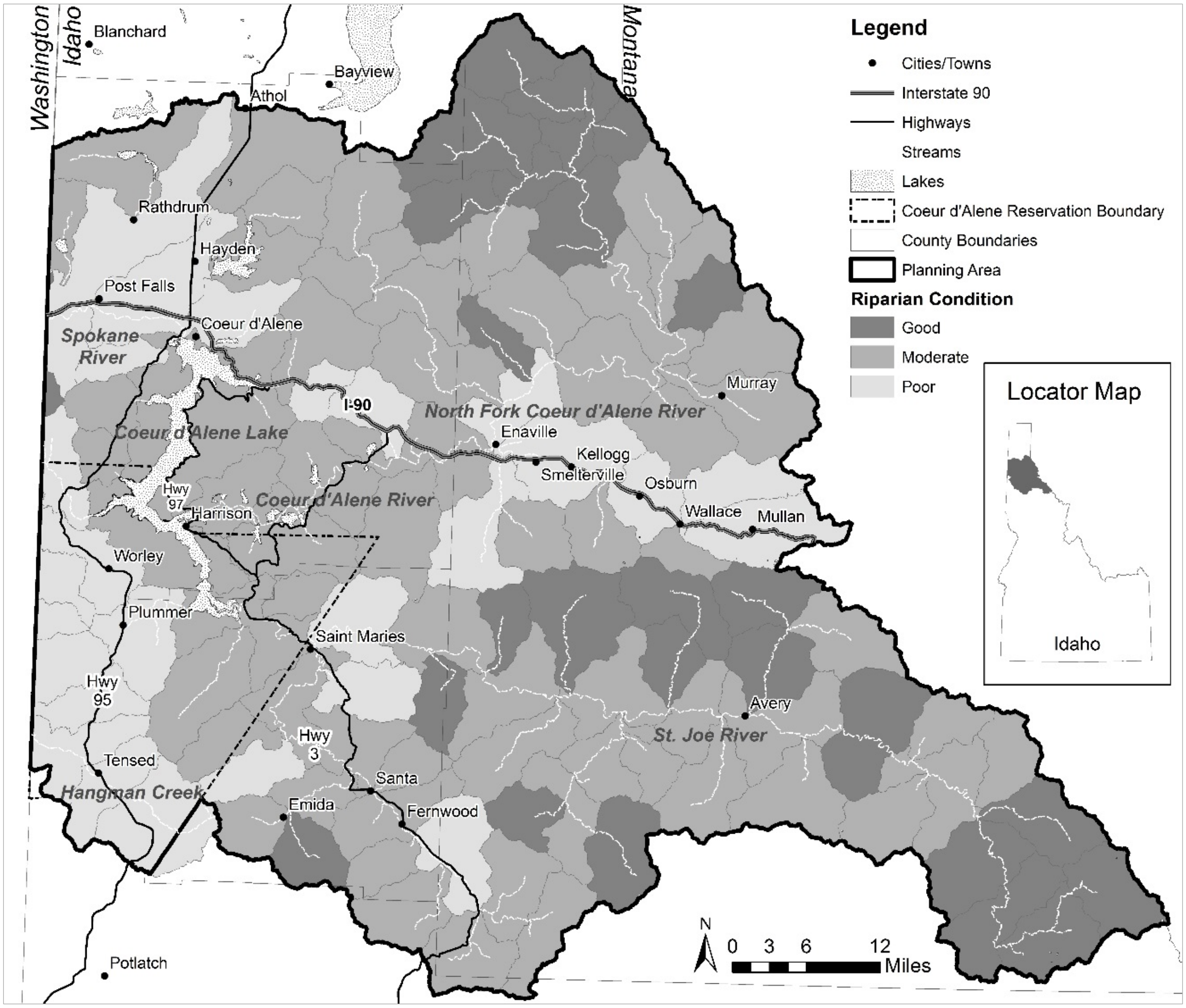

Figure 4. Riparian condition within subbasins of the Coeur d'Alene Basin

Lakes in the planning area provide valuable and necessary habitat for waterbirds, waterfowl, and aquatic and terrestrial mammals. Large open water lakes (especially those that do not freeze entirely in winter) provide valuable security areas for waterfowl and waterbirds to loaf and rest while being inaccessible to terrestrial predators. For a few species, open water can also be used for nesting habitat. Lakes provide a food source for fish-eating wildlife species such as bald eagle, osprey, and river otter. The productive riparian zone at the lake margin provides hiding cover, nesting habitat, and a food source for many wildlife species.

Open water lakes are particularly important to diving birds and migrating waterfowl. Most diving birds use water depths between 2 and 10 feet. Examples include ring-necked duck, redhead, canvasback, lesser scaup, and common goldeneye. Some species are able to exploit much greater depths in pursuit of fish. Double-crested cormorants, whose numbers are increasing in recent years, can be found on the deeper lakes within the planning area year round. This fish-eating species can dive up to 26 feet below the surface. Common loons use larger and deeper lakes within the planning rea during migration and have been found at depths up to 196 feet (Rodewald 2015). Historically common loons nested on lakes with deeper water and floating vegetation in the planning area. However, water level management, high levels of recreational boating, human development, and disturbance have made lakes within the planning area unsuitable for nesting (IDFG 2005). The western grebe is a fish-eating species that has used Cave Lake and other planning area lakes as a colonial nesting area in recent years. Black tern, American white pelican, and pie-billed grebe, can also be found using the open water lakes within the planning area throughout the year. In winter, horned grebe, red-necked grebe and numerous gull species depend on the open water of large lakes for foraging and security.

Mammalian use of open water is largely limited to routes of transportation and water for drinking. Beaver, otter, and muskrat use lakes as transportation routes that allow them to move between waterbodies without being vulnerable to terrestrial predators. For terrestrial mammals the vegetation community adjacent to lakes is typically of higher value than the lakes themselves. Vegetation at the lake margin provides nesting habitat for waterfowl, which is then exploited by mammals such as skunks and raccoons. Moose, deer, and elk forage on the shrubs, forbs, and emergent vegetation found at the lake margin. Lush vegetation at the lake margin can also provide thermal cover to animals in the hot summer months, and the vegetation on lake margins has higher moisture content which can be important to herbivorous mammals during periods of drought (Patton and Judd 1970).

With the exception of smaller backcountry lakes, all of the listed lakes in the proposed action share the characteristic of being heavily to moderately impacted by people. Private lands along lake shorelines are frequently developed into home sites, or harvested for timber values. The associated travel network required for these activities has resulted in high densities of primary and secondary roads near lake shorelines where private lands are present. Home developments along lake shorelines typically result in conversion of shoreline habitats dominated by shrubs, native forbs and grasses, and emergent vegetation into lawns and constructed beaches. These modified habitats provide reduced habitat value to wildlife compared to intact historical vegetation.

Management of water levels at the Post Falls Dam influences the quality and development of shoreline habitat for Coeur d'Alene Lake as well as all the lakes along the Coeur d'Alene and St. Joe rivers. The result for these lakes is impaired development of shoreline vegetation because productive shoreline habitat is flooded during the warm months and exposed during the cold wet months, increasing the erosion of valuable shoreline habitat (NPCC 2005).

Recreational and commercial use may also impact water quality and disturb wildlife. Boating, motorized trail use, hiking, mountain biking, hunting, angling, wildlife viewing, camping, and berry picking are just a few of the activities occurring on or near lakes that may disturb wildlife or affect wildlife use patterns.

Coeur d'Alene Lake

Coeur d'Alene Lake provides the largest single area of deepwater habitat within the planning area and has approximately 150 miles of shoreline which provide habitat and food resources for an abundance of terrestrial wildlife species. Coeur d'Alene Lake is the highest priority for lake restoration which includes improving water quality and shoreline restoration. Coeur d'Alene Lake as a geographic priority area includes Chatcolet, Round, Hidden and Benewah lakes located within the southern portion of the lake because these are hydrologically connected and function as single waterbody. Coeur d'Alene Lake provides habitat for an abundance of wildlife including open water staging areas for early migrating waterfowl when other Basin lakes and wetlands are frozen.

Coeur d'Alene Lake's water quality has been heavily degraded by mine-waste contamination, development, aquatic invasive species, and upstream land uses such as timber harvest, and agriculture. Extensive development has occurred along some areas along the lake limiting lake-margin wildlife habitat and potentially degrading water quality. Water level management from Post Falls Dam has also reduced the quality of lake-margin habitat as mentioned previously.

Chain Lakes

The Chain Lakes within the floodplain of the Coeur d'Alene River provide important habitat for a variety of terrestrial wildlife species due to their heterogeneity and extensive distribution across the floodplain. A large portion of the floodplain is part of the State of Idaho's Coeur d'Alene River Wildlife Management Area and is actively managed to enhance wildlife habitat and increase waterfowl production (IDFG 2014). The distribution of the Chain Lakes across the floodplain provide deep-water resting habitat for thousands of waterfowl in close proximity to many nearby feeding areas during migration. Many areas of the Chain Lakes are relatively remote requiring access by boat, and therefore provide important habitat for wildlife that are less tolerant of disturbance. Restoration of the Chain Lakes will be a primary focus of the proposed action; these lakes comprise the majority of Tier 2 and 3 geographic priority areas.

The Chain Lakes have been affected by metals contamination, transportation networks, hydropower, and invasive species. The majority of the Chain Lakes have not been impacted by development relative to other lowland lakes within the basin. The majority of the lake beds are contaminated by metals, but some areas, such as those located south of the Trail of the Coeur d'Alenes, are generally protected from flood events (Bookstrom et al. 2004). The depth and extent of the lakes are dependent on operations of the Post Falls Dam as well as flood events. Invasive species such as Eurasian milfoil also alter wildlife habitat within the lakes.

Other Lakes

Other lakes within the planning area include lowland lakes on the Rathdrum Prairie that are not hydrologically connected by surface flow to major drainages within the Coeur d'Alene Basin, and many high elevation lakes in the surrounding mountains. These lakes are identified as Tier 4 geographic priorities within proposed action and little restoration is expected to occur within this tier. These lakes are not contaminated by metals pollution but may be degraded by development, agriculture, invasive species, and other pollutants. Lakes in this tier range from 3,900-acre Hayden Lake to small unnamed high elevation lakes only a few acres in size. Many of the lowland lakes have been heavily developed and lake margins have been degraded. Larger lowland lakes likely provide habitat for waterbirds and waterfowl as well as mammal communities but data are lacking. High elevation lakes provide necessary habitat for wildlife but are generally in suitable condition and restoration is not needed.

Wetland Habitats and Species

The planning area is in the Pacific Flyway and abundant wetlands in the planning area provide critical breeding, wintering, and feeding habitat for thousands of migratory waterfowl. Waterfowl use within the planning area can vary depending on many factors including Pacific Flyway population trends, environmental variables, and episodic events such as flooding. High use of wetlands is likely driven by habitat quality, preferred feeding habitat (suitable water depths), and the subsequent accessibility to food resources by waterfowl (USFWS 2014b). Twenty-five percent of the designated wetlands within the planning area are classified as freshwater emergent and 7 percent are forested/scrub-shrub wetlands. Following is a brief description of wetland types, their characteristics, and their associated wildlife species within the planning area.

The distribution of the various wildlife species associated with wetlands in the planning area is related to the type of wetland habitat available. The water depth, duration, and timing of high or low water levels, and the characteristics of adjacent upland habitat all influence wildlife use of wetland areas. Palustrine wetlands are non-tidal, and are dominated by vegetation such as trees, shrubs, and herbaceous plants. Those that are dominated by herbaceous vegetation are referred to as emergent marshes, and make up most of the palustrine wetland acreage (22,013 acres) in the planning area. Emergent marshes can be dominated by a variety of plant communities, depending in part on their water regime. Temporarily flooded wetlands have standing water for brief periods during the early growing season, and are dry for the remainder of the year. They can support a mixture of upland and wetland vegetation, and occur at higher elevations or where the water table is substantially lower than the soil surface. Seasonally flooded wetlands are flooded for longer periods during the growing season, but are still dry by the end of the growing season in most years. Semi-permanently flooded wetlands have standing water throughout the growing season in most years, and permanently flooded wetlands are flooded throughout the growing season in all years (Mitsch and Gosselink 2000).

Moist soils found in seasonally flooded agricultural areas and shallow wetlands attract many wildlife species. Wetlands and their associated vegetation communities provide important hiding cover, nesting habitat, and forage resources to many terrestrial wildlife species. Some of the most visible and easily recognized wildlife in these areas include dabbling ducks (mallards, wood ducks, teal, and northern pintail) and Canada Geese. Waterfowl numbers in the Coeur d'Alene Basin are highest during spring and fall migration (USFWS 2014b). Mallard, blue-winged teal, green-winged teal, Canada goose, and wood duck are a few of the waterfowl that nest within and adjacent to the wetlands of the planning area. Mallard, green-winged teal, gadwall, and wood duck are examples of dabbling ducks that nest and forage in the shallow wetlands found within the lower Coeur d'Alene River. Lane Marsh, Canyon Marsh, Schlepp Agriculture to Wetland Conversion Project, Thompson Lake, Cougar Bay, Heyburn State Park, Lake Chatcolet, and Benewah Lake are some of the areas hosting high numbers of waterfowl during migration and relatively high numbers of nesting waterfowl during the late spring and summer.

Wetlands with water depths greater than about 10 inches are used by species such as hooded merganser, American coot, and bufflehead (Fredrickson 1982). Tundra swans arrive in the thousands each spring on their way to northern nesting grounds. Occasionally trumpeter swans can be found during spring migration as well. Tundra swans can use deeper wetlands, but are rarely found to forage in wetlands with water depths greater than about 4 feet (Fredrickson 1982). Wetlands with the highest use by Tundra Swans in the planning area include Lane Marsh, Canyon Marsh, and Strobel Marsh; and Cave, Chatcolet, Benewah, Round, and Hepton lakes. Over the last two years, large numbers (more than 3,000) of tundra swans have been observed at the Schlepp's East and West Fields that were converted from agriculture to wetlands. Secretive marsh birds such as the sora, Virginia rail, and American bittern use the dense vegetation in shallower wetlands for nesting and foraging as well. Great-blue heron can frequently be seen "fishing" in shallower water depths (5 to 10 inches).

Wetlands in the planning area also provide habitat for numerous species of terrestrial and aquatic mammals such as moose, elk, white-tailed deer, mule deer, beaver, bats, muskrat, and river otter. Carnivores and omnivores that use the wetlands or the adjacent transition habitat as a resource for food or as hiding or thermal cover include red fox, black bear, mountain lion, and coyote.

Small mammals such as the deer mouse and the meadow vole are found throughout the planning area in both forested and non-forested landscapes adjacent to wetlands. Red squirrels, and flying squirrels use cavities in snags found in flooded forest and the uplands that border wetland communities in the project area.

Wetlands in the planning area have been heavily impacted by historical use by people. Drainage of wetlands to convert areas to agriculture or to develop home or commercial sites has reduced the acres of intact wetlands available to wildlife. Much of the floodplain habitat within the planning area would have historically provided seasonal or perennial wetlands. These areas have been converted to quasi uplands that no longer flood and no longer support wetland vegetation. Thus, the capacity for wetlands in the Coeur d'Alene Basin to support wetlands-associated wildlife has been profoundly reduced.

Along with changes in hydrology, there are numerous other activities that influence the capacity for wetlands in the planning area to support wildlife. Certain invasive species such as *Phragmites*, purple loosestrife, yellow flag iris, and Eurasian milfoil continue to degrade existing wetlands. Other nonnative species such as wild rice may provide forage and has been planted as a food source for waterfowl in some of the wetlands over the past 50 years, but now occurs primarily near Killarney Lake and on both sides of the St. Joe River near its mouth. Historically, Idaho Department of Fish and Game harvested wild rice each year and distributed it to landowners, other agencies, and tribes. Because it is nonnative, aggressive, and may attract waterfowl to contaminated areas, it is no longer planted in the Coeur d'Alene River Wildlife Management Area, but has recently been planted on the Schlepp Agriculture to Wetland Conversion Project to attract waterfowl to clean feeding habitat. In general, certain nonnative species replace native vegetation and reduce productivity of the habitat for wildlife that use wetlands while others may provide benefits to wildlife (Zedler and Kercher 2004).

The same infrastructure that impacts lake shorelines also impacts wetlands. Transportation networks such as highways and secondary roads not only impede water flow but also impede movement of wetland associated wildlife throughout the planning area. It is not uncommon for wetland animals in the planning area (like turtles, muskrat and beaver) to be killed by vehicles where roads obstruct their movements.

South Fork Coeur d'Alene River Watershed

Little wetland habitat is present within the South Fork Coeur d'Alene watershed and what remains has been heavily degraded by the aforementioned impacts to riparian areas within this watershed. Most of the historical wetland habitats adjacent to the river were filled in by mine-waste through deposition, or drained for development. Repository siting has also filled in wetland habitat but there has been mitigation for those losses. Several wetlands were created through cleanup actions at Smelterville Flats, and other nearby wetland areas include the Page Ponds wetland complex—two wetlands (East and West Swamp) occurring on the east and west sides of the Page tailings impoundment near Smelterville. The U.S. Fish and Wildlife Service has monitored waterfowl within several wetlands near Smelterville in the South Fork watershed over the past 10 years. Data indicate very low waterfowl use compared to other watersheds, but observations include mallard, Canada goose, common and Barrow's goldeneye, bufflehead, lesser scaup, redhead, and ring-necked duck. The Fish and Wildlife Service has documented elevated lead levels within the blood of waterfowl using the wetlands near Smelterville, as well as the Page Ponds wetland complex. Waterfowl using these wetlands are at considerable risk from lead exposure (Burch et al. 1996).

North Fork Coeur d'Alene River Watershed

The North Fork Coeur d'Alene River watershed contains approximately 8 percent of the wetland habitat within the planning area. The majority of wetlands in this portion of the planning area are forested/scrub-shrub and are located within the narrow North Fork floodplain. Wetlands have primarily been degraded within the watershed due to transportation networks and development within the floodplain. Conversion of wetlands to hay fields reduced wetlands along the North Fork substantially in the 1800s and early 20^{th} Century. More recently these areas have been sold or are being leased for camping areas along the river. Recreational use along the North Fork has increased substantially in recent decades causing greater disruption and displacement of wildlife that use remaining wetlands along the North Fork.

Coeur d'Alene Lake Watershed

The Coeur d'Alene Lake watershed contains approximately 56 percent of the planning area's wetlands. The lower Coeur d'Alene River flows through an extensive 20,000-acre floodplain with large complexes of wetland habitat that are incredibly diverse and productive. The river has been disconnected from its floodplain in many areas by levees and water control structures. Hydrologic connectivity between the lateral lakes and wetlands and the river exists during periodic high water overflow events and from surface channels that have been deepened or widened by dredging in the past.

Wild rice has been introduced into most wetlands during the past 50 years, and now occurs primarily in wetlands surrounding Killarney Lake (IDFG 2014). Wild rice is an important food resource for migratory waterfowl and other wildlife.

The Fish and Wildlife Service monitors waterfowl use within the Coeur d'Alene River floodplain during spring migration, conducting 12 weekly waterfowl surveys between February and May. In 2010, 2011, and 2012, a total of 141,074, 108,212, and 120,882 waterfowl (respectively) representing 32 species were observed using 23 wetlands surveyed within Coeur d'Alene River floodplain. The five most common species observed over the 3-year period included Canada goose (42 percent), northern pintail (14 percent), tundra swan (9 percent), mallard (8 percent), and American coot (7 percent). The remaining 27 species comprised less than 20 percent of the observations. Waterfowl numbers may also be high during fall migration but surveys are not conducted.

Although timing, magnitude, and duration of migration within the Coeur d'Alene Basin may fluctuate annually, Canyon Marsh, Lane Marsh, Cave Lake, Harrison Slough and Schlepp's East Field exhibit the highest waterfowl use. High use of wetlands is likely driven by habitat quality, preferred feeding habitat (with suitable water depths), and the subsequent accessibility to food resources by waterfowl.

The Coeur d'Alene River floodplain also provides habitat for one of the larger breeding populations of wood ducks in the Northwest. Wood ducks are cavity nesters and dependent on naturally occurring cavities or cavities excavated by woodpeckers in large trees for nest sites. Large cottonwood trees are especially important (IDFG 2014).

Wetland habitat has been affected by transportation networks, invasive species, and agriculture. Since the early 1900s, approximately 9,500 acres of wetlands have been converted to agricultural use (NRC 2005). However, the Environmental Protection Agency has identified within the OU 3 Record of Decision that approximately 1,500 acres of agriculture may be converted to wetlands to provide clean feeding habitat for waterfowl. Approximately, 400 acres of agricultural fields were converted to wetlands from 2007 to 2011 at the Schlepp Ranch.

Lead contamination as a result of upstream mining and mineral processing has had the most severe impact to lake and wetland habitats within the Coeur d'Alene River floodplain. Ingestion of contaminated sediment is the principal exposure pathway of migratory waterfowl to lead in the basin (Beyer et al. 1998; Audet et al. 1999; Beyer et al. 2000). Approximately 95 percent of the available waterfowl habitat in the lower Coeur d'Alene River floodplain contains lead concentrations above the cleanup goal of 530 milligrams of lead per kilogram (USEPA 2002). Lead residues in blood and liver tissues of waterfowl using the floodplain exceed both clinical and severe poisoning thresholds, and lead toxicosis has been shown to be the leading cause of waterfowl deaths within the floodplain (Stratus 2000; USEPA 2001).

Coeur d'Alene Lake has intermittent wetlands scattered around its shoreline, particularly in bays and backwaters. The largest aggregation of emergent wetland habitat is found within Cougar, Wolf Lodge, and Mica Bays. These areas are important feeding areas for migratory waterfowl and wildlife.

St. Joe River Watershed

Approximately 19 percent of the planning area's wetlands are found within the St. Joe River watershed. The lower St. Joe meanders across a wide alluvial valley and includes a relatively even distribution of palustrine emergent herbaceous, forested, scrub-shrub, and lake habitats.

Wet meadows are also present, but are generally dominated by nonnative reed canarygrass. Intact marshes and wet meadows occur further upstream where they fill old meander scars and depressions in the valley bottom (IDFG 2005). Within the lower portions of the St. Joe watershed, the Coeur d'Alene Tribe conducts waterfowl surveys during spring migration at Chatcolet, Round, Benewah, and Hepton lakes as well as other locations within the floodplain. Common species are similar to what is observed within the Coeur d'Alene River subbasin.

Most of the wetlands have been converted to agricultural-related uses and the river is constrained by levees within many areas that were constructed to protect agricultural lands from flooding; these actions have disrupted the natural hydrology. More recently, historical wetlands that have been converted to agriculture are now being converted to private recreation sites for semi-permanent camping sites and cabins. Recreation along the St. Joe River and its adjacent floodplain habitat has increased substantially in recent decades and human disturbance to wildlife that use the remaining wetlands along the river has increased as well. Public and privately owned wetlands are used by waterfowl hunters throughout the St. Joe watershed.

Extensive wetland complexes are present within the southern portion of Coeur d'Alene Lake, the marsh-dominated Round Lake, and the mouth and historic delta islands of the St. Joe River. The "River that flows through the Lakes" is a unique feature of the lower St. Joe River. Here the river flows between two natural levees that are surrounded by Benewah, Chatcolet, Round, Hidden, and Coeur d'Alene lakes. The State of Idaho and the Tribe manages most of these wetlands while infrastructure development is limited and most human impacts to wetland wildlife and habitat is recreation related. Hunting, angling, recreational boating, and annual jet boat races occur along the lower St. Joe River and disturbance to wetland wildlife occurs year round.

The St. Maries River valley immediately upstream of the confluence with the Saint Joe River is a wide wetland complex similar to the lower portions of the St. Joe floodplain. Where the St. Joe and St. Maries rivers meet there has been extensive drainage of and impact to historical wetlands from the urban development of the town of St. Maries. In what wetlands remain along the lower St. Maries River, cattails are common in marshes while sedges and rushes occupy wet meadows. Backwater sloughs and oxbow ponds are present. Although the lower St. Maries River has a levee system, the whole valley can flood during extreme flood events. Portions of the valley bottom have been drained for agricultural-related uses and to develop home and commercial sites.

Upper Spokane River Watershed

The upper Spokane River watershed contains approximately 10 percent of the Coeur d'Alene Basin's wetlands with 70 percent consisting of lake habitat and 20 percent as emergent wetlands. Within the upper Spokane River watershed data is lacking on waterfowl use, but relative to the St. Joe and Coeur d'Alene Lake watersheds, these wetlands provide limited stopover, resting, and nesting habitat for migratory and resident waterfowl.

Wetlands within the Rathdrum Prairie have been heavily impacted by residential development and agriculture. The remaining wetlands primarily occur along the foothills of the surrounding mountains and are associated with lake margins such as Hauser, Twin, Chilco, and Hayden lakes.

These wetlands range from less than 1 acre to nearly 250 acres and are primarily seasonally flooded emergent wetlands.

Hangman Creek

This watershed has been subjected to intensive farming practices resulting in heavily degraded wetland habitat. Extensive drainage has depleted many of the wetlands in the area so that they could be farmed (Green 2011). Most croplands are plowed to the edge of the streams and forestry practices have cleared much of the upper watershed, contributing to increased flooding frequency as well as increases in sediment inputs and decreased base flows. All of these factors have greatly altered the hydrology and reduced water retention necessary to support wetland function. However, flooded agricultural fields provide stopover habitat for migrating waterfowl and where wetland habitat exists it provides feeding, resting, and nesting habitat for waterfowl.

Streams and River Habitats and Species

Numerous streams and rivers deliver water to lakes and wetlands within the planning area. Priority streams identified for restoration are based on the needs of injured west slope cutthroat trout and bull trout and include both contaminated and uncontaminated systems throughout the planning area.

The habitat within and adjacent to streams and rivers provides important food resources, hiding cover, movement corridors, and thermal cover, for many wildlife species. Some animals, such as harlequin duck, American dipper, and river otter depend entirely on stream habitats to complete their life cycle. For example, bank swallows, northern rough-winged swallows and belted kingfishers rely on sloughing riverbank habitat to construct their cavity nests (Rodewald 2015). Black swifts nest behind or near waterfalls (Rodewald 2015). Species like these are so closely tied to stream and river environments that their populations increase or decline in large part based on the availability of intact and productive stream habitats. The majority of the Idaho breeding population of Harlequin ducks is concentrated on approximately 30 headwater streams in the upper St. Joe River, Marble Creek, a major tributary to the St. Joe River, and the North Fork upper Coeur d'Alene River (Jankovsky-Jones 1999).

Other species, such as moose, elk, black bear, fisher and white-tailed deer use the stream environments as water sources, for thermal cover, and because riparian habitat adjacent to streams is highly productive in both prey and forage species.

There are indirect beneficiaries of healthy streams and rivers, such as pileated woodpeckers, bald eagles, Bullock’s orioles, and downy woodpeckers that nest in the seral forests that can be found adjacent to streams (such as cedar groves and cottonwood forests). Vigorous shrub communities found along stream corridors also provide valuable habitat for migratory and resident passerine bird species. The diverse vegetation along streams supports a diverse insect community which, in turn, supports numerous birds and mammals (Patton and Judd 1970, Darveau et al. 1995). A few of the bird species that are known to use the planning area and are highly associated with the riparian habitat along streams and rivers include Bullock’s oriole, yellow warbler, willow flycatcher, northern waterthrush, and American redstart.

Like wetlands and lakes, stream habitats have been heavily impacted by people and their activities (see section 3.4). Many of the factors that affect the capacity of streams and rivers to provide habitat for aquatic species also affect the wildlife habitats associated with these systems. Only backcountry streams have low levels of disturbance and impacts. Even in less developed areas, small streams are used for fishing, hiking, camping, and even small-scale mining. Development of thousands of miles of primary and secondary roads to access forest resources, private lands, and recreation sites has altered stream flow and runoff and provided greater access to stream habitats. The American dipper and some bat species, which nest and roost under the numerous small bridges over high gradient streams, have benefited from such developments.

Historical and current mining activities have impacted stream environments more dramatically and more visibly than any other habitat type in the planning area. The transport of tailings and contaminated sediments, as well as the intentional placement of tailings within stream corridors has drastically altered the vegetation community, especially in the South Fork watershed. These impacts are discussed in more detail in the geographic subsections below.

South Fork Coeur d'Alene River Watershed

Streams and their associated riparian habitats within the South Fork Coeur d'Alene River watershed have been heavily degraded by major transportation networks (such as Interstate 90), development, and invasive species. However, over a century of mining and mineral processing operations has had the largest impact to riparian resources within the watershed and Stratus (2000) summarized riparian conditions as follows:

- In the riparian zones of Canyon Creek, Ninemile Creek, and the South Fork Coeur d'Alene River, extent of vegetation cover, species richness, and vegetation structural complexity are significantly negatively correlated with concentrations of hazardous substances in soils.
- Phytotoxic concentrations of hazardous substances in floodplain soils have resulted in significant and substantial reductions in riparian vegetative cover and an increase in the amount of bare ground in the riparian zones of Canyon Creek, Ninemile Creek, and the South Fork Coeur d'Alene River.
- Soil phytotoxicity and reductions in vegetation cover have resulted in deterioration of ecological functions, including habitat for all wildlife resources that are dependent on riparian habitats in the subbasin; growth media for plants; food, cover and feeding and resting areas for migratory birds and mammals; and the migration corridor provided by the riparian zone.

Riparian habitat has also been influenced by cleanup actions aimed at reducing and containing metals contamination within the subbasin. Large-scale cleanup actions and repositories for mine waste have both created and eliminated riparian habitat along the South Fork Coeur d'Alene River and its tributaries. Cleanup actions at Smelterville Flats reduced contamination levels and, since cleanup occurred, riparian habitat has responded and large areas of riparian vegetation are now present (USFWS 2014b). However, target cleanup goals at this site were for human health and were not protective of wildlife. Recent studies have shown songbirds using newly established riparian habitat are at risk from continued metals exposure (USFWS 2008; Hansen et al. 2011). Repositories are needed to contain large volumes of mine waste from cleanup actions and, due to topography, most of these are located within floodplains that will limit riparian recovery. Current and/or planned repositories are located near Osburn, Woodland Park, Cataldo, Kellogg, and Smelterville.

Many areas within this watershed are in need of restoration actions, but many constraints, including transportation networks, development, and metals contamination, will continue to limit restoration success.

North Fork Coeur d'Alene Watershed

Riparian habitat within the North Fork Coeur d'Alene has not been impacted by mining with the exception of placer and hard-rock mining in the Prichard and Beaver Creek drainages flowing into the North Fork Coeur d'Alene River. These actions released mine contamination and resulted in miles of floodplain being turned over by dredging operations.

Riparian habitat within this watershed has primarily been affected by over a century of timber harvest and associated transportation networks (USFS 2012). Historically, trees were harvested within riparian areas and riparian habitat has not fully recovered. Other effects include invasive species, development, and recreational activities (NPCC 2005; USFS 2012). Riparian habitat along the lower portions of the river are in poor condition, the middle reaches are in moderate condition, while the upper reaches are generally in good condition (see Figure 4 on page 97). The lower portion of the river has seen almost exponential growth in recreational use. Private land along the river that is not being actively used for agriculture is being quickly converted to recreation sites. Floating, angling, and camping opportunities have attracted substantial numbers of users and the associated infrastructure may contribute to degradation of wildlife habitat along the lower portions of the North Fork.

Coeur d'Alene Lake Watershed

Riparian habitats along streams in the Coeur d'Alene Lake watershed have been altered by development, agriculture, timber harvest, invasive species, hydropower, grazing, and metals contamination. Metals concentrations within riparian soils have produced phytotoxic conditions and deposition of mine waste has covered native organic soils resulting in areas of bare ground and reduced vegetation. Although conditions are not as severe as on the South Fork and some of its tributaries, riparian conditions have been degraded along the Coeur d'Alene River from upstream mining operations.

Agriculture, grazing, flood control, and hydropower have also reduced riparian vegetation in many areas along the Coeur d'Alene River. Agriculture, including cropland, pastures, and meadows for grazing livestock is a dominant land use along the Coeur d'Alene River, which has resulted in areas of bare ground, monotypic vegetation, or reduced riparian vegetation communities. Post Falls Dam causes flooding along as much as 25 miles of the Coeur d'Alene River shoreline during the summer months, which also has resulted in unvegetated "drawdown zones" along the shoreline (NPPC 2005). The zones frequently collapse when spring flows increase, ultimately reducing the acreage of available riparian habitat along the river.

Although altered by human activity, the riparian zones along the lower Coeur d'Alene River still support riparian habitat. Riparian zones along shallow areas at the outlet of the river at Coeur d'Alene Lake support aquatic vegetation, emergent vegetation in Harrison Slough, and forested wetlands in the uppermost floodplain zone. Upstream at the confluence of Fourth of July Creek, riparian areas along emergent wetlands line both sides of the river. Although all of these riparian zones support diverse riparian vegetation communities, soils are contaminated with lead and pose a significant risk to some wildlife species, including ground-feeding songbirds (Hansen 2011; USFWS 2014b).

St. Joe River Watershed

Riparian conditions within the St. Joe River watershed follow a similar pattern as modelled within the North Fork Coeur d'Alene River watershed. Riparian habitat within upper reaches of the St. Joe River and many of its tributaries are in good condition with conditions becoming moderate within the middle reaches and poor in the lower reaches (see Figure 4 on page 97). The watershed has been subjected to timber harvest, road building, agriculture, grazing, and development. The lower reaches of the St. Joe River support extensive pasturelands and hayfields and approximately 75 percent of riparian zones along the lower portions of the St. Joe River have been converted to agriculture (NPPC 2005). A historically unprecedented proportion of the riparian zones in third order and larger drainages are now deforested, mechanically scarified, or dominated by early succession vegetation (NPPC 2005). Where riparian areas are intact, riverbanks are vegetated with black cottonwood, quaking aspen, and willow, with shrubs and emergent vegetation along broader floodplains and in backwater sloughs. Remnant strings of cottonwoods are present along the naturally raised levees of the St. Joe River channel. Remaining cottonwood stands along the St. Joe River are among the most natural stands known in terms of native species presence in the state of Idaho (NPPC 2001).

Recreational use of the St. Joe River has increased dramatically in recent decades. Conversion of the riparian habitat to developed camping sites and recreation on public lands attracts many users to the St. Joe River. Non-motorized boat use, angling, hunting, hiking, and wildlife viewing occur in the lower and upper portions of the St. Joe River and its tributaries. Motorized boat use along the lower reaches of the St. Joe is common and jet boat races occur on the lower reaches annually. The year-round and growing presence of recreational, commercial, and private uses influences the occurrence of wildlife in stream habitats along the St. Joe.

Along the lower St. Maries River, riparian deciduous forests, scrub shrub, and occasional emergent wetland communities are also present. Many of the activities described above for the St. Joe River are prevalent within the St. Maries River drainage, although recreational use is not as high.

Post Falls Dam causes water fluctuations on as much as 25 miles of the lower St. Joe River, 1ncluding a few miles of the St. Maries River, during the full pool summer months (NPPC 2000).

Upper Spokane River Watershed

Riparian habitat along the Spokane River from its outlet at Coeur d'Alene Lake to Post Falls Dam has been heavily degraded by residential development and water fluctuations resulting from hydropower operations at Post Falls Dam. Public and private recreational areas and beaches have also reduced riparian vegetation along the Spokane River.

Riparian areas along streams, wetlands, and lakes on the Rathdrum Prairie have also been heavily impacted by residential development as well as agriculture. Lakes and wetlands and their associated riparian habitats are a low priority for restoration (for reasons mentioned previously) and little restoration will likely occur within these areas.

Hangman Creek

Wildlife habitats within the portion of the Hangman Creek watershed that lies within the Coeur d'Alene Reservation have been degraded from a century of land management practices that include widespread conversion of native habitats to agricultural production and intensive silvicultural practices (Green 2001). The Coeur d'Alene Tribe analyzed riparian habitats on Coeur d'Alene Reservation lands within the Coeur d'Alene Lake watershed and determined that almost 50 percent of Reservation riparian zones are currently in agricultural land uses and another 4 percent are developed (Coeur d'Alene Tribe 2001). Riparian vegetation is likewise sparse over much of the watershed. In the valley bottom along Hangman Creek, fields are typically plowed to the channel margins, and where riparian vegetation does exist in the open bottomlands, it is often dominated by invasive reed canary grass (Green and Roberts 2003).

Upland Habitats and Species

Although restoration projects will primarily occur within the aquatic environment, its associated riparian habitat, or in the flood plain of rivers and streams, in some instances, upland habitats or habitats that currently function as uplands will be restored as well. An example of this would be the conversion or restoration of an agricultural field within the floodplain into a wetland. Also, streambank and river restoration projects may influence forest communities that lie adjacent to the riparian zone.

Upland habitats within the historic floodplains of the planning area are often agricultural lands, predominantly pastureland and hayfields. These areas can provide habitat for migratory birds such as bobolink and savannah sparrow during the summer. These agricultural fields also provide habitat for small mammals and raptors, as well as foraging and fawning habitat for white-tailed deer. Elk will use fields for forage, especially in winter months and during spring green-up. Coyotes and fox will also hunt in fields where small mammal abundance is high.

3.5.2 Analysis of Effects – Terrestrial Species and Habitats

3.5.2.1 Spatial and Temporal Scale

The broad planning area is the area of analysis for terrestrial wildlife species although the extent of certain effects may be more localized. This area is sufficiently large to determine the effects to species with larger ranges that use many portions of the planning area, such as waterfowl, moose, and bald eagle. It is also small enough to detect effects to species that are very localized and use smaller portions of the planning area, such as kingfisher or muskrat.

In assessing the effects of direct disturbance and mortality, it is important to note that project implementation would be spaced out temporally and geographically over many years, giving displaced wildlife alternative habitats to use temporarily and allowing local populations to recolonize or recover after implementation of a project is complete.

3.5.2.2 Definitions

Implementation of Alternatives 2 and 3 would affect wildlife habitat and distribution, as well as species abundance. Impacts to terrestrial wildlife that are common to both alternatives can be grouped into four categories: **distribution**, **disturbance**, **displacement**, and **mortality**. The definitions below help to describe the types of impacts and the assumptions used in this analysis. These categories can further be refined by their severity and duration:

Short-term impacts are those that are typically direct, are likely to occur during project implementation and possibly shortly after. Short-term effects to habitat and species could occur over hours, days, or possibly up to one year during the active construction phase, depending on project type.

Long-term impacts are typically indirect impacts and they occur from 1 year to perpetuity. Long-term effects would consist of changes in habitat conditions as a result of actions proposed in the alternatives.

3.5.2.3 Analysis Assumptions

No Net Loss of Riparian Habitat

The following analysis assumes that there will be no net loss of riparian habitat (wetlands, lakes, streams and their associated riparian habitats) throughout the planning area as a result of implementing Alternative 2 or 3. The analysis also assumes that proportions of the various types of habitat would change (for example, a net gain of shallow wetlands, but a loss of agricultural floodplain), but the total acreage of riparian habitat in the planning area would either stay the same or increase.

Climate Change

Changing climate will affect terrestrial wildlife regardless of which alternative is selected. How climate change will specifically impact wildlife and their habitats is speculative. However, lower annual precipitation, lower snowpack levels, and higher temperatures are projected for the planning area (Mote et al. 2014). All three of these effects of climate change can have dramatic impacts on wetland ecosystems used by terrestrial wildlife. Lower water availability would reduce available wetland acres and change water depths, which could impact wetland vegetation and have a cascading effect on primary (herbivores) and secondary (carnivores, omnivores, and scavengers) users.

While climate change will be unaffected by the implementation of this project, the benefits and costs of implementation may be variably and disproportionately impacted by climate change. For example, if water availability is substantially reduced within the lower Coeur d’Alene River Basin, then those wetlands that remain available to wildlife become exponentially more valuable and critical to wetland-dependent terrestrial wildlife species. If the remaining wetland areas are highly contaminated, then the risk of greater exposure to contaminants is increased for wildlife.

Application of Design Features

It is assumed that the design features outlined in section 2.2.4 will be implemented as a part of restoration projects. These design features will help to reduce mortality and disturbance related to construction and other elements of project implementation.

3.5.2.4 Alternative 1 – No Action

Direct and Indirect Effects

Under this alternative, there would be no direct impacts to wildlife because no restoration would be implemented. There would be no disturbance or mortality related to construction or implementation of restoration projects. The current level of disturbance of wildlife in the planning area due to other human-related factors would be expected to continue. Any displacement of wildlife that occurs would be due to existing levels of human disturbance, changes in habitat related to climate change, or normal geomorphological processes.

Long-term and indirect effects from the no-action alternative are discussed below.

Abundance and Distribution of Terrestrial Species and Habitat

In the no-action alternative, the distribution of species would stay as it is currently. Wildlife would continue to use contaminated areas. The number and diversity of species would likely remain as they are currently. Data collected by the U.S Fish and Wildlife Service between 2005 and 2012 (SFWS 2014b) and Idaho Fish and Game (IDFG 2014) do not indicate a decreasing trend in waterfowl diversity and abundance.

Contaminated soils would continue to degrade the planning area until clean soils are naturally deposited to depths such that they do not come into contact with terrestrial wildlife. This process could take several centuries. The distribution of lake, stream, and wetland habitats would not change and thus there would be no changes to distribution of the various wildlife communities associated with shallow wetlands, lacustrine habitats, or stream corridors. Plant communities in portions of the planning area would continue to support a lower diversity of wildlife species. Habitat impairment due to contamination, as described in section 3.5.1.2, would continue to limit the health of wildlife populations throughout the planning area.

Mortality levels due to metals contamination would continue to reduce survival, physiology, and reproductive success. Annual waterfowl deaths from exposure to contamination would likely continue over time until baseline conditions are ultimately reached. Those species most vulnerable to contaminants would have continued exposure within contaminated habitats of the planning area. Over time (centuries) contamination levels would decrease and wildlife mortality resulting from contamination would decrease as well.

Effects to Federally Listed Species

There would be no effect to federally listed species specific to the no-action alternative because no action would be taken that might cause direct or indirect impacts to wildlife. There also would be no eventual beneficial impacts to listed species that could potentially use the area in the future. For example, improvements to stream habitat and native trout populations that might make the planning area more suitable for use by grizzly bears would not occur.

Cumulative Effects

Under the no-action alternative, there would be no implementation of projects that combine with the effects of other actions to create cumulative effects.

Recovery of Species and Habitats toward Baseline

The exact rate of recovery of terrestrial wildlife species and their habitats toward baseline under the no-action alternative cannot be predicted but would certainly be much slower than if Alternative 2 or 3 were selected. The rate of recovery would largely depend on restoration work that may be carried out by others, and the success of remediation projects in the upper portion of the basin and the eventual transport of uncontaminated sediments through the Coeur d’Alene, St. Maries and St. Joe rivers. Over time, deposition of clean sediments would reduce the impairment of riparian habitats, but this process would likely take centuries. Without intervention, riparian areas now dominated by invasive species would likely remain within a degraded state, and thus never be able to support wildlife species or abundance at optimal levels.

3.5.2.5 Alternative 2 – Ecosystem Focus With Additional Human Use Considerations (Proposed Action)

Under this alternative, up to 10 percent of the funds would be used for projects whose main purpose is to restore human uses of injured natural resources in the planning area in the near term (such as subsistence gathering, hunting, fishing, and creating or improving recreational sites) while ecosystem restoration proceeds. These projects may not have an ecological benefit. In addition, this alternative increases the geographic area for restoration to include natural resources in the upper Hangman Creek watershed on the Coeur d’Alene Reservation. Major actions related to human uses of natural resources that are included in Alternative 2 are:

- Restore and facilitate recreational and other opportunities;
- Enhance opportunities for people to connect with Tribal and non-Tribal cultural resources;
- Provide targeted scenic improvements to viewsheds; and
- Promote stewardship of natural resources and support education associated with cleanup and restoration.

Because funds would be used to restore near-term human uses under Alternative 2, fewer dollars would be available for ecosystem-based restoration projects. What this would mean for wildlife and their habitats is difficult to predict. However, selection of Alternative 2 may result in fewer acres of habitat that would be restored primarily to benefit wildlife.

Because this analysis is programmatic and the details of the restoration projects are not known, the analysis has been broken down into broader categories relating to the type of project. The analysis below addresses how the implementation of restoration methods in the priority areas outlined in Alternative 2 would affect the distribution of wildlife habitat and the abundance of wildlife in the planning area.

Direct and Indirect Effects

Examples of the physical techniques that would be employed to achieve restoration under Alternative 2 are described in section 4.1.3 of Appendix 5 include but are not limited to:

- diking
- installing water control structures
- pumping water
- excavating shallow water areas
- plugging ditches
- planting desirable vegetation
- controlling noxious weeds
- controlling other undesirable vegetation
- installing nest boxes
- blasting
- constructing islands
- breeching levees
- constructing channels
- streambank bioengineering
- creating snags
- revegetating shorelines
- stabilizing shorelines and banks
- moving, removing, or improving roads
- fencing
- capping, flipping, or removing contaminated soil in coordination with other agencies

Projects that may be proposed in Alternative 2, but are not proposed in Alternative 3, include those designed to improve human uses of natural resources, such as:

- constructing and improving access sites and trails
- paving, and installing boardwalks
- creating swimming areas in lakes and rivers
- creating observation blinds
- building educational kiosks
- providing hunting and fishing opportunities

Short-term Effects

All of the approaches outlined above, which would include earth moving, vegetation removal, and disturbance, have the potential to negatively impact wildlife, through mortality and disturbance. For species such as meadow vole that cannot easily move long distances and are more vulnerable to dirt removal, paving, and soil leveling, the likelihood of mortality is high. But for species such as moose, disturbance would be temporary and displacement to suitable habitat nearby would not likely be life threatening. Effects to species would not occur at the population level. Implementation of design features would minimize the impacts of construction projects designed to improve human uses of natural resources.

Direct mortality to wildlife from the implementation of the potential restoration and human use projects is expected. For example, removal of vegetation during the restoration process could result in loss of bird nests. Mortality to subterranean mammals and ground nesting birds, or other species during earth moving, temporary or permanent draining or flooding of wetlands, and flooding of upland areas would also be expected.

The levels of direct mortality resulting from implementation of Alternative 2 will be at the individual level and not result in population level effects. Disturbance will be localized occurring within the footprint of the project area, particularly with the addition of the design features outlined in section 2.2.4.

Long-term Effects

Wildlife Habitat

Actions identified under this alternative that potentially may have long-term negative effects to terrestrial wildlife habitat are primarily aimed at reducing contaminant exposure within heavily contaminated wetlands where high waterfowl mortality occurs (such as Strobel Marsh). Temporary water level manipulation (artificial flooding) would be used to mimic natural hydrologic processes within contaminated wetlands within the planning area only during periods of high waterfowl use (like spring migration). Although, water level manipulation may have negative effects to some species, it would be beneficial to dabbling waterfowl by decreasing exposure to lead contamination. Artificially holding water for a brief time would not likely result in substantial effects to wetland habitat. In highly contaminated wetlands, vegetation composition would be changed to make wetland food resources less desirable; this would result in negative impacts to wetland habitat but would help keep waterfowl from feeding in these areas.

Temporary water level manipulations may also occur within some wetlands on an annual basis as a management tool to increase wetland productivity, resulting in long-term habitat changes during certain timeframes. These actions would alter the hydrology and in turn may affect vegetation composition of the wetland.

The long-term effects to terrestrial wildlife would be largely beneficial under Alternative 2. Habitat throughout the planning area would be enhanced or restored where projects are implemented. New wetland habitats would be created where projects shift dryland habitats to wetlands, increasing the abundance of wetland and associated riparian areas in the planning area. Major actions to accomplish long-term benefits to terrestrial wildlife habitat identified under this alternative include:

- Restoration of wetland processes and functions, including plant diversity and hydrology to degraded wetlands.
- Wetland construction.
- Restoration of wetlands after cleanup actions (conducted by other agencies) to provide clean habitat.

- Protection and preservation of riparian and wetland habitat.
- Restoration and enhancement of riparian habitat along streams, rivers, wetlands, and lakes.

Projects carried out under Alternative 2 to restore human uses of natural resources (enhancing or creating recreational opportunities) may also produce long-term negative effects on wildlife habitat. These actions may increase access and use, which may affect vegetation and soil stability. Design features under this alternative may limit human use disturbance but some negative long-term effects are expected to occur where human use projects are implemented.

Wildlife Species

Impacts to wildlife species can be categorized by the type of action implemented, whether the impacts are direct or indirect, and by the temporal scale of the impact. The resulting change as it relates to wildlife populations can be described as changes to the abundance and distribution of wildlife and changes in population as a result of changes to the distribution of habitat. The following analysis discusses how displacement, distribution, disturbance, and mortality may alter the abundance and distribution of wildlife and their habitats within the planning area.

Actions that Restore, Rehabilitate, or Create Riparian and Wetland Habitat

Changes in Terrestrial Wildlife Abundance – Actions that restore, rehabilitate, or create riparian and wetland habitat identified under Alternative 2 may have short-term adverse effects to wildlife abundance (as described previously) but would have long-term benefits resulting in increased abundance of wildlife. Restoration would improve the quality of habitat, thereby providing increased areas for breeding, rearing, feeding, and cover. Additional habitat acreage would also be created, thereby increasing wildlife abundance.

Changes in Wildlife Species Distribution – The distribution of a species is largely determined by the availability of suitable habitat and an individual's ability to access that habitat. All of the various methods for restoration have the potential to redistribute riparian and wetland habitat for wildlife in the planning area. This distribution of wildlife can be influenced by the change in availability of suitable habitat (habitat is converted to more suitable conditions or newly created habitat becomes available). In addition, whether a species occupies suitable habitat is often determined by whether that habitat is accessible (for example, there may be obstacles to access, the suitable habitat is already occupied and at carrying capacity, or the habitat is beyond the dispersal distance that a species is capable of traveling).

Habitat changes resulting from restoration actions proposed under Alternative 2 could result in shifts in species assemblages, ranging from changes in the distribution or occurrence of species across the planning area to complete displacement of certain species. For example:

- If habitat changes associated with restoration projects are profound enough to make conditions unsuitable for existing species, then displacement would occur. In this circumstance, some species may be less able to move long distances to find suitable habitat. For example, muskrats have small home ranges that rarely exceed 300 feet from their lodges (Fredrickson 1982). The longest dispersal distance for males rarely exceeds 19 miles (Fredrickson 1982). Thus, if a shallow wetland area is temporarily drained so it can be effectively restored, a displaced muskrat would require a wetland with similar characteristics within about 19 miles. If this wetland is already occupied, it may be unsuitable for use though it has the necessary vegetation and hydrological characteristics. Risk of mortality by predation, vehicle collision, or exposure, increases for animals as the distance of dispersal increases (Murray 1967).

- Likewise, bird species assemblages would change following projects that alter water depths. For example, if a highly contaminated area is temporarily flooded to create water depths that are unsuitable for foraging swans (greater than about 4 feet) then animals that prefer deeper wetlands will use this area during that time (such as coots, grebes, or loons). Likewise, those species that prefer shallow wetlands (dabbling ducks, raccoons, and great-blue herons) would be forced to find a different area that is suitable for foraging.
- Projects that manipulate water depths would shift species assemblages. If water levels are managed to make contaminated soils less accessible or is used to increase wetland productivity, those species that prefer deeper water lakes (such as diving ducks, cormorants, loons, and grebes) would have additional sites to use for some of the year while at the same time displacing swans, mallards, Canada geese, or other dabbling ducks that previously may have used the site for foraging. Distribution of aquatic mammals such as muskrat and beaver would also change as deeper water wetlands are redistributed in the planning area.
- Conversion of an agricultural field that currently supports small mammals, coyotes, nesting short-eared owls, and northern harriers to a shallow water wetland or flooded field would displace the previous assemblage with wetland species such as dabbling ducks, osprey, moose, great-blue herons, and marsh wrens.
- Projects that use water control structures to alter the time of year certain water depths are available (to deter waterfowl such as tundra swans from feeding in contaminated sites) or increase wetland productivity would attract a new suite of wildlife species, such as grebes, coots, and ring-necked ducks.
- Large mammals that are associated with wetlands, such as moose, would also change their habitat use patterns as wetlands with their preferred characteristics are restored and created in the planning area.
- Restoration of lakeshore vegetation would affect habitat suitability and distribution of wildlife species associated with lakeshores. For example, there are many acres of floodplain adjacent to Killarney Lake and Mission Slough that are currently dominated by *phragmites*, an invasive and nonnative plant. While *phragmites* functions well to stabilize soil, it is a poor substitute for healthy riparian vegetation. *Phragmites* crowds out native wetland vegetation, reducing plant diversity and creating a monoculture. (Meyerson et al. 2000). After remediation of the contaminated soils conducted by other agencies, native vegetation (such as a diverse community of willow and cottonwood) might be planted in the same area. The newly established native vegetative community would support a more diverse and abundant wildlife community. Species such as willow flycatcher, Bullock's oriole, and moose would find the site far more suitable after restoration and recovery.

Depending on the specific action under this alternative, wildlife may either expand or shift their distribution across the planning area. Riparian or wetland restoration would temporarily reduce the suitability of habitat during implementation and it is likely that some animals would be displaced and temporarily redistributed. Eventually, degraded riparian and wetland habitats would improve after restoration and these habitats would be less impaired and provide greater benefits to wildlife, such as foraging areas, cover, and movement corridors. Thus, some animals would be displaced and shift their areas of use within the planning area during implementation but may return, and in greater numbers, once riparian and wetland habitat has been restored. Highly impaired riparian habitats like those found in the South Fork of the Coeur d'Alene River and its tributaries, should see dramatic improvements in riparian habitat within restored areas. These functioning habitats would essentially add acreage available to wildlife species that use riparian habitats and expand wildlife distributions.

Actions that Reduce Exposure to Contaminants

Restoration projects that reduce wildlife exposure to contaminants would reduce the morbidity and mortality of wildlife. Methods that may be used to reduce contaminant exposure include:

- Creating new wetlands with little or no contamination.
- Restoring existing clean wetlands to increase wildlife use.
- Temporarily manipulating water levels to decrease suitable habitat within heavily contaminated wetlands to reduce wildlife exposure.
- Restoration following cleanup actions (conducted by other agencies) to attract wildlife to clean habitat

Changes in Terrestrial Wildlife Abundance – A reduction in the morbidity and mortality of wildlife would be expected and is a major focus of ecological restoration in the contaminated portions of the planning area. Actions aimed at reducing wildlife exposure under this alternative would increase wildlife abundance, and species that use contaminated habitats within the planning area are most likely to experience the greatest benefits of reduced contamination exposure under Alternative 2 compared to the no-action alternative. Therefore, abundance of some wildlife species that use contaminated habitat would likely increase under this alternative.

Actions that Restore Human Uses

Changes in Terrestrial Wildlife Abundance – Improvements to human uses (such as increased access to sites or recreational facilities) are likely to attract more users to the planning area and could increase the likelihood of wildlife mortality due to hunting and disturbance. For instance, installation of a boat launch that can be used during low water levels in fall and winter would allow for greater waterfowl hunter access and hunting pressure may increase in wetlands near the new boat launch.

Wildlife that are sensitive to disturbance (such as breeding migratory birds, moose, and bobcat) may decrease locally in areas of high human use. However, these decreases in abundance would often be seasonal and localized. For example, if a human use project establishes a camping area near a lake, there may be mortality to some animals from construction activities at the site (such as vegetation removal, dirt removal, paving, and leveling, or structure building). In addition, the high levels of human disturbance associated with campground use during the migratory bird nesting season could cause nest abandonment or increase the likelihood of nest failure.

Some of the human uses projects proposed under Alternative 2 could have an indirect and long-term benefit to wildlife in the planning area, including intangible benefits that may not be realized for many years. Examples include:

- Environmental curriculum development for local schools that help instill an appreciation for conserving wildlife and wildlife habitat
- Promotion of environmental stewardship through interpretive trails or similar approaches
- Restoration of wildlife-based non-consumptive recreational opportunities such as wildlife viewing areas
- Preservation of open space

Changes in Terrestrial Wildlife Distribution – Because Alternative 2 includes selection of projects that restore human uses to the planning area, there is a potential for medium to long-term impacts to wildlife species distribution if more people are drawn to the planning area for recreation or other uses (such as hunting, boating, or hiking). Increased human use is likely to disturb wildlife (Carney and Knight 1999; Taylor and Knight 2003). Disturbance to wildlife often results in changes in habitat use (Harris et al. 2014).

For example, increased access results in greater human use of wetlands and lakes for hunting or other uses, and distribution of waterfowl and other wildlife may change as a result of disturbance from the increased human activity. Another example might be the establishment of a swimming area along a lake shoreline in the planning area. High levels of human uses in the summer months might displace nesting migratory birds that previously used riparian vegetation, when the vegetation has been degraded or removed. Other animals that may have used the area to access drinking water or for thermal cover in the hot summer months, would likely find a different area to access water and riparian habitat nearby that had less disturbance.

Effects to Federally Listed Wildlife Species

Grizzly Bear

Grizzly bears have wide-ranging territories and can use a variety of habitats throughout the year. There are no bear management units, core areas, or designated critical habitats within the planning area. The planning area is currently considered by the Interagency Grizzly Bear Committee to be unoccupied (Interagency Grizzly Bear Committee 2014). However, there have been recent documented sightings of grizzlies within the planning area (see section 3.5.1.1). Thus, the chance that a grizzly bear may be in the planning area during implementation cannot be ruled out entirely. An analysis of impacts, though they are unlikely, is provided below.

Direct impacts that could occur if a grizzly bear was present during implementation include disturbance and displacement. The presence of humans and equipment during implementation could cause a grizzly to leave a preferred area. Because construction would be temporary in nature, the individual(s) could return to the site upon completion of the project if the modified habitat is still suitable. Grizzly bears that are disturbed by humans spend less time foraging and more time moving, which negatively impacts their energy budget (White et al. 1999).

If implementation of the project resulted in habitat that was either temporarily or permanently unsuitable, the individuals would have to find suitable habitat elsewhere. Because grizzly bears are generalists, it is unlikely that temporary or even permanent displacement would cause significant negative impacts to grizzly bears that may use the planning area.

Restoration of riparian habitats and aquatic habitats would benefit many terrestrial wildlife species. Increasing numbers of native trout would improve the suitability of habitats in the planning area for grizzly bear. Restoration of riparian habitats would increase diversity, species richness, and productivity which would also benefit use by grizzly bears now or in the future, if the planning area were to ever become occupied.

For the reasons listed below, effects to grizzly bear are unlikely, however individual projects, when proposed will be further evaluated:

- There have been only six confirmed sightings of grizzly bears in the planning area in the last 15 years.
- There are no designated critical habitats, bear management units, or core areas within the planning area.
- Any potential impacts would be temporary.
- Habitat improvements and restoration of fish populations would improve habitat suitability for grizzly bears if they were to use the planning area.

Canada Lynx

While Canada lynx are more specific in their habitat requirements than grizzly bears, they are long-ranging animals that use large areas of the landscape and have a sizeable dispersal distance (Interagency Lynx Biology Team 2013). There is no designated critical habitat for this species within the planning area. There are lynx analysis units within the planning area; however, they largely occur within higher order streams where restoration projects are less likely to occur (Tier 2 and Tier 3 Priority Areas). In the unlikely case of disturbance, impacts would be similar to those described for grizzly bears. Impacts to lynx would be unlikely and temporary for the following reasons:

- There have been 20 unconfirmed sightings of Canada lynx in the planning area since 1916.
- There is no designated critical habitat within the planning area.
- Any potential impacts would be temporary.
- Habitat improvements and restoration of riparian and aquatic habitats would improve habitat suitability for Canada lynx if they were to use the planning area.

Recovery of Populations toward Baseline

Alternative 2 differs from the no-action alternative in terms of the rate, extent, and likelihood that wildlife populations will return to baseline conditions.

Rate: The exact rate of recovery toward baseline cannot be predicted but would certainly be faster than if the no-action alternative were selected. More productive habitats with lower exposure to contaminants would reduce morbidity and mortality and support high reproductive rates for terrestrial wildlife in the planning area. In addition, some areas that currently do not function as riparian habitats may be converted and add riparian acreage to the planning area.

Extent: The extent of the area of recovery would theoretically be greater under Alternative 2 because of the addition of the upper Hangman Creek drainage. However, because there will be fewer funds available to conduct ecosystem only projects there may be fewer acres overall restored.

Likelihood: Terrestrial wildlife populations are far more likely to recover toward baseline levels under this alternative then under the no-action alternative and slightly less likely than under Alternative 3. The difference of likelihood between Alternatives 2 and 3 would be related to the likelihood that fewer acres would be restored in Alternative 2 than Alternative 3. How many fewer acres is not known but what is known is that up to 10 percent of the available funds would be diverted to projects that restore human uses of natural resources and not necessarily ecosystems.

Cumulative Effects

Spatial and Temporal Scope

The temporal scope is approximately 15 years, as described in section 3.1. The broad geographic scope of the cumulative effects analysis for terrestrial wildlife habitat and species is the boundary of the restoration planning area. For some species or habitat types, cumulative effects may only be measurable or meaningful at smaller spatial scales. Conversely, for some migratory species with vast ranges (such as migratory birds), the planning area represents only a small fraction of the habitats they occupy during their life histories and species populations may be structured by events or conditions outside of the planning area. Furthermore, migratory species that use the planning area may represent only a small portion of a larger population that congregates and separates seasonally throughout the entire western hemisphere. Thus for migratory species, cumulative effects to wider populations due to the alternatives may be difficult to predict. For the purposes of this analysis, effects are described only for the portion of the larger species populations that use the planning area.

Effects of Past and Present Actions

The effects of past and present actions on terrestrial wildlife species and their habitats are evident in the existing conditions today; therefore, they are discussed in the existing condition description of the “Affected Environment” section.

Effects of Reasonably Foreseeable Actions

Reasonably foreseeable actions are described in Appendix 2. Among this group of actions, activity types particularly relevant to terrestrial wildlife species and their habitats include actions that affect:

- Extent and abundance of wetland habitats
- Hydroperiod and water depths in wetlands and floodplains
- Vegetation composition and diversity in wetland and riparian areas
- Levels and availability of contaminants
- Recreation use patterns
- Residential and urban development
- Species management and harvest regulations

Additionally, climate change is also expected to alter the quantity, quality, and distribution of wildlife habitats throughout the planning area. Associated changes in temperature, precipitation, and surface and soil moisture regimes will likely influence vegetation and natural disturbance processes.

Cumulative impacts to terrestrial wildlife and habitat could arise when the short- and long-term effects of the actions considered under Alternative 2 overlap with other actions affecting wildlife species and habitat in time and space.

Potential Cumulative Effects

The short-term effects of actions proposed under Alternative 2 (primarily short-term disturbance to species or habitats) could contribute to cumulative effects to wildlife habitat and species if actions are clustered together within too small an area and in too brief a time resulting in an overlap of effects (spatial and temporal “crowding”). There is little likelihood that the short-term impacts of restoration actions proposed under Alternative 2 could combine with similar effects of other actions to create cumulative effects at scales beyond the immediate project vicinity. Short-term direct impacts to wildlife resulting in disturbance, displacement, or mortality are expected to be highly localized and temporary in nature and, as such, have low potential to combine with other actions to create cumulative effects.

Furthermore, Alternatives 2 and 3 include a provision wherein the Trustees would reduce the risk of overlapping effects by coordinating the timing and nature of ground-disturbing restoration projects with actions in the vicinity of the project being carried out by others. This coordination would also minimize the need for disturbing an area more than once as well as ensure the extent of restoration-associated disturbance to wildlife is reduced to below the level of significance. Design features will reduce the impacts to wildlife below the level of significance based numbers of wildlife currently using the planning area and the proportion which are likely to be negatively impacted.

Many of the long-term effects to terrestrial habitat from actions proposed in Alternative 2 (summarized above) are considered beneficial. The primary long-term effects from these actions, when added to the present, and reasonably foreseeable future actions, would be a net cumulative benefit to aquatic habitat and wildlife species.

Projects carried out under Alternative 2 that increase the abundance and extent of wetland habitats when combined with similar projects that may be carried out by other entities (such as the Coeur d'Alene Tribe, Natural Resource Conservation Service, or Idaho Fish and Game) would result in a cumulative increase in wetland habitats within the planning area. This would combine with work proposed by the Environmental Protection Agency (EPA) as part of their 2002 record of decision for OU3. In the record of decision, the EPA identified an objective of working cooperatively with private landowners to cleanup and restore 1,500 acres currently used for agriculture back to wetlands. Projects that restore physical habitat and function would produce benefits primarily localized to the area within the project footprint (for example, altering water levels in a wetland would affect habitat only within that wetland; restoring a vegetated lake margin would improve habitat on along that section of lakeshore). As such, these projects would not likely contribute to cumulative effects to wildlife habitat beyond the project scale. However, for mobile species (birds, ungulates) that may move between and among a network of isolated habitats, or species that use wetlands as movement corridors, individual projects carried out under Alternative 2 may combine with wetland restoration or protection projects implemented by others to create an improved network of habitats, resulting in cumulative beneficial effects to mobile and migratory species in the planning area.

Other projects carried out under Alternative 2 may adversely affect some existing wildlife habitat or species over the long term. For example, projects that introduce or increase recreational use may reduce habitat quality (through elimination of vegetation necessary for foraging or cover) or eliminate species through direct disturbance or displacement. Projects that convert one habitat type to another (such as conversion of agricultural fields to wetlands) would eliminate habitat for mesic species in favor of species dependent on moist conditions. Thus, the potential cumulative increase in wetland habitat described above would also result in a cumulative decrease in mesic or dryland habitats, and the species associated with them.

3.5.2.6 Alternative 3 – Ecosystems Focus

The potential impacts to terrestrial wildlife in the planning area under Alternative 3 would be very similar to those described for Alternative 2. The tiered priority wetlands, streams, and lakes are the same, the possible methods for restoration are the same. The two key differences are that, under Alternative 2, up to 10 percent of funds would be allocated to projects or project elements that specifically target the human uses of natural resources. In contrast, under Alternative 3, 100 percent of funds would be used for projects that restore ecosystems, resulting in increased recovery of ecosystem processes. Additionally, under Alternative 3, restoration work would be carried out only in the Coeur d'Alene Lake basin and the upper Spokane River. No work would be performed in the upper Hangman Creek watershed. Thus, there would be no effects, either beneficial or adverse, to terrestrial wildlife or habitat in the upper Hangman watershed.

Direct and Indirect Effects

The direct and indirect effects of Alternative 3 would be identical to Alternative 2 except that effects would be restricted to the Coeur d'Alene Lake Basin and upper Spokane River as described above. No effects would occur in the upper Hangman Creek watershed. Additionally, because ecosystem restoration projects are projected to require more extensive ground disturbance than projects or project components that restore near term human uses, direct mortality related to implementation (such as loss of bird nests or mortality to subterranean mammals) would be greater under Alternative 3 because more restoration projects would be implemented or more acres would be restored. The minor increase in project-related mortality still would not have population level effects for any wildlife species in the planning area. As described in Alternative 2, implementation of design features would reduce mortality to some species.

Long-term Impacts

Abundance and Distribution of Terrestrial Wildlife

Regardless of how Alternative 3 would be implemented, there would still be impacts to wildlife. The distribution and abundance of wildlife species would change based on where restoration projects occurred. The analysis of impacts under Alternative 2 describes the impacts of implementation of restoration in detail. All of these impacts to wildlife abundance and distribution would apply to implementation of Alternative 3. But the scale and the distribution of these impacts would be different because of the larger amount of funding available for ecosystem-only projects and because the upper Hangman Creek watershed would not be included in restoration efforts under this alternative.

Under this alternative, there would likely be greater disturbance to wildlife if more projects are implemented or more acres are restored as compared to Alternative 2. Temporary disturbance would occur related to construction. Dirt moving, draining, ditching, dike removal, planting, and bank stabilization all have the potential to disturb wildlife. Disturbance during construction would still be temporary in nature.

Because Alternative 3 does not designate funds for restoring human uses of natural resources, projects implemented will not include infrastructures to facilitate greater human use of the planning area, though they may enhance the area by increasing aesthetics and increasing wildlife numbers. This could have two possible outcomes. Increased long-term disturbance may occur if projects attract people to use the planning area, even though their use is not facilitated by improvements to or increases in access. More wildlife, more aesthetically pleasing habitat, safer habitat, and improved fish populations could result in larger numbers of people hunting, boating, hiking, and fishing. Another possibility is that some wildlife may experience less disturbance if projects make areas less accessible to the public. In an attempt to reduce human exposure to contaminants, some areas may be made inaccessible, or projects may be designed to reduce human access in order to benefit wildlife. In this case, the disturbance and displacement of wildlife would decrease, which would be a positive effect of implementing Alternative 3.

Just as in Alternative 2, displacement related to habitat conversion would also occur if wetlands are temporarily drained or flooded or if uplands are restored or converted to wetlands. Similarly, construction along streams would displace animals as well. Displacement would occur if restoration sites do not provide suitable habitat until they have had a chance to recover from implementation. For example, lakeshore stabilization and restoration might entail removal of invasive nonnative vegetation, bank stabilization, and re-vegetation. During and after project implementation, this habitat would not be suitable for many wildlife species. But given a chance to recover, the native vegetation would provide a superior habitat value than the same site without restoration. In the meantime, wildlife species would be forced to find suitable habitat elsewhere during recovery and establishment of the vegetation.

Long-term mortality levels resulting from contaminants would decrease under Alternative 3 in more areas and theoretically more quickly than either of the other two alternatives. If greater funding results in projects that reduce wildlife exposure to contaminants more quickly or over more acres, there should be greater reductions in morbidity and mortality levels of wildlife in the planning area.

Alternative 3 is most likely to have the greatest benefit to injured wildlife and their habitats. While the short-term direct impacts may be more widespread or more severe, these impacts are not substantial enough to nullify the beneficial impacts of implementing. Alternative 3 would bring more habitats back to baseline, or would bring habitat back to baseline more quickly than Alternative 2.

Effects to Federally Listed Species

While no effects to federally listed species are expected from implementation of Alternative 3, a description of possible impacts from this alternative is described under Alternative 2.

Recovery of Populations toward Baseline

Alternative 3 differs from the no-action alternative and Alternative 2 in terms of the rate, extent, and likelihood that wildlife populations would return toward baseline conditions.

Rate: Like Alternative 2, the exact rate of recovery toward baseline cannot be predicted but would certainly be faster than if the no-action alternative were selected. More productive habitats with lower exposure to contaminants would reduce morbidity and mortality and support higher reproductive rates for terrestrial wildlife in the planning area. In addition, some areas that currently do not function as riparian habitats may be converted and add riparian acreage to the planning area.

Compared to Alternative 2, it is likely that the rate of recovery toward baseline would be faster. But this difference would not be dramatic as the difference in additional funding is only 10 percent higher.

Extent: The extent of the area of recovery would theoretically be smaller under Alternative 3 because no restoration would occur in the upper Hangman Creek drainage. However, the greater amount of funding would likely result in more acres overall being restored within the planning area.

Likelihood: Terrestrial wildlife populations are far more likely to recover toward baseline levels under Alternative 3 then under the no-action alternative and slightly more likely when compared to Alternative 2. The difference between likelihood between Alternatives 2 and 3 would be related to the likelihood that fewer acres would be restored in Alternative 2 than Alternative 3. How many fewer acres is not known but what is known is that 10 percent of the available funds would be diverted to projects that restore human uses and not necessarily ecosystems.

Cumulative Effects

The mechanisms for cumulative effects described for Alternative 2 would be the same under Alternative 3; however, no cumulative effects would occur in the upper Hangman Creek watershed because no projects would be done there. Cumulative effects would be limited to the Coeur d'Alene Lake Basin.

Additionally, effects from projects or project components to restore human uses of natural resources in the short term would not occur under Alternative 3, and therefore would not contribute to cumulative effects.

3.6 Vegetation

3.6.1 Affected Environment

This section focuses on aquatic and riparian vegetation communities because those are the most likely to be affected by the proposed restoration. For the purposes of this section, aquatic vegetation is defined as plants that only grow in water or in soil that is permanently saturated with water. These include floating plants that are not attached to the bottom (like duckweed) and rooted plants (like water potato). Rooted plants include submergent plants (with most of their vegetative mass below the water surface) or emergent plants (with most of their vegetative mass above the water surface). Aquatic vegetation provides cover and substrate for aquatic species, produces oxygen, and acts as a food source for diverse aquatic and nonaquatic species (such as waterfowl or moose). Historically, aquatic plants such as water potato provided a critical subsistence food for members of the Coeur d'Alene Tribe while plants such as *tule* (bulrush) were used to form mats used in housing and textiles for the Tribe (Coeur d'Alene Tribe 2007).

In the planning area, aquatic plant communities are found primarily in lakes and wetlands but may also be found in sloughs and off-channel habitats adjacent to slow-moving rivers. Aquatic plants often comprise the majority of species found in the littoral zone (where aquatic plants grow at the water's edge) of planning area lakes.

Riparian vegetation consists of plant communities that occur within a zone of interaction between upland and aquatic habitats. This includes plant communities that are influenced by waters of streams and lakes as well as upland vegetation that directly influence the water. As such, riparian vegetation may consist of species terrestrial species relatively intolerant of moisture (conifers such as ponderosa or lodgepole pine, shrubs such as elderberry or serviceberry) or moisture-tolerant or moisture-dependent species such as alder, water birch, red-osier dogwood or willow).

Riparian vegetation supports and maintains physical and ecological function in adjacent aquatic habitats. Specifically, it:

- maintains cool water temperatures through provision of shade and creation of a cool and humid microclimate;
- provides food resources for the streams and lakes in the form of leaves, branches, and terrestrial insects;
- stabilizes streambanks and lakeshores by providing root cohesion on banks and floodplains;
- filters sediment, chemicals, and nutrients from upslope sources;
- supplies large wood to stream channels, which maintains channel form through the sorting and storage of sediments and improves aquatic complexity; and
- moderates downstream flood peaks through temporary upstream storage of water.

3.6.1.1 Vegetation Patterns in the Planning Area

Coeur d'Alene Lake Basin

The following description of aquatic and riparian vegetative patterns in the Coeur d'Alene Lake Basin portion of the planning area was excerpted from Stratus (2000).

In the high-gradient, headwater, V-shaped canyons, and in the medium gradient, U-shaped canyons, terrestrial communities include riparian and upland communities. Where local gradient allows, wetland communities may also occur (or may have been present in the past). Riparian communities in the narrow V-shaped canyons are dominated by thinleaf alder, snowberry, bush honeysuckle and goldenrod in the shrub layer, and wild ginger, aster, lady fern, redtop bentgrass, violet, bluebell, fescues, and oxeye daisy in the herbaceous layer. Black cottonwood and conifers such as grand fir), white pine and, in higher elevations, western hemlock may also be present in the riparian zone.

In U-shaped, open riparian reference areas where the stream meanders more (such as headwater tributaries to the St. Joe River), willow communities develop on point bars. Black cottonwood, Rocky Mountain maple grand fir, western hemlock, and western red cedar are typical canopy layer dominants (Table 2). Historically, the valley flats along the South Fork Coeur d'Alene River were dominated by western red cedar stands. Dominant shrub species in reference areas include willows, thinleaf alder, cascara, ninebark, service berry, snowberry, red-osier dogwood and mockorange. Typical herbaceous layer dominants include mosses, bluebell, lady fern, redtop bentgrass, reed canarygrass, sedges*,* marsh cinquefoil, and Solomon-seal.

Along the lower Coeur d'Alene River and lateral lakes, and the bays of Coeur d'Alene Lake, vegetation community types include riparian, palustrine, and lacustrine communities. These community types are differentiated by the predominant vegetation species and, particularly, the moisture tolerance of these species. Riparian communities are typically dominated by black cottonwoods and willows in the overstory, and Douglas spiraea, willows, and red-osier dogwood in the shrub layer.

Palustrine and lacustrine communities are the dominant communities of the lateral lake wetlands. Palustrine wetlands are dominated by emergent wetland vegetation. Dominant species include sedges, rushes, horsetail , cattail, wild rice, common reeds , bulrushes, and water potatoes. Lacustrine vegetation is characterized by submergent and floating vegetation, including duckweed, potamogeton, and algae.

Hangman Creek Watershed

Information in this section has been excerpted from Peters et al. (2003).

Prior to settlement by nonnative people, the original vegetation patterns within Hangman Creek watershed included the eastern edge of the Palouse Steppe, mesic mountain forests, open woodland transition forests, (Bailey 1995, Lichthardt and Mosely 1997, Black et al. 1998) and wetland and riparian habitats (Jankovsky- Jones 1999). Currently, the major vegetation coverage is agriculturally derived and native habitats have been greatly altered to channel water off the landscape for agricultural production (Black et al. 1998, Jankovsky-Jones 1999).

Riparian and wetland plant communities within the planning area can be divided into five general categories: coniferous forest, deciduous forest, deciduous shrub, graminoid wetlands (Jankovsky-Jones 1999), and camas marsh (Daubenmire 1988). The coniferous forest communities include mountainous riparian communities that are dominated by western red cedar, or mountain hemlock. In the lower elevations, coniferous forest riparian plant associations are dominated by ponderosa pine. The deciduous forest riparian plant associations are dominated by aspen and black cottonwood. The deciduous shrub plant associations are dominated by red-osier dogwood, Douglas hawthorn, alder, and willow . The graminoid wetlands are dominated by grasses, sedges and various rushes. Extensive camas marshes were once present in the planning area (Seltice 1990); however, these plant communities may have been supported by Native American agricultural techniques (Lambert 2000).

Original distribution of the ponderosa pine, deciduous forest, deciduous shrub, graminoid, and camas marsh riparian plant associations within the planning area is subject to conjecture because these communities were eliminated before their distribution was understood. In addition, the introduction of invasive weeds, such as hawkweed (*Hieracium* sp.), reed canarygrass, and common tansy, and landscape alterations have changed riparian wetland environments from their original form.

Upper Spokane River and Rathdrum Prairie

Vegetation along the Idaho portion of the upper Spokane River has been heavily degraded from development and water fluctuations from Post Falls Dam. Urban development along the river has resulted in displacement of native vegetation with landscaping and ornamental vegetation. Public and private recreational areas and beaches have also reduced riparian vegetation along the Spokane River. Seasonal water fluctuations as a result of operations at Post Falls Dam also limit riparian vegetation along the river upstream of the dam to Coeur d'Alene Lake. Where vegetation does exist, it is limited to discontinuous narrow bands directly bordering the river. Downstream of Post Falls Dam there is less development and riparian vegetation is largely intact.

Riparian areas along streams, wetlands, and lakes on the Rathdrum Prairie have also been heavily impacted by residential development, agriculture, and invasive species. Invasive Eurasian milfoil is present within Hayden Lake and is being treated with aquatic herbicide while Hauser Lake has a boat wash station to prevent spread into that lake. However, due to restoration and conservation measures, several areas have intact wetland and riparian vegetation communities including Hauser and Twin lakes.

Prior to settlement by nonnative people, the Rathdrum Prairie was dominated by native grasses and was influenced by a regular fire regime. Common grass species included rough fescue and Idaho fescue or blue bunchgrass that were mixed with a variety of forbs (Ertter and Moseley 1992). Since then, the majority has been converted to agriculture for either pasture for livestock, or in planted crops such as hay, wheat, bluegrass seed, barley, and oats. In recent years, residential development has also greatly increased replacing agriculture crops. Invasive species such as spotted knapweed is also displacing native vegetation in many areas. The lower elevation prairie transitions with increases in elevation into mountainous Douglas fir, ponderosa pine, western larch, and grand fir coniferous communities that surround the prairie.

Special Species and Vegetation Communities

The planning area includes the following unique or rare vegetation species and communities.

Cottonwoods of the Lower St. Joe

Remnant strings of cottonwoods are present along the naturally raised levees of the St. Joe River channel. Remaining cottonwood stands along the St. Joe River are among the most natural stands known in terms of native species presence in the state of Idaho (NPPC 2005).

Spion Kop Research Natural Area

This area is located on National Forest System lands on the floodplain of the North Fork Coeur d'Alene River and provides an example of complex river channel features, associated wetlands and river terraces, and riparian hardwood communities in excellent natural condition. The research natural area contains stands and scattered individual trees of very large northern black cottonwood that provide habitat for rare lichens, abundant hawthorn, and riparian shrub and grass/forb communities that have been relatively undisturbed except by natural events (Mosely and Bursik 1994).

Peatlands

Peatlands are generally defined as wetlands with waterlogged substrates and at least 12 inches of peat accumulation. Three important peatland sites are located in Rose, Hidden, and Thompson lakes in the Coeur d'Alene River Wildlife Management Area. These peatlands have extensive floating and fixed mats along the lake margins that provide substrates for a mosaic of mosses, sedges, pink spirea, cattails, rushes, alder, and willows. Rare plant species associated with the wildlife management area's peatlands include swamp willow-weed, water clubrush, many-fruit false loosestrife, and watery celery (IDFG 2014). Over 15 plant species of concern are associated with north Idaho peatlands (Partners in Flight 2000).

Tribally important Plants

The historic and current culture of the people of the Coeur d'Alene Tribe is closely tied to plants. Plants were used for food, shelter, medicine, ceremonies, and clothing. Camas and water potato are examples of species with special significance to the Tribe. Well-known camas meadows are associated with the wetlands of the lower St. Joe River, West Fork St. Maries River Meadows, and upper Hangman Creek. Water potato sites are associated with the margins of Chatcolet Lake. Other locations are closely held for various reasons, but exist in the planning area.

Conservation Priority Wetlands

The following wetlands were listed as conservation priority wetlands due to the presence of unique plant communities, globally rare species, or containing habitat for globally rare species (Murphy et al. 2012):

- Hauser Lake Wetlands Complex
- Coeur d'Alene River - Cataldo Mission Flats
- Saint Joe River - River in a Lake
- Saint Joe River Valley
- Saint Joe River (Herrick to Calder)
- Saint Maries River Valley
- West Fork Saint Maries River Meadows

Additional wetlands may be present in the planning area containing unique or rare species that are not listed above, including wetland complexes on the Coeur d'Alene Tribe Reservation.

Threatened and Endangered Species

The planning area includes habitat or recorded siting of three species of plants that have been listed as threatened under the Endangered Species Act.

- **Spalding's catchfly:** Spalding's catchfly is suspected to occur in the three counties where restoration would be conducted (Benewah, Kootenai, and Shoshone) (USFS 2015). The plant is typically found in mesic, perennial grasslands and upland plant communities. As a result, it is not likely to occur in the aquatic and riparian habitats where restoration is proposed.
- **Water howellia:** Water howellia is generally associated with old meander scars and cutoff oxbows that are no longer hydrologically connected to flowing surface water. Populations of this species are currently extant in California, Idaho, Montana, and Washington. The major population centers for water howellia are in Montana and Washington; however the Idaho Department of Fish and Game Plant Conservation Database reported two observations of the plant in Benewah County in 2011 (IDFG Species Catalog Online Database, 2016). Water howellia appears to be extirpated from Kootenai County in Idaho (Shelly and Gamon 1996). There are no known populations on the Idaho Panhandle National Forest, which comprises a large portion of the planning area (USFS 2015). The plant has been documented to occur in the Hangman Creek drainage (Coeur d' Alene Tribe 2012).
- **Ute ladies'-tresses *(Spiranthes diluvialis):*** This species is primarily restricted to wetland and riparian areas, including spring habitats, wet meadows and river meanders. It occurs between 4,300 and 7,000 feet in the central Rockies and adjacent plains. Habitat consists of alluvial substrates along perennial stream and rivers that flood in the spring. Soil must be moist to the surface throughout the growing season. Within Idaho, it is only known in Jefferson, Madison, and Bonneville counties of eastern Idaho. Idaho populations occur in the Idaho Falls, Palisades, and Lower Henrys watersheds within the Columbia Plateau and Utah-Wyoming Rocky Mountains ecoregions (Fertig et al. 2005). Very few of the plant associations known to host Ute's ladies-tresses occur in northern Idaho (Idaho Conservation Data Center in USFS 2002). It is therefore not considered likely to occur in the planning area.

Noxious Weeds and Invasive Plant Species

Noxious weeds are plant species that have been designated "noxious" by law in the Idaho Code (title 22, chapter 24, "Noxious Weeds"). Noxious weeds are invasive plant species that can have detrimental effects on ecosystem function, agriculture, commerce, or public health. They spread aggressively and are difficult to manage. These species are generally not native to the United States. Noxious and invasive plant species may threaten the success of restoration actions and recovery of injured resources. The soil disturbance often associated with ecosystem restoration projects provides opportunities for invasive plant species to become established in newly restored areas. When these species become established in a developing wetland or riparian restoration site, they may quickly establish, outcompete and displace native plants already present, and prevent the establishment of new native plant communities, reducing habitat potential and limiting overall biodiversity (USNRCS 2007).

The Inland Empire Cooperative Weed Management Weed Identification and Control Handbook (2014) lists 23 terrestrial species and 5 aquatic species of noxious weeds that occur in the three counties that comprise the majority of the planning area (Benewah, Kootenai, and Shoshone).

Terrestrial Weed Species

- Common and small bugloss
- Common tansy
- Orange and meadow hawkweeds
- Hoary alyssum
- Houndstongue
- Spotted and other knapweeds
- Kochia
- Large knotweeds (Japanese, Bohemian and giant)
- Leafy spurge
- Oxeye daisy
- Rush skeletonweed
- Scotch broom
- Tansy ragwort
- Thistles-Canada and Scotch
- Toadflax-Dalmatian and yellow
- Vipers bugloss
- Whitetop (Hoary cress)
- Yellow starthistle

Aquatic Weed Species

- Eurasian watermilfoil
- Curlyleaf pondweed
- Flowering rush
- Common reed (nonnative genotype)
- Purple loosetrife
- Yellow-flag iris

A number of species on the list (such as spotted knapweed, oxeye daisy, toadflax species, and the hawkweeds) are already widely distributed in the planning area. Others such as leafy spurge and scotch broom are currently restricted in their distribution but have the propensity to spread easily over large areas. While all of the species listed have affected native plant diversity and density in the planning area and have the capacity to affect the success of future restoration, the following species are currently profoundly affecting the abundance and diversity of native plant communities and threaten likelihood of successful restoration of aquatic and riparian habitats on a widespread basis.

Eurasian watermilfoil (*Myriophyllum spicatum*): This plant is a substantial threat to recovery of injured natural resources and human uses in the aquatic ecosystems of the planning area. The noxious, invasive plant, Eurasian watermilfoil has been documented in Chatcolet and Round lakes, the lower St. Joe and St. Maries rivers, and most of the Chain Lakes (Lower Lakes Aquatic Vegetation Survey Project Final Report (Avista 2014). Milfoil has also been inventoried and treated in northern bays and Harrison slough (Avista 2011). Eurasian watermilfoil quickly out-competes native species by rapidly forming dense mats which block sunlight from slower-growing and shorter species. This plant presents a substantial threat to fish and wildlife habitats and may entangle swimmers. The dense mats increase the pH of the water and, under certain circumstances, can reduce the amount of dissolved oxygen, killing fish and other life

(IDEQ and Coeur d'Alene Tribe 2009). Large beds of decaying watermilfoil also potentially contribute to depression of hypolimnetic oxygen levels which may result in the release of toxic heavy metals from lake sediments (DEQ 2011).

Reed canarygrass (*Phalaris arundinacea)*: This rhizomatous perennial grass produces dense, vigorous, monocultures and successfully outcompetes other desirable native species, making reestablishment of native vegetation as part of restoration extremely difficult. Once established, reed canarygrass is difficult to control because it spreads rapidly by rhizomes. The species is pervasive in the Coeur d'Alene Basin. It commonly grows in monocultures along many streams in the planning area, including the lower Coeur d'Alene and St. Joe rivers and along upper Hangman Creek (Hangman Erosion Inventory, *hnt'k'wipn* Management Area Plan; Coeur d'Alene Tribe 2012), and is a common dominant species in a number of prominent wetlands in the lower basin (Murphy et al. 2012).

Giant reed grass *(Phragmites communis*): This species was intentionally established in the basin when it was planted in locations such as the dredge spoils at Cataldo Flats to control wind-blown sand and dust (Bookstrom et al. 1999, Status 2000). The species has thrived where the water table is at or near the surface and has now spread to other wet and semi-wet sandy areas where it tends to produce almost impenetrable growths of tall reeds, precluding the recovery of native species. Phragmites has spread along the lower Coeur d'Alene River and has formed dense stands in the Chain Lakes (Avista 2014).

3.6.1.2 Current Conditions and Factors Affecting Vegetation Communities

The following have influenced the abundance and composition of vegetation communities throughout the planning area as well as the capacity of those communities to provide the critical ecological functions described above.

Mine Waste Contaminants

The presence of phytotoxic chemicals associated with mine waste contamination inhibits plant growth and species diversity and abundance. The extent of vegetative cover, species richness, and vegetation structural complexity are significantly reduced in areas such as Canyon Creek, Ninemile Creek, and the South Fork Coeur d'Alene River where metals concentrations are elevated.

Operations of Post Falls Dam

By extending the period of time when the lake level is held up through most of the growing season, a substantial amount of historically vegetated lowlands and riparian areas have been converted to mudflats and raw exposed river and streambanks when water levels are down. Maintenance of high water levels in the summer precludes the establishment of vegetation on streambanks and floodplains within the backwater area.

Historic and Current Land Uses

Riparian and wetland vegetation has been substantially altered by a variety of historic and current land uses, including timber harvest and livestock grazing, residential development, development and management of transportation infrastructure, riparian recreation, and draining and conversion of wetlands to agricultural production or other uses.

Physical Alteration of Stream Channels

Stream channels and lake margins have been armored by rock and concrete, precluding the establishment of vegetation.

Nutrients

Nutrient loading from on-site sources and tributaries have increased aquatic plant growth in Coeur d'Alene Lake (Peters and Vitale 1998).

3.6.2 Analysis of Effects – Vegetation

3.6.2.1 Spatial and Temporal Scale

The impact analysis for vegetation compares the effects of each programmatic alternative in both the short and long terms based on the categories of foreseeable on-the-ground actions that would likely occur. Short-term effects on plants would occur during the active construction phase. Long-term effects are the result of changes in growing conditions as a result of the actions proposed in the alternatives. Although the overall scale of the analysis is the planning area, most of the likely effects to vegetation would be at the localized project area scale.

In addition to short- and long-term effects, the analysis considers the effect of each alternative on recovery of injured vegetation communities towards baseline conditions, which is defined as conditions that would exist without the presence of contaminants. The analysis also compares the rate, extent, and likelihood of recovery to baseline conditions among the three alternatives.

3.6.2.2 Analysis Assumptions

Changing Climate

Climate change, as discussed in section 3.2.2, will continue to affect plants and their habitats, including changes in seasonal temperatures and the timing, amount, duration, and extent of moisture, in the form of both precipitation and streamflow.

Application of Design Features

Projects carried out under Alternatives 2 and 3 will incorporate the protect design features specified in section 2.2.4.

3.6.2.3 Alternative 1 – No Action

Direct and Indirect Effects

In this alternative, there would be no direct effects because no work would be done. Over the long term, plant communities would continue to be reduced in abundance and diversity where the effects of mine waste contamination and other factors such as soil instability, altered moisture regimes, insufficient seed sources, or invasive nonnative species have affected them. The likelihood and extent of recovery of aquatic and riparian species plant community abundance and diversity would be substantially less under the no-action alternative than under Alternatives 2 and 3, which propose not only extensive vegetative restoration but restoration of the ecological processes that support the recovery of vegetation communities.

Effects to Federally Listed Plant Species

There would be no direct effects to plant species because no work would be done. There would be no long-term indirect effects to Spalding’s catchfly from the no-action alternative because the plant is associated with mesic grasslands and uplands and therefore would not be positively or negatively affected by the conditions that would occur if restoration were not performed. Water howellia and Ute’s ladies’ tresses are associated habitats that could be affected from restoration proposed in the Alternatives 2 and 3. Although historically they appear not to have been widely distributed in the planning area, it is possible that under the no-action alternative, conditions limiting those species would persist without active restoration.

Cumulative Effects

Under the no-action alternative, no work would be done that would generate effects to combine with other actions to create cumulative effects.

3.6.2.4 Alternative 2 – Ecosystem Focus With Additional Human Use Considerations (Proposed Action)

Under Alternative 2, up to 10 percent of available restoration funds would be allocated to projects or project components intended to restore human uses of natural resources in the near term while ecosystem restoration proceeds. This would include restoring natural resources unique to the Coeur d’Alene Tribe in the upper Hangman Creek watershed on the Coeur d’Alene Reservation. The inclusion of the upper Hangman Creek watershed is unique to this alternative.

Direct and Indirect Effects

The following direct and indirect adverse effects would be expected under Alternative 2:

- Temporary disturbance or mortality of vegetation due to removal of upland vegetation on banks and adjacent uplands (for bank regrading), or similar activities with site preparation and implementation of restoration;
- Short-term changes in soil moisture or flow patterns due to dewatering or construction-related diversions, causing wilting or dead vegetation; and

- Changes to project area soils or other growing conditions that could inhibit the success of future plant establishment (for example, soil compaction or increases in access and subsequent trampling of plants and growing surfaces as a result of human uses projects). Alternative 2 includes design features to prevent inhibiting success of future plant establishment (from compaction).

Over the long term (measured in years), restoration projects would affect plant community composition by altering plant habitat. Hydrology is often considered the most important factor that influences wetland flora because wetland plants are adapted to specific hydrological regimes (Mitsch and Gosselink 2000, Van der Valk et al. 1994, Baldwin et al. 2001). Restoration projects that convert seasonal or shallow water regimes to long-term, deep water habitats may reduce plant community diversity with emergent communities being replaced by submergent aquatic species (Janovsky-Jones 1999). Conversely, restoration approaches that create or enhance macro- and microtopography increase the diversity of water depths and hydroperiods, resulting in a more complex wetland vegetation community (Changwoo 2001, Moser et al. 2007, NRCS 2008).

Projects that alter the physical environment are also likely to affect the abundance of plants or change community composition. Restoration approaches that increase roughness in lotic systems (such as placement of woody debris) help sediments deposit in places that create establishment sites for early successional plant species such as willows and sedges (Featherston et al. 1995, Naiman et al. 2010). Projects that remove hardened surfaces such as rip-rap or provide temporary stability to over-steepened bare banks would provide conditions allowing for reestablishment of vegetation to banks and margins of rivers and lakeshores.

Restoration activities proposed under Alternative 2 would affect the abundance and distribution of nonnative, invasive plant species. The abundance and future distribution of these species would be reduced by active weed removal. Restoration techniques that remove or reduce the influence of nonnative weed species would also facilitate increases in abundance and diversity of native communities. At the same time, projects carried out in or adjacent to aquatic systems provide a potential risk of providing conditions or vectors for weed establishment, increase or spread. This can occur from soil disturbance (which releases seeds already present on project area soils), introduction of seeds of plants in topsoils or other imported fill material, or plant materials carried in on construction equipment. Alternative 2 includes a number of design features to minimize this risk.

Alternative 2 includes restoration designed to accelerate the recovery of human uses of injured natural resources. This could include projects that create or enhance access to habitats critical for plant species, and adversely affect plants through trampling, destabilization of habitats, or conversion of habitats. Alternative 2 includes design features to minimize the risk and extent of these effects.

Recovery of Plant Species Communities toward Baseline

Alternative 2 differs from the other alternatives in terms of the extent, rate, and likelihood of recovery of plant species communities to baseline.

Extent: The extent of recovery can be measured in the number of plant populations restored, or the acreage of suitable plant habitat restored. Alternative 2 would restore more populations or acres of suitable plant habitat than no action, resulting in a greater extent of population recovery; however, under Alternative 2, up to 10 percent of funds would be allocated to near-term projects and project components that directly target restoration of human uses of injured natural resources in the short term and not specifically habitat. As a result, the extent of plant species and community recovery under Alternative 2 is expected to be less than Alternative 3.

Unlike Alternative 3, Alternative 2 proposed restoration in the upper Hangman Creek watershed. As a result, recovery of plant communities there would be more extensive than under Alternative 3, which excludes Hangman Creek from the restoration planning area.

Likelihood and Rate: Alternative 2 provides a greater likelihood than the no-action alternative that vegetation would recover and at a faster rate of recovery because Alternative 2 targets conditions currently inhibiting species recovery that are highly unlikely to improve without direct restoration intervention. These include:

- Establishment of plants in areas where lack of seed sources or propagules make natural recovery extremely unlikely, or would require many decades to reestablish without intervention;
- Restoration of systems where the hydrologic regimes that supported wetland plant communities have been permanently altered (such as rehydration of floodplains by elevating permanently incised channels; removal of dikes and other barriers to restore wetland conditions to agricultural settings); and
- Removal of invasive plant species that prevent the reestablishment and recovery of native plant communities.

Effects to Federally Listed Plant Species

There would be no effects from restoration activities proposed under Alternative 2 for Spalding's catchfly because the plant is associated with mesic grasslands and uplands where no restoration is proposed to occur.

Although suitable habitat exists in the planning area for both water howellia and Ute ladies'-tresses, these species are not considered likely to occur. Within Idaho, Ute ladies'-tresses is only known in Jefferson, Madison, and Bonneville counties of eastern Idaho. It has not been recorded within the planning area.

Water howellia has only been recorded in the Hangman Creek drainage. Because Alternative 2 proposes restoration in potentially suitable habitat within the Hangman Creek watershed, there is a greater likelihood of effects to water howellia than the no-action alternative or Alternative 3 (which does not include the Hangman watershed). Effects to the plant under Alternative 2 are unlikely because restoration targets areas where riparian and aquatic habitat have been degraded, reducing the likelihood that the plant would occur in those sites. Additionally, Alternative 2 includes design features that require surveys for the plant prior to ground disturbance as well as a requirement to redesign proposed projects to avoid adversely affecting the plant should it be located.

Cumulative Effects

Spatial and Temporal Scope

The broad geographic scope of the cumulative effects analysis for vegetation is the restoration planning area although due to the highly localized nature of direct and indirect effects to vegetation, cumulative effects may be only measurable and meaningful at a smaller spatial scale.

The temporal scope is the approximately 15 years, as described in section 3.1.

Effects of Past and Present Actions

The effects of past and present actions on vegetation are evident in the existing conditions today; therefore, they are discussed in the existing condition description of the "Affected Environment" section.

Effects of Reasonably Foreseeable Actions

Reasonably foreseeable actions are described in section Appendix 2. Among this group of actions, activity types particularly relevant to riparian and aquatic vegetation as well as nonnative plant species include proposals or programs of work that:

- Remove or disturb trees in riparian zones (such as riparian timber harvest, wildfire, livestock grazing, recreation, or clearing for residential development).
- Permanently harden sites, permanently precluding the establishment of vegetation (such as placement of rip-rap, channelization, or construction of repositories).
- Protect or restore aquatic and riparian plant communities. Ongoing or proposed protection or restoration efforts carried out by other entities such as Coeur d'Alene Tribe, Forest Service, Idaho Department of Fish and Game, or others.
- Increase inputs or concentrations of nutrients. Widespread nutrient pollution in the planning area may result in abnormal rates of aquatic macrophytes and periphyton.
- Affect the abundance and distribution of nonnative plant species (such as treatment of noxious weeds by Federal, State, Tribal, and County entities; pervasive actions that potentially introduce or spread noxious weeds).

Potential Cumulative Effects

To have a cumulative effect on vegetation, activities carried out under the plan must have an effect that is greater than would otherwise occur in the absence of the action. The majority of effects to riparian and aquatic plants from the activities proposed in Alternative 2 would be localized in both time and space. Short-term adverse effects to plant communities due to construction disturbance would not extend beyond the footprint of a project site to combine with other actions to affect plant communities elsewhere or at a later time. Likewise, projects that actively restore riparian and aquatic plant communities, whether by restoring natural processes that create suitable growing sites or by actively planting or propagating plants, would function independently from other activities affecting plant communities. Few activities would create far-reaching effects that could combine with other activities in the basin to create cumulative effects to vegetation.

Projects carried out under Alternative 2 would result in adverse cumulative effects to riparian and aquatic plant communities in the planning area if project activities introduce or contribute to the spread of nonnative, invasive plant species. Ground-disturbing restoration projects or projects that require importation of growing media (like topsoil), seed, or facilitate recreational access and traffic (such as human uses projects) increase the risk of introducing invasive nonnative plant species. Invasive or noxious weed species may quickly establish and spread beyond the footprint of a restoration project. In doing so, these effects would combine with the effects of past and present actions that contribute to the continued persistence and spread of nonnative plant species in the planning area.

Activities under Alternative 2 could have cumulative beneficial effects to vegetation at smaller spatial scales (such as the 6^{th}-code watershed scale) if numerous projects are carried out in a small area, and co-occur with the restorative efforts of others or, where extensive restoration efforts combine to alter growing conditions or hydrologic regimes. Restoration projects that restore seed sources or natural propagules may influence plant communities beyond the footprint of the original project through the continual contribution of colonizing propagules and seed.

3.6.2.5 Alternative 3 – Ecosystems Focus

The following are the key differences between Alternative 2 and Alternative 3 relevant to vegetation:

Ecosystem Focus: Under Alternative 3, 100 percent of restoration funds would be allocated to ecosystem restoration, in contrast to Alternative 2, which uses up to 10 percent of funds, or up to $14 million for projects or project components intended to restore human uses of natural resources in the near term while ecosystem restoration proceeds. Thus, under Alternative 3, up to an addition $14 million would be spent on ecosystem restoration, resulting in increased recovery of injured plant communities.

No Human Uses Project Effects: Because no work would be done under Alternative 3 to specifically restore human uses of natural resources in the near term, effects to plants and their habitats specific to these projects would not occur.

Geographic Area: Under Alternative 3, restoration work would be carried out only in the Coeur d'Alene Lake Basin and the upper Spokane River. No work would be performed in the upper Hangman Creek watershed.

Direct and Indirect Effects

The direct and indirect effects of Alternative 3 would be identical to Alternative 2 except that those effects would be restricted to the Coeur d'Alene Lake Basin as described above.

The rate, extent, and likelihood of plant species recovery would likely be greater under Alternative 3 than no action or Alternative 2 because more ecosystem restoration would be done under this alternative. The magnitude of effects to vegetation due to the approximate $14 million restoration spending difference in spending between Alternative 2 and 3 is difficult to predict. Because the amount represents 10 percent of available funds for restoration, it could be considered that the ecological benefits of restoration to vegetation under Alternative 3 could theoretically be up to 10 percent greater than Alternative 2.

Effects to Federally Listed Plant Species

There would be no effects from restoration activities proposed under Alternative 3 for the Spalding's catchfly because the plant is associated with mesic grasslands and uplands where no restoration is proposed to occur.

Suitable habitat exists within the planning area for Ute ladies-tresses but it is considered unlikely to occur. Within Idaho, Ute ladies-tresses is only known in Jefferson, Madison, and Bonneville counties of eastern Idaho. It has not been recorded within the planning area.

Water howellia has only been recorded in the Hangman Creek drainage which is not included in Alternative 3.

Cumulative Effects

Potential cumulative effects under Alternative 3 would be similar to Alternative 2 with the following key differences:

- Cumulative effects would not occur in the upper Hangman Creek watershed because restoration would not occur there; and
- Cumulative effects related to projects that restore human uses of natural resources would not occur because Alternative 3 does not include that category of restoration.

3.7 Recreation and Human Uses[11] of Natural Resources

3.7.1 Affected Environment

3.7.1.1 Recreation Opportunities and Land Use

According to United States Census Bureau, nearly a million people live, work, and play within an hour's drive of the Coeur d'Alene area and rely heavily on the natural and physical resources the environment provides. In addition to the communities surrounding Coeur d'Alene, the Silver Valley, and the St. Maries area, people from the metropolitan area of Spokane, Washington are known for using Coeur d'Alene Lake and its tributaries as a major source of recreation activities, and therefore has considerable influence on the numbers of visitors and recreationists to the area. Proximity to a broad range of multi-season recreational activities and public land amenities are major reasons people choose to visit and reside in the Coeur d'Alene Basin area (CDA 2030).

More than 50 percent of land within the Coeur d'Alene Basin area is public land (Figure 1). This is important because qualities of public land and their amenities can make a region an attractive place to live, recreate, and work. For some communities, surrounding public lands may serve an economic role by creating a setting that attracts and retains people and businesses. For others, recreation opportunities may attract tourists. And for some, the opportunities to hunt, fish, and view wildlife serve as a magnet that keeps them from leaving. According to the latest National Visitor Use Monitoring completed in 2009 by the Idaho Panhandle National Forests (USFS 2009), outdoor recreation is the fastest growing use within the national forests and grasslands; a use expected to increase in the future.

Major Categories of Recreation Opportunities in the Planning Area

Summer and Water-based Activities

The planning area is heavily used by visitors and residents for a broad range of water-related recreation, such as: swimming, birding, beach-play, shore and boat fishing, waterfowl and migratory game hunting, camping along shorelines, sailing, and paddle- and power-boating. White-water boating opportunities may be found on the upper St. Joe, Spokane, and North Fork Coeur d'Alene rivers. Such activities are enjoyed not only by local residents, but increasingly by visitors from all over the country who are coming here to recreate. A boat inspection station set up by the Idaho Department of Agriculture along the I-90 interstate corridor between Coeur d'Alene and Cataldo, Idaho, recorded where boaters were traveling from and what their destinations were in 2012. Figure 5 illustrates how visitors are traveling from all over the nation, including Canada and Alaska, to recreate in and around the planning area.

[11] Note: Tribal uses of natural resources are covered in more detail section 3.9

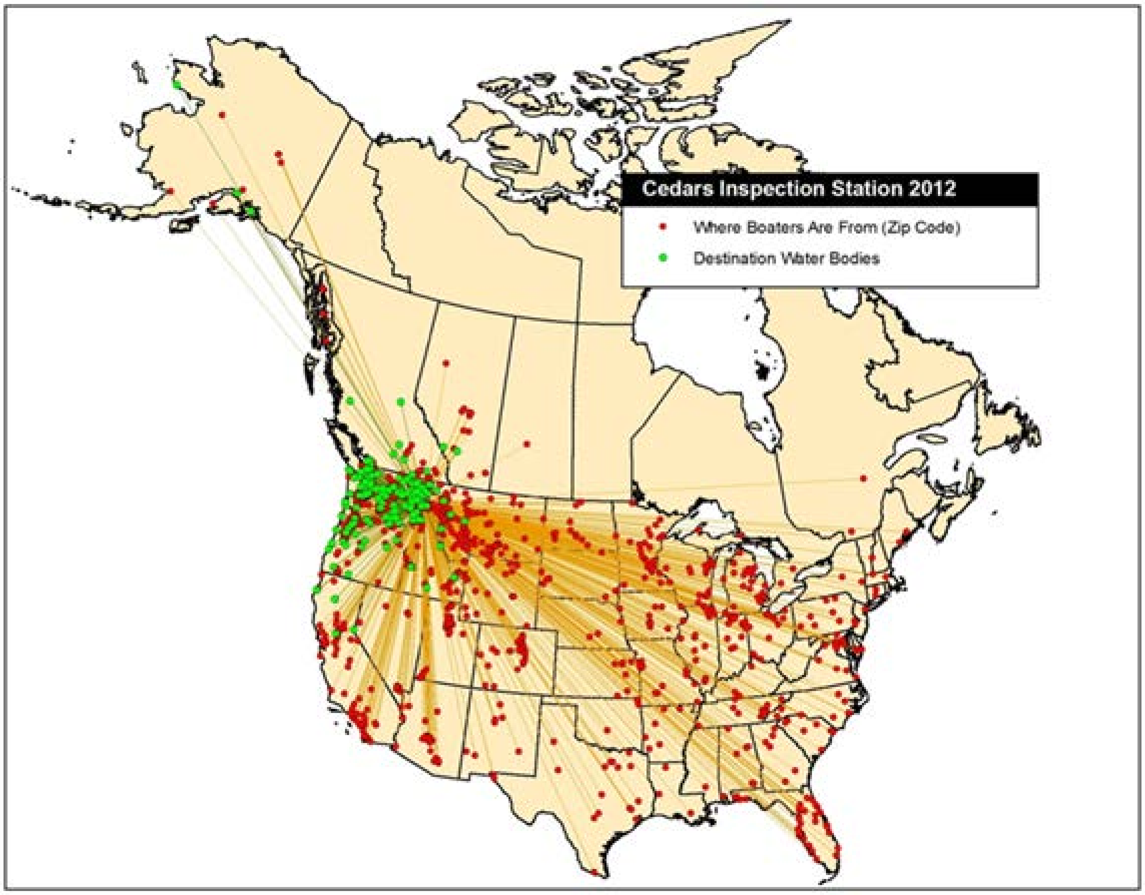

Figure 5. Boat inspection station set up by Idaho Department of Agriculture along the I-90 corridor between Coeur d'Alene and Cataldo, Idaho, recorded where boaters were traveling from and what their destinations were in 2012

Hiking and Backpacking

During the summer months, hiking and backpacking are popular on extensive trail networks located throughout the planning area. Lookout Pass is one of the many starting points for hikes and backpacking adventures involving mountain lakes.

Road and Mountain Biking

Mountain biking and road cycling are fast becoming a key recreational pursuit for both locals and tourists throughout the Coeur d'Alene Basin planning area (Lynch 2011). The popular 72-mile Trail of the Coeur d'Alenes passes through the heart of the area injured by mine waste contamination. The thick asphalt and gravel barriers on the sides of the trail act as a permanent cap to isolate contaminants from the surrounding environment. Other popular cycling trails include the Centennial Trail (bordering the Spokane River) and Nor-Pac Trails in the upper Silver Valley.

Winter and Snow-based Activities

The planning area is also recognized for its winter-based opportunities, including ice fishing, snowmobiling and skiing. Silver Mountain Ski and Recreation Area and Lookout Pass Ski and Recreation Area attract visitors from Montana to Washington during the winter months.

Hunting and Foraging

Hunting is a popular pastime in the project area and includes diverse opportunities. Spring and fall are the busiest seasons, offering bow, rifle, and muzzleloader hunting for deer, elk; black bear, mountain lions, and wolves; limited entry hunts for moose and mountain goat; wild turkey hunting; and water fowl hunting. Foraging and berry picking activities in the project area are also on the rise (IDPR 2014). While foraging for naturally occurring plants and fungi has been a means of sustenance for humans from the beginning of human history and still is for tribal populations such as the Coeur d'Alene Tribe, it has recently resurfaced as a modern food trend, and is growing in popularity (Scott 2013). According to the Idaho Parks and Recreation Statewide Comprehensive Outdoor Recreation and Tourism Plan (IDPR 2014), in the state of Idaho, mushroom gathering, berry picking and general sustenance and foraging activities have increased 30.8 percent from 1994 to 2011 and are predicted to continue to grow in popularity.

Cultural Resources and Sense of Place

One of the major actions under Alternative 2 is directly restoring or enhancing the human uses of natural resources in addition to restoring injured ecosystems. This includes enhancing opportunities for people to connect with cultural resources that contribute to local and regional heritage and a sense of place, including opportunities for members of the Coeur d'Alene Tribe to connect with unique historical and cultural resources associated with the planning area. The Council on Environmental Quality regulations require that agencies consider the effects of their actions on all aspects of the "human environment." Humans relate to their environment through their culture, and to cultural aspects of their environment (such as cultural uses of the natural environment, the built environment, and human social institutions). The lands within the planning area have cultural significance for Tribal and non-Tribal populations. Protection or enhancement of culturally and historically important natural resources can affirm a community's sense of place by honoring the local heritage and the role that natural resources have played in the history and culture of the basin.

Historical Context of the Coeur d'Alene Basin

Residents of the Coeur d'Alene Basin historically relied on the bounty of natural resources the area has provided for both recreation and economic stability. In addition, members of the Coeur d'Alene Tribe historically relied on the resources in the basin to support their subsistence lifestyle (NRC 2005). However, the widespread metals contamination in the Coeur d'Alene Basin and effects of mining on the scenery and resources of the basin have impacted the many human uses of the area (North Idaho Economic Development Corporation 2014).

Despite the history of contamination from the mining activities there is much local pride surrounding the mining history of the Coeur d'Alene Basin and its many historic landmarks. For example, the historic mining town of Wallace has been referred to as the "Silver Capital of the World" with over a billion ounces of silver produced in Shoshone County since the late 1800s, and every building in the town is on the National Historic Register.

Trends

Because the Coeur d'Alene River Basin was one of the most productive silver, lead, and zinc mining areas in the United States, many of the communities were formed around the development of natural mineral resources. Silver, gold and large timbers drew settlers to the Coeur d'Alene Basin in the late 1800s (NRC 2005). The remnant roads that once led to work for such settlers are now used for access to recreation areas and as motorized and nonmotorized trails. The treasures sought by visitors and locals today center around recreational water-based activities, winter sports, and traditional hiking, hunting, fishing, and gathering. As identified in the social assessment for the Idaho Panhandle National Forests Land Management Plan (Parker and Wulfhorst 2002), areas such as Coeur d'Alene illustrates that "the local economy, culture, and identities have shifted to more of an amenity-based model for development activities, including tourism, recreation, and retiree benefits" (Parker and Wulfhorst 2002). The amount of people using the landscape in the Coeur d'Alene Basin is changing as well. Demand for outdoor recreation opportunities in Idaho and the Coeur d'Alene River Basin is on the rise (IDPR 2014). More detailed information on the changing socioeconomic environment within the Coeur d'Alene Basin can be found in the "Socio-economic Effects" section (3.10).

Climate Change

According to the Climate section (3.2.2), climate models predict that annual temperatures will increase 2.2 degrees Fahrenheit by the 2020s and 3.5 degrees Fahrenheit by the mid-21st century, compared to the average for 1970 to 1999. Temperature increases are projected to occur during all seasons, with the greatest increases projected in summer.

Weather patterns resulting in longer, drier summer months drive more people toward water-based recreation (Morris and Walls 2009). In addition to increased recreation pressure due to expanding regional populations, the demand for water-based recreation is expected to increase due to warming climate (IPCC 2014).

Geographically Distinct Recreation Areas of the Planning Area

The Coeur d'Alene Basin encompasses mountainous terrain with numerous streams, rivers, and lakes (see Hydrology section 3.3), which support the overall makeup of the basin. From the north, the North Fork of the Coeur d'Alene River drains the Bitterroot and Coeur d'Alene Mountains. The river flows west and reaches its confluence with the South Fork in Enaville, Idaho. From the east, the South Fork of the Coeur d'Alene River drains the Bitterroot Mountains and flows through the Silver Valley, joining the North Fork to form the mainstem Coeur d'Alene River. The southern portion of the Coeur d'Alene Basin includes the St. Joe and St. Maries rivers. These rivers join in St. Maries, ID. The St. Joe River mainstem flows northwest for approximately 20 miles where it flows into Lake Coeur d'Alene. Throughout these landscapes and waterways a spectrum of recreation opportunities can be experienced and are characterized by such things as setting, landscape character, socioeconomic status, activities offered, and general access to uncontaminated environments. For the sake of this analysis, regions within the planning area with their own unique recreation character have been categorized into six distinct Recreation Areas. Each identified recreation area listed below has unique landscape character attributes, settings, and access levels that contribute to certain types of recreation opportunities.

Coeur d'Alene Reservation and Upper Hangman Creek Drainage Recreational Area

Landscape Character

Ecological attributes of the Coeur d'Alene Reservation include the Coeur d'Alene and St. Joe rivers, the southern half of Lake Coeur d'Alene, Black Lake, and the Hangman Creek drainage. This area is within the Lake Lands and Columbia Rockies subregion of the Rocky Mountains and consists of rounded low hills, prairie lands and some water forms such as lakes and streams. The Reservation covers 345,000 acres, spanning the rich Palouse farm country and the western edge of the northern Rocky Mountains. (Coeur d'Alene Tribe 2015). The Tribe's socially and spiritually valued attributes of their land are centered on healthy water and ecosystems, as described in the "Coeur d'Alene Tribal Resources" section.

The Tribe values clean and healthy settings in which to recreate and participate in culturally important activities. Tribal members focus on areas of the basin that provide these settings, even though better access may be available to sites with levels of contamination.

Recreation Opportunities: Access and Settings

Outdoor recreation opportunities on the Reservation today generally consist of walking and riding bikes along the Trail of the Coeur d'Alenes, hunting, fishing, swimming and participating in sports such as basketball and golf (Weixel pers. comm 8-2015). Heyburn State Park, adjacent to the Reservation, provides opportunities for cycling, hiking, watching wildlife, boating, and camping. Members of the Coeur d'Alene Tribe frequent Camp Larson (6 miles northeast of Worley, Idaho on the shore of Cottonwood Bay) for outdoor recreation, sacred ceremonies, and cultural events. Education opportunities for Tribal youth to learn the historic ways of the Coeur d'Alene Tribe are highly valued as well (University of Idaho 2007). Participation in recreation such as swimming, diving, and canoe racing in portions of the Reservation located in the Coeur d'Alene Basin has been diminished because Tribal members are currently offended by the contaminated water (see Tribal Services Section). In general, the recreation settings on the Reservation are less developed with the exception of the Trail of the Coeur d'Alenes trailhead where there is a higher level of development.

Coeur d'Alene Lake and the Upper Spokane River Recreational Area

Because the Rathdrum Prairie, Spokane River, and Lake Coeur d'Alene have the most developed and urban recreation settings within the planning area and receive similar use by the public, they will be grouped as one recreation area with emphasis on Lake Coeur d'Alene. The waterbodies in the Rathdrum Prairie are considered a low priority for restoration according to the draft Restoration Plan whereas Lake Coeur d'Alene is in the top tier of priorities. Not only is Coeur d'Alene Lake the largest lake (approximately 28,000 acres) in the planning area, it is the focus for a variety of important social, cultural, and economic uses for the region. The Restoration Plan describes the Coeur d'Alene Lake geographic priority area to include Chatcolet, Round, Hidden, and Benewah lakes at the southern end of Coeur d'Alene Lake because these lakes are hydrologically connected to Coeur d'Alene Lake and function as a single waterbody.

Landscape Character

Coeur d'Alene Lake is a natural lake characterized by its large size, approximately 25 miles long and 10 miles across at its widest point and is within the Lake Lands subregion of the Rocky Mountains. It is one of the largest lakes in the Western United States and considered one of the outstanding features of the Rocky Mountain region. Alternatives 2 and 3 identify Coeur d'Alene Lake as the highest priority among lakes for restoration due to its unique social and ecological context and regional importance. Lake Coeur d'Alene is primarily fed by the Coeur d'Alene and St. Joe rivers with the Spokane River serving as its single outlet. The 150 miles of shoreline offer views to the rolling uplands and hills, contain lake shore homes, and provide access to a wide variety of recreational activities. The Coeur d'Alene area is not only a destination for residents and tourists from all over the country, it is also important to members of the Coeur d'Alene Tribe.

Recreation Opportunities: Access and Settings

The Coeur d'Alene Lake area is an increasingly popular recreation destination and an economic catalyst for Northern Idaho and Eastern Washington. Development along the lake's shoreline has increased dramatically in recent years, featuring multiple commercial resorts, nine major marinas, and an ever-increasing number of lakeside homes (IDEQ and Coeur d'Alene Tribe 2009). In addition to private recreational development, public and Tribal recreation facilities exist around the lake. Several campgrounds and more than a dozen public boat ramps surround Coeur d'Alene Lake, providing additional opportunities for recreational power- and hand-propelled boating and recreational fishing. During the summer months, shoreline areas surrounding the lake make for a popular tourist destination, providing scenic vistas and beach activities.

Coeur d'Alene Lake is also known for its kokanee and Chinook salmon recreational fishery. Largemouth and smallmouth bass, and northern pike, also support substantial fishing effort. Fly anglers pursue cutthroat trout on the north end of the lake every spring. Wildlife viewing is also a major attraction in the area. During the winter, migrating bald eagles visit the lake area to feed on spawning kokanee salmon, drawing thousands of viewers from all over the country. Waterfowl hunting is popular in the bays during fall and early winter. .

Along the northeastern shore of the Lake is the North Idaho Centennial Trail, which is popular among walkers, joggers, hikers and cyclists. A portion of the 72-mile Trail of the Coeur d'Alenes (described in the next section) runs along the southern shore of Coeur d'Alene Lake.

The upper Spokane River Corridor is bordered by the North Idaho Centennial Trail, which spans from the Idaho-Washington border to Higgins Point on Coeur d'Alene Lake. In addition to trail use, the river corridor includes several small rapids and whitewater "play spots" popular with kayakers.

Chain Lakes and Coeur d'Alene River Recreational Area

Landscape Character

The Chain Lakes and Main Stem Coeur d'Alene River area covers land and waterbodies from Cataldo southwest to Harrison, Idaho. This area is within the Columbia Rockies and Lake Lands Subregions of the Rocky Mountains and consists of low mountains, broad valley floors, marshes, meadows, swamps and large water forms that dominate the visual scene. The Coeur d'Alene River flows into the lateral lakes west from the Silver Valley, the major source of mine waste contaminants (NRC 2005). The Chain Lakes consists of Anderson Lake, Thompson Lake, Blue Lake, Black Lake, Swan Lake, Cave Lake, Medicine Lake, Killarney Lake, Bull Run, Rose Lake, and Porter Lake. The most prominent ecological features of this area are the lower Coeur d'Alene River and the associated lateral (Chain) lakes and marshlands in the river floodplain (IDFG 2014). Many of the wetland complexes contained in the Chain Lakes and Main Stem Coeur d'Alene River area have been identified as top priorities for restoration in Alternatives 2 and 3. In this area, small farms combined with natural features tend to dominate the visual presence of human settlement, resulting in a more natural and pastoral-appearing landscape.

Recreation Opportunities: Access and Settings

Recreation around the Chain Lakes in the summer months consists mainly of motorized and nonmotorized boating, fishing, wildlife viewing, camping, and swimming. Waterfowl hunting is especially popular in the fall. In winter, many of the lakes are popular locations for ice fishing. From the confluence of the North and South forks down to Cataldo the mainstem Coeur d'Alene River supports a popular and high quality fishery for westslope cutthroat trout. The uplands surrounding the lakes are heavily used for hunting by locals as well as those from the larger adjacent cities such as Coeur d'Alene and Spokane, WA (IDFG 2014). The use of all-terrain vehicles (ATVs) and utility-terrain vehicles (UTVs) on old timber management roads in this area is also common. Beach and shoreline camping remains popular despite information signs warning the public of the hazards associated with the mine waste contamination in soils and sediments surrounding the waterbodies. The main motorized travel route is State Highway 3, also known as the White Pine Scenic Byway, which provides direct access to much of this area. In addition to being a popular scenic travel route, a portion of State Highway 3 parallels the Trail of the Coeur d'Alenes bike path. The Trail of the Coeur d'Alenes is a paved bike trail providing 72 miles of bike path from Mullan to Plummer, Idaho, and is used by locals and visitors from all over the country. The Trail of the Coeur d'Alenes is also of key importance to the Coeur d'Alene Tribe as a source of recreation and revenue from tourism (Coeur d'Alene Tribe 2014). There are also developed boat launches in the area, providing access to the lakes and mainstem Coeur d'Alene River. According to the Kootenai County Comprehensive Plan, population increases and tourism growth has created a greater need for more recreational sites with improved diversity of recreational opportunities (Kootenai County 2010). Much of the lower valley along the river corridor is part of the Coeur d'Alene River Wildlife Management area, providing extensive access to the public.

North Fork Coeur d'Alene River - Little North Fork to the Confluence Recreational Area

Landscape Character

The North Fork Coeur d'Alene River begins near the northern divide separating the Coeur d'Alene subbasin from the Pend Oreille Lake subbasin. It carves its way south through rounded, glaciated mountains, and converges with the South Fork Coeur d'Alene River near Enaville, Idaho, along Interstate 90. This area is within the Columbia Rockies Subregion of the Rocky Mountains and demonstrates meandering shorelines, dense forests and subordinate canyons and drainages. Approximately 95 percent of the North Fork watershed is public land administered by the U.S.

Forest Service, Idaho Panhandle National Forests. Eighty-seven percent of the watershed consists of coniferous forest (USFS 2012). There are many historic properties, archaeological sites, and culturally sensitive areas. Natural processes (such as wildfire and floods) and human disturbance (such as mining and timber harvests) have shaped the landscape character and development of the area (USFS 2012). The planning area incorporates the entire North Fork Coeur d'Alene River watershed, where dispersed camping and hunting. The North Fork watershed supports some of the highest densities of elk hunters in the state of Idaho. In addition to hunting, fishing on the mainstem North Fork as well as tributary streams such as TeePee Creek are also popular. This analysis focuses on the character of the portion of the watershed where substantial recreational use of aquatic and riparian areas occurs (the river corridor along the North Fork from the mouth of the Little North Fork to the confluence with the South Fork.

Recreation Opportunities: Access and Settings

The semi-primitive and rural characteristics along with ease of access (adjacent road network and several developed and dispersed campgrounds and access sites) make the North Fork a popular area for water-related recreation activities such as floating, fishing, and beach play (USFS 2012). The North Fork provides one of the State of Idaho's premier westslope cutthroat trout fisheries, providing anglers with outstanding opportunities to catch native westslope cutthroat trout and other species (IDFG 2013, USFS 2012). The North Fork Coeur d'Alene River Watershed Advisory Group sponsors an educational program called "Respect the River" in hopes of inspiring conservation practices and reducing the amount of trash and shoreline degradation as a result of large congregations of people recreating on the North Fork. Due to population increases in nearby cities and the growing desire for outdoor recreation opportunities, the North Fork is currently experiencing resource impacts (Brown et al. 2011).

South Fork Coeur d'Alene River Recreational Area

Landscape Character

The South Fork of the Coeur d'Alene River passes through the Coeur d'Alene Mountains to the river's confluence with the North Fork Coeur d'Alene River near Enaville, Idaho. This area is within the Columbia Rockies Subregion of the Rocky Mountains and consists of expanses of indistinct and dissected landforms, marshes, meadows and swamps with minor geologic features. The Silver Valley demonstrates rural characteristics through a mix of small communities, mining and industrial sites, forests, and ownerships (IDEQ 2014). The scenic integrity of the landscape has been compromised due to historic and active mining activities. For example, where large cedar groves once stood along a portion of the Trail of the Coeur d'Alenes in Smelterville, only stumps and stunted vegetation remain.

Recreation Opportunities: Access and Settings

The South Fork of the Coeur d'Alene River has fewer opportunities and access to water-related recreation activities (like beach camping and shoreline fishing) than other recreation areas in the basin due to the presence of mine waste contamination as well as topography (narrow river corridor bordered by hillslopes) and the presence of transportation infrastructure in the river corridor. Access to the South Fork corridor is via Interstate 90. The Trail of the Coeur d'Alenes is the main developed location for outdoor recreation in the South and offers diverse scenic opportunities from high mountain views to wetlands that serve thousands of migrating waterfowl each year. Uplands and uncompromised drainages within the area are used for hunting, hiking, ATV riding, berry picking, and mushroom gathering. Winter recreation is popular at the Lookout Pass and Silver Mountain Ski Areas, and brings in many visitors from neighboring big cities such as Missoula, Spokane, and Coeur d'Alene. The towns of Wallace and Kellogg are popular for heritage- related recreation pursuits due to their connection with mining history in the Silver Valley.

The St. Joe River Watershed Recreational Area

Landscape Character

The St. Joe River is a tributary of Coeur d'Alene Lake and flows west through the towns of Avery, Calder and into St. Maries, where it is joined by the St. Maries River. The primary uses of the St. Joe River subbasin are forestry, recreation, and agriculture. Much of the surrounding land is public land managed by the U.S. Forest Service and Bureau of Land Management, with large portions of the St. Joe owned by large private timber companies, including Potlatch, Stimson, Molpus, Hancock, and others. Distinctive landscape features of the upper St. Joe watershed include mixed coniferous forest and steep, rigid canyons on either side of the river, while the landscape of the St. Maries River watershed is less rugged and with less relief. The upper reaches of the St. Joe River contain cascades and rapids that offer whitewater opportunities. The St. Joe River upstream from Avery has received wild and scenic river status by Congress because it possesses "outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values" (Wild & Scenic Rivers Act, October 2, 1968).

Recreation Opportunities: Access and Settings

The St. Joe River is one of North America's premier trout streams and has numerous small, rustic campgrounds along the shores, making it popular for recreationists seeking a more primitive experience. Access to the St. Joe River corridor is via State Highway 50. Trout fishing is also seasonally important on the St. Maries River. Hiking trails and national forest roads provide for ATV, single-track motorized and nonmotorized recreation types. Portions of the river and its tributaries provide outstanding class III and IV whitewater boating opportunities (such as Spruce Tree to Avery on the mainstem and the prominent tributary, Marble Creek). The steep cliffs and hills surrounding the St. Joe River provide a spectacular backdrop and contribute to the backcountry setting of the corridor. The St. Joe River watershed river area is also a popular place for big game hunting, and the popular Emerald Creek Garnet area is located in the upper St. Maries River watershed.

3.7.2 Analysis of Effects – Recreation and Human Uses of Natural Resources

3.7.2.1 Analysis Methodology

Analysis issues analyzed for recreation resources and human uses address how the proposed actions will change recreation opportunities and affect landscape character. Issue indicators to measure recreation opportunities include changes in recreation settings and changes in access to or abundance of diverse recreation opportunities. Indicators to measure landscape character include changes in landscape character attributes and its recovery toward baseline. Because of the programmatic scale of Alternative 2 and therefore this environmental analysis, a general move in the positive or negative direction for each issue indicator was used to determine adverse effects for each alternative.

Recreation Opportunities: Access and Settings

Sustaining a broad spectrum of recreation opportunities, which includes abundance and diversity of recreation opportunity types, in the planning area is important to provide people with choices (Watt 1972). The "recreation opportunity spectrum" classifies a wide range of recreation settings varying in levels of development and access to ensure that the public will find a broad range of quality outdoor recreational experiences (USFS 1979, USBR 2009). People tend to choose a specific setting for their recreation activity to realize a desired set of experiences. However, a change in the recreation setting of an area has the potential to change use patterns, and result in visitor impacts that may adversely affect natural resources. Because the proposed action plans to restore human uses such as hunting, fishing, subsistence, and scenery, effects of the Restoration Plan on recreation opportunities will be measured by the general increase or decrease in locations (access points), the diversity and extent of developed access, and restored opportunities for activities such as fishing and hunting. Effects to recreation settings will be measured on a spectrum of primitive or undeveloped to modern or developed.

Landscape Character

Landscape character is described as a combination of the scenic attributes, cultural and ecological, that make each landscape identifiable or unique. Landscape character creates a "sense of place," and describes an image of the area (USFS 1995). A landscape character description contains pertinent information about the positive and socially valued scenic attributes, such as landform, vegetation, water, air, sky, wildlife, and cultural and historic features of the area (USFS 1995). Because Alternatives 2 and 3 propose to restore ecosystems affected by mine waste injury to baseline conditions (to the ecological conditions that would have exited if the release had not occurred), the desired landscape character attributes used as indicators for this analysis will be those attributes of the landscape that made it identifiable without the effects of the injury. Effects will be measured by a general movement away or towards the desired landscape character.

3.7.2.2 Analysis Assumptions

Changing Climate

Climate change models, as discussed in section 3.2.2.1, project increasing average annual temperatures over the coming decades in the Pacific Northwest. As a result, demand for water-based recreation is projected to increase.

Changes in Population

Demand for recreation opportunities associated with the natural resources of the planning area is expected to increase as a result of increasing populations in portions of the planning area.

Application of Design Features

Projects carried out under this alternative will incorporate the design features specified in section 2.2.4.7.

3.7.2.3 Spatial and Temporal Scale

The impact analysis for recreation resources compares the effects of each programmatic alternative in both the short and long term based on the categories of foreseeable on-the-ground actions that would likely occur. Short-term effects to recreation and the surrounding landscape would occur during active construction phases. Long-term effects to recreation opportunities and the characteristics of the landscape would occur as a result of changes in natural resource conditions as a result of ecosystem restoration. Long-term effects may also occur due to widespread changes in use patterns in the months or years following changes in recreation opportunities due to the actions proposed in the alternatives. The spatial scale of effects to the recreation resources and the landscape will vary depending on the effect.

3.7.2.4 Alternative 1 – No Action

Direct and Indirect Effects

In this alternative, there would be no direct and indirect effects because no work would be done. Human uses of the services that natural resources provide (such as water-based recreation, fishing, hunting, and birdwatching) would recover at much slower rates, or not recover at all, depending on the extent of recovery of water quality, habitats, species populations, and scenery. The abundance and diversity of recreational opportunities and facilities that connect people with their environment (in both contaminated and uncontaminated sites) would remain the same unless changes occur due to work by others.

Over the long term, in the absence of restoration of injured resources (including restoration opportunities associated with use of those resources), the following changes may occur to the existing landscape character:

- In areas where mine waste contamination has directly affected the desired landscape character, attributes of the landscape which made it identifiable in absence of the injury could slowly return depending on the success of remediation efforts currently underway by the Environmental Protection Agency and others who may be doing restoration in the Coeur d'Alene Basin.
- Because the effects of mine waste contamination have been most noticeable on the South Fork of the Coeur d'Alene River, this corridor may not be able to recover scenic and ecological attributes associated with its natural landscape character without active and extensive restoration.

- Under the no-action alternative, projects that would increase or enhance recreational opportunities both within and outside of contaminated environments would not be conducted, and recreation pressure would continue to be shifted to opportunities elsewhere. Existing recreational destinations would continue to experience resource damage due to increased pressure, and resulting conditions would likely move these areas away from their desired landscape character attributes.

Cumulative Effects

For the no-action alternative, no cumulative effects are anticipated because no work would be done.

3.7.2.5 Alternative 2 – Ecosystem Focus With Additional Human Use Considerations (Proposed Action)

Alternative 2 integrates restoration of injured natural ecosystems with approaches that are intended to accelerate the recovery of human uses of the natural resources lost due to the injury. Under Alternative 2, up to 10 percent of funds (approximately $14 million) would be allocated to projects or project components designed specifically to enhance access for human uses of natural resources and services in the short term (such as recreational facilities). This alternative also includes opportunities to conduct natural resources restoration and human services restoration work within the upper Hangman Creek watershed, within the boundaries of the Coeur d'Alene Reservation. The inclusion of the Hangman area is unique to this alternative.

Direct and Indirect Effects

Recreation Access and Opportunities

The program of work considered under Alternative 2 could directly affect access to existing recreation sites and opportunities in both the short and long terms. For example, construction activities may result in temporary access limitations at both existing developed or dispersed recreation sites. The duration of access limitations would depend on the nature of the project, and may range from part of a season (for reconstruction of a boat ramp or restoration of a trail feature) or multiple seasons (for restoration of plant communities associated with a recreation site, where plants must become well established prior to use). Access restrictions associated with project construction could shift use to nearby sites, or to a different region of the planning area.

Certain projects may directly alter existing access due to the relocation or redesign of existing facilities (such as the movement of a facility to a less contaminated area or redesign of a facility to reduce associated resource damage). Other projects could change access from vehicular to walk-in sites, or vise-versa.

Alternative 2 may also directly affect the abundance and diversity of recreation opportunities. For example, some projects may increase opportunities by providing new access or opportunities where none currently exist (such as the creation of a birding trail, canoe launch, or interpretive facilities associated with a newly created wetland). Other projects may create or improve access to resources in contaminated areas by providing sites or features such as walkways that enable the public to enjoy natural resources while minimizing risk of contamination. These projects would have a direct positive impact (increase) to the overall abundance of recreation opportunities. At the same time, some restoration actions considered under Alternative 2 could result in the closure of existing unimproved sites where doing so would improve ecological conditions or help move resource conditions closer to baseline, resulting in a decrease in the abundance and diversity recreation facilities (such as closure and rehabilitation of a dispersed campsite next to a waterbody where use has resulted in removal of streambank vegetation, destabilizing streambanks). At this programmatic scale of planning, it is not possible to determine the magnitude of either positive or negative effects to the abundance of recreation opportunities.

Diverse recreation opportunities in the planning area are dependent on access to and availability of suitable facilities and the abundance of opportunities. However, recreation opportunities are also dependent on the condition and abundance of the natural resources that provide the basis for those opportunities. Recreation activities (such as hunting, fishing, birdwatching, or scenic enjoyment) associated with the injured natural resources in the planning area are tied to the recovery of abundant species populations, healthy habitat conditions, and natural landscape processes that support them. Thus, the abundance and diversity of aquatic and terrestrial species, the quality of the water and vegetation communities, and the aesthetic character of the surrounding area all directly and indirectly affect the recreational experience. The actions proposed under Alternative 2 that improve habitat conditions and increase species populations dependent on those habitats would provide a substantial indirect benefit to recreation in the planning area.

Recreation Settings

Recreation settings are places or areas where a combination of physical, biological, social, and managerial attributes give a place value as a destination for leisure or recreational activities. People tend to choose a specific setting for their recreation activity to realize a desired set of experiences. However, a change in the recreation setting of an area has the potential to change the original characteristics of that site or area that made it desirable, resulting in direct and indirect changes in use patterns.

The actions proposed under Alternative 2 may affect key features in both the short and long terms that contribute to a recreational setting. Over the short term, noise, increased traffic, dust, or other factors associated with construction activities necessary for projects under Alternative 2 may detract from the natural character or solitude associated with more primitive recreation settings, and diminish the recreational quality of that area on a short-term basis. These effects would be most noticeable in the lesser developed recreational character areas, such as the Coeur d'Alene Reservation and upper Hangman Creek, or areas of the South Fork and North Fork Coeur d'Alene River.

Over the long term, projects that involve the enhancement and creation of new recreation opportunities would potentially change the recreation setting development level on a long-term basis. For example, hardening or paving a dirt access road (for example, as part of a project to reduce road-related sediment into an adjacent waterbody) would change the driving experience for users recreating there. Driving on a dirt or gravel road is associated with a more rustic and less developed recreation setting and experience (USFS 1979). Likewise, projects that create developed, hardened sites where previously primitive or dispersed sites were located would shift a primitive or undeveloped setting to a modern or developed setting. Depending on the abundance and diversity of recreation settings accessible in the area, a long-term change from a less to more developed setting could prove positive or negative. Alternative 2 includes a design feature requiring that human use projects (projects intended to restore access to natural resources) integrate with the existing landscape recreation settings, which would minimize the likelihood that projects specifically associated with providing or enhancing access would shift recreation settings over the long term. However, shifts to recreation settings could occur where ecosystem restoration projects (not specifically intended to restore short-term human uses) result in widespread changes to physical and biological features or use patterns. For example, ecosystem-focused restoration projects that restore vegetative structural and species diversity to areas where plant communities are sparse (improving scenic scenery as well as dense vegetative cover) could produce a general trend towards a more primitive recreation setting in that area.

Landscape Character

The recreational experience and sense of place that people derive from an environment is affected by the long-time aesthetic character of the surrounding landscape. As described previously, landscape character is a combination of the scenic, cultural, and ecological attributes that make each landscape identifiable or unique. Landscape character creates a sense of place and describes an image of the area (USFS 1995). Because the actions considered under Alternative 2 would directly affect the ecological and scenic attributes of the landscape, they have the potential to both affect the existing landscape character as well as contribute to the recovery of the baseline landscape character (the condition of the landscape were it not for the release of mine waste contaminants).

Direct effects to existing landscape character would be associated with construction activities (extensive ground disturbance associated with major stream channel reconstruction or extensive wetland restoration). These effects would continue through the active construction period (days to months) and extend for as long as was required for natural landscape features associated with the project (such newly established plant communities) to recover (months to years).

Long-term changes to landscape character would result from actions that alter ecological and scenic characteristics as described below.

Restoration of Vegetation

Widespread restoration of vegetation to aquatic and riparian habitats or adjacent hillslopes may fundamentally alter both the scenic and ecological attributes of existing landscape character. By restoring natural vegetation communities in areas with low abundance of vegetation, an area's ecological attributes would be more intact and appear more natural. These effects would be most pronounced where vegetation is currently severely limited, such as river reaches and lakeshores with poorly vegetated banks or extensive artificial hardening (such as rip-rap), widespread tailings piles, or floodplain and channel complexes with poor growing conditions (such as unstable banks of Hangman Creek or metals-affected floodplains in the South Fork Coeur d'Alene River watershed). Effects to landscape character would be less pronounced in areas such as the Chain Lakes or the North Fork Coeur d'Alene River watershed that are already extensively vegetated.

Restoration of Hydrologic Processes

Alternative 2 includes measures that would restore natural stream channel function, including altering the overall shape of valley bottoms and function and appearance of stream channels. Other projects would manipulate water levels in wetlands, changing the extent of the wetland footprint and the duration and depth of standing water. In doing so, these project would fundamentally alter existing landscape features. Projects that restore historic wetlands or create new wetlands in areas historically converted to agricultural uses (like a pasture on the floodplain adjacent to a river) would potentially change the existing natural and cultural attributes of the landscape that make it identifiable and change the existing landscape character. Such a project may result in a greater diversity of habitat for fish and wildlife and positively affect the ecological attributes that contribute to the landscape character. Conversely, if the existing pasture has positive cultural associations with the community, there would be potential to negatively affect social attributes of the landscape character resulting in an adverse impact to sense of place.

Creation or Enhancement of Recreational Sites

Alternative 2 includes a design feature that ensures that projects designed to restore human uses integrate with the existing landscape character type and recreation setting. As a result, long-term effects to landscape character would not be expected from the introduction of recreational facilities or enhancements that are out of place with existing landscape characteristics. However, even where initial design of these projects match existing landscape character, increasing access to a river or stream could indirectly and negatively affect the ecological attributes of the existing landscape character (through trampling or overuse of aquatic and riparian habitats as a result of increased use). Conversely, ecological aspects of landscape character would be improved by projects that restore vegetation to existing recreation sites with degraded natural resource conditions, or modify sites to reduce ongoing impacts to natural resources.

Recovery toward Baseline

For the purposes of this analysis, baseline landscape character is considered the potential appearance of the planning area landscape had mine waste contaminants not been released. The restoration actions proposed under Alternative 2 are designed to restore ecosystems and associated natural resources toward baseline levels in areas of the Coeur d'Alene Basin that were affected by mine waste contaminants. Thus, restoration projects that restore baseline ecosystem conditions would subsequently contribute to restoring baseline landscape character by changing ecological and scenic landscape attributes.

Cumulative Effects

Spatial and Temporal Scope

The broad geographic scope of the cumulative effects analysis for the recreation resource under Alternative 2 is the planning area boundary encompassing all of the recreation character areas identified in the "Affected Environment" section. Past actions affecting recreation opportunities, landscape character and risks to human health were accounted for in the description of each recreation character area, although due to the localized nature of some effects, cumulative effects may be only measurable or meaningful at a smaller spatial scale (for example, changes to landscape character in the South Fork Coeur d'Alene River watershed cannot contribute to cumulative changes to landscape character in the Hangman Creek watershed).

The temporal scope is approximately 15 years, as described in section 3.1.

Effects of Past and Present Actions

The effects of past and present actions on the recreation resource are evident in the existing conditions today; therefore, they are discussed in the existing condition description of the "Affected Environment" section.

Effects of Reasonably Foreseeable Actions

Cumulative effects to recreation would occur if the activities proposed under Alternative 2 overlap in time and space with other ongoing or future actions that likewise affect recreation. Reasonably foreseeable actions relevant to the recreation resource are included in Appendix 2. Among this group of actions, activity types particularly relevant to recreation resources and potential direct and indirect effects include:

Vegetation Manipulation: Adverse short term impacts to recreation settings and attributes of existing landscape character are likely from actions carried by others that reduce vegetative density and/or alter vegetative patterns (e.g., timber management or floodplain and riparian restoration). These effects would continue until vegetation returns (e.g., timber management, when created openings no longer appear as openings). Vegetation manipulation aimed at restoration would help restore the natural character of the landscape, having a long-term positive impact on the baseline landscape character of the area. No potential impacts to recreation opportunities are likely. Actions that restore vegetation communities would positively affect the natural character of the landscape.

Watershed Restoration: Road obliteration, road drainage improvements, and other water quality improvements in the planning area would likely have adverse short-term impacts to recreation opportunities, setting and landscape character of treatment areas (such as using sediment fence during construction). Potential for adverse long-term impacts to recreation access (like permanent removal of an access road) through road obliteration, road drainage improvements, and other water quality improvements, though minimal, are likely.

Remediation and Contaminants Management: Adverse short-term impacts are likely to affect the setting and landscape character of treatment areas during construction through clean up or active manipulation of the input or deposition of contaminants. These activities would likely have a long-term positive impact to the baseline landscape character of the area. Likewise, reductions in contaminants throughout the basin would positively improve recreational opportunities through both reduction in health risk and improvements in natural resource conditions (such as scenery, and abundant fish and wildlife) that support recreation.

Recreation: Operation and maintenance of existing recreation sites, trails, and roads (such as right-of-way stabilization and transportation system management) would likely have short-term adverse impacts to recreation access while work on recreation sites is being carried out. Because such actions are geared to enhancing recreation, long-term positive impacts to recreation opportunities would be likely. Additionally, various entities may enhance existing or create new recreation facilities or access points or may close existing developed or dispersed sites.

Climate Change: Adverse long-term impacts are likely to affect the abundance and diversity of recreation opportunities and landscape character within the planning area due to predicted shifts in climate and weather patterns resulting in longer, drier summer months driving more people toward water-based recreation (Morris and Walls 2009).

Potential Cumulative Effects

The short-term effects of actions proposed under Alternative 2 could contribute to cumulative effects to recreation access and recreation settings if actions are concentrated within too small an area and in too brief of time, resulting in an overlap of effects (such as access to multiple recreation sites within a larger area being limited due to construction or maintenance activities occurring at the same time, or the quality of an existing recreation setting is diminished by extensive construction activity). Alternatives 2 and 3 include a provision wherein the Trustees would reduce the risk of overlapping effects by coordinating the timing and nature of ground-disturbing restoration projects with actions in the vicinity of the project being carried out by others, reducing the likelihood of cumulative effects due to the implementation of Alternative 2.

The direct and indirect effects to landscape settings described potential long-term effects to recreation setting development levels, including shifts from less to more developed as well as general trends towards less developed where extensive vegetation is restored. Alternative 2 includes a design feature requiring that projects intended to restore access to natural resources integrate with the existing landscape recreation settings, which minimizes the likelihood that projects specifically associated with providing or enhancing access would shift recreation settings over the long term, and thus minimizing the likelihood that these projects could combine with the effects of other actions' cumulative changes in landscape settings.

As described previously, it is impossible to determine at this programmatic planning scale to what extent the actions proposed under Alternative 2 would change the abundance of recreational opportunities in the planning area. Individual actions carried out under the plan could combine with the actions carried out by other agencies that have similar effects, resulting in cumulative increases, decreases, or even no cumulative change to the abundance of recreation opportunities in the planning area. The degree to which other entities in the planning area are considering adding to or enhancing existing recreational opportunities, or reducing opportunities, is not well known but there are a few exceptions. In the Coeur d'Alene Reservation recreation area, the Tribe's 2014-15 Schlajalqw Analysis Area Plan proposes increased recreation opportunities. In the South Fork Coeur d'Alene area, the Shoshone County Sportsmen's Association and Idaho and Shoshone County agency partners are enhancing the Gene Day Pond in Osburn to provide a recreational fishing opportunity targeted at children. The Idaho Panhandle National Forest Plan identifies a range of potential actions affecting access and the abundance of recreation opportunities in all of the recreation character areas identified in this document, including construction of new facilities, modification of existing facilities, or closure of certain facilities.

The great majority of actions that would be carried out under Alternative 2 are intended to restore long-term natural ecosystem function in areas of the planning area that were injured by mine waste contamination, including populations of fish and wildlife and the habitats that support them. Because of the integral connection between the injured natural resources and recreation values, cumulative effects from Alternative 2 to the natural environment have the potential to cumulatively affect recreation as well. Thus, the cumulative effects described in other sections of this document would provide the basis for cumulative effects to the recreation resources. Detailed descriptions of the potential cumulative effects of Alternative 2 to water quality, vegetation, and aquatic and terrestrial species were described elsewhere in this document. Collectively, the ecological restoration actions considered under Alternative 2 would positively affect the ecological and scenic attributes of landscape character.

3.7.2.6 Alternative 3 – Ecosystems Focus

The following are the key differences between Alternative 2 and Alternative 3 relevant to recreation and human uses:

- **Ecosystem Focus:** Under Alternative 3, 100 percent of restoration funds would be allocated to ecosystem restoration, in contrast to Alternative 2, which uses up to 10 percent of funds, or up to $14 million for projects or project components intended to restore human uses of natural resources in the near term while ecosystem restoration proceeds. Thus, under Alternative 3, up to an addition $14 million would be spent on ecosystem restoration, resulting in increased recovery of injured plant communities.
- **No Human Uses Project Effects:** Because no work would be done under Alternative 3 to restore human uses in the near term, effects to recreation settings and landscape character specific to human uses projects would not occur.
- **Geographic Area:** Under Alternative 3, restoration work would be carried out only in the Coeur d'Alene Lake Basin and the upper Spokane River. No work would be performed in the upper Hangman Creek watershed. Thus there would be no effects to recreation or other human uses associated with natural resources in the upper Hangman watershed.

Direct and Indirect Effects

Recreation Access and Opportunities

There would be no direct increase in access to natural resources or to the abundance and diversity recreation sites under Alternative 3, although recreation opportunities may change in the planning area due to the work of others. Access to existing recreation sites may be reduced if ecosystem restoration projects are carried out in or adjacent to both developed and dispersed sites. For example, projects designed to restore degraded vegetation or other habitat conditions at an existing site may require some or all of the site to be closed while vegetation communities recover. The period of closure could range from months to years depending on restoration objectives and outcomes.

Recreation activities associated with the injured natural resources in the planning area (such as hunting, fishing, birdwatching, or scenic enjoyment) are dependent on the recovery of abundant species populations, healthy habitat conditions, and natural landscape processes that support them. Thus, the abundance and diversity of aquatic and terrestrial species, the quality of the water and vegetative communities, and the aesthetic character of the surrounding area all directly and indirectly affect the recreational experience. Although Alternative 3 would not include immediate restoration of features that enhance human uses of natural resources (such as recreational facilities) the natural resources that ultimately provide for and support those human uses would improve to a greater extent under Alternative 3 than under Alternative 2. However, the recovery of those resources would be limited to the Coeur d'Alene and upper Spokane River Basins because the Hangman Creek area is not included under Alternative 3.

Recreation Settings

Potential changes to recreation settings under Alternative 3 would be similar to those described under Alternative 2, with the following exceptions:

- Changes in recreation settings as a result of projects designed to enhance existing or create new recreation sites would not occur under Alternative 3.
- Changes in recreation settings would not occur in the Hangman Creek watershed because no work would be conducted there.

Landscape Character

Potential effects to attributes of landscape character under Alternative 3 would be similar to those described under Alternative 2 with the following exceptions:

- No changes would occur as a result of projects designed to enhance existing or create new recreation sites because those projects would not be carried out under this alternative.
- There would be no effects to attributes of landscape character in the Hangman Creek watershed because no work would be conducted there.
- In the Coeur d'Alene Basin and upper Spokane River area, more funds would be allocated under Alternative 3 to restore the natural processes and features that comprise the ecological attributes of existing landscape character.

Cumulative Effects

Potential cumulative effects under Alternative 3 would be similar to Alternative 2 with the following key differences:

- No cumulative effects would occur to recreation access or the abundance of recreation opportunities in the planning area because no projects would be conducted under Alternative 3 to create or directly enhance recreational resources.
- There would be no cumulative effects to recreation settings or landscape character in the Hangman Creek watershed portion of the Coeur d'Alene Reservation recreation character area because no work would be conducted there.

- Cumulative benefits to the recreation resource as a result of improving ecological conditions would be more extensive under Alternative 3 because 100 percent of funds would be allocated to ecosystem restoration.

3.8 Heritage Resources

Heritage resources are the surviving archaeological and historical remains and ruins of past cultural groups. Heritage resources might include ancient Indian villages and artifacts; travel routes and markers; military forts and battlefields; abandoned mines and mills; homesteads and ranches; logging trestles and splash dams; railroad grades and construction camps; Civilian Conservation Corps-built recreation sites; and forest ranger stations and lookouts. Inclusive within this general definition are traditional cultural properties, which are places that exemplify the continuing practices or beliefs of a living community and are fundamental to that community's history.

3.8.1 Affected Environment

The analysis area for heritage resources is the restoration planning area as shown in Figure 1. The ancient and recent history of the Coeur d'Alene Basin is documented in regional and local histories (Bamonte and Bamonte 2005; Schwantes 1991), agency culture resource overviews and reports (Hudson et al. 1982; Miller et al. 2014), and academic studies (Walker 1998). A brief overview is provided here.

Humans have inhabited the lands now encompassed by the Coeur d'Alene Basin for 10,000 years or more. The earliest Native American occupations are documented at a few widespread archaeological sites containing stone tools and camp refuse. Native camps and villages were more concentrated around major rivers and large lakes where fishing, gathering, and hunting were especially productive. Ancestral Coeur d'Alene and other native peoples seasonally journeyed to forested mountains, grass-covered hills and grassy basins surrounding these large lake and river systems for a wide range of socioeconomic purposes. During nonnative settlement of the U.S. this vast aboriginal territory was drastically reduced to the 345,000-acre of the current Coeur d'Alene. Today, the Coeur d'Alene Tribe depends on the natural resources of their reservations and nearby public and private lands for cultural and spiritual amenities and participate in the management of both.

This foraging traditions and culture of the native people radically changed with the arrival of nonnative explorers and fur trappers early in the 19th Century. David Thompson of the Northwest Fur Company established a trading post on Lake Pend Oreille in 1809. Jesuit missionaries later established a mission among the Coeur d'Alene Tribe on the St. Joe River in 1842. Gold strikes in Idaho in the early 1860s, including in the Coeur d'Alene Basin, eventually led to intensive development of the area by placer and lode miners and corporations representing many nationalities. By the early 1870s, railroads, ferries, steamboats, and overland routes such as the Mullan Road facilitated travel to and from the Coeur d'Alene Basin in all directions.

Lode mines became well established in the Coeur d'Alene Basin, eventually producing millions in gold, silver, zinc, and lead. As a consequence, settlements such as Kellogg and Wallace eventually grew up around the mining camps, replete with fine examples of late 19th Century architecture in the Gilded Age. This rich mining legacy continued well into the 20th Century, ultimately leading to environmental concerns, litigation, legal settlements, and mine waste remediation, as described elsewhere in this document. The Bunker Hill Mining Complex Superfund site is a significant example of mining and milling, and subsequent remediation, in the Coeur d'Alene Basin (Miller et al. 2014).

Timber became another major extractive resource synonymous with North Idaho. By the turn of the 20th Century, dense native forests were being extensively harvested by both railroad companies (who obtained alternating legal sections through land grants from the Federal Government) and local and regional timber corporations.

Agriculture was slow to develop across the basin but the Homesteading Act of 1906 provided incentive for further settlement, including dairy operations. However, outside of the relatively rich river bottom lands, most "stump farms" were eventually abandoned and public lands were withdrawn from homesteading by the mid-1930s. The railroads and roads opened up the region to national markets and communities slowly developed, surviving economic peaks and valleys such as the Great Depression. The construction of the Post Falls Dam and associated hydroelectric facilities over the period between 1902 and 1906 provided an important source of electricity for the operation of mines, mills, factories, cities, businesses, and railways in the planning area and beyond.

By the 1950s, a proliferation of State and Federal highways provided further impetus for socioeconomic growth and development, with the greater Spokane and Coeur d'Alene area becoming a regional hub for north Idaho. Today, the regional economy is based on a mixture of resource extraction, recreation, and a myriad of regional enterprises and local businesses.

A 2015 Idaho State Historic Preservation Office records search identified some 2,302 archaeological resources within the basin planning area. This total includes 1,824 historic occupations, 368 American Indian occupations, and 102 locales containing both ancient and recent components. A total of 1,119 historic structures are also identified within the planning area. These cultural resources represent a broad spectrum of themes (areas of significance) in Idaho cultural history, including agriculture, commerce, conservation, exploration, industry, military, settlement, and so forth.

This currently known sample indicates the range of sites within the Coeur d'Alene Basin that may be affected by future restoration projects. The total number is difficult to estimate since private lands are infrequently examined for cultural resources. Many of the known sites qualify, or are likely to qualify, for listing on the National Register of Historic Places (National Register), the nation's honor roll of places important in local, regional and national history, as defined by the National Historic Preservation Act (NHPA) of 1966 (NHPA; 16 U.S.C. § 470, as amended) and its regulations at 36 CFR 60.

3.8.2 Analysis of Effects – Heritage Resources

3.8.2.1 Analysis Assumptions

The analysis of effects for heritage resources assumes that projects carried out under the Alternatives 2 and 3 will comply with the design features described in section 2.2.4.6 as well as the National Historic Preservation Act of 1966. Section 106 of the Act requires Federal agencies to take into account the effect of their undertakings, including actions, financial support, and authorizations, on cultural resources included in or eligible for inclusion in the National Register of Historic Places. Further, agencies are required to consult with State Historic Preservation Officers, Indian Tribal Historic Preservation Officers, the Advisory Council on Historic Preservation, and other consulting parties in the management and protection of cultural resources. Regulations at 36 CFR 800 define specifically how agencies must meet their statutory responsibilities under the National Historic Preservation Act.

This programmatic analysis for the Coeur d'Alene Basin Restoration Project sets the stage for a wide range of site-specific aquatic and riparian habitat restoration work in the future. There is not enough site-specific information at this planning level about the range of potential undertakings, or their effects to known or potential cultural resources, to undertake a meaningful analysis for purposes of meeting section 106 compliance with the National Historic Preservation Act. Rather, this document identifies the procedures for fulfilling section 106 compliance as projects come online by the project proponent.

All site-specific restoration actions on Federal lands will require section 106 compliance review, potentially including field inventory, National Register evaluation of identified cultural resources, analysis of project effects, development of mitigation measures as necessary, consultation, and documentation in a memorandum of agreement among the lead agency, State Historic Preservation Officer, Advisory Council, Indian Tribe and other consulting parties as appropriate. In some cases, the proposed work or effects will be so negligible that section 106 compliance is unnecessary. This determination must be made by a qualified Heritage Resource professional during the project selection and planning stage.

The National Historic Preservation Act is also invoked when Federal funding supports restoration work on State, private and Tribal lands. Protocols would involve notification to the property owner that cultural resource review, identification and evaluation will precede restoration planning and implementation. Project proponents and the landowner would work cooperatively to identify cultural resources and protect or mitigate cultural resource values to the extent appropriate.

3.8.2.2 Alternative 1: No Action

Direct and Indirect Effects

In this alternative, there would be no direct and indirect effects because no work would be done.

Cumulative Effects

There would be no cumulative effects to heritage resources because no work would be done.

3.8.2.3 Alternative 2 – Ecosystem Focus With Additional Human Use Considerations (Proposed Action)

Alternative 2 includes the upper Hangman Creek watershed in the planning area (in contrast to Alternative 3, which excludes the Hangman Creek watershed).

Direct and Indirect Effects

Restoration is designed to address aquatic and riparian resources within the larger basin planning area. Thus, the majority of future ground-disturbing restoration actions would be located in, or adjacent to, streams, wetlands, lakes and associated riparian areas. A wide range of cultural resource site types are typically found in these environments, contingent on past or recent disturbances. Native American camps and villages were concentrated around bodies of water throughout the Holocene Epoch. Later, Euro-American settlement focused in these same places, including roads, homesteads, and industrial sites, layering history atop prehistory.

Historic mining sites and areas, such as along the South Fork of the Coeur d'Alene River, may be specifically targeted for restoration. The basin's long history of precious and base metal mining and milling since the turn of the 20th Century has resulted in a large amount of toxic mine waste contamination, often concentrated in waterways and wetlands. While mines and mining ruins were typically salvaged for equipment and materials after their productive life, some remnant ruins are likely to have historic value that requires consideration in project design and implementation.

Restoration could involve ground-disturbing work in the vicinity of historic mining facilities or other ruins and archaeological features, all of which directly affect or disturb these features. Other effects may be less direct and more nuanced, such as highly visible streamside restoration structure near a traditional cultural property. Projects or project components that increase or enhance recreational access could result in impacts such as increased vandalism, removal of materials, or inadvertent damage.

The likelihood of direct and indirect effects to heritage resources described above is expected to be minimized by requirements to survey for cultural resources prior to ground disturbance and to avoid or minimize effects. Despite inventories, the potential exists for undiscovered sites to be exposed or damaged by surface disturbance or other events. These sites may or may not be noticed in time to allow mitigation. This damage represents an unavoidable adverse effect, which would be present in Alternatives 2 and 3.

Cumulative Effects

Numerous past actions and influences, both natural and man-induced, have impacted cultural resources. These include, extensive ground disturbance due to a century of intensive mining; residential development; development of transportation infrastructure including Interstate 90 and State highways 3 and 95; developed and dispersed recreation; ground disturbance due to forest management; wildfire, floods, and erosion; and exposure to the elements.

The actions proposed in Alternative 2 include direct and indirect effects that may result in loss of sites or parts of sites. Ongoing and future actions in the planning area may have similar effects.

Thus, cumulative effects from proposed restoration may include incremental loss of the cultural resource base within the planning area.

3.8.2.4 Alternative 3 – Ecosystems Focus

The amount of ground disturbance under Alternative 3 would likely be the same as under Alternative 2. The key differences between the alternatives with relevance to cultural resources include geographic area and the inclusion of projects and project components intended to restore human uses of natural resources in the short term (in Alternative 2 but not in Alternative 3). Additionally, under Alternative 3, restoration work would be carried out only in the Coeur d'Alene Lake Basin and the upper Spokane River. No work would be performed in the upper Hangman Creek watershed. Thus, cultural resources that may be found in the upper Hangman Creek watershed would not be affected under Alternative 3.

Direct and Indirect Effects

The direct and indirect effects of Alternative 3 would be similar to Alternative 2. However, Alternative 3 would not include human uses projects that would create or enhance recreation use of the planning area. As a result, the likelihood of indirect effects such as increased visibility of heritage resources, vandalism, removal of materials, and damage, would therefore be less under Alternative 3 than under Alternative 2.

Cumulative Effects

Cumulative effects that are the result of direct effects to cultural resources as a result of ground disturbance would be the same under Alternative 3 as Alternative 2. However, the likelihood of cumulative effects due to adverse indirect effects (such as increased visibility and access) would be less under Alternative 3 because this alternative would not include human uses projects that create or enhance access.

3.9 Resources of Particular Significance to the Coeur d'Alene Tribe

3.9.1 Affected Environment

3.9.1.1 Historical Context

The aboriginal territory of the Coeur d'Alene Tribe spanned nearly 4 million acres throughout present-day northern Idaho, northeastern Washington, and western Montana. The current Reservation boundaries encompass only 345,000 acres of the Tribe's once vast aboriginal territory.

The traditional relationship of natural resources with the spiritual, cultural, and aesthetic aspects of Coeur d'Alene Tribal life was and continues to be, centered around water; specifically the watercourses comprising Coeur d'Alene Lake and its surrounding environment. More than any other Plateau Tribal culture, the Coeur d'Alene's continue to define themselves in reference to water and consider the Lake as "the heart of the aboriginal territory" (Sprague 1999). Members of the Tribe lived not only around the entire perimeter of the Lake itself but up its tributary streams, rivers, and adjacent uplands. The combination of the region's physical geography and abundant natural resources provided by its aquatic and riparian ecosystems provided the resources vital to the Tribe's survival.

The historical condition of the natural resources in the Coeur d'Alene Basin has been described by various informants through oral history. Tribal members lived off of the bounty of healthy natural resources and pure water in and throughout the basin (harvested roots, berries, and fish in particular westslope cutthroat and red band trout) throughout the planning area. Prior to 1858, the Coeur d'Alene Basin (including the lakes, rivers, and smaller streams) was considered to be in a utopian state.

Coeur d'Alene Lake and surrounding streams and wetlands provided an important source of food. Cutthroat trout were (and continue to be) an important fishery for the Tribe, particularly after anadromous fish migration into the area was blocked by the construction of dams on the Columbia River. Peltier (1975) reported that the Coeur d'Alene's maintained several semi-permanent and permanent fishing camps along the Spokane River near Coeur d'Alene Lake and that the harvest of large salmon and cutthroat trout in the river, and bull trout from the Lake, contributed substantially to their overall subsistence needs. Scholz et al. (1985) estimated that in the mid-1800s, Coeur d'Alene Tribal members annually harvested 210,000 pounds of resident fish and 460,000 pounds of salmon. A traditional fish trap was operated on the Coeur d'Alene River for over 50 years until it was flooded by the construction of Post Falls Dam in 1903 (Scott 1968; and Scholz et al. 1985). This trap caught thousands of trout and whitefish annually. Successful harvest of resident species continued for many years after that. In 1967, the harvest of fish (total number of fish taken) from Coeur d'Alene Lake ranked second only to Lake Pend Oreille (Mallet 1968). It is estimated that Coeur d'Alene Tribal fishers caught substantial numbers of cutthroat during this time (Scholz et al. 1985). Besides subsistence fishing, the waters of the lake and rivers also provided opportunities for traditional cultural practices such as canoe racing and the ritual "plunge" in cold lake water following the religious practice of sweating in the sweat lodge.

Prior to the release of contaminants, Tribal members harvested blue camas (*Camassia esculenta*) bulbs from wetlands, annual floodplains, wet meadows, and streamside areas throughout the entire planning area. Murphey (1959) wrote, "When camas was in bloom in wet meadows adjacent to wetlands, the flowers grew so thickly that they looked like a blue lake." The camas bulbs were harvested, pit-cooked, and made into cakes and served as a main staple for the Tribe. Camas stalks and leaves were used to make mattresses and other products. Tribal members harvested berries throughout the summer as they ripened at successive elevations (Sprague 1999), and a variety of other flora (wild rose, thimbleberry, ocean spray, and hard stem bulrush) were used for medicinal purposes and other cultural practices. Water potatoes (*Sagittaria latifolia*) or *sqigwts* were harvested late in the season and used for food throughout the winter.

3.9.1.2 Effects of Mine Waste Contamination

Mine waste contamination of the Coeur d'Alene Basin has greatly affected the Tribe. The most profound and troubling loss resulting from the release of mine waste contamination was the loss of pure water. Contamination of the waters affected both subsistence harvest of natural resources and cultural practices.

By 1967, the trout number harvested from the lake dropped dramatically when only 3,329 cutthroat were harvested by both Tribal and non-Tribal anglers on Coeur d'Alene Lake (Mallet 1968) although migratory waterfowl and some resident ducks provided additional game from the water. Effects of contamination to the lateral lakes and wetlands of the lower Coeur d'Alene River and adjacent to Coeur d'Alene Lake heavily impacted the water potato (*S. latiforial*). Due to the significance of this species as a subsistence and cultural item to the Tribe, the Fish and Wildlife Service and others evaluated the extent of heavy metals concentrations in water potatoes in wetlands along the lower Coeur d'Alene and St. Joe rivers (Campbell et al. 1999). Results indicated that sediment on the potato skin (which are not removed by Tribal members prior to consumption) exceeded the human health criteria for metals. In response Tribal authorities issued a health advisory and warning in 2002, advising Tribal members not to engage in subsistence activities, including the gathering of water potatoes, or recreational activities such as swimming, that expose them to the soils and sediments in the Coeur d'Alene River Basin (CDA Resolution 42).

In addition to subsistence impacts due to the loss of fishing, hunting, and gathering were the losses to the Tribe of the spiritual and cultural uses of the basin. Coeur d'Alene ritual is intimately tied to the availability of pure water. There was a loss of the joy of building canoes and their uses, lost recreational opportunities such as swimming, diving, and canoe racing diminished because Tribal members were and continue to be offended by the contaminated water (Sprague 1999). Due to the pollution in the lake, Tribal members could no longer take the required plunge following the ritual sweat by the Lake. Tribal members could no longer harvest the culturally important flora and fauna from contaminated areas used for medicinal purposes and many other cultural practices.

In addition to the effects of mine waste contamination, emergent wetland communities that formerly provided abundant flora and fauna for subsistence and cultural practices were affected by flooding from the Post Falls Dam. Prior to the construction of the dam (circa 1908), areas typically producing camas, water potato, and *tule* (hardstem bulrush) camas were found at an elevation of 2,122 around Chatcolet, Benewah, and Round lakes (Parametrix 2003). A 2003 survey also showed a significant reduction in water potato and camas harvest areas around the southern portion of Coeur d'Alene Lake due to the surface water elevations being too high (Coeur d'Alene Tribe 2005). The extent of camas meadows has also been greatly reduced. Dam operations and changes in hydrology annually inundate 8,352 and 10,000 acres of wetland habitats with water during summer growing season, largely precluding the growth of camas (Parametrix 2004). These surveys also documented 808 acres of *tule*-dominated emergent marsh had decreased to 6 acres. The cultural tree and shrub species are also no longer as prevalent or uncontaminated throughout the entire lake area. Culturally important plant species such as hawthorn, currant, rose, chokecherry, and serviceberry were not found on portions of the Reservation affected by dam flooding (24 sites surveyed), and cottonwood, aspen, and dogwood were found within the inundation zone in limited sites off of the Reservation (59 sites). The injury and loss of water potato and camas in most wetland areas throughout the entire planning area has had a substantial cultural and spiritual impact on Tribal members. Many of the plant species affected both by contamination and flooding previously aided Tribal members during seasonal migrations between lake, wetland, and upland habitats. Seasonal changes in plant communities were highly important to the Tribal traditional calendar which signaled seasonal movements and other Tribal activities (Tribal member committee traditional calendar 2015).

Today, Tribal uses of injured natural resources remain limited and fewer Tribal members experience the traditional gathering of tribally important species such as water potato and camas. Following contamination of traditional harvesting areas, reductions in the abundance and distribution of natural resources, and the imposition of the Tribal Resolution resulting in a moratorium on natural resource gathering and other activities in contaminated areas, Tribal members turned towards alternative gathering sites in the southern end of Coeur d'Alene Lake. However, limited resources combined with the effects of the Post Falls Dam have resulted in shifts to alternative gathering sites such as the upper Hangman Creek watershed.

The Hangman Creek watershed provides natural resources and opportunities for natural resources-based cultural practices similar to injured areas in the Coeur d'Alene Basin. It serves as an important resource to the Tribe due to the close proximity of the area to Tribal population centers. Moreover, Tribal government ownership and management of the Hangman drainage lands, and its legal status within Reservation boundaries, provide an accustomed environment in which Tribal members interact with natural resources that is often drastically different than areas off the Reservation. Although the upper Hangman watershed was not affected by mine waste contamination, other land use practices have had a negative impact on natural resources important to the Tribe (such as agriculture and stream channel alterations) that compromise the capacity of the area to provide natural resources to replace resources lost by the injury in the Coeur d'Alene Basin.

3.9.2 Analysis of Effects – Resources of Particular Significance to the Coeur d'Alene Tribe

As outlined in the background section of the "Affected Environment" section, the traditional relationship of natural resources with the spiritual, cultural, and aesthetic aspects of Coeur d'Alene life was and continues to be, centered around water, more specifically, the watercourses comprising Coeur d'Alene Lake and its surrounding environment. Prior to injury from contamination, natural resources in the planning area formerly provided for important and unique Tribal uses, including subsistence and traditional cultural and religious practices.

3.9.2.1 Spatial and Temporal Scale

This analysis describes potential short- and long-term effects of proposed restoration on natural resources important to the Tribe as well as Tribal patterns of use of those resources. Short-term effects to the natural resources or Tribal members' use of those resources could occur over hours, days, or possibly weeks during the active construction phase. Long-term effects are the result of restoration-related changes in the abundance and distribution of natural resources, resulting in changing use patterns by the Tribe. When considering the potential future outcomes of restoration and other activities, members of the Coeur d'Alene Tribe think in terms of "seven generations" (Sprague 1999).

3.9.2.2 Analysis Assumptions

See Analysis Assumptions in Hydrology and Water Quality, Aquatic Habitat and Species, Terrestrial Habitat and Species, Vegetation, and Socioeconomics sections, as these assumptions influence the analysis in this section.

The analysis of effects to the natural resources important to the Coeur d'Alene Tribe evaluates the effects of the alternatives on access to and availability of resources to Tribal members. Resource availability is based on the proximity of resources to Tribal population centers. The majority of Tribal members live within the Reservation; therefore, for the purpose of this analysis, natural resources are assumed to be more available if they occur within the exterior boundaries of the Reservation.

Restoration of natural resources throughout the entire planning area will result in restored and available resources for Tribal and non-Tribal populations. However, the vast majority of Tribal members that live on the Reservation have a reluctance to engage in cultural and harvesting practices off-reservation because they are not comfortable in engaging in these culturally important practices on non-tribally owned or managed lands (pers. comm., Cajetan Matheson, Cultural Resources Protection Program Manager, Coeur d'Alene Tribe, 12-14-2015).

3.9.2.3 Alternative 1 – No Action

Direct and Indirect Effects-

In this alternative there would be no direct effects because no restoration of natural resources would be conducted; therefore, no lost Tribal uses of those resources would be restored.

Under the no-action alternative, it is unlikely that injured natural resources would recover sufficiently to support the traditional subsistence and cultural practices unique to the Coeur d'Alene Tribe.

In the Coeur d'Alene Basin, without active restoration, there would continue to be reduced abundance of culturally important fisheries, waterfowl, and plants. In particular, resources of significance to the Tribe such as adfluvial westslope cutthroat trout and water potato would persist in extremely low abundance and reduced distribution. Over time, due to the Environmental Protection Agency's remediation and natural attenuation, some habitats and species populations may recover without active restoration to support traditional uses. However, as discussed in the "Vegetation," "Aquatic Species and Habitat," and "Hydrology" sections, the rate of recovery of those resources under the no-action alternative would be very slow and the future extent of resources would be substantially less.

Current use patterns of natural resources by Tribal members as well as increased risk to human health due to exposure to contaminants through the use of natural resources located in the planning area would not change. The rate of recovery of clean natural resources would follow the progress of Environmental Protection Agency remediation and the natural rate of attenuation and deposition and sedimentation of clean sediments could take a long time to occur. Currently under the Environmental Protection Agency's Interim Record of Decision for OU3, there are no plans to do remediation in Coeur d'Alene Lake; therefore, the rate of recovery of natural resources in the lake is unknown. During this time, Tribal members would harvest natural resources elsewhere (such as Hangman Creek) due to both the lack of available and abundant resources in the injured areas combined with the Tribal Moratorium on use of contaminated natural resources in the lower basin.

Under the no-action alternative, aquatic and riparian resources in Hangman Creek would likewise not be restored, thus reducing the abundance of available replacement of natural resources that would provide Tribal services in the absence of available resources in the Coeur d'Alene Basin.

Cumulative Effects

Under the no-action alternative, there would be no direct and indirect effects that could combine with the effects of other actions to contribute towards cumulative effects.

3.9.2.4 Alternative 2 – Ecosystem Focus With Additional Human Use Considerations (Proposed Action)

Under Alternative 2, up to 10 percent of available restoration funds would be allocated to projects and project elements that restore human uses of injured natural resources. This would include restoring natural resources unique to the Coeur d'Alene Tribe in the upper Hangman Creek watershed on the Coeur d'Alene Reservation. The inclusion of the upper Hangman Creek watershed is unique to this alternative.

Direct and Indirect Effects

The short-term direct effects of restoration actions that would be carried out under Alternative 2 to the natural resources important to the Tribe are described in other sections of this document (see "Hydrology," "Effects to Water Quality," "Vegetation," "Aquatic Species and Habitat," and "Terrestrial Habitat and Species" sections).

Restoration projects may directly affect access and availability of tribally important natural resources in both the short and long terms. Sites may be closed during and after construction to protect recovering natural resources. These restrictions are expected to last as long as required for plant populations to become well established or until other natural resource objectives are met, and may extend from days to months or potentially years, depending on site conditions and restoration objectives. Restoration projects that affect transportation networks (such as removal or alteration of riparian roads or removal of stream crossing structures) could affect long-term access to tribally important areas (such as sacred sites); however, project design features include a provision wherein Trustees would coordinate with affected tribes to identify and mitigate concerns prior to carrying out such work.

Indirect effects from restoration would occur following restoration activities, and would extend in duration for years or decades. The "Aquatic Species and Habitat," "Vegetation," and "Terrestrial Habitat and Species" sections described in detail the likely indirect effects of Alternative 2 on the abundance, distribution, and likelihood of recovery of the natural resources important to providing traditional Tribal services in the Coeur d'Alene Basin and the upper Hangman watershed. In summary, over the long term, implementation of the restoration activities proposed under Alternative 2 would increase the rate of recovery of resources important to the Tribe as compared to the no-action alternative. There would also be an increased extent of available resources (such as more acres of wetlands and more populations of fish) due to active restoration, as well as a greater likelihood that natural resources would recover sufficiently to provide services and access to Tribal members than under the no-action alternative.

Following the aquatic and riparian restoration proposed under Alternative 2, the abundance of plant species important to the Tribe (water potato, thimbleberry, wild rose, and hard stem bulrush) would likely increase in both abundance and distribution, as well as the tribally important wildlife species that are supported by these areas (such as beaver, elk, deer, and others). In restored streams, rivers, and lakes, there would be improved and enhanced fisheries habitat for west slope cutthroat trout and mountain whitefish, which are important to the Tribe.

Restored natural resources would also have positive effects on Tribal members' spiritual connection to the entire planning area and improve an overall sense of place (as described in the Recreation and Human Services section).

However, despite the restoration actions proposed under Alternative 2, in the Coeur d'Alene Basin, the continued presence of metals, prevalence of nonnative fish, water quality issues, operations of the Post Falls Dam, and other factors beyond the scope of the proposed action to address are expected to continue to limit the full recovery of injured resources, especially in and adjacent to Coeur d'Alene Lake.

Despite the restoration actions proposed in Alternative 2, use patterns by Tribal members in the Coeur d'Alene Basin could potentially remain the same due to the ongoing Tribal Moratorium on use of contaminated areas in the lower basin. However, should the Moratorium be lifted, the increased extent of restored vegetation communities and species populations in those areas is expected to result in changing use patterns for the Tribe as members return to hunt, fish, and conduct traditional practices in these areas. The restoration actions proposed in Alternative 2 would not substantially affect existing levels of contaminants unless the Environmental Protection Agency has conducted remedial actions prior to the restoration being implemented by the Trustees.

However, Alternative 2 includes restoration of harvestable natural resources in areas outside the influence of contaminants (the Hangman Creek area) and would thus indirectly and beneficially reduce human health risks by providing opportunities to harvest resources in those uncontaminated areas. Restoration actions to restore natural resources in the upper Hangman Creek watershed is designed to replace culturally important resources lost in the Coeur d'Alene Basin due to contamination. In contrast to the no-action alternative and Alternative 3 (which does not include the Hangman watershed), Alternative 2 would increase the abundance of tribally important natural resources in the Hangman area. For example, the floodplains and wetlands of upper Hangman Creek provide an opportunity to reintroduce and restore harvestable amounts of camas, while these opportunities are limited in the contaminated wetlands and floodplains of the Coeur d'Alene Basin due to the existing contamination. Likewise, restoration in upper Hangman Creek would provide improved habitat conditions and connectivity for the redband trout (a culturally important species to the Tribe not found elsewhere in the planning area).

Restoration of natural resources in the Hangman Drainage would substantially increase the availability of culturally important resources for Tribal members in the long term, by increasing the abundance of natural resources in close proximity to the major Tribal population centers within the exterior boundaries of the Reservation.

There is no risk of metals contamination in the Hangman drainage, so restoring resources there and the subsequent use by Tribal members would not increase human health risks.

Cumulative Effects

Spatial and Temporal Scope

The temporal scope of the cumulative effects analysis is approximately 15 years, as described in section 3.1. The aboriginal homeland of the Coeur d'Alene Tribe encompasses the full restoration planning area, so the broad geographic scope of the cumulative effects analysis for the natural resources important to the Coeur d'Alene Tribe and to the uses of those resources by Tribal members is the boundary of the restoration planning area. Projects that restore habitats and associated species may contribute incrementally to overall recovery of natural resources towards baseline that formerly provided for important Tribal uses, including subsistence, cultural, and religious practices. The cumulative effects to those natural resources were described in the "Hydrology" and "Water Quality," "Aquatic Species and Habitat," "Terrestrial Habitat and Species," and "Vegetation" sections.

This section focuses on the cumulative effects of restoration actions on access and availability of culturally important resources, especially in Tribal population centers or areas close to Tribal population centers, including areas within the boundaries of the Tribal reservation. For this issue, the spatial scope of the cumulative effects to resource availability is the boundary of the Tribal reservation.

Effects of Past and Present Actions

The effects of past and present actions on the availability of and access to culturally important resources are evident in the existing conditions today; therefore, they are discussed in the existing condition description of the "Affected Environment" section.

Effects of Reasonably Foreseeable Actions

Reasonably foreseeable actions are described in Appendix 2. Among this group of actions, activity types particularly relevant to the availability and access to tribally important resources are those that affect natural resources within the boundaries of the Reservation, and includes (but is not limited to):

- Tribal Integrated Resource Management Plan: This proposes a wide variety of actions intended to restore aquatic and riparian resource abundance within the Reservation boundaries.
- Hangman Creek watershed Plan: This proposes a wide variety of restoration actions designed to improve watershed, channel, and floodplain function in order to support recovery of tribally important resources such as camas and redband trout.
- Benewah Creek Restoration Plan: This proposes restoring floodplain processes, stream channel function, and cutthroat trout habitat and migratory connectivity to Coeur d'Alene Lake.
- Windy Bay Wildlife Mitigation Plan: This proposes wetland restoration and land acquisition to improve the abundance and availability of natural resources, including harvestable plant species important to the Coeur d'Alene Tribe.
- Lake Creek Restoration Plan: This proposes restoration of wetlands to support improving channel function, water quality, and abundance of riparian resources within portions of Lake Creek on the Tribal reservation.

Potential Cumulative Effects

The short-term effects of actions proposed under Alternative 2 could contribute to cumulative effects to the availability of resources to Tribal members if numerous projects are conducted concurrently, restricting access to a large portion of harvestable resources due to an overlap of effects (spatial and temporal "crowding"). There is little likelihood that the short-term impacts of restoration actions proposed under Alternative 2 could combine with similar effects of other actions to create cumulative effects to access and availability. Alternative 2 includes a provision wherein the Trustees would reduce the risk of additive effects by coordinating the timing and nature of ground-restoration projects with actions in the vicinity of the project being carried out by others. Likewise, the team responsible for planning and carrying out restoration includes representatives from the Coeur d'Alene Tribe, helping to ensure coordination in planning and implementation of restoration between the Trustees and the Tribe. Such coordination would also reduce the likelihood that sites would be disturbed more than once.

Restoration projects carried out by the trustees within the boundaries of the Coeur d'Alene Reservation would have largely beneficial effects to the abundance of natural resources important to the Coeur d'Alene Tribe (native fisheries and plant communities) in the area where they are most available and accessible to Tribal members (within Reservation boundaries). These beneficial effects would combine with the beneficial effects of present and future restoration of important resources carried out by others. Although there may be access limitations to restored sites, these limitations would be localized to single sites and of relatively short duration. Additionally, coordination with the Tribe and strategically sequencing of projects would prevent additive limitations in access to tribally important areas. As a result, these effects would not contribute to overall cumulative effects to access to tribally important resources.

As discussed in other sections of this document, within contaminated areas the Coeur d'Alene Basin lying inside the exterior boundaries of the Reservation, the abundance and extent of restored resources will be affected by factors outside the scope of the restoration plan to address, including the widespread prevalence of nonnative species, basinwide water quality concerns, and the effects of the Post Falls Dam. As a result, projects implemented outside the influence of these offsetting factors (such as in the Hangman Creek watershed) would provide the greatest contribution to cumulative improvements in abundance and availability.

3.9.2.5 Alternative 3 – Ecosystems Focus

The following are the key differences between Alternative 2 and Alternative 3 relevant to natural resources important to the Coeur d'Alene Tribe.

- **Ecosystem Focus:** Under Alternative 3, 100 percent of restoration funds would be allocated to ecosystem restoration, in contrast to Alternative 2, which uses up to 10 percent of funds, or up to $14 million for projects designed to restore human uses of injured resources (such as recreation, environmental education, or natural resources services unique to the Coeur d'Alene Tribe). Thus, under Alternative 3, the extent and magnitude of restoration of ecosystems would likely be greater than under Alternative 2.
- **Geographic Area:** Under Alternative 3, restoration work would be carried out only in the Coeur d'Alene Lake Basin and the upper Spokane River. No work would be performed in the upper Hangman Creek watershed.

Direct and Indirect Effects

Direct effects would be the same as Alternative 2 except that there would be no short-term effects in the Hangman Creek drainage because restoration work would only be carried out in the Coeur d'Alene Basin.

Under Alternative 3, all of the restoration funds would be allocated to the Coeur d'Alene Basin. This would potentially result in increased abundance and distribution of tribally important plant and animal species populations lower Coeur d'Alene Basin; however, there would be a lower likelihood that lower basin natural resources specific to Tribal needs would recover sufficiently to provide traditional services to the Tribe than under Alternative 2. Due to continued and extraordinary influence of metals in the lower basin, lack of proposed remediation, and additional factors such as the influence of the Post Falls Dam and nonnative species, tribally important species populations may never recover, or would recover at an extremely slow rate.

Furthermore, under Alternative 3, no restoration would be carried out in the Hangman Creek area that would increase the rate and extent of recovery of replacement natural resources there as well as provide increased natural resources in an area that is in close proximity to Tribal population centers.

Under Alternative 3, patterns of Tribal use of natural resources in the Hangman Drainage would likely continue at their current level. Use of the Lower Coeur d'Alene Basin would likely continue at the current reduced levels due to continuing health risks due to exposure to contaminants and the associated Tribal Moratorium. Tribal use of the Coeur d'Alene Basin may increase at specific restoration sites if the activities proposed under Alternative 3 restore culturally important resources (such as camas or water potato) in areas outside of contaminated zones. Restoration carried out in areas of the upper basin that are distant from the exterior boundaries of the Reservation is not expected to substantially alter use patterns due to the distance of those sites from Tribal population centers.

Cumulative Effects

Cumulative effects to the abundance of resources important to the Tribe under Alternative 3 would be similar to those described for Alternative 2, except that the geographic scope of restoration would be limited to the Coeur d'Alene Basin. No restoration would be carried out in the upper Hangman watershed.

Although restoration activities proposed under Alternative 3 would increase resource abundance in the Coeur d'Alene Basin, which includes portion of the Tribal reservation, Alternative 3 would not contribute to significant cumulative improvements in the availability of harvestable resources for Tribal members due to likely cumulative offsets to the effects of restoration, including the effects of Post Falls Dam, nonnative species, and the continuing presence of metals.

3.10 Socio-economic Effects and Environmental Justice

3.10.1 Topics and Issues Addressed in this Analysis

The purpose of the Restoration Plan (Appendix 5) is to restore, replace, or acquire the equivalent of injured natural resources in the Coeur d'Alene Basin. During the initial scoping period, members of the public raised a number of concerns about the proposed restoration and its effects, including concerns about the social and economic aspects of the restoration and how it might affect the human uses and values for the injured natural resources.

As outlined in the Plan's "Restoration Approach and Values" section:

> The Trustees value the Tribal and non-Tribal cultural significance of natural resources throughout the Coeur d'Alene Basin, and will strive to restore them in a way that provides for traditional uses, subsistence uses, natural resource-based recreation, and other services. By keeping cultural values at the forefront, restoration will contribute to the ecological and socioeconomic well-being of the Basin for current and future generations (Section 2.7).
>
> The Trustees value restoration of injured natural resources in a way that sustains regional cultures and economies and contributes to the health of the Basin as an ecological and socioeconomic region. Healthy, functioning ecosystems support local economies by increasing availability of clean soil and water, providing jobs to conduct restoration work, increasing tourism, improving community aesthetics, and providing increased recreational opportunities (Section 2.9).

The "Affected Environment" section illustrates the existing socioeconomic conditions related to these issues and the "Analysis of Effects" section analyzes effects to these issues resulting from each of the alternatives considered in this DEIS.

3.10.2 Resource Indicators and Measures

Based on public concerns, the following resource indicators and measures are used in this analysis to measure and disclose effects of the alternatives.

Indicators of Economic Conditions of Communities in the Planning Area:

Employment and Income:

- Change in number of jobs
- Change in income
- Change in economic sectors (growth or decline in agriculture, mining, and recreation sectors)

Tax Revenue:

- Changes in property values
- Changes in land use (agriculture to conservation/habitat)

Indicators of Social Conditions (human uses and values of the landscape and natural resources in the planning area)

Cultural Conditions:

- Sense of place - Aesthetic changes in the landscape (see “Recreation” section)
- Changes in opportunities for traditional subsistence uses (see “Aquatic Species and Habitat” and “Terrestrial Species and Habitat” sections)
- Changes in recreational opportunities (see “Recreation” section)
- Changes in natural attributes of cultural values to the Coeur d’Alene Tribe (see “Coeur d’Alene Tribal Resources” section)

Biological Resources Conditions:

- Changes in water quality (see “Water Quality” section)
- Changes in terrestrial wildlife habitat and populations (see “Terrestrial Species and Habitat” section)
- Changes in aquatic species habitat and populations (see “Aquatic Species and Habitat” section)

3.10.2.1 Analysis Methodology

Economic Analysis

Economic impacts are modeled using IMPLAN Professional Version 3.0 with 2012 data and the Forest Service planning tool FEAST. IMPLAN is an input-output model, which estimates the economic impacts of projects, programs, policies, and economic changes on a region. The IMPLAN model used in this analysis describes the economy in 440 sectors. FEAST is a custom spreadsheet tool that uses IMPLAN outputs to relate management activities to expected economic effects. Since the Restoration Plan is a programmatic document, the data necessary to estimate the total economic impacts are not available. Therefore, estimates of economic impacts are provided per dollar of restoration spending.

IMPLAN calculates direct, indirect, and induced economic effects. Direct economic effects are generated by the activity itself, such as the work required to complete restoration treatments. Indirect employment and labor income effects occur when a business or contractor purchases supplies and services (such as tires, fuel, equipment, or accounting services) from other firms. Induced effects are the employment and labor income generated from the spending of new household income generated by direct and indirect effects. In the economic impact tables, direct, indirect, and induced contributions are summed.

The employment estimates reported here are full-time, part-time, or seasonal jobs reported on an annualized basis. IMPLAN does not distinguish between full-time and part-time employment. That is, in this analysis, 1 job could represent a full-time job lasting all year, a part-time job lasting all year, two part-time jobs lasting 6 months each, four full-time jobs lasting 3 months each, or some other combination that amounts to one year of employment.

The economic impact analysis uses national data on restoration spending patterns to estimate effects of restoration spending on jobs and labor income in the economic impact analysis area. The economic impact analysis also uses national data on visitor spending to estimate the employment and income effects associated with recreational use in the planning area. The analysis estimates the annual number of jobs and labor income that would be supported by project spending, compared across the alternatives.

Social Analysis

The social analysis identifies some of the important values, beliefs, and attitudes expressed by community members during meetings and in written comments. Public meetings to discuss social values were held in Benewah, Kootenai, and Shoshone Counties in Idaho and with the Coeur d'Alene Tribe.[12] Members of the public also submitted written comments.

For the purposes of this analysis, values, beliefs, and attitudes are defined as follows:

Values are "relatively general, yet enduring, conceptions of what is good or bad, right or wrong, desirable or undesirable."

Beliefs are "judgments about what is true or false – judgments about what attributes are linked to a given object. Beliefs can also link actions to effects."

Attitudes are "tendencies to react favorably or unfavorably to a situation, individual, object, or concept. They arise in part from a person's values and beliefs regarding the attitude object" (Allen et al. 2009).

The social effects are based on estimated changes in the availability of resources and opportunities in the planning area that people use and value. Indicators used in the social analysis to measure changes between alternatives are described above.

Information Sources

Various data sources were used to assess demographic characteristics, economic conditions, and resource uses in the planning area. These data sources include the U.S. Census Bureau, the Bureau of Economic Analysis, and the Bureau of Labor Statistics. The social analysis uses information obtained from public comments and meetings with area representatives. Estimates of social and economic effects rely on resource use data from other specialist resource reports.

Incomplete and Unavailable Information

Since the details of the restoration activities are not yet determined, estimates of the total economic consequences of the alternatives are not provided. Instead, jobs and income estimates per unit of spending are provided (that is, for $1 million in restoration spending, x jobs and $y labor income are estimated to result). Without site-specific and project-level information,

---

[12] Meetings were held in the following locations:
St. Maries, ID on June 22, 2015 with the Benewah County Commissioners.
Coeur d'Alene, ID on July 22, 2015 with the Kootenai County Commissioners.
Wallace, ID on June 22, 2015 with the Shoshone County Commissioners.
Plummer, ID on June 25, 2015 with Coeur d'Alene Tribal members and representatives.

much of the analysis is general in nature and this report is heavily reliant on qualitative analysis. The quantitative estimates provided below can be applied to the detailed activities as they are determined to assess the economic impacts.

3.10.3 Affected Environment – Socio-economic Effects and Environmental Justice

3.10.3.1 Analysis Area

The planning area is located primarily in Shoshone, Kootenai, and Benewah Counties (Figure 6). A small portion of Latah, Bonner and Clearwater Counties occur in the planning area. However, since the population centers include the cities of Coeur d'Alene, Post Falls, and Harrison (Kootenai County), St. Maries and Plummer (Benewah County), and Kellogg, Smelterville, and Wallace (Shoshone County), the majority of social and economic effects are expected to be concentrated in Shoshone, Kootenai, and Benewah Counties and the Coeur d'Alene Reservation. Although some effects may occur outside of this area (for example, a contractor performing restoration activities may be based out of Spokane, WA), the issues and concerns raised in public comments indicate that the majority of the effects will occur within the three counties and the Reservation where the restoration activities are proposed to occur.

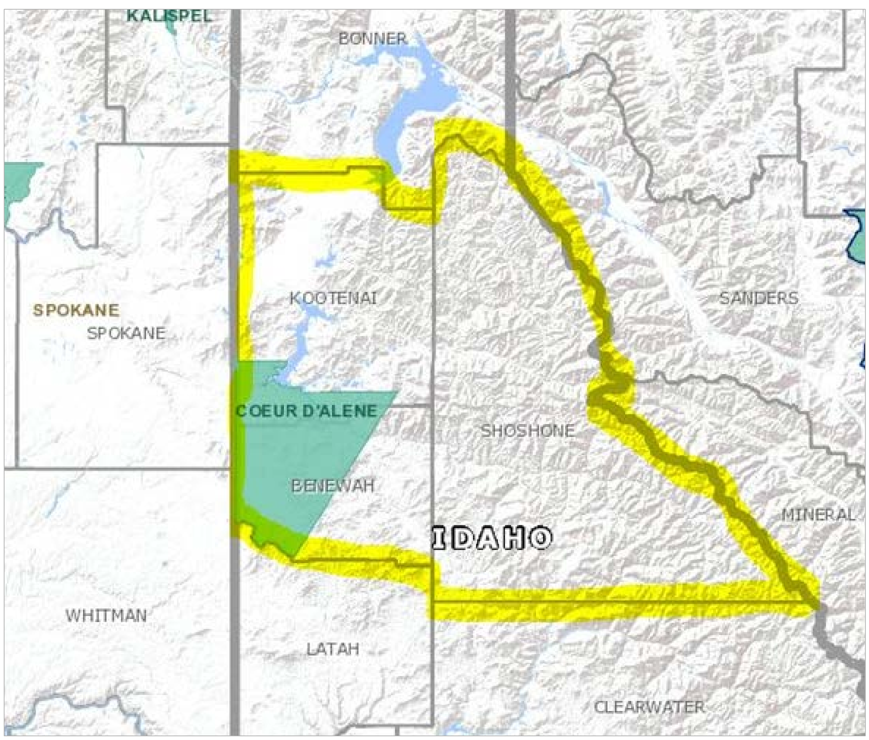

Figure 6. Socio-economic analysis area

For the economic impact analysis, the analysis area consists of Benewah, Kootenai, and Shoshone Counties, which represent the functional economy for people living and working around the project area. IMPLAN data does not include the Coeur d'Alene Reservation as a separate unit of analysis. The Coeur d'Alene Reservation is mostly in Benewah County, with a small portion in Kootenai County, so the employment and income in this area is still captured in the economic analysis. The social analysis treats the Coeur d'Alene Reservation as a distinct area.

3.10.3.2 Existing Condition

Certain defining features of every area influence and shape the nature of local economic and social activity. Among these are population characteristics, industry composition, and area amenities. Natural amenities may contribute to population growth, economic activity, and quality of life for area residents and visitors. Federal, State, and Tribal governments operate as stewards of many natural amenities. This discussion addresses the character and extent of the connections between public land resources and human well-being in the planning area.

Population Change

The total population in the analysis area was 166,000 in 2013 (USDC 2014). From 2000 to 2013, the population of Kootenai County increased from 108,685 to 140,785, a 30 percent increase, while the Benewah County population remained the same, Shoshone County's population declined by 8 percent, and the population on the Coeur d'Alene Reservation increased slightly (U.S.D.C. (see Figure 7). As of 2014, Coeur d'Alene Tribal enrollment was 1,500 in Idaho and 2,400 total (Peterson 2015).

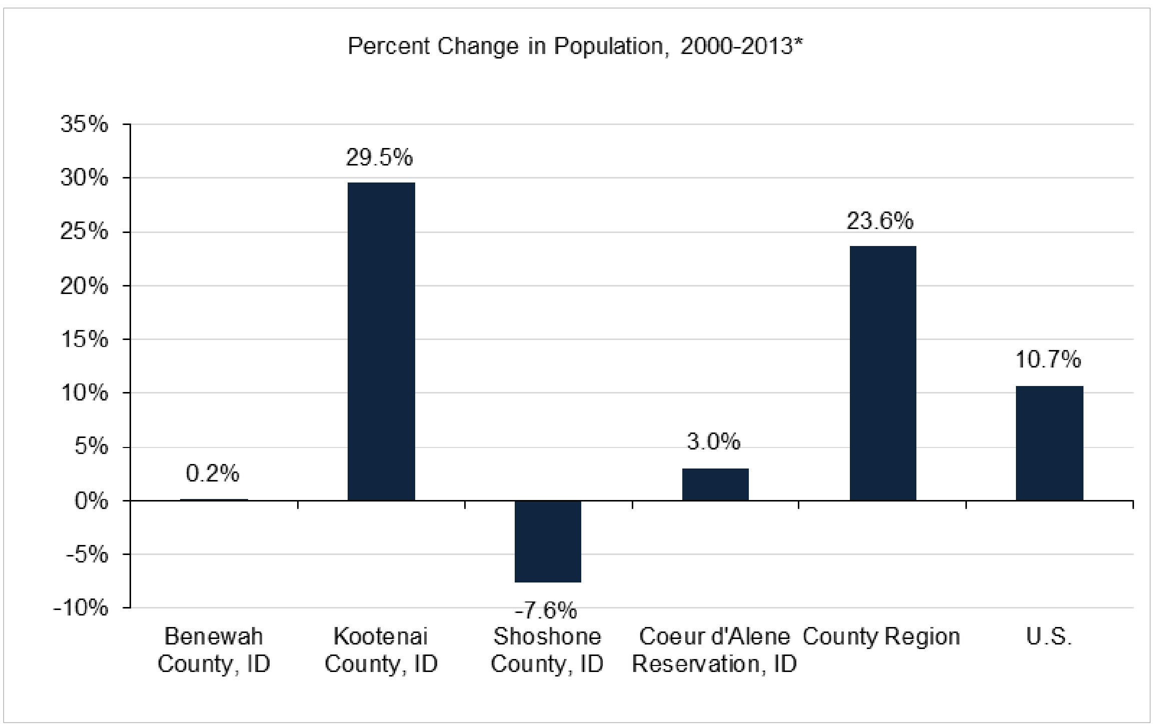

Figure 7. Population change 2000-2013 (U.S. Department of Commerce 2013)

Across the planning area, the population increased by 23.6 percent between 2000 and 2013. In contrast, the United States population only increased 10.7 percent over the same period. There is substantial variation in population growth among the planning area counties. The driving force behind the planning area population growth is primarily due to the rapid growth in Kootenai County since Benewah County experienced little population change and Shoshone County experienced population decline from 2000 to 2013. Population change influences both the extent of the affected population and the demand for human uses of public lands. For example, as more people move to Kootenai County, recreation visitation is expected to increase.

Economic Characteristics

A majority of the planning area historically consisted of resource extraction-based economies that depended on mining and timber harvest to support their communities. While not as heavily reliant on these sectors as in the past, some communities still depend on these sectors. For example, employment in the logging industry in Benewah County is 3.7 % of total employment in Benewah County and employment in the mining industry in Shoshone County is 10.4% of total employment in the County (IMPLAN 2012). At the same time, the overall composition of the economies has been changing. As identified in the social assessment for the Idaho Panhandle National Forests Land Management Plan, areas such as Coeur d'Alene and Sandpoint are examples where "the local economy, culture, and identities have shifted to more of an amenity-based model for development activities, including tourism, recreation, and retiree benefits" (Parker 2002). The distribution of employment among economic sectors is displayed in Figure 8 (below). Retail trade, government, and health care and social assistance sectors contain the largest shares of employment in the three-county analysis area (IMPLAN 2012). The Coeur d'Alene Tribe is a major employer in the planning area, which contributes to the size of the government sector.

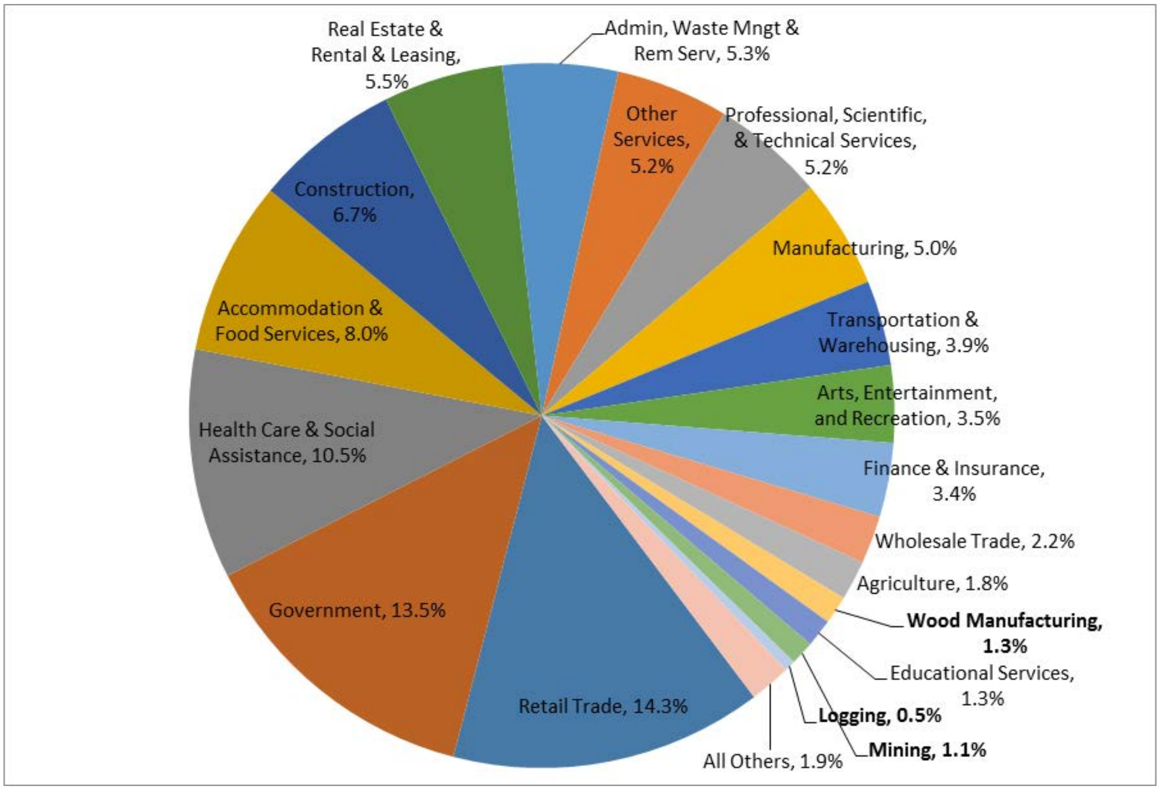

Figure 8. Employment in the analysis area, including Benewah, Kootenai, and Shoshone counties (IMPLAN 2012)

Employment by sector in Benewah, Kootenai, and Shoshone counties are displayed in Figure 9 through Figure 11 (below). As seen in these figures, employment in the logging and wood manufacturing and agriculture sectors is the greatest in Benewah County, whereas mining employment is the greatest in Shoshone County. Employment in the accommodation and food services and construction sectors is the greatest in Kootenai County, likely because of the tourism surrounding Coeur d'Alene. Due to these differences in the county-level sector employment, economic impacts from the restoration spending could differ depending on location.

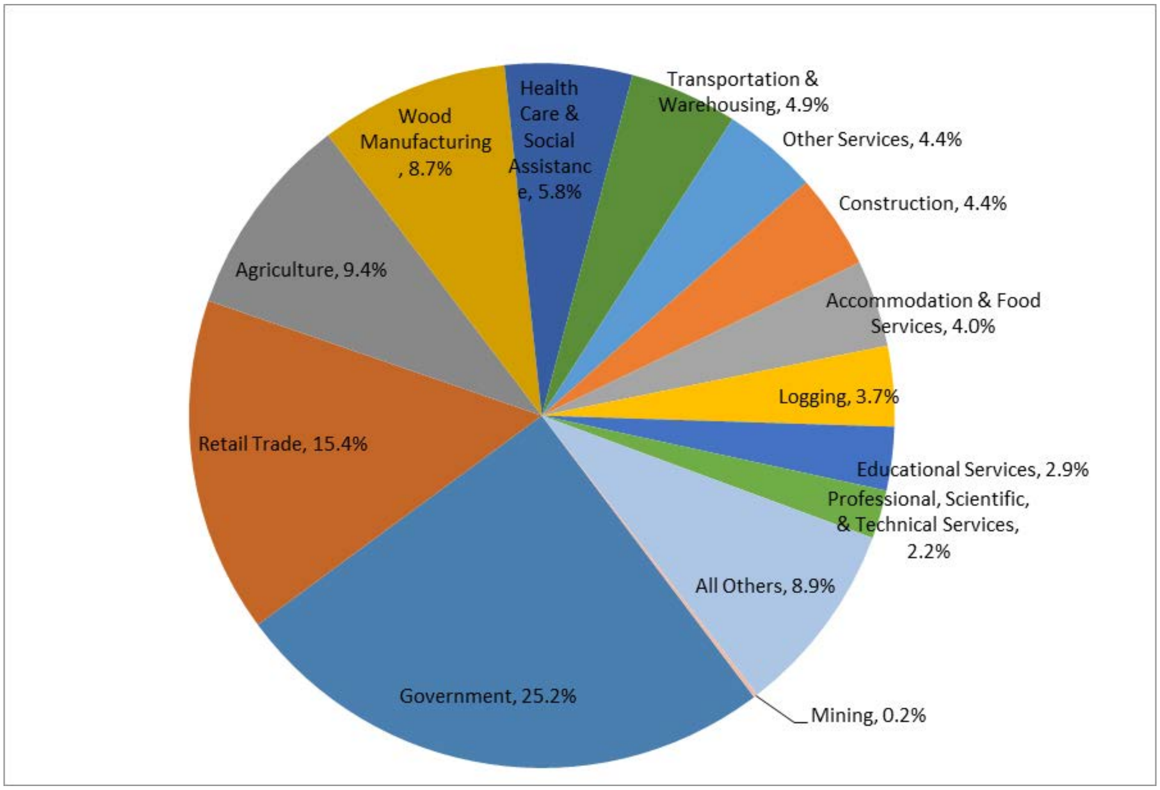

Figure 9. Employment in Benewah County (IMPLAN 2012)

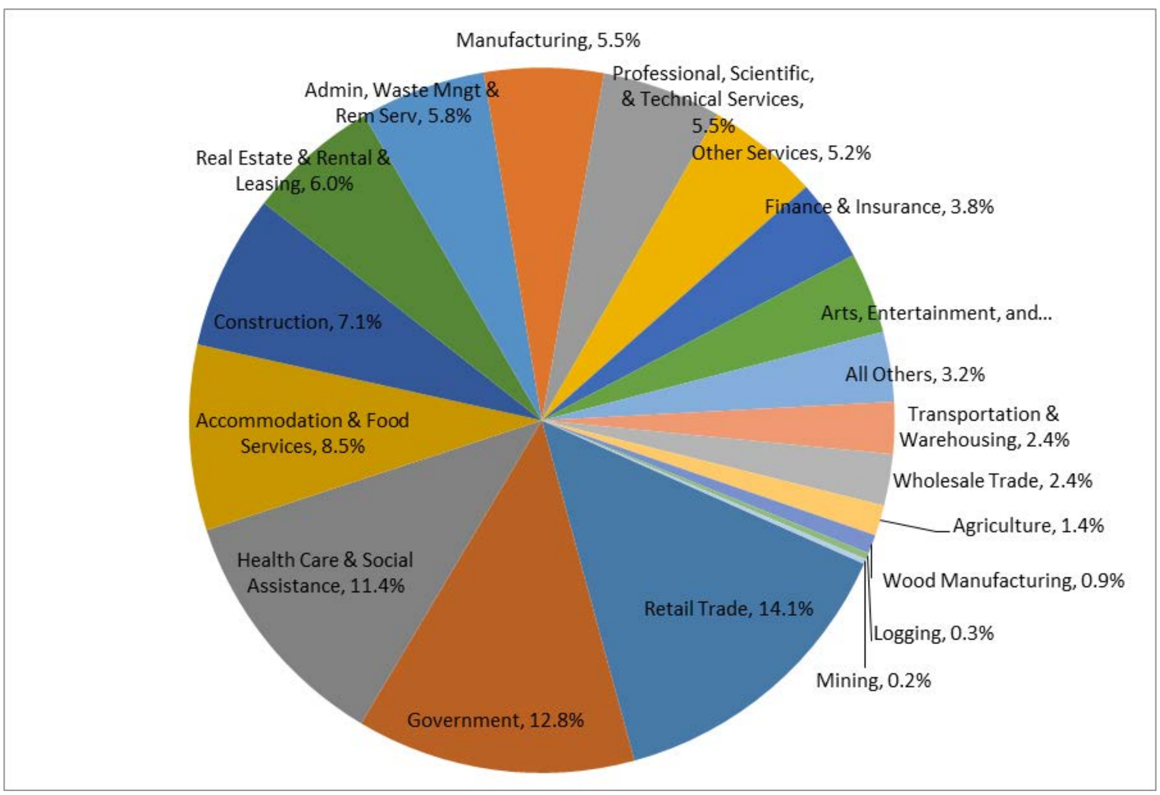

Figure 10. Employment in Kootenai County (IMPLAN 2012)

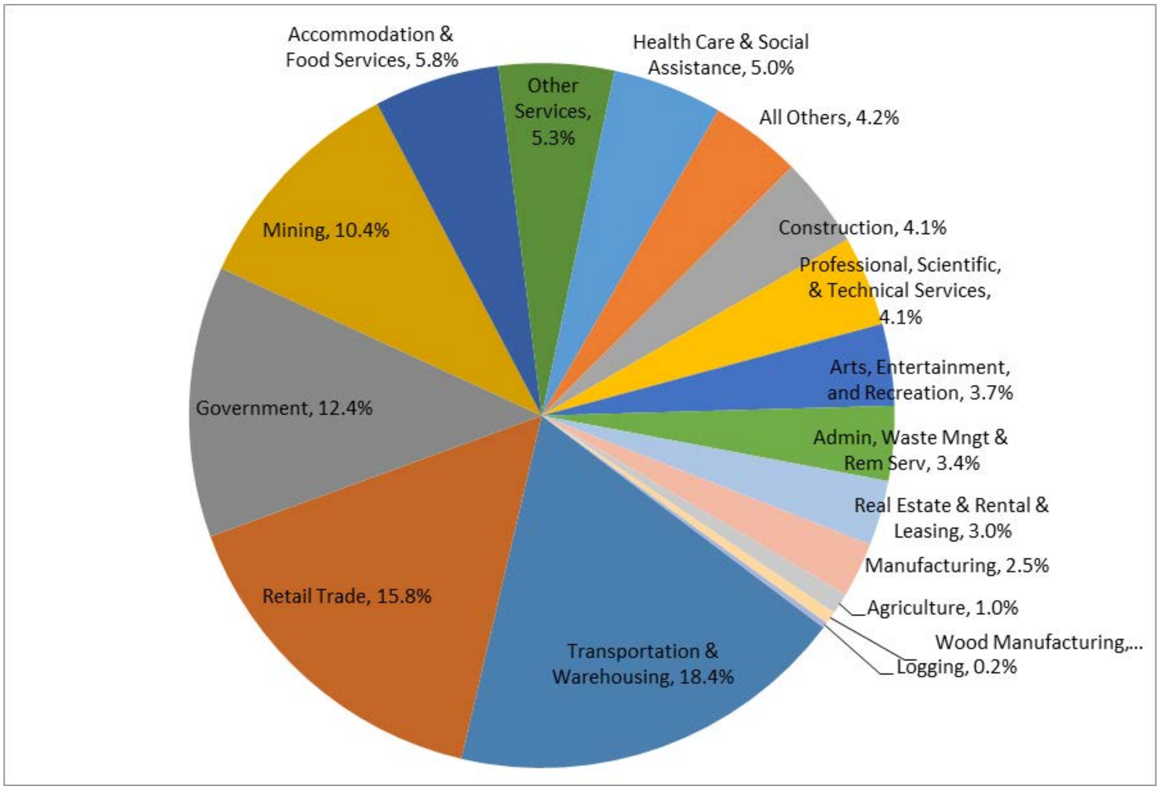

Figure 11. Employment in Shoshone County (IMPLAN 2012)

Ecosystem Restoration

The purpose of the Restoration Plan is to provide a framework to guide the restoration of natural resources and dependent services injured by the release of mining hazardous substances in the Coeur d'Alene Basin. Restoration projects will rely on employees in the construction, professional, scientific, and technical services sectors to implement restoration activities. Together, these sectors account for approximately 12 percent of employment and 13 percent of labor income in the economic analysis area (IMPLAN 2012). The average wage in these sectors is approximately $39,000, which is similar to the average wage in all sectors ($37,000; IMPLAN 2012).

Recreation and Tourism

The Restoration Plan is also intended to accelerate the recovery of human uses of natural resources. One of the key human uses in the Coeur d'Alene Basin restoration planning area is recreation, which includes wildlife viewing, fishing, and hunting. Recreation visitors typically spend money on food, gas, lodging, and souvenirs during their trip (White et. al. 2013). The Forest Service and U.S. Fish and Wildlife Service collect national recreation visitor spending data through the National Visitor Use Monitoring (NVUM) program and National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, respectively (White et. al. 2013, USFWS 2014c). The Bureau of Land Management does not collect equivalent visitor spending data and typically uses NVUM data as the best available (USDI 2014). None of the agencies collect site-specific information on recreation visitation to the Coeur d'Alene Basin restoration planning area.

Therefore, for consistent treatment of recreation visitor spending across the planning area, the NVUM visitor spending estimates from the Idaho Panhandle National Forests are used in the economic analysis (White et. al. 2013). Recreation visitors to the Idaho Panhandle National Forests spend less than the average national forest visitor. Average total trip spending per party[13] is $113 (White et. al. 2013).

Visitor expenditures particularly affect employment and income in the retail trade, accommodation and food services, arts, entertainment and recreation, and real estate, rental and leasing sectors. These four sectors account for 31 percent of employment in the analysis area, but only 19 percent of labor income. The average wage in recreation-related sectors is about $22,700, which is lower than the average wage for all sectors (IMPLAN 2012). Recreation-related jobs are often low-skilled and part-time service sector jobs. This highlights the importance of addressing employment changes at the sector level.

The value of tourism is perceived differently across the Coeur d'Alene Basin communities. In discussions with representatives from Benewah County, tourism is not perceived as a sustainable economic activity since it diverts natural resources (like fish) away from their local people. Furthermore, there were concerns that tourism drains municipal funding via trash collection and response to accidents. However, Shoshone and Kootenai County representatives expressed a belief that tourism positively contributes to their economy and community. Kootenai County representatives expressed a belief that healthy ecosystems (clean air, clean water, and viewsheds) will attract more tourism and stimulate economic activity.

Natural Resources Extraction

Public comments noted that continued employment opportunities in the timber and mining sectors are important to communities in the planning area. In 2012, employment in the commercial logging sector provided about 420 jobs, the sawmills and wood preservation sector accounted for about 600 jobs, and the mining gold, silver, and other metal ore sector contributed about 800 jobs to the analysis area, which is 0.5, 0.7, and 0.9 percent of the total employment in the three-county analysis area, respectively (IMPLAN 2012). While the size of the timber and mining sectors is small relative to the regional economy, jobs in resource extraction sectors continue to be important to smaller communities whose economies have historically been dependent on natural resource sectors. For example, employment in the agriculture, forestry, fishing and hunting, and mining industries is greater in Benewah (13.6 percent) and Shoshone (11.6 percent) Counties than Kootenai County (2.4 percent; U.S. Department of Commerce 2013).

The average wage in natural resource extraction sectors is high compared to wages in recreation-related sectors. For example, the average wage in the commercial logging sector is about $45,000 and the mining gold, silver and other metal ore sector average wage is about $85,000 (IMPLAN 2012). Thus, increases in employment in sectors associated with lower wages alongside decreases in sectors associated with higher wages could indicate a decrease in area economic well-being. However, we cannot say with certainty that decreases in economic well-being have resulted from increases in recreation-related sector employment. Population and employment

[13] Expressed in 2009 dollars.

changes are related to natural amenities (Knapp and Graves 1989) often provided by public lands. For example, people might move to the area to take recreation-related jobs but exchange the lower wage they receive for the unique natural and cultural amenities. In this manner, some may benefit from a secondary income, not provided by their place of employment, but by the benefits they gain from living in the area.

As the planning area shifts away from a historically resource extraction-based economy, overall wages are based on more than recreation-related sectors. In a study on the effects of non-extractive and multiple use land management techniques, Lewis et al. (2003) found that “wage growth rates are not significantly affected by the shares of land under either management regime.” If people migrate to the planning area due to the natural amenities it provides, the overall wage growth would be dependent on more than just the recreation-related sectors (healthcare and education). Therefore, shifts away from natural resource extraction sectors and changes in recreation-related sectors will not necessarily reduce overall wages.

Benewah and Shoshone County representatives expressed strong interest in maintaining productive land. They believe that the restoration of wetlands could replace productive land used for agriculture, which would have consequences on their economies.

Tax Revenue and Property Values

Some commenters were concerned about the effects of restoration on the local tax base. In Idaho in 2014, property tax accounted for 33 percent of total state and local taxes collected, sales tax was 29 percent, individual income tax was 28 percent, and less than 5 percent each for corporate income, motor fuels and other taxes (Idaho State Tax Commission 2014). According to the Idaho State Tax Commission (2015), “Sales tax applies to the sale, rental, or lease of tangible personal property and some services. Food is taxed in Idaho, but prescription drugs are not. Temporary lodging (30 days or less)—including vacation rentals by owner—is taxed.” Therefore, changes in land ownership, recreation visitor spending, restoration activities, and personal income may affect local tax revenue.

Natural amenities affect how much people are willing to pay for real estate. Shoshone County representatives believe that restoration would increase adjacent property values. The median value of owner-occupied housing units from 2009 to 2013 was $136,000 in Benewah County, $188,800 in Kootenai County, and $123,200 in Shoshone County (USDC 2013). Changes in property values would affect property tax revenue. However, changes in property values may also affect housing affordability for area residents.

As shown in Table 8, approximately 75 percent of land in Shoshone County is owned by the Federal Government (Idaho Association of Counties 2010). Federal lands are exempt from property taxes, but counties receive payments-in-lieu-of-taxes (PILT) from Federal lands in their jurisdiction.

Table 8. Acreage and percent of total private, state, and federal lands (Idaho Association of Counties 2010)

County	Total County Acres	Total Private Land*	Total State Land	Total Federal Land
Benewah County, ID	496,640	77.6%	12.2%	9.8%
Kootenai County, ID	796,928	62.1%	5.5%	31.9%
Shoshone County, ID	1,685,760	22.0%	3.4%	74.5%
Idaho	52,960,576	31.6%	5.1%	63.1%

*Includes Tribal land, public road and highway rights-of-way, county and municipal

Values, Beliefs, and Attitudes

People value the planning area for its contributions to sense of place, livelihoods and subsistence, cultural heritage, and ecological integrity. Meetings with Benewah, Kootenai, and Shoshone County commissioners, meetings with Coeur d'Alene Tribal members, submitted written comments, and public scoping meetings inform this discussion of the values, beliefs, and attitudes of area residents and representatives.

People commented that the area proposed for restoration contains many resources that sustain a way of life and tie people to ancestral uses of the land. Sense of place is often tied to the physical and aesthetic characteristics of areas. Attachment to the land is influenced by viewsheds, subsistence uses, and swimming and recreation opportunities—particularly access to Lake Coeur d'Alene and the Hangman Creek drainage. These activities and areas provide connections to the past and a sense of identity for many planning area residents. The Tribe's website notes that, "every Tribal member knows and feels the link to generations past. The culture and traditions have developed and been passed on for thousands of years - in the same place" (Coeur d'Alene Tribe 2015).

Recreating in the Coeur d'Alene Basin provides opportunities for family and friends to get together for exercise, fun, and celebrations, which improve physical, mental, and spiritual well-being. Some commenters believe that improving the ecosystem health is the best way to improve recreation opportunities. However, the Benewah County commissioners were concerned that ecosystem restoration may increase non-local recreational fishing and reduce the quantity of fish available for local subsistence use.

Subsistence uses are critical to the Tribe and other communities in the planning area. Both Tribal representatives and Benewah County commissioners noted that locals rely on fishing to feed their families. While the Tribe believes that subsistence is very important, they view it more than just a mode of survival: "To Tribal members, these subsistence resources are not just aesthetic characteristics of the quality of life, but are vital to the future of the Tribe and the survival of its Tribal culture and identity" (Coeur d'Alene Tribe 2007).

The Coeur d'Alene Tribe is particularly interested in the ecological integrity of the planning area. As Dongoske (2015) explains, "many Native American Tribes perceive the environment through an animistic ontological lens that embodies a sense of stewardship, manifest through a spiritual, umbilical connectedness to the natural world." While multiple Coeur d'Alene communities value healthy ecosystems, tourism, and subsistence, Tribal members expressed their spiritual connection with the injured natural resources and land in the area. They feel a sense of responsibility for the injured natural resources. For example, "one common Native American view is that humans are subservient to and part of the natural environment. In this perspective, humankind's role is one of stewardship and working to maintain rapport with nature" (Dongoske 2015). They believe that the presence of natural resources help validate their identity as a Tribe and that any restoration that improves the natural resources will solidify this connection. Tribal members also pointed out that these sacred places could be compromised if their location is publicized through the Restoration Plan.

The water quality, soils, vegetation, and wildlife sections contain more details on the biology of the planning area. The sections "Heritage Resources" and "Resources of Particular Significance to the Tribe" provide more details on values of the Coeur d'Alene Tribe.

Climate Change and the Human Environment

Climate change is expected to affect the provision of many ecosystem services. For example, warmer weather may affect fish populations and increase competition between subsistence and recreational users for fishing opportunities. Climate change may also affect the demand for some ecosystem services. Demand for water-based recreation opportunities may increase as temperatures rise. The consequences of climate change on human well-being are not evenly distributed across the population. The adaptive capacity of individuals, households, and communities are affected by a variety of factors. Income, education, reliance on natural resources, health, and local institutions affect the vulnerability of human populations to climate change (IPCC 2014).

The discussion of climate change in the "Recreation," "Terrestrial Species and Habitat" and "Vegetation" sections provide more detail on the relationship between climate change and the provision of ecosystem services (such as recreation opportunities and fish and wildlife populations).

3.10.4 Analysis of Effects – Socio-economic Effects and Environmental Justice

3.10.4.1 Effects Common to all Alternatives

Recreational use is expected to increase regardless of the selected alternative. Population growth in the Coeur d'Alene Basin is expected to increase recreational use. Additionally, warmer summers due to climate change will likely drive more interest in water-based recreation, such as swimming, fishing, and boating. None of the alternatives will measurably affect population growth or climate change, therefore, these effects are common to all alternatives.

3.10.4.2 Alternative 1 – No Action

Under this alternative, no action would be taken by the Trustees to restore natural resources that were injured as a result of the release of mine waste contamination in the Coeur d'Alene Basin.

Direct and Indirect Effects-Socioeconomics

Employment and Income

Under the no-action alternative, there would be no spending on restoration activities and therefore employment and income in the analysis area would not be affected.

Tax Revenue and Property Values

The no-action alternative would not directly affect tax revenue. However, the indirect effects could be slower growth in development and associated tax revenue. Since the area would not receive restoration spending, it is expected to take longer for the injured natural resources to recover. The quality of nearby natural amenities may affect home prices. Therefore, a prolonged recovery of injured natural resources may delay the growth of tax revenue resulting from higher property values and the migration of people attracted by natural amenities.

Values, Beliefs, and Attitudes

Cultural Conditions

With no restoration or human uses spending, opportunities for recreation and subsistence would take longer to improve than under Alternatives 2 and 3. Access to recreation sites and the abundance and diversity of recreation opportunities would be the same as current conditions. Therefore, the no-action alternative would not affect the quality of life of individuals and groups who value recreation opportunities in the Coeur d'Alene Basin. The "Recreation" section provides detail on effects to access, landscape character,[14] and recreation settings.

Similarly, availability and access to natural resources would be the same as current conditions. However, indirect effects with no restoration spending on the injured natural resources in the area could include a reduced abundance of fish, waterfowl, plants, and other amenities that support the traditional lifestyle services by Tribal members and non-Tribal residents that use the natural resources in the planning area to support their way of life. Therefore, opportunities to use and enjoy culturally-important natural resources would continue to be negatively affected under the no-action alternative. See the "Heritage Resources" and Coeur d'Alene Tribal Resources" sections for more details.

Biological Conditions

People value biological attributes of the Coeur d'Alene Basin, including clean water and habitat quality. Under the no-action alternative, no restoration would be done. Therefore, these and other biological attributes would likely improve in the long term, but at a slower pace and by a

[14] According to the Forest Service Agriculture Handbook 701 (1995): "Landscape Aesthetics," landscape character is an overall visual and cultural impression of landscape attributes-the physical appearance and cultural context of a landscape that gives it an identity and "sense of place."

lower magnitude than under Alternatives 2 and 3. There would be no direct, short-term impacts to ecosystem services since there would not be any restoration activities. Long-term, adverse indirect effects may include a slower rate and less likelihood of recovery of injured aquatic and terrestrial habitat and species populations than under Alternatives 2 and 3 where extensive restoration is proposed. The slower rate of recovery of injured natural resources may reduce quality of life in the Coeur d'Alene Basin relative to Alternatives 2 and 3. People who value the natural resources for consumption (such as water for drinking or catching fish), recreation, and aesthetic purposes would have fewer opportunities to use and enjoy the basin. See the "Aquatic Species and Habitat" section for more information.

Cumulative Effects-Socioeconomics

There would be no cumulative effects of Alternative 1 since no action would be taken by the Trustees to restore natural resources that were injured as a result of the release of mine waste contamination in the Coeur d'Alene Basin. Other projects in the planning area that could contribute to cumulative effects include improvements to wastewater treatment in Kellogg, Wallace, Plummer, Coeur d'Alene, Hayden, and Post Falls. There are also streambank stabilization and culvert replacement projects planned for tributaries to Coeur d'Alene Lake. If these other projects improve water quality, wildlife habitat and recreation access, this could increase opportunities for substitute behavior and reduce the quality of life effects from the no action alternative. In contrast, other actions that would reduce the availability of substitute opportunities would have effects to quality of life that could be more severe than described above.

3.10.4.3 Alternative 2 – Ecosystem Focus With Additional Human Use Considerations (Proposed Action)

The Restoration Plan integrates restoration of injured natural ecosystems with approaches that are intended to accelerate the recovery of human uses of natural resources, including natural resource-based uses unique to the Coeur d'Alene Tribe in the upper Hangman Creek watershed on the Coeur d'Alene Tribal reservation. To speed up the process of restoring human uses of natural resources, under Alternative 2 the Trustees are prioritizing 10 percent of the restoration funds to accomplish projects that could be achieved in a relatively short time and connect humans to natural resources. These projects would typically improve access or use of natural resources, support environmental stewardship and education, and strengthen community heritage and cultural connections to natural resources.

Examples of potential projects that would restore uses by the public may include, but are not limited to:

- Restore and facilitate recreational and other opportunities associated with the use of restored natural resources;
- Enhance opportunities for people to connect to Tribal and non-Tribal cultural resources that contribute to local and regional heritage and sense of place;
- Provide targeted scenic improvements to viewsheds; and

- Promote stewardship of natural resources and support education associated with cleanup and restoration.

Direct and Indirect Effects -Socioeconomics

Employment and Income

Alternative 2 would implement ecosystem restoration and human uses activities to recover injured natural resources and opportunities for enjoyment of services in the Coeur d'Alene Basin. The precise effect on employment and labor income in the local economy is uncertain, because the Restoration Plan does not authorize specific activities. Therefore, the expected local employment and labor income effects are described per $1,000,000 spent. The local economic consequences of restoration activities would differ based on a number of factors: type of activity (such as wetland restoration or paving an access road), the labor intensity of the work, and the size and number of firms in the relevant sectors in the planning area.

Due to the lack of information on the precise types of activities to be implemented, employment and income estimates are modeled based on typical sectors that may be engaged in ecosystem restoration and human uses activities. Estimates are provided for: (1) natural resource support services sector and (2) road construction and maintenance sectors. For each $1,000,000 spent ecosystem restoration (natural resources support services sector), it would support 34.3 jobs and $1.2 million in labor income (2012 U.S. dollars). For each $1,000,000 spent on roads activities, it would support 7.5 jobs and $287,000 in labor income (2012 U.S. dollars).

Total employment in the three-county analysis area is 86,377 jobs and labor income is $3.2 billion (IMPLAN 2012). Therefore, the economic effects of Alternative 2 would be minimal since each $1,000,000 spent on ecosystem restoration would support approximately 34 jobs and $1.2 million in labor income (2012 USD). For example, if $100 million were spent on restoration over the next 10 years, this would contribute about 3,400 jobs to the analysis area, which is about 4 percent of the total jobs in the area. While 4 percent of total employment is a small percent in the planning area, this could be a significant impact on smaller communities where the jobs are concentrated. If the jobs resulting from restoration are concentrated in smaller communities, the community impacts could be relatively greater than if the impacts were distributed across the larger area. Relative to the no-action alternative, the economic impacts are greater under this alternative. Without knowing the precise types of activities to be implemented, this general economic effect per spending amount is the same between Alternatives 2and 3.

Tax Revenue and Property Values

Although the Restoration Plan is not expected to impact the timber and mining industries and the tax revenue they create, it could impact the tax base in other ways. Tax revenue from recreation and tourism-related sectors (sales and property taxes) could increase as natural amenities are restored and recreational infrastructure is improved. Increases in the number of recreation visits and associated spending would increase sales tax revenue, as visitors purchase goods and services in the analysis area. Additionally, improved natural amenities (including environmental health and outdoor recreation opportunities) may attract new residents to the basin. New residents contribute to increases in both sales and property tax revenue.

With improved natural amenities such as the water quality of Lake Coeur d'Alene, property values in the area could increase. A study in Northern Idaho found that "proactive mitigation approaches to cope with potential environmental degradation in lake ecosystems could have significant economic benefits to owners of lakefront properties and local communities" (Liao et. al. 2016). Since more funds would be spent on restoration under this alternative than the no-action alternative, property values near the lake are likely to increase, which would have positive impacts on the property tax revenue.

Values, Beliefs, and Attitudes

Cultural Conditions

As described in the "Affected Environment" section, people in the area get their sense of place mostly from the beauty and health of the land. Alternative 2 increases access, diversity, and abundance of recreational opportunities in the planning area relative to both Alternatives 1 and 3. However, due to spending on human uses, somewhat less money would be allocated for ecosystem restoration under Alternative 2 compared to Alternative 3. Therefore, landscape character in the basin may more slowly recover to the baseline. Additionally, spending on human use projects (like paving an access road) may detract from landscape character that contributes to sense of place. For people that get their sense of place from the access to areas and recreation opportunities, they would likely benefit the most from Alternative 2. The "Recreation" section provides detail on effects to access, landscape character, and recreation setting.

Subsistence uses are largely dependent on the health of vegetation, wildlife, and water quality. Since Alternative 2 includes recovery of human uses unique to the Coeur d'Alene Tribe in the upper Hangman Creek watershed, some cultural values of Tribal members would be positively affected under Alternative 2 compared to the no-action alternative and Alternative 3. Alternative 2 would restore more natural resources important to the Tribe in areas where they are available and accessible by Tribal members. Access to the Hangman Creek drainage contributes to the Tribe's sense of place, enables subsistence activities, and provides a place to gather. See the "Coeur d'Alene Tribal Resources" section for more information about impacts to Tribal resources.

Biological Conditions

People expressed values for the health of the ecosystems in the area. In particular, the Tribe indicated the importance of ecological integrity and healthy ecosystems to their members' well-being. Alternative 2 allocates a portion of funding to human uses, so less would be spent on ecosystem restoration to improve biological conditions. For example, improvements to water quality and soil structure are expected to be lower under Alternative 2 than Alternative 3.

Short-term, temporary disturbance to terrestrial and aquatic species and habitat would likely result from construction activities under Alternative 2. Therefore, people who value clean water and wildlife for fishing would be more negatively impacted in the short-term under this alternative. However, the long-term effects are protected water quality and increased abundance of wetland habitat and species, which would positively affect quality of life in the planning area. These effects are higher than under the no-action alternative. Since Alternative 2 includes 10 percent of available restoration funds for projects that restore human uses of injured natural resources, this would result in an increase in human recreational uses, slightly greater than under the no-action alternative and Alternative 3. Increases in recreational use could affect plant abundance, diversity, and soil stability. If projects facilitate human uses of and access to wildlife habitat, wildlife mortality from disturbance and hunting would increase. Therefore, increased human uses could compromise water quality, habitat, and wildlife that people value in the planning area. Generally, the benefits people receive from the planning area resources that are dependent on healthy and functioning ecosystems would be greater under Alternative 2 compared to the no-action alternative but less than the positive impacts under Alternative 3. See the "Aquatic Species and Habitat" and "Terrestrial Species and Habitat" sections for more information.

Cumulative Effects

The analysis area described above is the geographic scope of the cumulative effects analysis (Benewah, Kootenai, and Shoshone Counties). The temporal scale for the cumulative effects analysis is 10 to 15 years. Even though the life of the Restoration Plan is 30 years, 10 to 15 years is a reasonable timeframe for which information on other actions is available. See section 3.1 for more details on the temporal scope of cumulative effects. Social and economic effects from the Restoration Plan could have cumulative effects in localized areas within the analysis area. This section describes those potential cumulative effects.

It is important to examine social and economic effects from the proposed restoration under Alternative 2 in comparison to the social and economic initiatives already underway in the area. This provides context for the effects. Social services and economic development is part of multiple comprehensive plans in the analysis area:

- "Support the improvement of health care, education, recreation, and cultural facilities; develop more cultural opportunities; preserve the historical recreation use on the county, state, and federal lands within the county; encourage reasonable public access to waterways" (Benewah County Planning and Zoning Commission 2003).
- Kootenai County future development includes a "comprehensive, progressive look at land use, promoting economic development while protecting natural resources" (Mabile 2014).
- The Panhandle Area Council acknowledges there is an "Opportunity to expand sports, cultural and recreational opportunities, use quality of life to attract business" (Mabile 2014).
- The CDA 2030 Plan includes community history and heritage strategies and actions, specifically, to "create historic markers that highlight historically and architecturally significant buildings, open spaces, natural resources, and other key community features." The CDA 2030 Plan also includes a strategy to "create a public partnership to accrue ownership and/or preserve shoreline access to Lake Coeur d'Alene from Silver Beach to Higgins Point." The CDA 2030 Plan's strategy for jobs and the economy includes "high wage employment opportunities" and "recruitment of living wage employers" (CDA 2030).

- The Coeur d'Alene Tribe aims to "Promote, protect, and enhance the natural and cultural assets of the Reservation while maximizing the benefits to its residents and utilize a tourism economy to sustain economic growth for residents on the Reservation" (Bertram 2014).
- The Kootenai County Comprehensive Plan chapter on Economic Development outlines the following goals:
    - "Goal 1: Encourage diverse employment opportunities that satisfy the socioeconomic needs of Kootenai County residents and increase the county's median household income"
    - "Goal 5: Protect the use of the County's diverse natural resources in an environmentally responsible way so as to maximize the positive economic impact of tourism and recreational use," which includes strategies to "promote visitor opportunities that complement the rural character of the County" and "support local jurisdiction efforts to improve and market visitor services."
    - "Goal 6: Improve the County's economy by supporting efforts to improve human and social services." This will implemented by "encourage development of human and social service facilities that create job opportunities, meet community needs, and maintain the County's quality of life" (Kootenai County 2010).

These goals and strategies collectively address tourism, recreation, access, and the protection of natural and cultural resources throughout the analysis area. A number of the comprehensive plans aim to increase recreational use and tourism. Population growth is increasing recreation demand, which causes more spending on water-based recreation, regardless of the proposed action. Over the past few decades, the planning area has also experienced a shift in the natural resource base of the economy. This economic change is seen in the reduced amount of resource extraction, which has shifted the focus to other industries, such as recreation. The cumulative effect of population growth, county plans to improve tourism and recreation opportunities, shifts in economic industries to tourism, and improvements in human uses due to the restoration plan would include (1) more competition for access to and use of recreation sites, (2) increased tax revenue from tourism, and (3) human disturbances to ecological health and integrity. Additionally, with plans to protect cultural and natural resources as stated in the comprehensive plans, the restoration plan would have cumulative benefits to the quality of life for people that value the planning area for subsistence uses.

Furthermore, if other agencies propose activities that would employ people in the natural resources support or roads sectors, this could create cumulative effects on employment. For example, if other actions cause growth in these sectors, it could affect the share of work that occurs locally (it could increase the number of jobs per $1 million spent).

During public meetings, Benewah County representatives voiced their concern for the changing land use (such as the shift from productive land to wetlands). Ongoing and reasonably foreseeable actions, such as continued population growth and an economic shift away from natural resource commodities, are likely to affect land use in the basin. Alternative 2 would increase the abundance of wetland habitat in the planning area. Therefore, the cumulative effects under Alternative 2 could cause a shift away from agricultural land. However, these cumulative impacts are likely less than Alternative 3, which dedicates more funding for wetland restoration.

3.10.4.4 Alternative 3 – Ecosystems Focus

Alternative 3 is similar to the proposed action except that no projects would be implemented to directly restore or accelerate the recovery of the human uses of natural resources that were lost as a result of mine waste contamination and no restoration would occur in the upper Hangman Creek watershed on the Coeur d'Alene Reservation. For example, under Alternative 3, no projects would be undertaken to restore and facilitate recreational, educational, and other opportunities associated with the use of restored natural resources. All of the restoration funds would be allocated to ecosystem restoration (about $14 million more than under Alternative 2, which allocates 10 percent of funds to human uses).

Direct and Indirect Effects

Employment and Income

Although the types of activities funded under Alternative 3 may differ from those funded under Alternative 2, the relationship between spending and local employment and income would be consistent. For each $1,000,000 spent on ecosystem restoration (natural resources support services sector), it would support 34.3 jobs and $1.2 million in labor income (2012 USD). For each $1,000,000 spent on roads activities, it would support 7.5 jobs and $287,000 in labor income (2012 USD).

Total employment in the three-county analysis area is 86,377 jobs and labor income is $3.2 billion (IMPLAN 2012). Therefore, the economic effects of Alternative 3 would be minimal since each $1,000,000 spent on ecosystem restoration would support approximately 34 jobs and $1.2 million in labor income (2012 USD). For example, if $100 million were spent on restoration over the next 10 years, this would contribute about 3,400 jobs to the analysis area, which is about 4 percent of the total jobs in the area. While 4 percent of total employment is a small percent, this could be a significant impact on smaller communities where the jobs are concentrated. Relative to the no-action alternative, the economic impacts are greater under Alternative 2 and Alternative 3. Economic effects will likely differ between Alternatives 2 and 3, but without specific information about the activities to be implemented, the quantitative difference in economic effects is unknown. The economic effects per dollar spent are estimated to be the same between Alternatives 2 and 3.

Tax Revenue and Property Values

Although the Restoration Plan is not expected to impact the timber and mining industries and the tax revenue they create, the Restoration Plan could impact the tax base in other ways. Since Alternative 3 allocates all of the funding for ecosystem restoration, the improved natural amenities could draw more people to the area for recreation. However, the growth in recreational visitation is expected to be smaller than under Alternative 2. In the long term, improved natural amenities may attract new residents to the basin and increase property values, which would contribute to the growth of sales and property tax revenue.

Values, Beliefs, and Attitudes

Cultural Conditions

Under Alternative 3, all of the funding would be spent on ecosystem restoration, therefore, this alternative would do less than Alternative 2 to increase access, diversity, and abundance of recreational opportunities in the planning area. Access to recreational opportunities is also expected to decrease relative to the no-action alternative since some restoration activities could impact access for recreation. Therefore, Alternative 3 would not contribute to quality of life improvements for individuals and groups who value access to recreational opportunities in the planning area. The "Recreation" section provides detail on effects to access, landscape character, and recreation setting.

Subsistence uses are largely dependent on the health of the vegetation, wildlife, and water quality. Spending on ecosystem restoration, which is the greatest under Alternative 3, is expected to increase opportunities for hunting, fishing, foraging, and other subsistence uses in the Coeur d'Alene Basin. These uses may become more attractive to the public as injured natural resources recover.

As described in the "Affected Environment" section, people get their sense of place from the beauty and health of the land. Alternative 3 is expected to improve landscape character relative to the other alternatives. Therefore, Alternative 3 would contribute to sense of place in the Basin. Since Alternative 3 is wholly focused on ecosystem restoration and does not include recovery of human uses unique to the Coeur d'Alene Tribe in Hangman Creek, effects to the Tribe's sense of place, ability to use the natural resources for subsistence, and a place to gather would be the same as the no-action alternative for the Hangman Creek area. However, the benefits Tribal members receive from the natural resources across the planning area would increase the most under Alternative 3 with improved ecosystem health. See the "Coeur d'Alene Tribal Resources" section for more information about these impacts.

Biological Conditions

People expressed values for the health of the ecosystems in the area. Alternative 3 allocates all of the funding to ecosystem restoration; therefore, this alternative is expected to produce the largest improvement in biological conditions. Alternative 3 is expected to have the most positive effect on water quality and soil structure among the considered alternatives. The rate, extent, and likelihood of terrestrial and aquatic habitat and species recovery would likely be the greatest under Alternative 3 compared to the other alternatives because more ecosystem restoration would be done under this alternative. Therefore, the quality of life for people who value clean water and wildlife would be positively impacted by activities under Alternative 3 compared to the no-action alternative and Alternative 2. See the "Aquatic Species and Habitat" and "Terrestrial Species and Habitat" sections for more information.

Cumulative Effects

The cumulative effects of Alternative 3 are very similar to those outlined under Alternative 2. The effects would be relatively minor given the total economic base for the area and the social and economic initiatives already occurring (see discussion above). However, the effects could be meaningful in localized areas. With all available funding allocated to ecosystem restoration, the cumulative effects from changes in recreational use would be minimal. Under Alternative 3, the cumulative effects of increasing abundance of wetland habitat would likely have more effects than the other alternatives to the preservation of agricultural land and its relationship to Benewah County residents' way of life. The difference in cumulative effects to the preservation of agricultural land in Benewah County is that Alternative 3 proposes all funding be spent on restoration activities and Alternative 2 allocates 90 percent of funding to restoration activities. Under Alternative 3, 10 percent more funding would be spent on restoration (including the restoration of wetland habitat) across the planning area, for which Benewah County is a part. However, the extent of agricultural land preservation is uncertain and will be analyzed further when specific project determinations are made.

3.10.4.5 Summary

Table 9 displays a summary of socioeconomic consequences for each alternative under consideration.

Table 9. Summary of socioeconomic consequences

Analysis Indicator	Alternative 1	Alternative 2	Alternative 3
Employment and income	No change to employment and income	34.3 jobs and $1.2 million in labor income for each $1 million spent on ecosystem restoration 7.5 jobs and $287,000 in labor income for each $1 million spent on road construction and maintenance	Same relationship between spending and employment and income as reported under Alternative 2
Tax revenue	No direct effect to tax revenue. Indirect effect may be to slow growth in tax revenue.	Dependent on increase in visitation and population from conditions created by Alternative 2. Increase in sales and property tax revenue from recreation- and tourism-related sectors. Improved natural amenities may attract new residents, contributing to increases in property tax revenue.	Dependent on increase in visitation and population from conditions created by actions under Alternative 3. Less growth in *recreation-related* tax revenue than Alternative 2. Property tax revenue could increase with improved natural amenities if increased ecosystem restoration draws more people to area.
Cultural conditions	No direct effects	Improvements to recreational opportunities provides related economic opportunities in the tourism- and recreation-related sectors. Improved sense of place and subsistence opportunities, especially for Tribal members that value access to Hangman Creek.	Greater ecosystem restoration ultimately creates increased opportunities for hunting, fishing, foraging, and other subsistence uses. Improved sense of place based on health of the ecosystem but not for Tribal members or others that value access to Hangman Creek.

Analysis Indicator	Alternative 1	Alternative 2	Alternative 3
Biological conditions	No direct effects	Benefits people receive from the planning area resources would be positively impacted by Alternative 2 compared to the no-action alternative but less than the positive impacts under Alternative 3.	Largest improvement in biological conditions. Quality of life related to clean water and wildlife would be positively impacted.

3.10.4.6 Degree to Which the Alternatives Address the Issues

Residents and stakeholders in the Coeur d'Alene Basin want to improve socioeconomic well-being for current and future generations. By focusing restoration spending on improving the health of the ecosystem (as in Alternative 3), this alternative would likely have greater long-term direct and indirect positive impacts on the sense of place and local economy compared to the no-action alternative. Since the human uses component of Alternative 2 is based on short-term improvements to such things as recreation opportunities and access, the long-term impacts to sense of place and the economy are expected to be less than under Alternative 3.

The economic conditions and human uses of the injured natural resources would likely be affected by Alternatives 2 and 3, as described above. The no-action alternative does not address the economic and cultural issues the public has communicated as the injured resources would continue to improve at a slower rate. The economic and social issues that are dependent upon human uses improvements (such as access to Hangman Creek, sense of place from improved recreation opportunities, and tax revenue from the tourism sector) would be better addressed by Alternative 2; whereas the economic and social issues that are dependent upon healthy ecosystems (water quality, wildlife abundance, sense of place, subsistence use, and tax revenue from improved natural amenities) would be better addressed by Alternative 3. The degree to which Alternatives 2 and 3 address the economic and social issues is difficult to predict given uncertainty about the specific project.

Chapter 4. Glossary

Abiotic: Non-living chemical and physical factors in the environment that affect ecosystems.

Acquisition: Acquisition of properties with high priority wetlands may be necessary to ensure their protection and restoration. Most likely, acquisition will be used on properties that have been in agricultural production and wetland restoration is possible.

Adfluvial: Migratory between lakes and rivers or streams.

Alluvial: Formed by moving water

Anadromous: Life history strategy of fishes such as salmon and trout. Anadromous fishes are born in freshwater, migrate to saltwater environments to rear, and return to freshwater to spawn.

Aquifer: An underground layer of water-bearing permeable rock, rock fractures, or unconsolidated materials (gravel, sand, or silt) from which groundwater can be extracted

Base flow: The portion of stream flow that is not runoff and results from seepage of water from the ground into a channel slowly over time. The primary source of running water in a stream during dry weather or late summer.

Baseline conditions: The condition of natural resources and services had the release of contaminants had not occurred

Basin (Lower): Includes the Coeur d'Alene River and its tributaries from the confluence of the North and South Forks downstream to the mouth of the Coeur d'Alene River at Coeur d'Alene Lake.

Basin (Upper): Defined to include the South Fork of the Coeur d'Alene River, its tributaries downstream to the confluence of the South and North Forks of the river, and the Bunker Hill "Box", a rectangular 21-square-mile area surrounding the former smelter complex.

Benthic flux: The transport of dissolved chemicals across the solid-liquid interface at the bottom of aquatic systems. The flux of solutes can be either positive (into the water column from the sediment) or negative (out of the water column into the sediment) and can vary over multiple temporal and spatial scales. Benthic flux of zinc, cadmium, arsenic, and mercury into the water column can impact lake system food webs.

Benthic macroinvertebrates: Small animals living among stones, logs, sediments and aquatic plants on the bottom of streams, rivers and lakes. They are large enough to see with the naked eye (macro) and have no backbone (invertebrate).

Best management practices: Accepted methods for controlling nonpoint source pollution. Best management practices may include one or more physical, structural, and/or managerial conservation practices that reduce or prevent pollution from entering a water body.

Biotic: A living or once living component of a community such as plants and animals.

Blasting: Although uncommon, blasting can create small, shallow water wetlands without the need for large equipment.

Centrarchid: Member of the sunfish family (Centrarchidae) of freshwater ray-finned fish belonging to the order Perciformes. Includes, largemouth bass, bluegill, pumpkinseed, and crappies.

The Coeur d'Alene Lake Collaborative: Represents the partnership effort of all stakeholders in the Coeur d'Alene Basin to protect and improve the water quality of Coeur d'Alene Lake. The guiding document for these efforts is the 2009 Coeur d'Alene Lake Management Plan (LMP), which was co-authored by the Tribe and the State. The Tribe and State jointly administer this plan and coordinate the collective efforts of all partners.

Cyprinid: Any fish belonging to the Cyprinidae, or minnow family. Includes carp, minnows, chub, and dace.

Deformable banks: In channel restoration design, a deformable channel bank is one which allows for maintenance of channel stability through gradual planform change via lateral bank migration. Deformable channel banks are considered wherever geomorphic integrity and floodplain function are required as objectives of natural channel restoration.

Dikes: Constructed to manage water levels in wetland restorations. Typically, they are no more than five feet high, and are used to restrict areas where shallow water is desired.

Down-cutting: Downward erosion or vertical erosion that deepens the channel of a stream by eroding removing material from the stream's bed or the valley's floor.

Easement: A tool to protect properties, but maintain current ownership. If an easement on a property is purchased, the landowner maintains ownership but loses development rights.

Ecosystem processes: The complex physical, chemical, and biological interactions within an ecosystem such as natural disturbance, hydrology, nutrient cycling, biotic interactions, population dynamics, and evolution. These processes determine the species composition, habitat structure, and ecological health of sites and landscapes. Reference: http://www.epa.gov/oecaerth/resources/policies/nepa/ecological-processes-eia-pg.pdf

Emergent plants: Plants that have a large portion of their shoots, leaves or flowering structures out of the water

Eutrophication: The natural processes by which lakes and ponds become enriched with dissolved nutrients and sediments, resulting in increased growth of algae and rooted aquatic plants and reduced water clarity. Anthropogenic eutrophication is a term for the acceleration of the eutrophication process caused by humans' land use activities.

Extirpated: In this plan, extirpated means to destroy, eliminate, or suppress natural resources as a result of mine waste contamination.

Fencing: Barriers used to prevent livestock from using wetlands and to make restoration possible.

Floodplain: An area of low-lying ground adjacent to a river, formed mainly of river sediments and subject to flooding.

Fluvial: Refers to processes associated with rivers and streams.

Focal resources: In this restoration plan, the focal resources refer to native fish and waterfowl.

Focal species: Species that receive management emphasis because their abundance or distribution is indicative of essential habitat conditions. Focal species may include "indicator species" which can be defined as those that tell something about the conditions in a particular habitat.

Food web: A series of organisms related by predator-prey and consumer-resource interactions; the entirety of interrelated food chains in an ecological community.

Habitat-forming processes: These are ecosystem processes (see definition above) that determine the composition, structure, and function of habitats for fish and wildlife. Examples include flooding, sediment transport and deposition, and large wood recruitment to streams.

Hardening: Placement of erosion resistant materials on shorelines and riverbanks, including rock (rip rap), timbered crib walls, or metal bulk-heads.

Head-cutting: The process of active erosion in a channel caused by an abrupt change in slope. Turbulence in the water undercuts substrate material resulting in collapse of the upper level. This undercut-collapse process advances up the stream channel.

Human uses (also Human services): The tangible and intangible benefits people derive from natural resources.

Hydric: Refers to ecosystem components containing high amounts of moisture. Hydric soils are formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions in the upper part. Reference: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/use/hydric/?cid=nrcs142p2_053961

Hydro-geomorphic processes: Natural processes such as floods, debris floods, and debris flows that move water, sediment, and large woody debris from the hillslopes of a watershed through channels to depositional areas

Introgression: Introgression, also known in genetics as introgressive hybridization, is the movement of a gene (gene flow) from one species into the gene pool of another by the repeated backcrossing of an interspecific hybrid with one of its parent species.

Invasive species: A species that is not native to a specific location (an introduced species), and which has a tendency to spread to a degree believed to cause damage to the environment, human economy or human health.

Island construction: Constructed land areas in wetlands that can add topographical diversity and provide drier areas for waterfowl loafing. Waterfowl surveys in some wetlands in the lower Coeur d'Alene Basin have shown concentrations of waterfowl near islands or higher areas (USFWS).

Littoral: The zone along a lake shore extending from ordinary high water to the limits of submerged rooted vegetation. Often these areas are where biological productivity is greatest and humans have maximum impact.

Lotic: Refers to flowing water

Natural resources: Naturally occurring components of our environment including land, fish, wildlife, other organisms, air, surface water, ground water, drinking water supplies, and other such resources. For the purposes of this plan, "natural resources" refers to those resources held in trust for the public by the Trustees. Reference: http://www.epa.gov/superfund/programs/nrd/primer.htm

Nearshore: See "littoral"

Nest boxes: Constructed boxes that provide places for mallards, geese, and wood ducks to nest where nesting habitat is limited. Although not a primary focus of restoration, nest boxes can increase bird use in restored wetlands and are inexpensive to install and maintain.

Noxious weeds: Nonnative, invasive plants that out-compete native vegetation. Within the Coeur d'Alene Basin area noxious weeds include reed canarygrass and Eurasian watermilfoil. Both need to be controlled for restoration to be successful. There are a variety of chemical, physical, and biological techniques used to control invasive species, and all will be considered depending on site-specific conditions.

Nutrient loads: The addition of nutrients, usually nitrogen or phosphorus, to a water body (often expressed in amount of weight per unit of time). The majority of nutrient loading in a lake usually comes from its tributaries.

Operable Units (OUs): A regulatory term meaning each portion of a Superfund site where cleanup activities occur and each OU is investigated and cleaned up separately from other portions of the site.

Phytoplankton: Microscopic organisms that live in watery environments, both salty and fresh. Some phytoplankton are bacteria, some are single celled organisms (like amoebas), and most are single-celled plants.

Phytotoxic: Poisonous to plants

Pollutant: A substance or energy introduced into the environment that has undesired effects, or adversely affects the usefulness of a resource. A pollutant may cause long- or short-term damage by changing the growth rate of plant or animal species, or by interfering with human amenities, comfort, health, or property values

Planform: Refers to the configuration of a channel when viewed from above. Elements of planform include the number of channels, sinuosity, and lateral stability.

Plug ditches: A cost effective way to return surface water levels to where they were before ditches were dug.

Point-source pollutants: Pollutants discharged from any discernible, confined, and discrete conveyance, including, but not limited to, any pipe, ditch, channel, sewer, tunnel, conduit, well.

Recovery: The desired result of ecological restoration that initiates or accelerates the return of an ecosystem and the biotic populations that depend on that ecosystem to health, integrity and sustainability. In the context of the CERCLA, recovery is the return of baseline conditions.

Refugia: Distinct geographic areas or habitats organisms retreat to, persist in, and potentially expand from under changing environmental conditions or disturbance.

Rehabilitate: Shifting a degraded ecosystem toward a higher use than it is serving currently.

Remediation: The cleanup of hazardous wastes through removal, containment, and other methods to protect human health and the environment.

Remedial action: Remedial actions generally are used to respond to long-term and chronic releases. Remedial actions usually are more costly than removal actions and are intended to achieve a permanent solution for risks to human health and the environment.

Removal action: A removal action is often a short-term action designed to stabilize or clean up a hazardous waste site that poses an immediate threat to human health or the environment. Removal actions may be taken to abate short-term threats at a site and facilitate a long-term remedial response.

Replace: Taking a degraded ecosystem and creating a completely new one.

Response Action: CERCLA authorizes three types of responses to the release of a hazardous substance or any pollutant or contaminant that may present an imminent and substantial danger to public health. These response actions include removal actions, remedial actions (also called remediation), and enforcement activities related to removal or remedial actions.

Restoration: Conducting actions that will return natural resource conditions toward the conditions that would exist absent the release of hazardous substances (i.e., baseline).

Riparian zone: Riparian "zones" are an area of interaction between an aquatic and upland areas. Extent of riparian zones is dependent on duration and extent moisture regime (e.g., influence of the aquatic habitat) and height of a site potential tree or other vegetation (e.g., furthest point from the waterbody from which nearby vegetation may directly influence that water body).

Riparian habitat: Riparian habitat is a key component of wetlands, lakes, and streams, and occurs as a transitional area between aquatic and upland ecosystems; it includes all land directly affected by surface water. Riparian habitats influence aquatic systems by controlling erosion and sedimentation, moderating water temperature, providing woody debris structure, and maintaining invertebrate communities that contribute to food chains in aquatic systems.

Salmonid: Belonging or pertaining to the family Salmonidae, including the salmongs, trout, chars, and whitefishes

Sense of place: Inhabitants of an area develop a “sense of place” through experience and knowledge of a particular area. A sense of place emerges through knowledge of the history, geography and geology of an area, its flora and fauna, the legends of a place, and a growing sense of the land and its history after living there for a time. Through time, shared experiences and history help connect place and people and to transmit feelings of place from generation to generation.

Services (natural resource services): Ecological and human services provided by natural resources. Ecological services include flood and erosion control. Human services include fishing, swimming, subsistence gathering, and wildlife viewing.

Sinuosity: The tendency of a river or stream to move back and forth across its floodplain, in an S-shaped pattern over time.

Spiny-rayed fishes: A group of warmwater game fish with rigid fin rays. Includes minnows, darters, bass, walleye, crappie, and bluegill.

Splay: A fluvial deposit which forms when a stream breaks its natural or artificial levees and deposits sediment on a floodplain.

Streambank bioengineering: A suite of restoration techniques that combine plants and other protective organic materials to increase the strength of riverbank soils to resist erosion and to restore habitats and ecological processes associated with natural riverbank vegetative communities.

Strongholds: Streams, watersheds, or other spatial unit where biotic populations are strong and diverse, and the habitat has high intrinsic potential to support a particular species or suite of species.

Subaqueous mixing: A non-removal cleanup technique for contaminated sediment that involves leaving the waste in place and isolating it from the environment by placing a layer of soil and/or material over the contaminated waste as to prevent further spread of the contaminant.

Submergent plants: Plants that have most of their plant structures below water.

Subsistence gathering: Uses of wild resources are defined as 'noncommercial, customary and traditional uses' for a variety of purposes. These include: Direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation, for the making and selling of handicraft articles out of non-edible by-products of fish and wildlife resources taken for personal or family consumption, and for the customary trade, barter, or sharing for personal or family consumption.

Trophic cascade: This term refers to the aquatic food web predator-to- prey relationship.

Water control structures: Installed in dikes or berms, and give managers the ability to directly manipulated water levels. They have a system of boards that can be removed to lower water levels, or put back in to raise water levels.

Watershed: An area or ridge of land that separates waters flowing to different rivers, basins, or seas.

Zooplankton: Small floating aquatic animals that drift with water currents and are a key food source for fish and other aquatic organisms.

Chapter 5. References

Adams, S. M., Giesy, J. P., Tremblay, L. A., & Eason, C. T. 2001. The use of biomarkers in ecological risk assessment: recommendations from the Christchurch conference on Biomarkers in Ecotoxicology. Biomarkers, 6 (1): 1–6.

Adams, R.A. 2003. Bats of the Rocky Mountain West. University Press of Colorado. Boulder, CO. USA. 289pp.

Allen, Stewart et al. 2009. Denise A. Wickwar, Fred P. Clark, Robert R. Dow, Robert Potts and Stephanie A. Snyder. "Values, Beliefs, and Attitudes Technical Guide for Forest Service Land and Resource Management, Planning, and Decision-making." USDA Forest Service. Pacific Northwest Research Station. General Technical Report PNW-GTR-788.

Allendorf, F. W., and R. F. Leary. 1988. Conservation and distribution of genetic variation in a polytypic species, the cutthroat trout. Conservation Biology 2: 170–184.

Apperson, K.A., M. Mahan, W.D. Horton, and C.M. Falter. 1988. Study Completion Report, Project F-73-R-10. Subproject IV: Rivers and Streams Investigations. Study IV: North Idaho Streams Fishery Research. Job 1: Fish Population Inventory; Job 2: Fish Habitat Description; Job 3: Fish Species and Stock Evaluation; St. Joe and St. Marie Rivers Limnology Update 1987. Idaho Department of Fish and Game.

Audet, D.J., J.L. Kaiser, D.J. Hoffman, L. McDonald, and T. McDonald. 1999. Lead Exposure of Bald Eagles and Prey Items in Northern Idaho and Eastern Washington. U.S. Fish and Wildlife Service, Spokane, WA.

Avista Corporation (AVISTA). 2011. Coeur d'Alene Reservation Aquatic Weed Management Plan 4€ Condition No. 7 Spokane River Hydroelectric Project FERC Paojrect No. 2545. Prepared by Coeur d'Alene Tribe in Cooperation with Avista Corporation. Revised April 1, 2011. 98 pp.

AVISTA. 2014. Lower Lakes Aquatic Vegetation Survey Project Final Report.

Bailey, R.G. 1995. Description of the bioregions of the United States. US Department of Agriculture, Forest Service Miscellaneous Publication No. 1391.

Baker, C.O. and F.E. Votapka. 1990. Fish passage through culverts. FHWA-FL-09-006. USDA Forest Service – Technology and Development Center. San Dimas, CA.

Baldwin, A. H., M. S. Egnotovich, and E. Clarke. 2001. Hydrologic change and vegetation of tidal freshwater marshes: Field, greenhouse, and seed-bank experiments. Wetlands 21: 519-531.

Bamonte, T. and S. Bamonte. 2005. Pend Oreille Country. In *Pathways to History; Roads, Trails and Journeys, the Mingling of Peoples and the Forming of Northwest Communities*. Tornado Creek Publications, Spokane.

Bashore, H.W., 1932. Rathdrum Prairie Project, Idaho: U.S. Bureau of Reclamation, 31 pp.

Bauer, S. 1975. Coeur d'Alene Fishery Studies. Idaho Department of Fish and Game Project Performance Report 1974.

Beck, J. M., J. Janovetz, and C. R. Peterson. 1998. Amphibians of the Coeur d'Alene Basin: A survey of Bureau of Land Management lands. Tech. Bull. No. 98–3, Idaho Bureau of Land Management, Boise, Idaho.

Behnke, R.J. 1992. Native trout of western North America. American Fisheries Society Monograph 6.

Behnke, R.J. and R.L. Wallace. 1986. A systematic review of the cutthroat trout, Salmo clarki Richardson, a polytypic species. In J.S. Griffith, editor. The ecology and management of interior stocks of cutthroat trout. Special Publication of the Western Division, American Fisheries Society. pp. 1-27.

Benewah County Planning & Zoning Commission. 2003. "Benewah County Comprehensive Plan." April 14, 2003.

Bennett, D. H. and T. J. Underwood. 1988. Population dynamics and factors affecting rainbow trout (Salmo gairdneri) in the Spokane River, Idaho, Completion Report No. 3. On file with the Washington Water Power Co., Spokane, Washington.

Berenbrock, C, and A.W. Tranmer. 2008. Simulation of flow, sediment transport, and sediment mobility of the Lower Coeur d'Alene River, Idaho: U.S. Geological Survey Scientific Investigations Report 2008–5093, 164 pp.

Bertram, J. L. 2014. "Coeur d'Alene Reservation Tourism Plan." Planmakers Planning & Urban Design and Intermountain Demographics prepared for the Coeur d'Alene Tribe.

Beyer, W.N. D.J. Audet, A. Morton, J.K. Campbell, and L. LeCaptain. 1998. Lead exposure of waterfowl ingesting Coeur d' Alene River Basin sediments. Journal of Environmental Quality 27: 1533-1538.

Beyer, W.N., D.J. Audet, G.H. Heinz, D.J. Hoffman, and D. Day. 2000. Relation of waterfowl poisoning to sediment lead concentrations in the Coeur d'Alene River Basin. Ecotoxicology 9: 207-218.

Black, A. E., E. Strand, R. G. Wright, J. M. Scott, P. Morgan, and C. Watson. 1998. Land use history at multiple scales: implications for conservation planning. Landscape and Planning 43: 49-63.

Bookstrom, A.A., Box, S.E., Jackson, B.L., Brandt, T.R., Derkey, P.D., and Munts, S.R., 1999. Digital map of surficial geology, wetlands, and deepwater habitats, Coeur d'Alene River valley, Idaho: U.S. Geological Survey Open-File Report 99-548, 121 pp.

Bookstrom, A. A., Box, S. E., Campbell, J. K., Foster, K. I., & Jackson, B. L. 2001. Lead-rich sediments, Coeur d'Alene River Valley, Idaho: Area, volume, Tonnage, and lead content. US Geological Survey Open-File Report, 01-140.

Booksktrom, A.A., Box, S.E, Fouseck R.S, Walllis, J.C, Kayser, H.Z, and B. L. Jackson. 2004. revised 2013. Baseline, Historic, and Background Rates of Deposition of Lead-Rich Sediments on the Floodplain of the Coeur d'Alene River, Idaho. USGS, Spokane, WA and Coeur d'Alene Tribe, Plummer, ID. U.S. Government Open-File Report 2004-1211, Version 1.1

Box, S.E., A.A. Bookstrom and M. Ikramuddin. 1996. Unpublished data, geochemical profiles of Dudley and Killarney river-channel drill transacts.

Brown, N., K. Purnell, T. Laninga, K. Stromberg, and C. Pitner. 2011. North Fork Coeur d'Alene River Cooperative Recreation Plan, version 1. Prepared for North Fork Coeur d'Alene River Watershed Advisory Group. 46 pp.

Burch, S., D. Audet, M. Snyder, and L. LeCaptain. 1996. Evaluation of metals accumulation in aquatic biota and mallard ducks from the Page Pond wetlands and sewage ponds on the Bunker Hill Superfund Site, Idaho. U.S. Fish and Wildlife Service. Prepared for the Environmental Protection Agency, IAG no. DW 14957137-01-0.

Campbell, J.K., D.J. Audet, T.L. McDonald, J. Kern, D. Strickland, and P.J. Cernera. 1999a. Heavy Metal Concentrations in *Sagittaria* spp. Tubers (water potato) in the Coeur d'Alene Basin, Idaho. Final draft. U.S. Fish and Wildlife Service, Spokane, WA. May.

Campbell, J.K., D.J. Audet, J.W. Kern, M. Reyes, and L.L. McDonald. 1999b. Metal Contamination of Palustrine and Lacustrine Habitats in the Coeur d'Alene Basin, Idaho. Final Draft. U.S. Fish and Wildlife Service, Spokane, WA.

Carney, K.M. and R.L. Knight. 1999. A Review of Human Disturbance Effects on Nesting Colonial Waterbirds. Waterbirds 22: 68-79.

Cassier, F.E., C.R. Groves, and D.L. Genter. 1994. Coeur d'Alene Salamander Conservation Assessment. U.S. Dep. Agric. For. Serv. Reg. 1, Missoula, Mont.

CDA 2030. Coeur d'Alene Vision and Implementation Plan. *Avail from* http://www.cda2030.org/.

Center for Water Research. ELCOM. The University of Western Australia, 2014. Web. 16 Jan. 2015. http://www.cwr.uwa.edu.au/software1/models1.php?mdid=5,

CAEDYM. The University of Western Australia, 2014. Web. 16 Jan. 2015. http://www.cwr.uwa.au/software1/models1.php?mdid=3

CH2M HILL. 2010. Enhanced Conceptual Site Model for the Lower Basin Coeur d'Alene River. Prepared for USEPA Region 10.

CH2M HILL and URS Corp. 2001. Final ecological risk assessment. Coeur d'Alene Basin remedial investigation/feasibility study. Contract No. 68-W-98-228. Prepared for U.S. Environmental Protection Agency.

Changwoo, A. 2009. Final report for USGS –NIWR Project Project: Microtopography effects on vegetative and biogeochemical patterns in created wetlands: a comparative study to provide guidance for wetland creation and restoration (2006-2008). George Mason University, Fairfax, VA.

City of Spokane Valley. 2010. Shoreline Master Program Update Inventory and Characterization Report. City of Spokane Valley Community Development Department 11707 East Sprague Ave. Spokane Valley, WA.

Clark, G.M., and Mebane, C.A. 2014. Sources, transport, and trends for selected trace metals and nutrients in the Coeur d'Alene and Spokane River Basins, northern Idaho, 1990–2013: U.S. Geological Survey Scientific Investigations Report 2014–5204, 62 p., *http://dx.doi.org/10.3133/sir20145204*.

Coeur d'Alene Basin Natural Resource Trustees (Trustees). 2013. Preliminary Scoping Report. Available from http://restorationpartnership.com/pdf/preliminary_report.pdf. 58 pp.

Coeur d'Alene Tribe. 2001. Draft Coeur d'Alene Subbasin Summary. Prepared for the Northwest Power Planning Council by the Coeur d'Alene Subbasin Planning Team, Coeur d'Alene Tribe, and Team Leader. March 16, 2001.

Coeur d' Alene Tribe. 2005. Impact Assessment Report, Overview of Effects of the Post Falls HED on the Natural Resources of the Coeur d' Alene Tribe, Avista Spokane River Project (FERC Project No. 2545). Plummer, Idaho. 94 pp.

Coeur d'Alene Tribe. 2007. Final Environmental Impact State for the Integrated Resource Management Plan. Coeur d'Alene Tribe Natural Resource Department, Plummer, ID. 424 pp.

Coeur d'Alene Tribe. 2008. *hnt'k'wipn* Management Plan. Coeur d'Alene Tribe Wildlife Program. Plummer, ID. 104 pp.

Coeur d'Alene Tribe. 2012. Integrated Resource Management Plan, *k'wen' chstqhessiple' hnkhwlkhwlstsutnet* "The future course of our renewal" prepared for the U.S. Department of Interior Bureau of Indian Affairs. *Avail. from:* http://www.cdatribe-nsn.gov/tribaldepts/notice/IRMP_ES.pdf

Coeur d'Alene Tribe. 2014. Reservation Tourism Plan*. Prepared by* Planmakers Planning & Urban Design and Intermountain Demographics. 46 pp.

Coeur d'Alene Tribe. 2015. http://www.cdatribe-nsn.gov/cultural/reservation.aspx

Corsi, C. 2016. Personal communication. 9-6-2016, Report on fish species present in Coeur d'Alene Lake.

Council on Environmental Quality (CEQ). 1997. Environmental Justice: Guidance Under the National Environmental Policy Act. Washington, DC: Executive Office of the President.

Council on Environmental Quality (CEQ). 2014. Revised Draft Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in NEPA Reviews, 79 Fed. Reg. 77,802, 77,826 (Council on Environmental Quality, Dec. 24, 2014)

Darveau, M., Beauchesne, P., Belanger, L, Huot, J. and I. Larue. 1995. Riparian forest strips as habitat for breeding birds in boreal forest. J. Wildl. Manage. 59: 67-78.

Daubenmire, R. F. 1988. Steppe vegetation of Washington. Wash. State Univ., Pullman. 131pp.

Dawson, S., Stevens, R., Flagor, B. and M Schlepp. 2004 Riverbank Stabilization Inventory (Final). Kootenai-Shoshone Soil and Water Conservation District Coeur d'Alene ID. 132 pp.

DeSante, D. F., Kenneth M. Burton, Pilar Velez, Dan Froehlich, and Danielle Kaschube. 2010. MAPS manual: Instructions for the establishment and operation of constant-effort bird-banding stations as part of the Monitoring Avian Productivity and Survivorship (MAPS) program. Institute for Bird Populations, P. O. Box 1346, Point Reyes Station, CA

Dongoske, Kurt E., Theresa Pasqual, and T.F. King. 2015. “The National Environmental Policy Act (NEPA) and the Silencing of Native American Worldviews.” Environmental Practice 17 (1): 36-45. Environmental Reviews and Case Studies.

Doyle, A.T. 1990. Use of riparian and upland habitat by small mammals. J. Mammal. 71: 14-23.

DuPont, J., M. Liter, and N. Horner. 2008. Little North Fork Clearwater River and Priest River Tributary Investigations. 2004 Job Performance Report. Idaho Department of Fish and Game. Federal Aid in Fish Restoration. Project F-71-R-29. Boise.

Ellis, M. M. 1940. Pollution of the Coeur d’Alene River and Adjacent Waters by Mine Wastes [a report by the U.S. Bureau of Fisheries to the Coeur d’Alene River and Lake Commission]. Typescript of 136 pages.

Ertter, B., and B. Moseley. 1992. Floristic regions of Idaho. Journal of the Idaho Academy of Science 28: 5770.

Fausch, K. D. 1988. Tests of competition between native and introduced salmonids in streams: What have we learned? Canadian Journal of Fisheries and Aquatic Science 45: 2238-2246.

Fausch, K. D. 1989. Do gradient and temperature affect distributions of, and interactions between, brook char (Salvelinus fontinalis) and other resident salmonids in streams? Physiology and Ecology Japan (Special Volume) 1: 303-322.

Fausch, K. D., and M. K. Young. 1995. Evolutionarily significant units and movement of resident stream fishes: a cautionary tale. Pages 360–370 in J. L. Nielsen, editor. Evolution and the aquatic ecosystem: defining unique units in population conservation. American Fisheries Society, Symposium 17, Bethesda, Maryland.

Fausch, K. D., Rieman, B. E., Young, M. K., and J.B. Dunham. 2006. Strategies for conserving native salmonid populations at risk from nonnative fish invasions: tradeoffs in using barriers to upstream movement. Gen. Tech. Rep. RMRS-GTR-174. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 44 pp.

Featherston, K. L., R. J. Naiman, and R. E. Bilby. 1995. Large woody debris, physical process, and riparian forest development in montane river networks of the Pacific Northwest, Geomorphology 13: 133–144.

Fredericks, J. 2011a. Email received by Scott Deeds (USFWS) from Jim Fredericks (IDFG) on July 29, 2011, reporting a bull trout caught on the St. Maries River by Ethan Crawford, WADFW fish biologist. Reported in USFWS (2013) Endangered Species Act Section 7 Consultation Biological Opinion on the Revised Forest Plan for the Idaho Panhandle National Forests Prepared by: U.S. Fish and Wildlife Service Northern Idaho Field Office Spokane Valley, Washington and U.S. Fish and Wildlife Service Montana Field Office Helena, Montana. 81 pp.

Fertig, W., R. Black and P. Wolken. 2005. Rangewide status review of Ute ladies'-tresses (Spiranthes diluvialis). Prepared for the U.S. Fish and Wildlife Service and Central Utah Water Conservancy District.

Fields 1935. The St. Joe: five year fish and game report. U.S. Forest Service, St. Joe National Forest, St. Maries, Idaho.

Firehammer, J. A., A. J. Vitale, S. H. Hallock, and T. Biladeau. 2013. Implementation of Fisheries Enhancement Opportunities on the Coeur d'Alene Reservation, 1/1/2011 – 12/31/2012 Annual Report, 1990-044-00. Bonneville Power Administration, Portland.

Fousek, R.S. 1996. Trace-element distributions in the sediments of the flood plain and river banks of the South Fork and Coeur d'Alene rivers, Shoshone and Kootenai Counties, Idaho. Auburn University, unpublished, M.S. thesis. 310 pp.

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

Fredericks, J. 2011a. Email received by Scott Deeds (USFWS) from Jim Fredericks (IDFG) on August 1, 2011, reporting a bull trout caught in Wolf Lodge Creek by Ryan Hardy, IDFG fish biologist.

Fredericks, J. 2011b. Email received by Scott Deeds (USFWS) from Jim Fredericks (IDFG) on July 29, 2011, reporting a bull trout caught on the St. Maries River by Ethan Crawford, WADFW fish biologist. Reported in USFWS (2013) Endangered Species Act Section 7 Consultation Biological Opinion on the Revised Forest Plan for the Idaho Panhandle National Forests Prepared by: U.S. Fish and Wildlife Service Northern Idaho Field Office Spokane Valley, Washington and U.S. Fish and Wildlife Service Montana Field Office Helena, Montana. 81 pp.

Fredericks, J., J. Davis, N. Horner, and C. Corsi. 2002. Regional fisheries management investigations, Idaho Department of Fish and Game, Federal Aid in Fish Restoration, F-71-R-23 Job c, 1998 Job Performance Report, Boise.

Fredrickson, Leigh H. 1982. Management of seasonally flooded impoundments for wildlife. (Resource publication; 148) Bibliography: p. Supt. of Docs, no. I 49.66:148.

Funk, W. C., Blouin, M. S., Corn, P. S., Maxell, B. A., Pilliod, D. S., Amish, S. and F.W. Allendorf. 2005. Population structure of Columbia spotted frogs (*Rana luteiventris*) is strongly affected by the landscape. Mol. Ecol. 14: 483–496.

Furniss, M. J., M. Love, and S. A. Flanagan. 1997. Diversion potential at road stream crossings. USDA Forest Service Technology and Development Program 9777-1814- SDTDC. San Dimas Technology & Development Center, San Dimas, California.

Furniss, M. J., T. S. Ledwith, M. A. Love, B. McFadin, and S. A. Flanagan. 1998. Response of road–stream crossings to large flood events in Washington, Oregon, and Northern California. USDA Forest Service, Technology and Development Program. 9877-1806- SDTDC. San Dimas Technology & Development Center, San Dimas, California.

Gidley, C.A., Scarnecchia, D.L. and J.A. Hansen. 2012. Fish community structure associated with stabilized and unstabilized shoreline habitats, Coeur d'Alene River, Idaho, USA. River Res. Applic. 28: 554–566.

Gore, J.A., and Milner, A.M. 1990. Island biogeographical theory: can it be used to predict lotic recovery rates? Environ. Manage. 14: 737–753.

Gowan, C., M.K. Young, K.D. Fausch, and S.C. Riley. 1994. Restricted movement in resident stream salmonids: a paradigm lost? Canadian Journal of Fisheries and Aquatic Sciences 51: 2626–2637.

Green, G.I. 2001. 'Hangman Restoration Project. Project No. 2001-03300. BPA Report DOE/BP-00009210-1. 23 pp.

Green, G. I. and F. Roberts. 2003. Coeur d'Alene Hangman Restoration Project Habitat Prioritization Plan. Coeur d'Alene Tribe Wildlife Program with funding from the Bonneville Power Administration.

Green, G.I. 2008. Hangman Restoration Project. BPA Project-2001-033-00. 2008 Year-End Report. Coeur d'Alene Tribe. Plummer, ID.

Green, G., B. Kinkead, and D. Callery. 2011. Prioritization Area Selection within the Hangman Watershed of the Coeur d' Alene Reservation. 28pp.

Green, G. I. and F. Roberts. 2003. Coeur d'Alene Tribe Hangman Restoration Project Habitat Prioritization Plan. Coeur d'Alene Tribe Wildlife Program. 25pp.

Hansen, J., D. Audet, B. Spears, K. Healy, R. Brazzle, D. Hoffman, A. Dailey, and N. Beyer. 2011. Lead Exposure and Poisoning of Songbirds Using the Coeur d' Alene River Basin, Idaho, USA. Integrated Environmental Assessment and Management. 7: 587-595.

Harper, B, Flett, S., Harris, C., Abeyta, C., and F. Kirschner. 2002. The Spokane Tribe's multipathway subsistence exposure scenario and screening level reasonable maximum exposure. Risk Anal. 22: 513–526

Harris, G., R.M. Nielson, T. Rinaldi, and T. Lohuis. 2014. Effects of Winter Recreation on Northern Ungulates with Focus on Moose (*Alces alces*) and Snowmobiles. European Journal of Wildlife Research 60: 45-58.

Hawdon, L. 2015. Personal communication. Email message 11-17-2015 to J. Christensen reporting conditions in the Upper St Joe watershed.

Hawdon, L. 2016. Pers comm. 8-17-2016, reporting results of bull trout spawning surveys carried out jointly with the Idaho Department of Fish in Game in the upper St Joe River watershed.

Hawes, E., and Smith, M. 2005. "Riparian buffer zones: Functions and recommended widths." Report. to the Eightmile River Wild and Scenic Study Committee, ttp://www.eightmileriver.org/ resources/ digital_library/appendicies/09c3_Riparian%20Buffer%20Science_ YALE.pdf Feb. 28, 2008.

Hecnar, S.J. and R.T. M'Closkey. 1996. Regional dynamics and the status of amphibians. Ecology 77: 2091–2097.

Hietanen, A. 1962. Metamorphic Idaho Batholith Near Pierce and Bungalow Clearwater County, Idaho: Metamorphic and Igneous rocks along the northwest border zone of the Idaho batholith. Geological Survey Professional Paper 344-D. U.S. Government Printing Office, Washington: 1963.

Hendrickson, S., Walker, K., Jacobson, S., Bower, F. 2008. Assessment of Aquatic Organism Passage at Road/Stream Crossings for the Northern Region of the USDA Forest Service.

Hoffman, R. and J. Dunham. 2007. Fish movement ecology in high gradient headwater streams: its relevance to fish passage restoration through stream culvert barriers. U.S. Geologic Survey, OFR 2007-1140, 1-37.

Horowitz, R. J. 1978. Temporal variability patterns and the distributional patterns of stream fish. Ecological Monographs 48: 307-321.

Horowitz, A.J. and K.A. Elrick. 1993. Effect of mining and related activities on the sediment trace element geochemistry of Lake Coeur d'Alene, Idaho, USA, Part I: surface sediments. Hydrological Processes, Vol. 7, 403-423.

Horowitz, A.J., Elrick, K.A., Robbins, J.A. and R.B. Cook. 1995a. A summary of the effects of mining and related activities on the sediment-trace element geochemistry of Lake Coeur d'Alene, Idaho, USA. Journal of Geochemical Exploration, 52 (1995) 135-144.

Horowitz, A.J., Elrick, K.A., Robbins, J.A. and R.B. Cook. 1995b. Effect of mining and related activities on the sediment trace element geochemistry of Lake Coeur d'Alene, Idaho, USA, Part II: subsurface sediments. Hydrological Processes, Vol. 9, 35-54.

Hudson, Lorelea, S. Boswell, C. D. Carley, W. Choquette, C. Miss, D. H. Chance, M. A. Stamper. 1982. *Cultural Resource Overview for the Colville and Idaho Panhandle National Forests and the Bureau of Land Management - Spokane and Coeur D'alene Districts* Vol I. Cultural Resource Narrative.

Huxel, G. R. and A. Hastings. 1999. The influence of restoration on species persistence in fragmented habitats. Restoration Ecology 7: 1-7.

Idaho Association of Counties. 2010. Idaho Public Lands: Facts and Figures. http://www.idcounties.org/DocumentCenter/Home/View/97.

Idaho Department of Environmental Quality (IDEQ). 2001. Subbasin Assessment and Total Maximum Daily Loads of the North Fork Coeur d'Alene River (17010301). 116pp.

IDEQ. 2002. South Fork Coeur d'Alene River Sediment Subbasin Assessment and Total Maximum Daily Load. Prepared by: Geoffrey W. Harvey Coeur d'Alene Regional Office, Idaho Department of Environmental Quality, Coeur d'Alene, ID. 136 pp.

IDEQ. 2003a. St. Maries River Subbasin Assessment and Total Maximum Daily Loads. Prepared by: Geoffrey W. Harvey and Shantel L. Aparicio, Coeur d'Alene Regional Office Department of Environmental Quality, Coeur d'Alene, ID. 179 pp.

IDEQ. 2003b. St. Joe River Subbasin Assessment and Total Maximum Daily Loads. Prepared by: Geoffrey W. Harvey and Shantel L. Aparicio, Coeur d'Alene Regional Office Department of Environmental Quality, Coeur d'Alene, ID. 252 pp.

IDEQ. 2007. Upper Hangman Creek Subbasin Assessment and Total Maximum Daily Load. Idaho Department of Environmental Quality, Boise, ID. Available from: www.deq.idaho.gov/water/ data_reports/ surface_water/tmdls/hangman_creek_upper/hangman_cr eek_upper_entire.pdf

IDEQ. 2011. Coeur d'Alene Lake and River Total Maximum Daily Load and Subbasin Assessment (Hydrologic Unit Code 17010303) 2011 Addendum and Update. Idaho, Department of Environmental Quality Coeur d'Alene Regional Office, Coeur d'Alene, ID.

IDEQ. 2013. Coeur d'Alene Lake and River Subbasin Assessment and Total Maximum Daily Loads 2013 Fernan Lake Addendum. Prepared by Idaho Department of Environmental Quality Coeur d'Alene Regional Office 2110 Ironwood Parkway Coeur d'Alene, Idaho.

IDEQ. 2014. Idaho's 2012 Integrated Report. Boise, ID: Idaho Department of Environmental Quality.

IDEQ and Coeur d'Alene Tribe. 2009. Coeur d'Alene Lake Management Plan, 2009. Idaho Department of Environmental Quality, Coeur d'Alene Idaho and Coeur d'Alene Tribe, Plummer, Idaho.

Idaho Department of Fish and Game (IDFG). 2005. Idaho Comprehensive Wildlife Conservation Strategy. Idaho Conservation Data Center, Idaho Department of Fish and Game, Boise, ID. http://fishandgame.idaho.gov/cms/tech/CDC/cwcs.cfm

IDFG. 2013. Management Plan for the Conservation of Westslope Cutthroat Trout in Idaho. Idaho Department of Fish and Game Fisheries Bureau Boise, Idaho. 813 pp.

IDFG. 2014. Coeur d'Alene River Management Area: 2014 – 2023 Management Plan, published December 2014. Prepared by M. Benker. 97 pp.

IDFG. 2015. Idaho Conservation Data Center. Elements of occurrence database. Idaho Department of Fish and Game, Boise, Idaho.

Idaho Department of Health and Welfare (IDHW). 2003. Evaluation of Metals in Bullhead, Bass, and Kokanee from Lake Coeur d'Alene. EPA Facility ID: IDD048340921 and Joint Fish Consumption Advisory issued by the State and Coeur d'Alene Tribe.

IDHW. 2016. Eat Fish, Be Smart, Choose Wisely - A guide to safe fish consumption for fish caught in Idaho waters. Idaho Department of Health and Welfare Bureau of Community and Environmental Health. Retrieved from: http://healthandwelfare.idaho.gov/Portals/0/Health/EnvironmentalHealth/FishGuide.pdf?ver=2012-08-30-084538-907.

Idaho Department of Parks and Recreation (IDPR). 2014. Idaho's Statewide Comprehensive Outdoor Recreation and Tourism Plan 2013-2017. 349 pp.

Idaho State Tax Commission. 2015. https://tax.idaho.gov/i-1023.cfm

Idaho State Tax Commission. 2014. 2014 Annual Report. http://tax.idaho.gov/reports/EPB00033_12-02-2014.pdf

IMpacts for PLANning (IMPLAN). 2012. Minnesota IMPLAN Group, Inc. Version 3.1.1001.2 Copyright 2014. Additional information available at www.implan.com.

Inland Empire Cooperative Weed Management Area. 2014. Weed Identification and Control Handbook 2014. 58 pp.

Interagency Grizzly Bear Committee. 2014. Interagency Grizzly Bear Committee (IGBC) .USDA Forest Service Federal Building - 200 East Broadway Missoula, MT 59802. http://www.igbconline.org/index.php/executive-committee

Interagency Lynx Biology Team. 2013. Canada lynx conservation assessment and strategy. 3rd edition. USDA Forest Service, USDI Fish and Wildlife Service, USDI Bureau of Land Management, and USDI National Park Service. Forest Service Publication R1-13-19, Missoula, MT. 128 pp.

Intergovernmental Panel on Climate Change (IPCC). 2014. Climate Change 2014: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Jankovsky-Jones, M. 1999. Conservation strategy for Spokane River Basin wetlands. Unpublished report prepared with funding from the United States Environmental Protection Agency through Section 104(b) (3) of the Clean Water Act. 26 pp. plus appendices.

Jeppson, P. 1960. Survey of fish populations in the lower St. Joe and St. Marie's Rivers, 1959. Idaho Dept. of Fish and Game. Coeur d'Alene, ID.

Jones, D. and A. Hansen. 2009. Factors Influencing Riparian Breeding Bird Communities Along the Middle and Lower Yellowstone River. Prepared for U.S. Army Corps of Engineers. 80 pp.

Kinkead, B. and J. Firehammer. 2011. Coeur d'Alene Tribe Fisheries Program – Final Draft Annual Report, Hangman Creek Fisheries Restoration, 2004-2007.

Kipp, S., and Callaway, C. 2003. On the Living Edge: Your Handbook for Waterfront Living, Ontario Edition. The Federation of British Columbia Naturalists. Co-published by Conservation Ontario. and Rideau Valley Conservation Authority. pp 148.

Kiser, T. 2015. Personal communication 9-11-2015. Email message reporting results of 2013 sampling in lower basin wetlands to J. Christensen.

Knapp, T.A., and P.E. Graves. 1989. On the Role of Amenities in Models of Migration and Regional Development. Journal of Regional Science 29(1): 71-87. http://spot.colorado.edu/~gravesp/JRSAmenitiesAndMigration1989.pdf

Kootenai County. 2010. Kootenai County Comprehensive Plan. Retrieved from: http://www.kcgov.us/ departments/planning/newcompplan.asp

Kootenai-Shoshone Soil and Water Conservation District (KSSWCD) and IDEQ. 2010. Lower Coeur d'Alene Riverbank Stabilization Prioritization. 57 pp.

Kuwabara, J.S., Topping, B.R., Woods, P.F., and Carter, J.L. 2007. Free zinc ion and dissolved orthophosphate effects on phytoplankton from Coeur d'Alene Lake, Idaho: 2007. Environmental Science and Technology, v41 i8, pp 2811-2817.

Lambert, S. M. 2000. Plant guide for common camas: ethnobotony, culture, management and use. Plant Materials Center Technical Note #41. Pullman, WA. http:/www.wsu.edu/~pmc~nrcs/technotes/plant_materials/tmtpm41.htm

Lannoo, M.J. (ed.). 2005. Amphibian Declines: The Conservation Status of United States Species. University of California Press, Berkeley, California. 1094 pp.

Lewis, D. J., G. Hunt, and A.W. Plantinga. 2003. "Does Public Lands Policy Affect Local Wage Growth?" Growth and Change 34(1): 64-86.

Liao, F.H., Wilhelm, F.M., and M. Solomon. 2016. "The Effects of Ambient Water Quality and Eurasian Watermilfoil on Lakefront Property Values in the Coeur d'Alene Area of Northern Idaho, USA." Sustainability 8(44).

Lichthardt, J., and R. K. Moseley. 1997. Status and conservation of the Palouse grassland in Idaho. Idaho Department of Fish and Game. Boise, Idaho, USA.

Lillengreen, K.L., Skillingstad, T., and A. T. Scholz. 1993. Fisheries habitat evaluation on tributaries of the Coeur d'Alene Indian Reservation. Bonneville Power Administration. Division of Fish and Wildlife. Portland, Or. Project #90-44. 218 pp.

Lillengreen, K., A. Vitale, and R. Peters. 1996. Fisheries Habitat Evaluation of Tributaries of the Coeur d'Alene Indian Reservation, 1993, 1994 Annual Report; Coeur d'Alene Tribe, Fish and Wildlife Program, Plummer, ID. 260 pp.

Long, K.R. 1998. Production and disposal of mill tailings in the Coeur d'Alene mining region, Shoshone County, Idaho–Preliminary estimates: U.S. Geological Survey Open-File Report 98-595, 14 pp.

Lynch, J. 2011. In Idaho, Former Mining Town Reinvents Itself a Trails Destination, The National Rails-to-Trail Conservancy. http://www.railstotrails.org/news/features/hiawathatrail.html

Lyon, J. and C.L. Sagers. 1998. Structure of herbaceous plant assemblages in a forested riparian landscape. Plant Ecology 138: 1-16.

Mabile, N. 2014. "Comprehensive Economic Development Strategy: Proudly serving Benewah, Bonner, Boundary, Kootenai and Shoshone counties 2014-2019." Panhandle Area Council, North Idaho Economic Development Corporation.

MacArthur, R.H. & E.O. Wilson. 1967. The theory of island biogeography. Princeton University Press, New Jersey

Mace, R.D. and J.S. Waller. 1996. Grizzly bear distribution and human conflicts in the Jewel Basin hiking area, Swam Mountains, Montana. Wildlife Society Bulletin 24: 461-467.

Mace, R. D., J. S. Waller, T. L. Manley, L. J. Lyon and H. Zuuring. 1996. Relationships among grizzly bears, roads and habitat in the Swan Mountains, Montana. Journal of Applied Ecology 33: 1395-1404.

Maclay, D.J. 1940. Tentative management plan—Coeur d'Alene National Forest. U.S. Forest Service, Coeur d'Alene, Idaho.

Magoulick, D.D. and R. Kobza. 2003. The role of refugia for fishes during drought: a review and synthesis. Freshwater Biology 48: 1186-1198.

Mallet, J. 1968. Coeur d'Alene Lake fisheries investigations. Idaho Dept. of Fish and Game. Coeur d'Alene, ID.

Mallett, J. 1969. The Coeur d'Alene Lake fishery. Idaho Wildlife Review. May-June, 1969. Pp 3-6.

Matheson, C. 2015. Meeting with R. Stevens on 12-14-15 to discuss contemporary geographic preference among tribal cultural and subsistence practices.

Mathis, A. 1989. Do seasonal spatial distributions in a terrestrial salamander reflect reproductive behavior or territoriality? Copeia, 1989, 783-786.

Mauser, G.R. 1972. Abundance and emigration of north Idaho cutthroat trout enclosed within sections of a tributary stream. Master's thesis, University of Idaho, Moscow.

McLellan, B.N. and F. Hovey. 2001. Natal dispersal of grizzly bears. Canadian Journal of Zoology 79: 838-844.

Meyerson L.A., Saltonstall K., Windham L., Kiviat E., and S. Findlay. 2000. A comparison of *Phragmites australis* in freshwater and brackish marsh environments in North America. Wetlands Ecology and Management: 8: 89–103

Mitchell, V.E. and E.H. Bennett. 1983. Production Statistics for the Coeur d'Alene Mining District, Shoshone County, Idaho, 1884-1980. Idaho Bureau of Mines and Geology, Technical Report 83-3.

Miller, H. L., Stevenson, A., Beckner, C. and J. A. Grant. 2014. Bunker Hill Mining and Metallurgical Complex Superfund Site Historic Properties Management Plan. Reported submitted to the Environmental Protection Agency and Coeur D'Alene Trust by Historical Research Associates, Inc., Seattle, Washington.

Mitsch, W. J. and J. G. Gosselink. 2000. Wetlands. Third edition. John Wiley & Sons. New York, New York, USA.

Morris, D. and M. Walls. 2009. "Climate Change and Outdoor Recreation Resources." Washington, DC: Resources for the Future. 1616 P St. NW Washington, DC 20036.

Moser, K., Changwoo, A., and G, Noe. 2007. Characterization of Microtopography and its influence on vegetation patterns in created wetlands. Wetlands 27(4): 1081–1097. The Society of Wetland Scientists.

Moseley, R.K. and R.J. Bursik. 1994. Black Cottonwood Communities of Spion Kop Research Natural Area, Coeur d'Alene River, Idaho. January. Cooperative Challenge Cost Share Project, Idaho Panhandle National Forests and Idaho Conservation Data Center, Idaho Department of Fish and Game.

Mote, P., A.K. Snover, S. Capalbo, S.D. Eigenbrode, P. Glick, J. Littell, R. Raymondi, and S. Reeder. 2014. Northwest. *In* Climate change impacts in the United States: The third national climate assessment, edited by J.M. Melillo, T.C. Richmond, and G.W. Yohe. Washington, DC: U.S. Global Change Research Program.

Muhlfeld, C. C., D. H. Bennett, R. K. Steinhorst, B. Marotz, and M. Boyer. 2008. Using bioenergetics modeling to estimate consumption of native juvenile salmonids by nonnative northern pike in the upper Flathead River system, Montana. North American Journal of Fisheries Management 28: 636–648.

Muhlfeld C. C., Kalinowski S. T., McMahon T. E., Taper M. L., Painter S., Leary R. F., et al. 2009. Hybridization rapidly reduces fitness of a native trout in the wild. Biol. Lett. 5: 328–331.

Murphey, E.V.A. 1959. Indian uses of native plants. Mendocino County Historical Society. 81 pp.

Murphy, C., J. Miller, and A. Schmidt. 2012. Idaho's landscape-scale wetland condition assessment tool— Methods and applications in conservation and restoration planning. Prepared for U. S. Environmental Protection Agency, Region 10, Wetland Program Development Grant. Idaho Department of Fish and Game, Wildlife Bureau, Habitat Section and Wildlife Diversity Program, and Information Systems Bureau, Idaho Fish and Wildlife Information System. 60 pp. plus appendices.

Murray, B.G., Jr. 1967. Dispersal in vertebrates. Ecology 48: 975-978.

Naiman, B., Bechtold, J.S., Beechie, T..J, Latterell, J.J. and R. Van Pelt. 2010. A process-based view of floodplain forest patterns in coastal river valleys of the Pacific Northwest. Ecosystems 13(1): 1-31

National Research Council Committee on Superfund Site Assessment and Remediation in the Coeur d'Alene River Basin (NRC). 2005. Superfund and Mining Megasites: Lessons from the Coeur d'Alene Basin. Washington, D.C., National Academies Press, 382 pp.

Nelson, C. 2016 memorandum to Bob Steed, Idaho Department Environmental Quality, on St. Joe River stabilization.

Normandeau Associates. 2012. Final Report: Predatory Fish Removal Analysis Lower St Joe River, Idaho 2009-2011. Report prepared for the AVISTA Corporation.

North Idaho Economic Development Corporation. 2014. Comprehensive Economic Development Strategy 2014-2019 for Region 1 of Northern Idaho. *Prepared by Nancy Mabile, Planning Consultant for* Panhandle Area Council, Inc. 164 pp.

Northwest Power Planning Council (NPPC). 2001. Coeur d'Alene Subbasin Summary. Prepared by: Coeur d'Alene Tribe, Idaho Dept. of Fish and Game, Idaho Dept. of Env. Quality, Idaho Dept. of Lands, USDA US Forest Service, USDA Natural Resources Conservation Service, and U.S. Fish and Wildlife Service.

NPPC. 2004. Spokane Subbasin Plan. *In* Columbia River Basin Fish and Wildlife Program. Portland, Oregon.

NPPC. 2005. Coeur d'Alene Subbasin Plan. *In* Columbia River Basin Fish and Wildlife Program. Portland, Oregon, 2005.

Panhandle Bull Trout Technical Advisory Team (PBTTAT). 1998. Coeur d'Alene Lake Basin bull trout problem assessment. Draft. Prepared for the State of Idaho. December 1998.

Parametrix. 2003. Draft Report. St. Joe River Juvenile Adfluvial Bull Trout Out-Migration Evaluation, 2003. Prepared for Fisheries Work Group, Spokane River Project Relicensing. October.

Parametrix. 2004. Spokane River Hydroelectric Project wetland and riparian habitat mapping and assessment. Final. Prepared for Avista Corporation, Spokane, WA. Partametrix, Kirkland, WA. July 2004.

Parker, J. and J.K. Wulfhorst. 2002. “Social Assessment for the Idaho Panhandle National Forests.”. University of Idaho under an agreement with the USDA FS. Challenge Cost Share Agreement No: 01-CS-11010400-018.

Partners in Flight. 2000. Idaho Bird Conservation Plan, Version 1.0--January 2000. Idaho Partners in Flight Coordinator, Hamilton, MT. 167 pp.

Patton D.R. and B.I Judd. 1970. The Role of Wet Meadows as Wildlife Habitat in the Southwest. Journal of Range Management 23(4): 272-275.

Peltier, J. 1975. Manners and customs of the Coeur d'Alene Indians: With some comparative studies. Spokane, Wash: Peltier Publications.

Perkins, S. 2007. Stream Channel Analysis North Fork Coeur d’Alene River Subbasin. Submitted to the Idaho Department of Environmental Quality, Coeur d’Alene, ID. 92 pp.

Pess, G. R., T. Quinn, R. Hilborn, and K. Kloehn. 2007. The influence of population dynamics and landscape condition on pacific salmon (*Oncorhynchus* spp.) re-colonization. Proceedings from the International Association of Landscape Ecology World Congress, July 8-12, 2007.

Peters, R. and A.J. Vitale. 1998. Supplementation Feasibility Report. Bonneville Power Administration, Project Number 90-044, Portland, Oregon.

Peters, R., Kinkead, B., and M. Stanger. 2003. Year-End Report: 2001-2002 Implementation of Fisheries Enhancement on the Coeur d’Alene Indian Reservation. BPA Project # 2001-032-00. Coeur d’Alene Tribe Department of Natural Resources Fisheries Program, Plummer, ID.

Peterson, S. 2015. “Tribal Economic Impacts: The Economic Impacts of the Five Idaho Tribes on the Economy of Idaho.”

Rabbi, F. 1994. Trace element geochemistry of bottom sediments and waters from the lateral lakes of Coeur d’Alene River, Kootenai County, North Idaho. Ph.D. Dissertation, Geology, University of Idaho, Moscow. pp. 256.

Rankel, G.L. 1971. An appraisal of the cutthroat trout fishery of the St. Joe River. M.S. Thesis, Univ. of Idaho. 55 p.

Reyna, M., Smith, J., and B. Foltz. 2013. Coeur d’Alene Community Survey: Residents Perspectives on Values, Trends, Issues, and Future Vision. University of Idaho. *In* http://www.cda2030.org/img/docs/CDAReport_FinalDraft_10_28.pdf.

Rich, B.A. 1992. Population dynamics, food habits, movement and habitat use of northern pike in the Coeur D’Alene River system, Idaho. Idaho Department of Fish and Game, Fisheries Management Investigations. Completion Report, F-73- R-14, Subproject No.: VI Study No. 3.

Ridolfi Engineers and Associates, Inc. 1993. Assessment Plan for the Coeur d'Alene Basin Natural Resource Damage Assessment, Phase I. Prepared for the Natural Resource Trustees, Coeur d'Alene Tribe, United States Department of Agriculture and United States Department of Interior.

Ridolfi Engineers and Associates, Inc. 1995. Surface Water Quality Data Compilation and Evaluation. Prepared for the Natural Resource Trustees. August.

Ridolfi Engineers and Associates, Inc. 1998. Revised Draft Restoration Plan for the Coeur d'Alene Basin NRDA. Prepared for the Coeur d'Alene Tribe. November.

Ridolfi Engineers and Associates, Inc. 1999. Draft Surface Water Quality Data Compilation and Evaluation and Addendum. Prepared for the Natural Resource Trustees. April.

Ridolfi Inc. and C.M. Falter. 2004. Restoration plan; Coeur d'Alene Basin natural resource damage assessment. Prepared for the Natural Resource Trustees by Ridolfi Inc. and C. Michael Falter, Ph.D.

Rieman, B. E., and J. D. McIntyre. 1993. Demographic and habitat requirements for conservation of bull trout. United States Forest Service, Intermountain Research Station, General Technical Report INT 302, Ogden, Utah.

Rodewald, P. (Editor). 2015. The Birds of North America Online: http://bna.birds.cornell.edu/BNA/. Cornell Laboratory of Ornithology, Ithaca, NY.

Rosgen, D.L. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, CO.

Saldi-Caromile, K., K. Bates, P. Skidmore, J. Barenti, D. Pineo. 2004. Stream Habitat Restoration Guidelines: Final Draft. Co-published by the Washington Departments of Fish and Wildlife and Ecology and the U.S. Fish and Wildlife Service. Olympia, Washington.

Sauter, S. T., J. McMillan, and J. Dunham. 2001. Issue Paper 1. Salmonid behavior and water temperature. Prepared as part of U.S. EPA Region 10 Temperature Water Quality Criteria Guidance Development Project. EPA-910-D-01-001. Available at http://yosemite.epa.gov/R10/WATER.NSF/1507773cf7ca99a7882569ed007349b5/ce95a3704aeb5715882568c400784499?OpenDocument

Scholz, A.T., K. O'Laughlin, D.R. Geist, J.K. Uehara, D. Peone, L. Fields, T.R. Kleist, I. Zozaya, T. Peone and K. Teesatuskie. 1985. Compilation of information on salmon and steelhead total run size, catch and hydropower related losses in the Upper Columbia River Basin, above Grand Coulee Dam. Fisheries Technical Report No. 2, Upper Columbia United Tribes, Fisheries Center. Eastern Washington University, Cheney, Washington. Fisheries Technical Report No. 2.

Schwantes, Carlos A. 1991 *In Mountain Shadows: A History of Idaho*. University of Nebraska Press, Lincoln.

Scott, C. 2013. “Foraging for edible plants and fungi in the forests of the Inland Northwest,” *Inlander*, May, 2013.

Scott, O. A. 1968. Pioneer days on the shadowy St. Joe. Coeur d’Alene, Idaho. 2nd Ed. Caxton Printers Ltd, Caldwell, Idaho. 372 pp.

Sedell, J.R., G.H. Reeves, F.R. Hauer, J.A. Standord, and C.P. Hawkins. 1990. Role of refugia in recovery from disturbances: Modern fragmented and disconnected river systems. Environ. Manage. 14: 711–724.

Seltice, J. 1990. Saga of the Coeur d'Alene Indians: an account of Chief Joseph Seltice. D. J. Kowrach and T. E. Connolly, editors. Ye Galleon Press. Fairfield, WA.

Servheen, G., and L.J. Lyon. 1989. Habitat use by woodland caribou in the Selkirk Mountains. J. Wildl. Manage. 53: 230-237.

Shea, K. and P. Chesson. 2002. Community ecology theory as a framework for biological invasions. Trends in Ecology and Evolution 17: 170-176.

Shelly, J.S. and J. Gamon. 1996. Public and agency review draft, water howellia (Howellia aquatilis) recovery plan. U.S. Fish and Wildlife Service, Helena, MT. 51 p.

Sileo, L., Creekmore, L.H., Audet, D.J., Snyder, M.R., Meteyer, C.U., Franson, J.C., Locke, L.N., Smith, M.R. and D.L. Finley. 2001. Lead poisoning of waterfowl by contaminated sediment in the Coeur d'Alene River. Archives of Environmental Contamination and Toxicology. 41: 364-368.

Sprague, R. 1999. An Anthropological summary of the dependence of the Coeur d’Alene Tribe upon Coeur d’Alene Lake. Report to Coeur d'Alene Tribe, Plummer, Idaho. Written Testimony in United States Government vs. ASARCO et aI., Idaho District Court, Coeur d'Alene, Idaho.

Stevens, B. S., and J. M. DuPont. 2011. Summer use of side-channel thermal refugia by salmonids in the North Fork Coeur d'Alene River, Idaho. North American Journal of Fisheries Management 31: 683-692.

Stratus Consulting (Stratus). 2000. Report of injury assessment and injury determination: Coeur d'Alene Basin natural resource damage assessment. Prepared for the U.S. Department of the Interior, U.S. Department of Agriculture, and Coeur d'Alene Tribe by Stratus Consulting Inc., Boulder, CO.

Stratus . 2009. 2008 Fish Population Monitoring and Environmental Sampling in the South Fork Coeur d' Alene River Basin, Idaho: Data Report. Prepared for the United States Department of Justice and the Coeur d' Alene Tribe. February 2009.

Stromberg, K., Lider, E., and C. James. 2013. North Fork Coeur d’Alene River Subbasin Watershed Restoration Effectiveness Review –Sediment Reductions and Biological Response. Report to Environmental Protection Agency, Boise, ID. 75 pp.

Strong, C. and C. Webb. 1970. White Pine: King of Many Waters, published by Mountain Press, Missoula, Montana.

Taylor, A.R. and R.L. Knight. 2003. Wildlife Responses to Recreation and Associate Visitor Perceptions. Ecological Applications 13: 951-963.

Tumeo M.A., and J. Pavlick. 2011. A Study of Bankfull Culvert Design Effectiveness. Report Number: FHWA/OH 2011/12. June 2011.

University of Idaho. 2007. The Coeur d'Alene Reservation Community Bioregional Atlas. University of Idaho Sustainable Communities Initiative. 79 pp.

URS Greiner and CH2M Hill. 2001. Final Remedial Investigation Report, Coeur d'Alene Basin. Prepared for USEPA, Region 10. October 2001.

U.S. Bureau of Reclamation (USBR). 2009. Water and Land Recreation Opportunity Spectrum (WALROS) Users' Handbook, Second Edition. Denver, Colorado: U.S. Department of Interior, Bureau of Reclamation Policy and Administration. 167 pp.

U.S. Department of Agriculture (USDA). 1997. Riparian Forest Buffer Handbook for the Chesapeake Bay Watershed. United States Department of Agriculture, Environmental Protection Agency, Forest Service and Northeastern Area State & Private Forestry, NA-TT-02-97. Washington, DC.

U.S. Department of Commerce (USDC). 2013. Census Bureau, American Community Survey Office. Washington, D.C. http://quickfacts.census.gov/

USDC. 2014. Bureau of Economic Analysis, Regional Economic Accounts. Table CA30. Washington, D.C.

U.S. Department of the Interior (DOI). 2014. U.S. Department of the Interior Economic Report FY 2013. Washington, D.C. 40 p.

U.S. Environmental Protection Agency (USEPA). 1991. Record of Decision, Bunker Hill Mining and Metallurgical Complex residential soils operable unit, Shoshone County, Idaho. U.S. Environmental Protection Agency Report.

USEPA. 1992. Record of Decision, Bunker Hill Mining and Metallurgical Complex, Shoshone County, Idaho. U.S. Environmental Protection Agency Report.

USEPA. 1995. Water Quality Functions of Riparian Forest Buffer Systems in the Chesapeake Bay Watershed. Chesapeake Bay Program, United States Environment Protection Agency, Washington, DC. EPA 903-R-95-004.

USEPA. 2001. Final Ecological Risk Assessment. Coeur d'Alene Basin Remedial Investigation/Feasibility Study. Prepared by CH2M Hill and URS Corporation. Region 10 EPA, Seattle, Washington.

USEPA. 2002. Record of Decision, The Bunker Hill Mining and Metallurgical Complex Operable Unit 3, Response Action Contract No. 68-W9-0054/0031, United States Environmental Protection Agency, Region 10. September 2002.

USEPA. 2012. Interim Record of Decision (ROD) Amendment, Bunker Hill Mining and Metallurgical Complex Superfund Site, United States Environmental Protection Agency, Region 10. August 2012.

USEPA. 2013. Bunker Hill Mining and Metallurgical Complex Superfund Site Superfund Cleanup Implementation Plan, 2012-2022, United States Environmental Protection Agency, Region 10. February 2013.

USEPA. 2015a. Fourth Five-year Review Report for Bunker Hill Superfund Site, Shoshone and Kootenai Counties, Idaho. United States Environmental Protection Agency, Region 10. February 2013. 310 pp.

USEPA. 2015b. Connectivity of Streams and Wetlands to Downstream Waters: A Review and Synthesis of Scientific Evidence.

US Forest Service (USFS). 1979. The Recreation Opportunity Spectrum: A Framework for Planning, Management, and Research. General Technical Report. PNW-98. Portland, OR: Pacific Northwest Forest and Range Experiment Station. 39 p

USFS. 1995. Landscape Aesthetics: A Handbook for Scenery Management. Agric. Handbook. 701. Washington, DC: U.S. Department of Agriculture, Forest Service. 246 p.

USFS. 2002. Idaho Panhandle National Forests FOREST PLAN MONITORING AND EVALUATION REPORT 2002. Idaho Panhandle National Forest, Coeur d'Alene, Idaho. 121 pp.

USFS. 2009. Visitor Use Report. Idaho Panhandle NF. USDA Forest Service. Region 1. National Visitor Use Monitoring (NVUM). Last updated 2015.

USFS. 2010. KIPZ Climate Change Report. Idaho Panhandle National Forest, Coeur d'Alene, Idaho. 203 pp.

USFS. 2012. Coeur d'Alene River Corridor Management Plan: North Fork and Little North Fork of the Coeur d'Alene River. Coeur d'Alene, Idaho: Idaho Panhandle National Forest, Coeur d'Alene River Ranger District. 53p.

USFS. 2013. Final Environmental Impact Statement for the Revised Land Management Plan Idaho Panhandle National Forests. Idaho Panhandle National Forests, Coeur d'Alene, ID. 741 pp.

USFS. 2015. Land Management Plan 2015 Revision, Idaho Panhandle National Forests. Forest Service. http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3826554.pdf

U.S. Fish and Wildlife Service (USFWS). 1998. Bull trout interim conservation guidance. U.S. Fish and Wildlife Service. December 1998.

USFWS. 2002. Chapter 15, Coeur d'Alene Lake Basin Recovery Unit, Oregon. 92 p. *In* U.S. Fish and Wildlife Service. Bull Trout (*Salvelinus confluentus*) Draft Recovery Plan. Portland, Oregon.

USFWS. 2004. Director's Memorandum on Application of the Destruction of Adverse Modification Standard under Section 7 (a)(2) of the Endangered Species Act. Memorandum to Regional Directors, Regions 1, 2, 3, 4, 5, 6, and 7 from U.S. Department of Interior, U.S. Fish and Wildlife Service, Director. December 9, 2004.

USFWS. 2006. Final Report. Annual Report 2005 Biological Resource Monitoring Coeur d'Alene Basin Operable Unit 3. Upper Columbia Fish and Wildlife Office, Spokane, WA. 33 pp.

USFWS. 2007. Annual report: 2006 Biological resource monitoring, Coeur d'Alene Basin Operable Unit 3. Final Report. USFWS, Spokane, Washington.

USFWS. 2008. Bunker Hill Facility Non-Populated Areas Operable Unit 2 Biological Monitoring, 2007. Final Report. USFWS, Spokane, Washington.

USFWS. 2010. [October 18] 50 CFR Part 17 Endangered and Threatened Wildlife and Plants: Critical Habitat Revised Designation of Critical Habitat for Bull Trout in the Coterminous United States (*Salvelinus confluentus*). Federal Register. 75 FR 200.

USFWS. 2014a. Revised draft recovery plan for the coterminous United States population of bull trout (*Salvelinus confluentus*). Portland, Oregon. xiii + 151 pp.

USFWS. 2014b. Biological Resource Monitoring 2010-2012, Bunker Hill Mining and Metallurgical Complex Superfund Site Operable Units 2 and 3. Final Report. USFWS, Spokane, Washington.

USFWS. 2014c. 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation: Idaho. Washington, D.C. 84 p.

USFWS. 2015. Columbia Headwaters Recovery Unit Implementation Plan for Bull Trout. 184 Prepared by U.S. Fish and Wildlife Service Montana Ecological Services Office, Kalispell Suboffice, Kalispell, Montana, Northern Idaho Field Office and Eastern Washington Field Office Spokane, Washington 184 pp.

USFWS. 2016. Draft Annual Report: 2013 Biological resource monitoring, Coeur d'Alene Basin Operable Unit 3. Draft Report. USFWS, Spokane, Washington.

U.S. Natural Resources Conservation Service (USNRCS). 2007. Noxious, Invasive, and Alien Plant Species: A Challenge in Wetland Restoration and Enhancement. Technical Note No. 190–72 March 2007. 26 pp.

USNRCS. 2008. Wetland Macrotopography. United States Department of Agriculture Biology Technical Note. NRCS, Indiana. ver. 1.0. 9 pp.

Van de Riet, K. 2016. Memorandum to Craig Cooper, Idaho Department Environmental Quality, on Coeur d'Alene River stabilization.

Van der Valk, A.G., Squires, L. and Welling, C.H. 1994. Assessing the impacts of an increase in water level on wetland vegetation. Ecol. Appl. 4: 525-534.

Vaughn, C.C, Allen D.C., Irmscher, P. and C. J. Miller. 2009. Freshwater mussel ecology: a multifactor approach to distribution and abundance. Journal of the North American Benthological Society 28 (2): 515-516.

Verry, E.S., Hornbeck, J.W., and C.A. Dolloff (eds). 2000. Riparian Management in Forests of the Continental Eastern United States. Lewis Publishers, Boca Raton, FL.

Vitale, A. 2015. Pers comm. Email message 9-22-2-15 to J. Christensen confirming presence of fluvial trout in the Hangman Creek system.

Walker, W. D. 1977. Indians of Idaho. University of Idaho Press. Moscow, ID. 207 pp.

Walker, D.E., editor. 1998. *Plateau: Handbook of North American Indians*, Volume 12, Smithsonian Institution Press, Washington DC.

Waller J.S and R. D. Mace. 1997. Grizzly Bear Habitat Selection in the Swan Mountains, Montana. The Journal of Wildlife Management 61 (4): 1032-1039.

Waller, J. and C. Servheen. 2005. Effects of Transportation Infrastructure on Grizzly Bears in Northwestern Montana. Journal of Wildlife Management 69 (3): 985-1000. 16pp.

Walrath, J.D., Quist, M.C. and J.A. Firehammer. 2015. Trophic Ecology of Nonnative Northern Pike and their Effect on Conservation of Native Westslope Cutthroat Trout, North American Journal of Fisheries Management, 35:1, 158-177, DOI: 10.1080/02755947.2014.970678.

Washington Department of Ecology (WADOE). 2005. The Hangman (Latah) Creek Water Resources Management Plan. Washington State Department of Ecology, Watershed Planning Grant #G0000101. Public Data File No. 05-02**.** Department of Ecology, Spokane, WA.

WADOE. 2008. Detailed Implementation Plan Hangman (Latah) Creek Watershed Water Resource Inventory Area 56. Department of Ecology, Spokane, WA.

WADOE. 2011. Hangman (Latah) Creek Watershed Fecal Coliform, Temperature, and Turbidity Total Maximum Daily Load, Water Quality Improvement Report. Publication No. 11-10-012. Department of Ecology, Spokane, WA.

Washington Department of Fish and Wildlife (WADFW). 2003. Design of Road Culverts for Fish Passage. Washington Department of Fish and Wildlife, 600 Capitol Way N.Olympia, WA 112 pp.

Watt, K. E. F. 1972. Man's efficient rush toward deadly dullness. Nat. His. 81(2): 74-77, 80, 82.

WADFW. 2009. Fish Passage and Surface Water Diversion Screening Assessment and Prioritization Manual. Washington Department of Fish and Wildlife. Olympia, Washington.

Watters, G. T. 1996. Small Dams as Barriers to Freshwater Mussels (Bivalvia, Unionoida) and their Hosts." Biological Conservation 75: 79-85.

Weixel, C. (Director of Benewah Wellness Center). 2015. Conversation with Forest Service Landscape Architect Morai Helfen on 8-2015 about recreation activities popular among tribal members.

White, E. M., Gooding, D.B., and D. J. Stynes. 2013. "Estimation of National Forest Visitor Spending Averages from National Visitor Use Monitoring: Round 2." USDA Forest Service Pacific Northwest Research Station and Oregon State University. 65 p.

White, D., Kendall K.C. and H.D. Picton. 1999. Potential energetic effects of mountain climbers on foraging grizzly bears. Wildl. Soc. Bull. 27: 146–151.

White, T.A., D.L. Mengel, and C.L. Grandinette. 2003. The Bunker Hill Hillsides: Site History and Planning for Early Successional Restoration on the Nation's Largest Superfund Site. Paper presented at the 2003 National Meeting of the American Society of Mining and Reclamation and the 9th Billings Land Reclamation Symposium, Billings MT, June 3-6, 2003. Published by ASMR, 3134 Montavesta Rd., Lexington, KY 40502.

Winslow, L.A., Read, J.S, Hanson, P.C, and E. H. Stanley. 2014. Lake shoreline in the contiguous United States: quantity, distribution and sensitivity to observation resolution. Freshwater Biology 59: 213–223.

Woods, P.F. and M.A. Beckwith. 1997. Nutrient and trace element enrichment of Coeur d'Alene Lake, Idaho. U.S. Geological Survey Water-Supply Paper 2485, 93 pp.

Zedler, J. and S. Kercher. 2004. Cause and consequences of invasive plants in wetlands: opportunities, opportunists, and outcomes. Critical Reviews in Plant Science 23: 431–452.

Chapter 6. List of Preparers

The preparation of the draft EIS for the Coeur d'Alene Basin Restoration Plan has been a major undertaking. This list of preparers is limited to those people who were members of the EIS Interdisciplinary Team (IDT) working on these draft documents. Preparation of these documents could not have been completed without the support and assistance from staff from the Coeur d'Alene Tribe, Idaho Department of Environmental Quality, Idaho Department of Fish and Game, Bureau of Land Management, the U.S. Forest Service Idaho Panhandle National Forest and Regional Office, and the US. Fish and Wildlife Service Eastern Washington Field Office, Northern Idaho Field Office, and Regional Office.

Members of the Interdisciplinary Team

Name	Unit	Position
Jo Christensen	U.S. Forest Service Idaho Panhandle National Forest	Team Lead, Aquatic Habitat and Species, Hydrology, Soils, Vegetation
Carl Davis	U.S. Forest Service Region 1	Heritage Resources
Morai Helfen	U.S. Forest Service Idaho Panhandle National Forest	Recreation
Carrie Hugo	U.S. Bureau of Land Management Coeur d'Alene Field Office	Terrestrial Habitat and Species
Jeff Johnson	U.S. Forest Service Idaho Panhandle National Forest	Geology
Tim Kiser	U.S. Fish and Wildlife Service Northern Idaho Field Office	Terrestrial Habitat and Species
Steve Lucas	U.S. Forest Service Region 1	Heritage Resources
Scott Pavey	U.S. Bureau of Land Management Coeur d'Alene District	NEPA Specialist
Rebecca Stevens	Coeur d'Alene Tribe	Tribal Resources
Kristen Waltz	U.S. Forest Service TEAMS	Socio-economics
Judy York	U.S. Forest Service TEAMS	Writer-Editor

Support to the Interdisciplinary Team

Name	Unit	Position
Krista Gebert	U.S. Forest Service Region 1	Socio-economics
Delilah Jaworski	U.S. Forest Service TEAMS	Socio-economics
Shawn Gibson	U.S. Forest Service Idaho Panhandle National Forest	Heritage Resources
Dave Leptich	Idaho Dept. of Fish and Game Panhandle Regional Office	Terrestrial Wildlife
Caj Matheson	Coeur d'Alene Basin Natural Resource Trustees	Public Affairs
John Ruebke	U.S. Forest Service Idaho Panhandle National Forest	Soils
Kajsa Van de Riet	Idaho Dept. of Environ. Quality Coeur d'Alene Regional Office	GIS Support, Fisheries

Appendix 1 – Relevant Statutes and Authorities

This appendix presents a review some of the primary potentially applicable laws and regulations that govern the Trustee Council restoration projects. Many federal, state, and local laws and regulations need to be considered during the development of restoration projects as well as regulatory requirements that are typically evaluated during the federal and state permitting process

LEGAL AND ADMINISTRATIVE FRAMEWORK

Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), 42 U.S.C §§ 9601 *et seq.*

National Environmental Policy Act (42 U.S.C. 4321 et seq.)

Rivers and Harbors Act of 1899, Sections 9 and 10 (33 U.S.C. 401)

Federal Water Pollution Control Act (Clean Water Act) (33 U.S.C. 1251-1387)

Clean Air Act, as amended, 42 U.S.C §§ 7401, et seq.

Endangered Species Act (16 U.S.C. Chapter 35)

Wild and Scenic Rivers Act (16 U.S.C. 1271-1287)

Fish and Wildlife Coordination Act (16 USC 661-666c)

Americans with Disabilities Act (ADA) of 1990, as amended (42 U.S.C. § 126 and 47 U.S.C § 5)

Section 508 of the Rehabilitation Act, 29 U.S.C. 749D

Archaeological Resources Protection Act, 16 U.S.C §§ 469, et seq.

National Historic Preservation Act, 16 U.S.C §§ 470 et seq.

Federal Farmland Protection Policy Act, 7 CFR part 658

Idaho Fish and Game Statutes (Title 36, Idaho Code)

Idaho Environmental Protection and Health Act (Title 39 Idaho Code)

Idaho Water Rights and Reclamation Statutes (Title 42, Idaho Code)

Idaho Public Lands Statutes (Title 58, Idaho Code)

DIRECTIVES AND EXECUTIVE ORDERS

Executive Order 11990 – Protection of Wetlands

Executive Order of 1873 Establishing the Coeur d'Alene Tribes' Reservation

Executive Order 11514 (35 F.R. 4247; March 7, 1970): Protection and Enhancement of Environmental Quality, as amended.

Executive Order 11990-Protection of Wetlands

Executive Order 11988 – Floodplain Management

Executive Order 12962 – Recreational Fisheries (as amended by EO 13474)

Executive Order 12898 (59 F.R. 7629; February 16, 1994): Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, as amended.

Executive Order 13007 (61 F.R. 26771; May 29, 1996): Indian Sacred Sites and Executive Order 13175 65 F.R. 67249, November 9, 2000): Consultation and Coordination with Indian Tribal Governments

Executive Order 13112 (64 F.R. 6183, February 8, 1999): Invasive Species.

Executive Order 13186 – Protection of Migratory Birds

Presidential Wetland Policy 1993

Reaffirmation of the Presidential Wetland Policy 1995

REGULATION AND POLICY

Regulations Governing Navigation and Navigable Waters of the United States (33 CFR 320-332)

Regulations for the National Pollutant Discharge Elimination System (NPDES) (40 CFR 122)

Water Quality Standards (WQS) Regulation (40 CFR 131, as amended)

Department of the Interior Regulations regarding Natural Resource Damage Assessment and Restoration 43 CFR 11

Idaho Rules Governing Classification and Protection of Wildlife (Idaho Administrative Procedures Act (IDAPA) 13.01.06)

Idaho Rules for the Regulation of Beds, Waters, and Airspace over Navigable Nol (IDAPA 20.03.04)

Idaho Rules Governing Stream Channel Alterations (IDAPA 37.03.07)

Idaho Water Quality Standards (IDAPA 58.01.02

Idaho Rules and Standards for Hazardous Waste (IDAPA 58.01.05)

Idaho Solid Waste Management Rules (IDAPA 58.01.06)

Idaho Institutional Controls Program (ICP). (IDAPA 41.01.01.500-543)

Idaho Ground Water Quality Rule (IDAPA 58.01.11)

Idaho Land Remediation Rules (IDAPA 58.01.18

Coeur d'Alene Tribal Code, Water Quality (Chapter 42)

Coeur d'Alene Tribal Code, Encroachments (Chapter 44)

Coeur d'Alene Tribal Code, Cultural Resources Protection (Chapter 52)

PERMITS

Army Corps of Engineers Permit for Discharge of Dredge or Fill Material (Individual, Nationwide, Regional General Permit, etc.) Army Corp 404 permits and EPA NPDES permits include certification from State of Idaho or Coeur d'Alene Tribe under Clean Water Act Section 401 Authority depending on jurisdiction of water.

Army Corps of Engineers Permit for Dams and Dikes in Navigable Waters of the U.S.

Army Corps of Engineers Permit for Structures in or Affecting Navigable Waters of the U.S.

EPA NPDES Permit (Individual Permit, Nationwide General Permit, Regional General Permit, Multi-Sector General Permit, Statewide General Permit)

Idaho Stream Channel Alteration Permit

Idaho Encroachment Permit (for encroachment in, on, or over navigable waters of the State)

Idaho Temporary Water Appropriation

Coeur d'Alene Tribe Encroachment permit

Appendix 2 – Ongoing and Future Foreseeable Actions

Planning Document	Action Area	Foreseeable Actions
AVISTA, State of Idaho, and the Coeur d'Alene Tribe		
2009 Spokane River Hydroelectric Project FERC License No. 2545	Coeur d'Alene Reservation	Lake water quality monitoring, wetland enhancement, shoreline protection, aquatic weed mgt.
Coeur d'Alene Tribe		
2008 Coeur d'Alene Tribe Fisheries Management Plan	Coeur d'Alene Reservation streams and lakes	Identifies restoration geographic priorities and restoration approaches to restore and enhance fishes and their habitats in Lake, Benewah, Evans and Alder creeks; prioritizes potential acquisitions to achieve fishery management goals; identifies an educational/outreach program for the general public within the CDA Reservation develop an interim fishery for tribal and non-tribal members of the reservation through construction and operation of trout ponds; describes approach to design, construct, operate, and maintain a trout production facility; and proposes a five-year monitoring program to evaluate the effectiveness of these projects.
2014 *hnt'k'wipn* Management Plan	Hangman Creek Watershed	Restore native vegetation, wetland enhancement, restore natural channel morphology (Sheep Creek), floodplain restoration (Hangman Creek)
2010 Coeur d'Alene Tribe Fire Management Plan	Coeur d'Alene Reservation	Coeur d'Alene Reservation habitat and timber management for wildfire
2008 Coeur d'Alene Tribe Habitat Protection Plan	Alder, Benewah, Evans, and Rock Creeks	Stream channel stability, restoration, riparian habitat restoration, etc.

Planning Document	Action Area	Foreseeable Actions
2008 Response Action Management Plan	Trail of the Coeur d'Alenes (73 mi)	Operations and maintenance on trail and right-of-way, barrier repair and replacement, and right-of-way stabilization. With the State of Idaho, EPA, and Union Pacific Railroad
2014-15 *Schlajalqw* Analysis Area Plan	Coeur d'Alene Tribe Trust lands, Liberty Butte, Hangman Creek watershed	Timber production, wildlife habitat enhancements, recreation opportunities, water, grazing aesthetics
Kootenai County		
2014 Kootenai County Natural Resources Plan-DRAFT Chapter 11 of Comp Plan	Kootenai County	Draft County guidance document to address protection of natural resources
Western Competitive Grant Wolf Lodge Creek Plan (Phase I and II)	Wolf Lodge and St. Maries Creeks	Kootenai-Shoshone Soil and Water Conservation District and Idaho Department of Lands Streambank stabilization, culvert replacement, road repair, etc.
Benewah County		
2013 Benewah County Natural Resources Management Plan	Benewah County	County guidance document to address protection of natural resources

Planning Document	Action Area	Foreseeable Actions
Idaho Department of Fish and Game		
Wildlife Management Plans	Statewide plans inclusive of the Restoration Planning Area	Provide directions, goals, and strategies for species or groups of species. Includes both game and nongame wildlife
Black Lake Ranch/St Maries parcels land exchange	Black Lake (off Highway 3 in the chain lakes area) and 1,402 acres of mostly forested land owned by the state of Idaho 6 miles south of St. Maries in the Lindstrom Peak area	Reduce pollution-related wildlife deaths and create recreational opportunities on the parcel adjacent to Black Lake
Coeur d'Alene River Wildlife Management Area Plan	In Kootenai County, from the mouth of the Coeur d'Alene River at Harrison upstream to Cataldo. A detached portion of the wildlife management area, referred to as the Round Lake segment, is located at the southern end of Coeur d'Alene Lake near the mouth of the St. Joe River	Develop and manage wetlands for waterfowl production; control noxious weeds; propagate wild rice; provide wildlife-related recreation, particularly public hunting, fishing and wildlife observation. Maintain recreational and access facilities; provide wetland and upland habitats for a variety of nongame wildlife species and furbearers; maintain water level control structures to provide stable water levels for aquatic furbearers; secure nesting conditions for bald eagles and ospreys; conduct timber harvest activities to maintain or improve wildlife habitat; Provide habitat for migrating waterfowl, big game, and upland game species; maintain share-crop agreement; maintain seven miles of boundary fence to exclude unauthorized livestock grazing; seasonally limit motorized access to minimize disturbance to big game species.
St Maries Wildlife Management Area Plan	Benewah County on the lower end of the St. Maries River drainage about five miles south of the town of St. Maries	The plan identifies the following activities: provide public hunting opportunity for big game and upland game species; maintain designated roads and trails; maintain or enhance winter range for deer and elk; maintain boundary fences to minimize trespass livestock; limit snowmobile access to designated roads to minimize disturbance or displacement of big game; control noxious weeds; provide outdoor recreational opportunities not in conflict with wildlife goals and program

Planning Document	Action Area	Foreseeable Actions
Idaho Aquatic Nuisance Species Plan	Statewide plan, inclusive of Restoration Planning Area	Identifies strategies to prevent introduction and spread of invasive species with the potential to spread uncontrollably cause significant economic or ecological harm.
Fisheries Management Plan 2013-2018	Statewide plan, inclusive of Restoration Planning Area	The Fisheries Management Plan describes the management direction of the Idaho Department of Fish and Game (Department) and is the guiding policy document for fisheries activities over the six-year period. This management plan establishes policy direction for Department personnel that maintains their focus on priorities identified by the Department's angling constituency and other stakeholders.
Management Plan for the Conservation of Westslope Cutthroat Trout in Idaho	Statewide plan, inclusive of Restoration Planning Area	The plan identifies strategies and potential actions for the conservation of westslope cutthroat trout in Idaho Conservation of Westslope to: 1) ensure the long-term persistence of the subspecies within the current range in Idaho; 2) manage populations at levels capable of providing angling opportunities; and 3) restore westslope cutthroat trout to those parts of its historical range where feasible.
Idaho Department of Lands		
Ten Year Sales Plan-St Joe Supervisory Area	Idaho Department of Lands-managed lands in the St Joe River watershed	88,023 acres vegetation management in the St Joe Supervisory Area
Ten Year Timber Sale Plan-Pend Oreille Lakes Supervisory Area	Idaho Department of Lands-managed lands in the Pend Oreille Lake basin (potential overlap with northern extent of Restoration Planning Area)	73,616 acres vegetation management in the Pend Oreille Lake basin (small potential for overlap with extreme northern extent of the Restoration Planning Area)
Ten Year Timber Sale Plan – Mica Supervisory Area	Idaho Department of Lands-managed lands in the Mica Supervisory Area (northern Coeur d'Alene Lake Basin)	15,262 acres vegetation management in the Mica Supervisory Area

Planning Document	Action Area	Foreseeable Actions
U.S. Bureau of Land Management		
City of Coeur d'Alene BLM Corridor R&PP Lease and Conveyance EA	City of Coeur d'Alene, Burlington Northern Santa Fe rail line	Lease and convey a 29-acre parcel of BLM-managed land to the City of Coeur d'Alene plan for the development of park and recreational facilities on the BLM Corridor and the adjacent Four Corners area.
Resource Management Plan	Lands management by the Coeur d'Alene Field Office	Programmatic plan: extensive vegetation management, noxious weeds treatment, recreation management, terrestrial and aquatic restoration, road maintenance and transportation system management,
Hancock Forest Management-Carbon Creek ROW EA	Shoshone County about 6 air miles northeast of Wallace, Idaho near Carbon Creek.	Grant a right-of-way to Hancock Timber Management to use an existing road, build a bridge, and build a new road through the BLM to haul timber from their private land.
U.S. Environmental Protection Agency		
2013 Superfund Cleanup Implementation Plan 2012-2022	Ninemile Creek	Interstate-Callahan Cleanup and riparian and channel reconstruction; riparian upland planning at Interstate Callahan; Success Mine site remediation; Tamarack Mine site remediation; Upper Ninemile riparian area removals and planting; riparian and upland planting at other remedial sites
	Canyon Creek	Woodland Park water collection and treatment actions; mine-adit drainage collection and treatment; pipeline from Canyon Creek to central treatment plant; source control at selected sites
	Bunker Hill OU2	Central Treatment Plant upgrades and pipeline construction; Central Impoundment Area groundwater collection system
	Site-wide Upper Basin	Remedy protection projects in tributaries of South Fork Coeur d'Alene River
	Lower Basin	Beach removal pilot projects

Planning Document	Action Area	Foreseeable Actions
2012 OU3 Record of Decision Amendment	South Fork Coeur d' Alene River	Removals and stabilization of stream banks (approximately 28 river miles)
	Splay Areas-Strobl Marsh, Black Rock Slough, Frutchey's Field	Construct sediment traps
	Lane Marsh (south of railroad right-of-way)	Removals, capping, and hydraulic controls (213 acres)
	Medicine Lake	Removals, capping, hydraulic controls, level construction (198 wetland acres); dredging (230 lake acres)
	Cave Lake	Removals, capping, hydraulic control (190 wetland acres) and dredging (746 lake acres)
	Bare Marsh	Removals, capping, hydraulic control (165 wetland acres)
U.S. Fish and Wildlife Service		
2016 Long-term Management Plan Schlepp Ag-to-Wetland Conversion Pilot Project	Schlepp Ranch-Chain Lakes Area	Hydraulic control, levee repair, cap repair, vegetation enhancement (400 wetland acres)
2016 Bull Trout Recovery Plan	Coeur d’Alene Lake Basin	Road decommissioning, barrier removals, riparian improvements (e.g., willow planting), stream habitat improvements, channel reconstruction, historic mine site decommissioning, bank stabilization

Planning Document	Action Area	Foreseeable Actions
U.S. Forest Service		
2015 Forest Plan Revision	USFS managed lands in the Coeur d'Alene Lake Basin	Programmatic plan: extensive vegetation management, noxious weeds treatment, recreation management, terrestrial and aquatic restoration, road maintenance and transportation system management,
Bottom Canyon Project	Little North Fork Coeur d'Alene River watershed	11,000-acre planning area: extensive vegetation and transportation infrastructure management and watershed restoration
Moose Drool Project	Little North Fork Coeur d'Alene River watershed	Extensive road obliteration, 21 fish passage culverts, three miles of in-stream fish habitat, including placement of more than 1,000 pieces of large woody debris.
Beaver Creek Project-near future	Beaver Creek-tributary to North Fork Coeur d'Alene River	Watershed improvement activities (culvert upgrades, road decommissioning, road storage, road reconstruction and maintenance, reducing unauthorized motor vehicle use); vegetation management activities (site preparation, commercial timber harvest, reforestation, and temporary and permanent road construction); hazardous fuels management activities (prescribed burning and fuel break development)
Halfway-Malin Project	St Joe sub-basin	Vegetation management, transportation infrastructure, culvert replacements and removals, aquatic restoration
IPNF Noxious Weed Control (EIS)	Entire Idaho Panhandle National Forests	Adaptive strategy to control/reduce noxious weeds including physical, cultural, chemical, and bio control methods
St. Joe Ranger District Travel Management	Idaho Panhandle National Forests-managed lands in the St Joe Sub-Basin	Manage road network to address health and safety, disturbance to wildlife, impacts to water quality and fisheries, effects on recreation experiences

Appendix 3 – Species in the Planning Area

[1]Status Ranking Indicator: FWS=E (endangered), T (threatened), C (candidate), P (proposed), or BCC (bird of conservation concern); FS=S (Forest Service Sensitive); B=T1,T2, or T3 (BLM Special Status Type1/Type2/Type3); ID=State Rank of Idaho Species of Greatest Conservation Need.

Table 10. Selected bird species in the planning area

Species	**Origin and Special Status Ranking Indicator[1]**	**Life History**	**Distribution**	**Habitat Associations in the Planning Area**
Geese, Swans, and Ducks				
American wigeon *Anas americana*	Native	Summer breeding, spring/fall migrant, winter	Widely distributed in lakes, wetlands, and agricultural areas throughout the planning area.	Dabbles for vegetation in shallow wetlands including ponds, marshes, and rivers.
Barrow's goldeneye *Bucephala islandica*	Native	Summer breeding, spring/fall migrant, winter	Lakes, wetlands, and agricultural areas throughout the planning area. High density at Page Ponds WTP.	Dives for prey on bottom of lakes and ponds.
Blue-winged teal *Anas discors*	Native	Summer breeding	Lakes, wetlands, and agricultural areas throughout the planning area.	Nest among grasses or herbaceous vegetation and forage by dabbling in shallow ponds, marshes, vegetated wetlands around lakes, and agricultural fields.
Bufflehead *Bucephala albeola*	Native	Summer breeding, spring/fall migrant, winter	Lakes, wetlands, and agricultural areas throughout the planning area.	Dives for prey in and nests in cavities near lakes and ponds.

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
Canada goose *Branta canadensis*	Native	Summer breeding, spring/fall migrant, winter	Widely distributed in lakes, wetlands, and agricultural areas throughout the planning area.	Feeds on vegetation in lakes, rivers, ponds, and in yards, park lawns, and agricultural fields.
Canvasback *Aythya valisineria*	Native	Spring/fall migrant, winter	Lakes, wetlands, and agricultural areas throughout the planning area. High density at Canyon Marsh during spring migration.	Dives for prey in lakes and ponds.
Cinnamon teal *Anas cyanoptera*	Native	Summer breeding	Lakes, wetlands, and agricultural areas throughout the planning area.	Dabbles for vegetation in wetlands, marshes, ponds, and slow-moving streams.
Common goldeneye *Bucephala clangula*	Native	Summer breeding, spring/fall migrant, winter	Lakes, wetlands, and agricultural areas throughout the planning area. High density at Page Ponds WTP.	Breeds along lakes and rivers bordered by forest. Dives for prey on bottom of lakes, ponds, and rivers.
Common merganser *Mergus merganser*	Native	Resident	Lakes, wetlands, and rivers throughout the planning area.	Breeds along large lakes and rivers bordered by forest. Feeds mostly on fish in streams, rivers, and lakes.
Eurasian wigeon *Anas penelope*	Native	Spring/fall migrant, winter	Occasionally inhabits lakes, wetlands, and agricultural areas throughout the planning area.	Dabbles for vegetation in shallow wetlands including ponds, marshes, and rivers.

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
Gadwall *Anas strepera*	Native	Resident	Lakes, wetlands, and agricultural areas throughout the planning area.	Breeds mainly in small ponds. Dabbles for vegetation in ponds, marshes, well-vegetated wetlands, and streams.
Green-winged teal *Anas crecca*	Native	Summer breeding, spring/fall migrant, winter	Lakes, wetlands, and agricultural areas throughout the planning area including Smelterville Flats, Canyon Marsh, and Schlepps' fields.	Dabbles for vegetation in shallow ponds with lots of emergent vegetation.
Harlequin duck *Histrionicus histrionicus*	Native FS=S, B=T2, ID=S1B	Summer breeding	Forested mountain streams and rivers throughout the planning area.	Breeds on fast-flowing mountain streams and rivers, usually in forested areas. Dives for prey on or near bottom.
Hooded merganser *Lophodytes cucullatus*	Native ID=S2B,S2N	Summer breeding, spring/fall migrant, winter	Lakes, wetlands, and agricultural areas throughout the planning area.	Dives for prey in small bodies of water. Nests in holes in trees near ponds and rivers.
Lesser scaup *Aythya affinis*	Native ID=S3B,S3N	Summer breeding, spring/fall migrant, winter	Lakes, wetlands, and agricultural areas throughout the planning area including Canyon Marsh and Schlepps' fields.	Dives for prey in lakes and ponds.
Mallard *Anas platyrhynchos*	Native	Summer breeding, spring/fall migrant, winter	Widely distributed in lakes, wetlands, and agricultural areas throughout the planning area.	Dabbles for vegetation in wide variety of wetland habitats including marshes, riverine floodplains, ponds, lakes, and agricultural fields.

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
Northern pintail *Anas acuta*	Native ID=S4B,S4N	Summer breeding, spring/fall migrant, winter	Widely distributed in lakes, wetlands, and agricultural areas throughout the planning area	Dabbles for vegetation in shallow wetland habitats including agricultural fields.
Northern shoveler *Anas clypeata*	Native	Summer breeding	Lakes, wetlands, and agricultural areas throughout the planning area including Canyon Marsh and Schlepps' fields.	Dabbles for vegetation and breeds in open, shallow wetlands and marshes.
Red-breasted merganser *Mergus serrator*	Native	Spring/fall migrant	Primarily Coeur d'Alene Lake.	Feeds mostly on fish in large lakes and rivers.
Redhead *Aythya americana*	Native	Resident	Lakes, wetlands, and agricultural areas throughout the planning area including Canyon Marsh and Schlepps' fields.	Dives for prey in lakes and ponds.
Ring-necked duck *Aythya collaris*	Native	Summer breeding, spring/fall migrant, winter	Lakes, wetlands, agricultural areas throughout the planning area including Canyon Marsh and Schlepps' fields.	Dives for prey in lakes and ponds.
Ross's goose *Chen rossii*	Native	Spring/fall transient	Occasionally inhabits lakes, wetlands, and agricultural areas throughout the planning area.	Feeds on vegetation in shallow wetlands and agricultural fields.
Ruddy duck *Oxyura jamaicensis*	Native	Summer breeding	Primarily in lower Basin lakes, wetlands, and agricultural areas.	Dives for prey in lakes and ponds.

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
Snow goose *Chen caerulescens*	Native	Transient	Occasionally inhabits lakes, wetlands, and agricultural areas throughout the planning area.	Feeds on vegetation in lakes, wetlands, and agricultural fields.
Trumpeter swan *Cygnus buccinator*	Native ID=S1B,S4N	Spring/fall migrant	Occasionally inhabits lakes, wetlands, and agricultural areas throughout the planning area.	Dabbles for vegetation in lakes, ponds, and marshes.
Tundra swan *Cygnus columbianus*	Native	Spring/fall migrant, winter	Widely distributed during migration throughout lower Basin lakes, wetlands, and agricultural areas.	Dabbles and grazes for vegetation in lakes, wetlands, and agricultural fields.
White-fronted goose *Anser albifrons*	Native	Spring/fall transient	Occasionally inhabits lower Basin lakes, wetlands, and agricultural areas.	Feeds on vegetation in lakes, wetlands, and agricultural fields.
White-winged scoter *Melanitta fusca*	Native	Transient	Occasionally inhabits lower Basin lakes and wetlands.	Dives for prey in lakes, ponds, and rivers.
Wood duck *Aix sponsa*	Native	Summer breeding, spring/fall migrant, winter	Lakes, wetlands, and agricultural areas throughout the planning area.	Dabbles for prey in and nests in cavities near wooded marshes and ponds.
Loons				
Common loon *Gavia immer*	Native FS=S, ID=S1B,S2N	Summer breeding, spring/fall migrant, winter	Occasionally inhabits lakes in the lower Basin.	Feeds mostly on fish in lakes.
Grebes				
Eared grebe *Podiceps nigricollis*	Native FWS=BCC	Spring/fall migrant	Occasionally inhabits lower Basin lakes, wetlands, and agricultural areas.	Feeds on prey at surface or by diving to the bottom of shallow lakes and wetlands.

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
Horned grebe *Podiceps auritus*	Native	Spring/fall migrant, winter	Lakes, wetlands, and agricultural areas throughout the planning area including Harrison Slough and Cave Lake.	Feeds on prey at surface or by diving underwater in shallow lakes and wetlands.
Pied-billed grebe *Podilymbus podiceps*	Native	Spring/fall migrant, winter	Lakes, wetlands, and agricultural areas throughout the planning area.	Dives for prey in lakes, sloughs, marshes, ponds, and slow-moving rivers.
Red-necked grebe *Podiceps grisegena*	Native ID=S2B	Summer breeding	Occasionally inhabits lower Basin lakes including Harrison Slough.	Dives for prey and breeds in lakes and wetlands.
Western grebe *Aechmophorus occidentalis*	Native ID=S2B	Summer breeding	Occasionally inhabits lower Basin lakes including Cave Lake.	Feeds mostly on fish and breeds in colonies on lakes and wetlands.
Pelicans and Cormorant				
Double-crested cormorant *Phalacrocorax auritus*	Native	Spring/fall migrant	Lakes, wetlands, and agricultural areas throughout the planning area.	Colonial waterbird that fishes and rests in high perches along lakes and wetlands.
White pelican *Pelecanus erythrorhynchos*	Native ID=S3B	Spring/fall migrant	Lakes, wetlands, and agricultural areas throughout the planning area.	Feeds in large flocks mostly on fish in lakes and wetlands.
Bittern, Herons and Ibises				
American bittern *Botaurus lentiginosus*	Native FWS=BCC	Summer breeding	Lakes, wetlands, and agricultural areas throughout the planning area.	Breeds and feeds in marshes with tall vegetation.

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
Great blue heron *Ardea herodias*	Native	Resident	Lakes, wetlands, and agricultural areas throughout the planning area.	Feeds on prey, including fish and small mammals, in wetlands, grasslands, and agricultural fields. Colonial nester in trees near lakes and ponds.
White-faced ibis *Plegadis chihi*	Native	Transient	Wetlands, lake margins, and flooded agricultural fields.	Feeds on aquatic invertebrates especially earthworms and larval insects.
Hawks and Eagles				
Bald eagle *Haliaeetus leucocephalus*	Native FWS=BCC, FS=S, B=T2, ID=S5	Resident	Forested shorelines adjacent to lakes, wetlands, rivers, and agricultural areas throughout the planning area.	Nests in forested areas adjacent to lakes, rivers, and marshes. Congregates in winter along lakes and rivers where fish concentrate. Also feeds on waterfowl and carrion.
Golden eagle *Aquila chrysaetos*	Native FWS=BCC, B=T2	Resident	Variety of habitats including open grasslands, coniferous forests, agricultural lands, and riparian areas	Prefers open country near mountains and cliffs.
Merlin *Falco columbarius*	Native ID=S4	Resident	Shorelines adjacent to lakes, wetlands, rivers, and agricultural areas throughout the planning area.	Hunts in open country feeding mostly on songbirds and shorebirds. May nest in shrubs and trees along rivers.

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
Northern harrier *Circus cyaneus*	Native	Resident	Grasslands, wetlands, and agricultural areas throughout the planning area.	Breeds and roosts in winter on the ground in wetlands and grasslands with low, thick vegetation. Feeds mostly on small mammals (meadow voles) and songbirds.
Osprey *Pandion haliaetus*	Native	Summer breeding	Shorelines adjacent to lakes, wetlands, rivers, and agricultural areas throughout the planning area.	Nests above ground near shallow fish-filled waters including rivers, lakes, and marshes. Feeds almost exclusively on fish.
Peregrine falcon *Falco peregrinus*	Native FWS=BCC, FS=S, ID=S2B	Summer breeding, spring/fall migrant	Variety of habitats including urban areas	Nests on tall structures including buildings, water towers, and cliffs
Swainson's hawk *Buteo swainsoni*	Native FWS=BCC, ID=S5B	Summer breeding, spring/fall migrant	Wide open spaces and grasslands	Prefers grasslands but may use agricultural areas intermixed with native vegetation.
Rails and Coots				
American coot *Fulica americana*	Native	Summer breeding, spring/fall migrant, winter	Widely distributed in lakes, wetlands, and agricultural areas throughout the planning area.	Dabbles and dives mostly for vegetation in wetlands and along lake shorelines. Breeds in heavy stands of emergent aquatic vegetation.
Sora *Porzana carolina*	Native	Summer breeding	Lakes, wetlands, and agricultural areas throughout the planning area.	Breeds in shallow wetlands with lots of emergent vegetation. Feeds on seeds and aquatic invertebrates.

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
Virginia rail *Rallus limicola*	Native	Summer breeding	Lakes, wetlands, and agricultural areas throughout the planning area.	Breeds in shallow wetlands with lots of emergent vegetation. Probes water and mud with bill feeding mostly on aquatic invertebrates.
Cranes				
Sandhill crane *Grus canadensis*	Native ID=S3B	Spring/fall migrant	Occasionally inhabits lower Basin wetlands and agricultural areas.	Probes water and mud with bill feeding heavily on seeds and grains in shallow wetlands and grasslands.
Shorebirds				
American avocet *Recurvirostra americana*	Native ID=S3B,S3M	Summer breeding, spring/fall migrant	Lakes, wetlands, and agricultural areas throughout the planning area.	Feeds on aquatic invertebrates in shallow wetlands while wading or swimming.
Black-necked stilt *Himantopus mexicanus*	Native ID=S4B	Spring/fall migrant	Occasionally inhabits lakes, wetlands, and agricultural areas throughout the planning area.	Wades along sparsely vegetated, shallow wetlands feeding on aquatic invertebrates and fish.
Greater yellowlegs *Tringa melanoleuca*	Native	Spring/fall transient	Occasionally inhabits lakes, wetlands, and agricultural areas in the lower Basin.	Wades in shallow ponds and marshes, picking up aquatic and terrestrial invertebrates.
Killdeer *Charadrius vociferus*	Native	Summer breeding	Widely distributed along shorelines adjacent to lakes, wetlands, and agricultural areas throughout the planning area.	Feeds mostly on invertebrates in open areas with short vegetation such as sandbars, mudflats, and grazed fields.

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
Lesser yellowlegs *Tringa flavipes*	Native	Spring/fall transient	Occasionally inhabits lakes, wetlands, and agricultural areas in the lower Basin.	Wades in shallow ponds and marshes, probing for aquatic and terrestrial invertebrates.
Upland sandpiper *Bartramia longicauda*	Native ID=S1B	Summer breeding	Occasionally inhabits grasslands and agricultural areas throughout the planning area.	Feeds and nests in upland prairie habitat including croplands, pastures, and wet meadows.
Spotted sandpiper *Actitis macularius*	Native	Summer breeding	Widely distributed along shorelines adjacent to rivers, lakes, wetlands, and agricultural areas throughout the planning area.	Nests along semi-open shoreline with patches of vegetation. Darts and probes for invertebrates along streambanks and lake edges.
Wilson's phalarope *Phalaropus tricolor*	Native ID=S4B	Summer breeding	Lakes, wetlands, and agricultural areas throughout the planning area.	Wades in shallow ponds or swims in circles, stirring up small aquatic invertebrates. Nests along wetland edges or in surrounding upland vegetation.
Wilson’s snipe *Gallinago delicata*	Native	Summer breeding	Widely distributed along shorelines adjacent to rivers, lakes, wetlands, and agricultural areas throughout the planning area.	Probes mostly for insect larvae in wet soil along rivers, and ponds with sedges, rushes, and cattails, including wet pasture and agricultural fields.
Jaegers and Gulls				
California gull *Larus californicus*	Native ID=S2N, S3B	Spring/fall migrant, winter	Lakes, wetlands, and agricultural areas throughout the planning area.	Dips for fish, invertebrates, small mammals and grain along lakes, farm fields, lawns, and pastures.

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
Franklin's gull *Leucophaeus pipixcan*	Native ID=S3B	Spring/fall migrant	Occasionally inhabits lakes, wetlands, and agricultural areas throughout the planning area.	Dips for invertebrates and seeds in marshes, agricultural fields, and pastures.
Ring-billed gull *Larus delawarensis*	Native	Winter	Lakes, wetlands, and agricultural areas throughout the planning area.	Dips for fish, invertebrates, small mammals and grain along lakes, farm fields, lawns, and pastures.
Terns				
Black tern *Chlidonias niger*	Native B=T2, ID=S2B	Summer breeding	Lakes, wetlands, and agricultural areas throughout the planning area.	Semi-colonially breeder in shallow marshes with emergent vegetation including margins of lakes, ponds, rivers, and sloughs.
Caspian tern *Hydroprogne caspia*	Native ID=S1B	Spring/fall migrant	Wide variety of habitats near water.	Breeds near water including lakes, wetlands, and river islands.
Forster's tern *Sterna forsteri*	Native ID=S2B	Spring/fall migrant	Areas with open water including large lakes.	Nests in scrapes of mud or sand but may also nest on floating vegetation or muskrat pushups.
Pigeons and Doves				
Mourning dove *Zenaida macroura*	Native	Resident	Wide variety of habitats except for large forests.	Feeds in agricultural fields and prefers open country and woodland edges.
Cuckoos				

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
Yellow-billed cuckoo *Coccyzus americanus*	Native T, ID=S1B	Summer breeding	Historical observations near Coeur d'Alene Lake.	Woodlands with low, scrubby, vegetation, abandoned farmland, and dense thickets along streams and marshes.
Owls				
Great horned owl *Bubo virginianus*	Native	Resident	Throughout the planning area.	Gravitates toward secondary-growth woodlands, swamps, and agricultural areas. Home range usually includes fields, wetlands, pastures or croplands, as well as forest.
Flammulated owl *Otus flammeolus*	Native FWS=BCC, FS=S, B=T2, ID=S3B	Summer breeding	Open woodlands with grassland edge throughout the planning area.	Nests in mature montane pine forests, roosts in scattered thickets of saplings or shrubs, and feeds in grassland edge.
Northern pygmy-owl *Glaucidium gnoma*	Native	Resident	Riparian forests throughout the planning area.	Feeds mostly on birds in forests including cottonwood, aspen, and mixed-conifer.
Short-eared owl *Asio flammeus*	Native FWS=BCC, B=T2, ID=S3	Resident	Grasslands, wetlands and agricultural areas throughout the planning area.	Feeds mostly on voles in marshes, grasslands, and agricultural lands. Ground nests in grasses and forbs.
Goatsuckers				

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
Common nighthawk *Chordeiles minor*	Native	Summer breeding	Open woodlands, grasslands, wetlands, and agricultural areas throughout the planning area.	Nests in open forests and grasslands. Feeds on flying insects near farmlands, river valleys, marshes, and open woodlands.
Swifts				
Black swift *Cypseloides niger*	Native FWS=BCC, FS=S, B=T2, ID=S1B	Summer breeding	Headwater tributary streams in the upper Basin.	Nests in mountains near flowing water, caves, and cliffs.
Vaux's swift *Chaetura vauxi*	Native B=T2	Summer breeding	Riparian areas along rivers and streams throughout the planning area.	Nests in coniferous or mixed forest. Forages in forest openings, especially above streams.
Hummingbirds				
Black-chinned hummingbird *Archilochus alexandri*	Native	Summer breeding	Riparian areas along rivers and streams throughout the planning area.	Open woodlands often near cottonwood and willow.
Calliope hummingbird *Stellula calliope*	Native FWS=BCC	Summer breeding	Riparian areas along rivers and streams throughout the planning area.	Open montane forests, mountain meadows, and willow and alder thickets, often near running streams.
Rufous hummingbird *Selasphorus rufus*	Native FWS=BCC	Summer breeding	Riparian areas along rivers and streams throughout the planning area.	Open or shrubby areas, forest openings, yards, parks, thickets, swamps, and meadows.
Kingfisher				

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
Belted kingfisher *Megaceryle alcyon*	Native	Resident	Lakes, wetlands, rivers, and streams throughout the planning area.	Feeds on fish in streams, rivers, ponds, and lakes. Nests along vertical earthen banks.
Woodpeckers				
Downy woodpecker *Picoides pubescens*	Native	Resident	Riparian areas along rivers and streams throughout the planning area.	Open woodlands, particularly deciduous woods and along streams.
Lewis' woodpecker *Melanerpes lewis*	Native FWS=BCC, B=T2, ID=S3B	Summer breeding	Riparian areas along rivers and streams throughout the planning area.	Burned ponderosa pine forests, riparian forests, and aspen groves.
Northern flicker *Colaptes auratus*	Native	Resident	Widely distributed in habitat surrounding lakes, wetlands, rivers, and streams throughout the planning area.	Woodlands, forest edges, open fields, streamside woods, flooded swamps, and marsh edges.
Red-naped sapsucker *Sphyrapicus nuchalis*	Native	Summer breeding	Forests along lakes, wetlands, rivers, and streams throughout the planning area.	Deciduous and mixed montane forests often with willows and aspens.
Tyrant flycatchers				
Dusky flycatcher *Empidonax oberholseri*	Native	Summer breeding	Riparian areas along lakes, wetlands, streams, and rivers throughout the planning area.	Scrub, brushy areas, streamside thickets, aspen groves, and open coniferous forests.
Eastern kingbird *Tyrannus tyrannus*	Native	Summer breeding	Riparian areas along lakes, wetlands, streams, and rivers throughout the planning area.	Fields with scattered shrubs and trees, along forest edges, aspen groves, and riparian habitats. Nests in trees that overhang rivers or lakes.

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
Western wood-peewee *Contopus sordidulus*	Native	Summer breeding	Riparian areas along lakes, wetlands, streams, and rivers throughout the planning area.	Open woodlands, along forest edges, and in riparian woodlands.
Willow flycatcher *Empidonax traillii*	Native FWS=BCC, B=T2	Summer breeding	Riparian areas along lakes, wetlands, streams, and rivers throughout the planning area.	Moist, shrubby areas, often with standing or running water.
Vireos				
Red-eyed vireo *Vireo olivaceus*	Native	Summer breeding	Riparian areas along lakes, wetlands, streams, and rivers throughout the planning area.	Deciduous and mixed forests with shrubby understories along streams and rivers; alder thickets and aspen groves.
Warbling vireo *Vireo gilvus*	Native	Summer breeding	Riparian areas along lakes, wetlands, streams, and rivers throughout the planning area.	Mature deciduous woodlands along streams, ponds, marshes, and lakes.
Swallows				
Barn swallow *Hirundo rustica*	Native	Summer breeding	Riparian areas along lakes, wetlands, agricultural areas, streams, and rivers throughout the planning area.	Open areas including agricultural fields and water over lakes, ponds, and rivers Access to nesting structures or cliffs, and a source of mud.
Cliff swallow *Petrochelidon pyrrhonota*	Native	Summer breeding	Cliff faces near lakes, wetlands, streams and rivers throughout the planning area.	Canyons, foothills, and river valleys with natural cliff faces and overhangs close to water, open fields, and a source of mud.

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
N. rough-winged swallow *Stelgidopteryx serripennis*	Native	Summer breeding	Riparian areas along streams and rivers throughout the planning area throughout the planning area.	Open habitats including river or streambanks.
Tree swallow *Tachycineta bicolor*	Native	Summer	Riparian areas along lakes, wetlands, agricultural areas, streams, and rivers throughout the planning area.	Fields, marshes, and shorelines near water with access to existing cavities in old trees or nest boxes.
Violet-green swallow *Tachycineta thalassina*	Native	Summer	Riparian areas along lakes, wetlands, agricultural areas, streams, and rivers throughout the planning area.	Open woodlands near water with access to existing cavities in old trees or nest boxes.
Chickadees and Titmouse				
Black-capped chickadee *Poecile atricapillus*	Native	Resident	Riparian areas along lakes, wetlands, agricultural areas, streams, and rivers throughout the planning area.	Deciduous and mixed forests, open woods, parks, willow thickets, cottonwood groves, and disturbed areas.
Chestnut-backed chickadee *Poecile rufescens*	Native	Resident	Riparian areas along streams and rivers throughout planning areas.	Dense, wet coniferous forests and some deciduous forests particularly willow and alder stands along streams.
Nuthatches				
White-breasted nuthatch *Sitta carolinensis*	Native	Resident	Riparian areas along lakes, wetlands, streams, and rivers throughout the planning area.	Mature woods more often associated with deciduous than coniferous forests.

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
Wrens and Dipper				
American dipper *Cinclus mexicanus*	Native	Resident	Rivers and streams throughout the planning area.	Aquatic songbird that feeds on aquatic insects and larvae in swiftly flowing streams with rocky bottoms.
Bewick's wren *Thryomanes bewickii*	Native	Resident	Variety of brushy or scrub habitats.	Prefers scrub and brushy areas but may use riparian woodlands.
House wren *Troglodytes aedon*	Native	Summer breeding	Open forests and forest edges and open areas with scattered trees.	Found in a variety of habitats including agricultural fields and riparian areas.
Marsh wren *Cistothorus palustris*	Native	Summer breeding, spring/fall migrant, winter	Lake edges, wetlands, and agricultural fields in the lower Basin.	Nests in a variety of marshes, especially with dense reeds.
Pacific wren *Troglodytes pacificus*	Native	Resident	Forests along lakes, wetlands, rivers, and streams throughout the planning area.	Coniferous and mixed forests, primarily with dense understory, often near water.
Kinglets and Gnatcatcher				
Ruby-crowned kinglet *Regulus calendula*	Native	Summer breeding, spring/fall migrant, winter	Riparian areas along streams and rivers throughout planning areas.	Nests in tall, dense stands of trees most often found in spruce-fir forests, but also in meadows, and floodplain forests of pine and aspen.
Thrushes				

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
American robin *Turdus migratorius*	Native	Resident	Widely distributed in riparian areas along streams and rivers throughout planning areas.	Ground-feeds in lawns, fields, open woodlands, and riparian forests.
Swainson's thrush *Catharus ustulatus*	Native	Summer breeding	Riparian areas along streams and rivers throughout the planning area.	Coniferous and deciduous forests including streamside woodlands, and alder or willow thickets.
Varied thrush *Ixoreus naevius*	Native	Resident	Riparian areas along lakes, wetlands, streams, and rivers throughout the planning area.	Dark, wet, mature forests. In winter, may inhabit lakeshores, and riparian areas.
Veery *Catharus fuscescens*	Native	Summer breeding	Riparian areas along lakes, wetlands, streams, and rivers throughout the planning area.	Dense, damp, mostly deciduous woodlands, often near rivers, streams, and swampy areas.
Thrashers				
Gray catbird *Dumetella carolinensis*	Native	Summer breeding	Riparian areas along lakes, wetlands, streams, and rivers throughout the planning area.	Dense shrubs and thickets of young trees in varied habitats including abandoned farmland and riparian areas.
Waxwings				
Cedar waxwing *Bombycilla cedrorum*	Native	Resident	Riparian areas along lakes, wetlands, streams, rivers, and agricultural areas throughout the planning area.	Deciduous, coniferous, and mixed woodlands, particularly along streams. Also in old fields and grasslands.
Wood Warblers				

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
American redstart *Setophaga ruticilla*	Native	Summer breeding	Riparian areas along lakes, wetlands, streams, and rivers throughout the planning area.	Moist, deciduous, second-growth woodlands with abundant shrubs, often near water, and include alder and willow thickets.
Audubon's warbler *Setophaga auduboni*	Native	Summer breeding	Riparian areas along lakes, wetlands, streams, and rivers throughout the planning area.	Mature coniferous and mixed coniferous-deciduous woodlands (such as in patches of aspen, birch, or willow) including streamside.
Common yellowthroat *Geothlypis trichas*	Native	Summer breeding	Riparian areas along lakes, wetlands, streams, and rivers throughout the planning area.	Most common in wet areas with dense vegetation low to the ground including wetlands and river edges.
MacGillivray's warbler *Geothlypis tolmiei*	Native	Summer breeding	Riparian areas along lakes, wetlands, streams, and rivers throughout the planning area.	Clear-cuts in coniferous forest, mixed deciduous forest, and riparian areas and thickets. Requires dense understory.
Northern waterthrush *Parkesia noveboracensis*	Native	Summer breeding	Riparian areas along lakes, wetlands, streams, and rivers throughout the planning area.	Thickets near slow-moving streams and ponds.
Orange-crowned warbler *Leiothlypis celata*	Native	Summer breeding	Riparian areas along lakes, wetlands, streams, and rivers throughout the planning area.	Shrubs and low-growing vegetation in riparian settings and patches of forest including willow, alder, and maple thickets.

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
Wilson's warbler *Cardellina pusilla*	Native	Summer breeding	Riparian areas along lakes, wetlands, streams, and rivers throughout the planning area.	Shrub thickets of riparian habitats, edges of ponds, lakes, and overgrown clear-cuts of montane forests.
Yellow warbler *Setophaga petechia*	Native	Summer breeding	Widely distributed along lakes, wetlands, streams, and rivers throughout the planning area.	Thickets along streams and wetlands, often found among willows.
Tanagers				
Western tanager *Piranga ludoviciana*	Native	Summer breeding	Riparian areas along lakes, wetlands, streams, and rivers throughout the planning area.	Open coniferous and mixed coniferous-deciduous woodlands including riparian woodlands, aspen stands, and along wetlands.
Sparrows and allies				
Chipping sparrow *Spizella passerina*	Native	Summer breeding	Open woodlands and forests with meadows.	Grassy forests, woodlands and edges with evergreens. Also use aspen and birch trees.
Dark-eyed junco *Junco hyemalis*	Native	Resident	Coniferous or mixed coniferous forests but also open woodlands and fields.	Coniferous and deciduous forests including aspens and cottonwoods.
Fox sparrow *Passerella iliaca*	Native FWS=BCC	Summer breeding	Coniferous forests and mountain scrub.	Dense riparian thickets (of alder, water birch, willows, currants, gooseberries, and rose).
Grasshopper sparrow *Ammodramus savannarum*	Native ID=S3B	Summer breeding	Open grasslands and prairies with patches of bare ground.	Nests on ground in open grasslands.

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
Savannah sparrow *Passerculus sandwichensis*	Native	Summer breeding	Wetlands and agricultural fields throughout the planning area.	Grasslands with few trees including meadows, sedge wetlands, and cultivated fields.
Song sparrow *Melospiza melodia*	Native	Resident	Widely distributed along lakes, wetlands, streams, rivers, and agricultural fields throughout the planning area.	Ground-feeds in varied habitats including grasslands, marsh and stream edges, and agricultural fields.
Spotted towhee *Pipilo maculatus*	Native	Summer breeding, spring/fall migrant, winter	Open shrubby areas, forest edges, and overgrown fields.	Dry thickets, brush tangles, forest edges, and old fields with dense shrub cover.
Vesper sparrow *Pooecetes gramineus*	Native	Summer breeding	Various open habitats.	Open habitats with grass, including prairie, sagebrush steppe, meadows, pastures, and roadsides.
Grosbeaks and Buntings				
Black-headed grosbeak *Pheucticus melanocephalus*	Native	Summer breeding	Riparian areas along lakes, wetlands, streams, and rivers throughout the planning area.	Large trees with rich understory near water including cottonwoods or aspens on floodplains and stream margins.
Lazuli bunting *Passerina amoena*	Native	Summer breeding	Riparian areas along lakes, wetlands, streams, and rivers throughout the planning area.	Brushy hillsides, riparian habitats, wooded valleys, thickets and hedges along agricultural fields.
Blackbirds and allies				

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
Brown-headed cowbird *Molothrus ater*	Native	Summer breeding	Variety of habitats but avoids thick forests.	Grasslands with low and scattered trees as well as woodland edges, brushy thickets, prairies, fields, and pastures.
Bullock's oriole *Icterus bullockii*	Native	Summer breeding	Riparian areas along lakes, wetlands, streams, and rivers in the lower Basin.	Riparian and open woodlands with tall trees.
Red-winged blackbird *Agelaius phoeniceus*	Native	Resident	Lakes edges, wetlands, and agricultural fields throughout the planning area.	Marshes and sedge meadows.
Western meadowlark *Sturnella neglecta*	Native	Summer breeding	Agricultural fields throughout the planning area.	Open grasslands, prairies, meadows, and some agricultural fields.
Yellow-headed blackbird *Xanthocephalus xanthocephalus*	Native	Summer breeding	Lake and river edges, wetlands, and agricultural fields throughout the planning area.	Shallow areas of marshes, ponds, and rivers.
Finches and allies				
American goldfinch *Carduelis tristis*	Native	Resident	Wide variety of habitats including suburban areas.	Weedy fields, open floodplains, and other overgrown areas, particularly with sunflower, aster, and thistle plants for food and some shrubs and trees for nesting.
Evening grosbeak *Coccothraustes vespertinus*	Native	Resident	Coniferous and deciduous forests.	Breeds in spruce-fir forests and aspen forests at higher elevation.

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
House finch *Carpodacus mexicanus*	Native	Resident	Wide variety of habitats including urban and suburban areas.	Varied habitats including stream sides and open coniferous forests.
Pine siskin *Carduelis pinus*	Native	Resident	Wide variety of habitats including suburban woodlands.	Open coniferous or mixed forests, deciduous forests and thickets, meadows, and grasslands.
Aquatic Dependent/Associated Mammals				
Beaver *Castor canadensis*	Native	Aquatic Dependent	Lakes, ponds, wetlands, streams, and rivers throughout the planning area	A wide variety of habitats with woody vegetation as the primary requirement
Muskrat *Ondatra zibethicus*	Native	Aquatic Dependent	Lakes, ponds, wetlands, streams, and rivers throughout the planning area	A wide variety of habitats with aquatic vegetation and unfrozen water in winter
River otter *Lontra canadensis*	Native	Aquatic Dependent	Large river systems within higher flows	Large rivers with available cover, undercut banks, and side channels and sloughs
Mink *Neovison vison*	Native	Aquatic Dependent	Streams and lakes throughout the planning area	Margins of streams and lakes associated with beaver and muskrat habitat
Water shrew *Sorex palustris*	Native	Aquatic Dependent	Small streams but may be found along wetlands, ponds, and lakes	Prefers steam side coniferous forests with coldwater and heavy cover
Meadow vole *Microtus pennsylvanicus*	Native	Aquatic Associated	Wet meadows throughout planning area	Wet meadows but may be associated with drier grassland conditions

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
Raccoon *Procyon lotor*	Native	Aquatic Associated	Riparian and wetland margins throughout the planning area	Riparian areas and lake and wetland margins with forested habitat
Moose *Alces alces*	Native	Aquatic Associated	River valleys and swampy areas throughout the planning area	Wide variety of habitats seasonally; feeds on willow and aquatic vegetation
Riparian Associated Mammals				
Skunk *Mephitis mephitis*	Native	Riparian Associated	Riparian and upland habitats throughout the planning area	Wide variety of habitats and but may use riparian habitat for foraging, cover, and travel corridor
Black bear *Ursus americanus*	Native	Riparian Associated	Riparian and upland habitats throughout the planning area	Wide variety of habitats and but may use riparian habitat for foraging, cover, and travel corridor
Fisher *Martes pennanti*	Native FS=S, B=T3, ID=S1	Riparian Associated	Riparian and upland habitats but data is lacking on presence and abundance within planning area	Variety of conifer forests and forested riparian habitat is also important, and stream courses may be used as travel corridors
White-tailed deer *Odocoileus virginianus*	Native	Riparian Associated	Riparian and upland habitats throughout the planning area	Wide variety of habitats but may use riparian habitat for feeding, cover, and migration
Mule deer *Odocileus hemionus*	Native	Riparian Associated	Riparian and upland habitats throughout the planning area	Wide variety of habitats but may use riparian habitat for feeding, cover, and migration
Elk *Cervus canadensis*	Native	Riparian Associated	Riparian and upland habitats throughout the planning area	Wide variety of habitats but may use riparian habitat for feeding, cover, and migration

Data obtained from a variety of sources including USFWS, USFS, BLM, IDFG, and Coeur d'Alene Tribe.

[1]Status Ranking Indicator: T=ESA listed as Threatened; FS= Forest Service Sensitive; B=BLM Special Status; ID=Idaho Species of Greatest Conservation Need

Table 11. Selected aquatic species in the planning area

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
Fishes				
Bull trout *Salvelinus confluentus*	Native T, FS=S3, B=T1, ID=G3	Fluvial, adfluvial	Spawning in upper St. Joe River; rearing in St. Joe River and Coeur d'Alene Lake; may occur in N. Fork Coeur d' Alene River	Clean, cold water streams with complex habitat and high connectivity; sensitive to metals contamination
Westslope cutthroat trout *Oncorhyncus clarki lewisi*	Native S, B=T2, FS=S3, ID=G4T3	Resident, fluvial, adfluvial	Widely distributed throughout the planning area but primarily in rivers and tributaries including Hangman Creek	Clean, cool water streams; sensitive to metals contamination
Redband trout *Oncorhynchus mykiss gairdneri*	Native S,FS=S4, B=T4, ID= G5T4	Resident	Present only in Hangman Creek watershed	Small populations in a few cool water tributaries to Hangman Creek and within upper Hangman Creek
Chinook salmon *Oncorhynchus tshawytscha*	Non-native	Hatchery propagation, adfluvial	Coeur d'Alene Lake, Coeur d'Alene and St. Joe Rivers	Spawns in mainstem rivers, primarily associated with deep open water in the Lake
Rainbow trout *Oncorhynchus mykiss*	Non-native	Resident, fluvial	Small numbers throughout planning area likely holdovers from hatcheries	Cool water streams, rivers, and lakes

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
Kokanee *Oncorhynchus nerka*	Non-native	Adfluvial	Coeur d' Alene Lake and limited spawning in rivers and tributaries	Primarily spawns along northern shoreline of Coeur d' Alene Lake, open water
Brook trout *Salvelinus fontinalis*	Non-native	Resident, fluvial	Widely distributed throughout planning area but primarily headwater streams	Cool water streams, rivers, and headwater tributaries
Mountain whitefish *Prosopium williamsoni*	Native	Resident, fluvial	Large populations within the North Fork Coeur d' Alene and St. Joe Rivers	Cool water streams and rivers
Lake superior whitefish *Coregonis clupeaformis*	Non-native	Pelagic lacustrine	May be present in Couer d' Alene Lake	Open water within Coeur d' Alene Lake
Northern pike *Esox lucius*	Non-native	Lacustrine, riverine	Coeur d'Alene Lake, Lateral Lakes, Coeur d'Alene and St. Joe Rivers	Lakes, wetlands, lower river systems, associated with submerged aquatic vegetation
Redfin pickerel *Esox americanus*	Non-native	Riverine	Hangman Creek	Slower moving water, heavily vegetated pools and backwaters
Tiger muskie *Esox masquinongy* x *Esox lucius*	Non-native	Hatchery propagation, lacustrine	Stocked in Blue and Hauser Lakes	Restricted to periodic stocking within designated lakes
Northern pikeminnow *Ptychocheilus oregonensis*	Native	Lacustrine, riverine	Coeur d'Alene Lake, Coeur d'Alene and St. Joe Rivers, and Hangman Creek	Lakes and lower river systems with slow moving water
Redside shiner *Richardsonius balteatus*	Native	Riverine	Coeur d'Alene Lake, Lateral Lakes, Coeur d'Alene and St. Joe Rivers, and Hangman Creek	Lakes and lower river systems with slow moving water

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
Speckled dace *Rhinichthys osculus*	Native	Riverine	Widely distributed throughout the planning area but primarily in rivers and tributaries including Hangman Creek	Variety of habitats but prefers cool slow moving habitats within streams and rivers
Longnose dace *Rhinichthys cataractae*	Native	Benthic riverine	Widely distributed throughout the planning area but primarily in streams and tributaries	May be found along edges of lakes but primarily found in riffle areas of streams
Fathead minnow *Pimephales promelas*	Non-native	Lacustrine, riverine	Hangman Creek	Slower moving water, tolerant of degraded aquatic habitats
Tench *Tinca tinca*	Non-native	Lacustrine, riverine	Coeur d'Alene Lake, Lateral Lakes, Coeur d'Alene, St. Joe Rivers and Hangman Creek	Lakes, wetlands, lower river systems, associated with submerged aquatic vegetation
Longnose sucker *Catostomus catostomus*	Native	Benthic lacustrine, riverine	Coeur d'Alene Lake, Coeur d'Alene, St. Joe Rivers, and Hangman Creek	Cool water lakes and rivers, prefers deeper pools
Largescale sucker *Catostomus macrocheilus*	Native	Benthic lacustrine, riverine	Coeur d'Alene Lake, Coeur d'Alene and St. Joe Rivers	Cool water lakes and rivers, prefers slack water and deep pools
Bridgelip sucker *Catostomus columbianus*	Native	Benthic lacustrine, riverine	Coeur d'Alene Lake, Coeur d'Alene and St. Joe Rivers	Primarily cool water rivers with slower water and sand silt bottoms
Channel catfish *Ictalurus punctata*	Non-native	Hatchery propagation; benthic lacustrine, riverine	Coeur d'Alene Lake, Lateral Lakes, lower Coeur d'Alene and St. Joe Rivers	Not suspected to reproduce naturally, dependent on hatchery introductions
Brown bullhead *Ictalurus nebulosus*	Non-native	Benthic lacustrine, riverine	Coeur d'Alene Lake, Lateral Lakes, Coeur d'Alene and St. Joe Rivers	Lakes, sloughs, wetlands, ditches, and slow moving rivers

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
Black bullhead *Ictalurus melas*	Non-native	Benthic lacustrine, riverine	Coeur d'Alene Lake, Lateral Lakes, Coeur d'Alene and St. Joe Rivers	Lakes, sloughs, wetlands, ditches, and slow moving rivers
Largemouth bass *Micropterus salmoides*	Non-native	Lacustrine, riverine	Coeur d'Alene Lake, Lateral Lakes, Coeur d'Alene and St. Joe Rivers	Lakes and slow moving rivers often associated with submerged vegetation and structure
Smallmouth bass *Micropterus dolomieui*	Non-native	Lacustrine, riverine	Coeur d'Alene Lake, Lateral Lakes, Coeur d'Alene and St. Joe Rivers	Lakes and rivers often associated with rocky substrates and deeper water
Black crappie *Pomoxis nigromaculatus*	Non-native	Lacustrine, riverine	Coeur d'Alene Lake, Lateral Lakes, Coeur d'Alene and St. Joe Rivers	Warm slow water of lakes, wetlands, and rivers
Pumpkinseed *Lepomis gibbosus*	Non-native	Lacustrine, riverine	Coeur d'Alene Lake, Lateral Lakes, Coeur d'Alene, St. Joe Rivers, and Hangman Creek	Warm bays of lakes, wetlands, and slow moving rivers
Bluegill *Lepomis macrochirus*	Non-native	Lacustrine, riverine	Coeur d'Alene Lake, Lateral Lakes, Coeur d'Alene and St. Joe Rivers	Weedy shorelines of lakes and slow moving rivers
Yellow perch *Perca flavescens*	Non-native	Lacustrine, riverine	Coeur d'Alene Lake, Lateral Lakes, Coeur d'Alene and St. Joe Rivers	Warm and cool waters of lakes and slow moving rivers
Torrent sculpin *Cottus rhotheus*	Native B=T5	Benthic riverine	Primarily found in the Coeur d' Alene, St. Joe River, and may occur in Hangman Creek	Middle reaches of streams with swift water and cobble/boulder substrates
Shorthead sculpin *Cottus confusus*	Native B=T5	Benthic riverine	Primarily found in the Coeur d' Alene, St. Joe Rivers, and may occur in Hangman Creek	Generally higher elevation streams in riffles but may occur in slower water

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
Cedar sculpin *Cottus schitsu'umsh*	Native	Benthic riverine	Distribution unknown but documented in Coeur d' Alene, St. Joe Rivers, may occur in Hangman Creek	Little is known about habitat preferences for this recently discovered species
Amphibians and Reptiles				
Coeur d'Alene Salamander *Plethodon idahoensis*	Native B=T3, ID=G4	Aquatic dependent	Primarily forested mountain streams within riparian areas	Spray and splash areas near streams, waterfalls, and springs
Western toad *Bufo boareas*	Native B=T3	Aquatic dependent	All areas with nearby water source	A variety of habitats and elevations but usually near water
Northern leopard frog *Rana pipiens*	Native ID=G5	Aquatic dependent	Currently thought to be extirpated from planning area	Marshes and wet meadows in both low and high elevations
Columbia spotted frog *Rana pretiosa*	Native ID=G4T2T3	Aquatic dependent	Not present	Not present
Long-toed salamander *Ambystoma macrodactylum*	Native	Aquatic dependent	All areas with nearby water source	A variety of habitats and elevations but usually near water
Idaho giant salamander *Dicamptodon aterrimus*	Native B=T3, ID=G3	Aquatic dependent	Upper river basins, forested riparian areas and streams	Moist coniferous forests and mountain streams above mining influence
Pacific chorus frog *Pseudacris regilla*	Native	Aquatic dependent	All areas with nearby water sources	Variety of habitats with nearby water source at various elevations
Bull frog *Rana catesbeiana*	Non-native	Aquatic dependent	Unclear if present in lower basin aquatic habitats	Variety of aquatic habitats with permanent water and prefers warmer temperatures

Species	Origin and Special Status Ranking Indicator[1]	Life History	Distribution	Habitat Associations in the Planning Area
Tailed frog *Ascaphus promelas*	Native	Aquatic dependent	Upper river basins, forested riparian areas and streams	Permanent high-gradient coldwater streams and tributaries
Painted Turtle *Chrysemys picta*	Native	Aquatic dependent	Lower river basins, aquatic habitats	Backwaters of streams and rivers and lower basin lateral lakes with mud bottoms and aquatic vegetation
Red-eared slider *Trachemys scripta elegans*	Non-native	Aquatic dependent	Unclear if present in lower basin aquatic habitats	Backwaters of streams and rivers and lower basin lateral lakes

Appendix 4 – Scoping and Outreach

The following describes the activities pursued by the Trustee Council to gather information used to develop the draft Restoration Plan (proposed action) and to inform the preparation of the Environmental Impact Statement

Pre-scoping Announcements and Meetings

May 22, 2013 – Basin Commission update by Phil Cernera included announcements of open house dates

Scoping Announcements and Press

May 22, 2013—Basin Environmental Improvement Project Commission Announcement

June 4, 2013—Open houses announced on Restoration Partnership website.

June 4, 2013—Press Release 1

June 12, 2013—Press Release 2

June 12, 2013—296 Scoping Letters sent out to snail mail list

June 12, 2013 – Email announcement to North Fork Coeur d'Alene Watershed Advisory Group w/ press release.

June 13, 2013—Notice of Intent published in the Federal Register

June 13, 2013—Press Release 2 resent

June 13, 2013 – Open Houses announcement posted on DEQ website calendar

June 13, 2013 – Open Houses announcement posted at DEQ offices

June 13, 2013 – Kellogg Open House announcement submitted to Coeur d'Alene Press and Nickelsworth community calendars

June 14, 2013 – Open Houses announcement emailed to Silver Valley Chamber of Commerce and Wallace Chamber of Commerce

June 14, 2013—220 Scoping Letters sent out to email list (along with copies of the Press Release).

June 14, 2013—Spokane Public Radio calendar added all four open house events

June 17, 2013—KREM.com added open house events to calendar

June 17, 2013 – Restoration Partnership page added to DEQ website (http://www.deq.idaho.gov/restoration-partnership) incl. meeting announcements

June 18, 2013—10-day ad began on CDA Press online calendar

June 18, 2013 – Email reminder of Kellogg and Harrison Open House meetings

June 20, 2013 – Announcement at Trail of the Coeur d'Alenes Bi-Annual Meeting

June 20, 2013 – Open Houses paid advertisement printed in Coeur d'Alene Press

June 20, 2013 – Spokesman Review prints article "Comments sought on mining cleanup"

June 21, 2013 – Email reminder of Coeur d'Alene Open House

June 24, 2013 - Open Houses paid advertisement printed in Coeur d'Alene Press

June 25, 2013 – Coeur d'Alene Press prints article "In the public's hands"

June 26, 2013 – Email reminder of Worley Open House

July 2, 2013 – Email reminder of August 12 scoping deadline

July 15, 2013 – Email promotion sent

July 22, 2013 – Email promotion sent

July 29, 2013 – Email and Press Release announcing the 15-day extension of the scoping period

August 7, 2013 – Letters sent to local churches

August 20, 2013 – Email announcement of final week of scoping

Scoping Open Houses/Public Forum

June 18, 2013 – Kellogg, Noah's Loft

June 20, 2013 – Harrison, Elementary School

June 25, 2013 – Coeur d'Alene, Coeur d'Alene Inn Best Western

June 27, 2013 – Worley, Rose Creek Longhouse

August 20, 2013 – Public Forum with Shoshone Board of County Commissioners

SCOPING PRESENTATIONS-in sequential order

Aaron Calkins—Rep. Raul Labrador's office, verbal presentation (May 2, 2013)

Karen Rotter—Sen. Mike Crapo's Office, verbal presentation (May 8, 2013)

Sid Smith—Sen. James Risch's Office, verbal presentation (May 8, 2013)

Coeur d'Alene Tribal Council, verbal presentation (May 9, 2013)

Environmental Protection Agency, verbal presentation (May 14, 2013)

U.S. Fish and Wildlife Spokane Office, scoping Power Point (May 23, 2013)

State of Idaho Governor's Office, verbal presentation (May 23, 2013)

Coeur d'Alene Chamber of Commerce- Natural Resource Committee, scoping PowerPoint (June 5, 2013)

4C's Natural Resource Committee, scoping PowerPoint (June 5, 2013)

Coeur d'Alene Tribe internal scoping PowerPoint (June 6, 2013)

Kootenai Environmental Alliance Lunch and Learn Power Point (June 6, 2013)

Idaho DEQ internal scoping meetings in Coeur d'Alene (June 7, 2013) and Kellogg (June 12, 2013). June 12 meeting in Kellogg included staff from Basin Commission and Panhandle Health District.

Kootenai-Shoshone Soil and Water Conservation District scoping presentation (June 12, 2013)

Internal dry run with TC and PAO's and Internal Federal (BLM and USFS) scoping workshop (June 13, 2013)

Trail of the Coeur d'Alene's Bi-Annual mtg with Tribe, DEQ, IDPR, and UPRR (June 20, 2013)

North Fork Coeur d'Alene Watershed Advisory Group (June 26, 2013)

Leadership Coeur d'Alene scoping presentation (June 27, 2013)

Coeur d'Alene Tribe Lake Mgt. Dept informal presentation (July 8, 2013)

Benewah Soil & Water Conservation District scoping PowerPoint (July 9, 2013)

Osprey Tour informal presentation with Q & A (July 13, 2013)

Idaho State Bar Association Annual Mtg. (July 19, 2013)

BEIPC Technical Leadership Group scoping PowerPoint (a.m. July 25, 2013)

BEIPC Citizens Coordinating Council scoping PowerPoint (p.m. July 25, 2013)

Mica Bay Homeowners Association scoping PowerPoint (p.m. July 31, 2013)

Coeur d'Alene Lake Tributaries Watershed Advisory Group scoping PowerPoint (August 9, 2013)

KEA Board member discussion (August 12, 2013)

Coeur d'Alene Chamber 'UpBeat Breakfast', Coeur d'Alene Resort, info table (a.m. August 13, 2013)

North Idaho Fairbooth (info table with handouts August 21-25, 2013)

Coeur d'Alene Rotary Sunrise Breakfast PowerPoint (a.m. August 27, 2013)

Meetings During Preparation of the EIS

The following meetings were held to discuss socio-economic conditions in the primary counties potentially affected by the Proposed Action and Alternatives in order to better inform the socio-economics analysis:

- St. Maries, ID on June 22, 2015 with the Benewah County Commissioners.
- Coeur d'Alene, ID on July 22, 2015 with the Kootenai County Commissioners.

- Wallace, ID on June 22, 2015 with the Shoshone County Commissioners.
- Plummer, ID on June 25, 2015 with Coeur d'Alene Tribal members and representatives.

Additionally, throughout the preparation of the Restoration Plan and DEIS, representatives of the state of Idaho on the Trustee Council and Restoration Team have met regularly with Benewah, Kootenai, and Shoshone County commissioners to discuss resource conditions, development of the Restoration Plan, and preparation of the DEIS (see Scoping Report for full details).

Appendix 5 – Draft Restoration Plan

DRAFT

Coeur d'Alene Basin Restoration Plan

(DEIS Alternative 2)

Contents

Tables

Figures

1. Introduction

For more than 100 years, the Coeur d'Alene Basin was one of the most productive silver, lead, and zinc mining areas in the United States, producing 7.3 million metric tons of lead and 2.9 million metric tons of zinc between 1883 and 1997 (Mitchell and Bennett 1983; Long 1998). The majority of mining and mineral processing in the Basin occurred along the South Fork of the Coeur d'Alene River and its tributaries (Mitchell and Bennett 1983). The wastes generated by these operations contain hazardous metals, including lead, zinc, cadmium, and arsenic. A significant portion of these wastes was discharged into the Coeur d'Alene River and tributaries.

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)[1] provides a means for addressing releases of hazardous substances that may endanger public health and the environment. State, Tribal, and the Federal governments may take legal action against responsible parties for the cleanup and restoration of sites affected by mining waste. The Act provides for the designation of "natural resource Trustees"—Federal, State, or Tribal authorities who represent the public interest in protecting and conserving natural resources.

These Trustees may seek monetary damages from responsible parties for injury, destruction, or loss of natural resources resulting from releases of hazardous substances. These damages, which are distinct from funding for remediation (also referred to as "cleanup"), must be used by the natural resource Trustees to "restore, replace, rehabilitate, and/or acquire the equivalent of" the natural resources that have been injured.

The Trustees for the Coeur d'Alene Basin are the U.S. Departments of Interior and Agriculture, the State of Idaho, and the Coeur d'Alene Tribe.

Trustees are Federal, State, or Tribal authorities who represent the public interest and act on their behalf regarding injured natural resources.

Through a series of lawsuits, the Trustees obtained funds for restoration of natural resources injured by past mining practices. The term "injured" refers to those natural resources negatively affected by mining contaminants. Examples include surface and ground water, soils and sediments, riparian resources, fish, birds, benthic macroinvertebrates, and phytoplankton. The Trustees have formed a Trustee Council as well as a Natural Resources Restoration Team that will be responsible for implementing the restoration plan. The Trustees have proposed this restoration plan for the Coeur d'Alene Basin to restore, rehabilitate, replace, or acquire the equivalent of injured natural resources and the services they provide.

[11] Title 42 United States Code [U.S.C.] Section 9601 et seq. Restoration comprises all actions to restore, rehabilitate, replace, and/or acquire the equivalent of injured natural resources as prescribed at 42 U.S.C §9607(f)(1).

Restoration means actions that accomplish the restoration, rehabilitation, replacement, and/or acquisition of equivalent resources and that are intended to return injured resources and services to baseline condition, and compensate the public for interim losses.

Remediation is the cleanup of hazardous wastes through removal, containment, and other methods to

Throughout this plan, "restoration" means actions that accomplish the restoration, rehabilitation, replacement, and/or acquisition of equivalent resources and that are intended to return injured resources and services to baseline condition, and compensate the public for interim losses. Although restoration activities will be coordinated closely with remediation activities prescribed by the Environmental Protection Agency (EPA) and others, this plan only addresses restoration.

1.1 Releases and Distribution of Hazardous Substances

For most of the 20th century, mining wastes in the Coeur d'Alene Basin were discharged into the Coeur d'Alene River and its tributaries, or were deposited on lands and eventually migrated into ground and surface waters. Mining products and wastes containing metals were transported by train and other vehicles that spilled and tracked metals along travel routes in the Basin. Mining-related wastes were also taken from mine and mill sites or hauled out of floodplain areas for use in other applications throughout the Basin, including ballast for railroad lines, materials for street and road surfacing, and concrete aggregate. As a result, mining-related waste rock, tailings, mine drainage, and contaminated floodplain deposits are continuing sources of metals contamination in the Coeur d'Alene Basin (Ridolfi 1998). Tailings and contaminated sediments continue to be deposited in the Coeur d'Alene River channel, levees, and floodplain, as well as in lakes and wetlands next to the river (Campbell et al. 1999; Box et al. 1996; Fousek 1996; and Rabbi 1994), and in Coeur d'Alene Lake (Woods and Beckwith 1997; Horowitz et al. 1993, 1995a, 1995).

1.2 Damage Assessment and Injury Determination

In 1983, the EPA listed the Bunker Hill Mining and Metallurgical Complex Superfund facility on the National Priorities List in response to human health risks associated with mining-related metals contamination in the 21-square-mile area around the former Bunker Hill smelter, known as "the Box." The facility includes mining-contaminated areas in the Coeur d'Alene River corridor, adjacent floodplains, downstream waterbodies, tributaries, fill areas, and the Box itself (EPA 2002, EPA 2012). The EPA defined "operable units" (OUs) for the facility. A record of decision was signed for the populated areas of Bunker Hill Box (OU 1) in 1991 (EPA 1991), and a second was signed for the unpopulated areas of the Box (OU 2) in 1992 (EPA 1992).

In 1991, the Tribe, DOI, and USDA as natural resource trustees initiated a Natural Resource Damage Assessment[2] to assess injuries to natural resources resulting from exposure to hazardous substances, particularly lead, zinc, arsenic, and cadmium in the Coeur d'Alene Basin. The Trustees developed the assessment consistent with the U.S. Department of Interior's

[2] 43 CFR Part 11

damage assessment regulations.[3] The Trustees subsequently prepared and released the *Phase I Injury Determination Assessment Plan* (Ridolfi 1993) and the *Phase II Injury Quantification and Damage Determination Assessment Plan* (Stratus Consulting 2000). Results of the injury determination and quantification studies documented the following:

- Concentrations of metals in floodplain soils of Canyon Creek, Ninemile Creek, and the South Fork Coeur d'Alene River valley are phytotoxic and have caused reduced riparian vegetative cover and habitat complexity, resulting in hundreds of acres of barren and sparsely vegetated floodplain soils and sediments.
- Concentrations of metals in surface water (Ridolfi 1995; Ridolfi 1999) exceed chronic and acute aquatic life criteria recommended by the EPA.[4] Fish and other aquatic resources have been injured as a result of exposure to elevated metals (Ellis 1940; Stratus Consulting 2000); populations of trout and other fish have been reduced or eliminated from the South Fork Coeur d'Alene River (Stratus Consulting 2000).
- Of the approximately 19,200 acres in the Coeur d'Alene River floodplain habitat, approximately 18,300 acres (95 percent) contain lead levels above those observed to cause negative physiological effects in waterfowl. Approximately 15,400 acres (80 percent) contain lead levels lethal to waterfowl (EPA 2002). Ingestion of lead-contaminated sediments has resulted in waterfowl deaths and other adverse physiological effects (Beyer et al. 2000; Sileo et al. 2001).
- Approximately 40 square miles, or 85 percent of lakebed sediments contain lead concentrations above values considered ecologically harmful.

In 1998, as the Trustees' damage assessment studies were near completion, the EPA initiated a CERCLA remedial investigation and feasibility study of human and ecological risks from exposure to mining-related metals contamination outside the Box. Identifying this area as OU 3, EPA's findings and conclusions were consistent with the Trustees' findings and conclusions concerning the extent and impact of mining-related metals contamination on natural resources in the Coeur d'Alene Basin. In 2002, the EPA issued an interim record of decision for Basin OU 3, specifying 30 years of cleanup actions in areas upstream and downstream of Coeur d'Alene Lake at an estimated cost of $359 million. The EPA did not select cleanup actions for Coeur d'Alene Lake; they deferred to the Tribe and the State of Idaho ("the State") to develop and implement an updated lake management plan to monitor and address metals-contaminated sediments in the lake (EPA 2002; Ridolfi and Falter 2004). Subsequently, the Tribe and State adopted the *Coeur d'Alene Lake Management Plan* in 2009 (IDEQ and Tribe 2009).

A number of agencies are implementing cleanup of hazardous wastes in the Coeur d'Alene Basin; they include the Idaho Department of Environmental Quality, U.S. Forest Service, Bureau of Land Management, and the EPA. The strategy for cleanup in the Basin focuses on source control and removal, particularly of lead in soil and sediment, as well as dissolved zinc, cadmium, and particulate lead in surface waters. Source control techniques include treating surface water and groundwater to remove excess zinc, arsenic, cadmium, lead, manganese and mercury;

[3] 43 CFR Part 11
[4] 63 FR 68354

excavating and removing contaminated soils; permanent capping of contaminated areas; and other techniques to reduce metal concentrations.

1.3 Litigation and Settlements

In 1983, the State initiated a civil action under the CERCLA against several mining companies for response costs and natural resource injuries in the Coeur d'Alene Basin. The State settled with those companies in 1986. The Tribe filed a lawsuit in 1991 and the U.S. Government filed one in 1996; these were later consolidated. The trial on liability issues began in January 2001, and continued through July 2001.

In 2003, the U.S. District Court for the District of Idaho ruled that the Tribe and Federal Trustees established that two non-settling mining companies, ASARCO Incorporated and Hecla Mining Corporation, Inc., were liable under the CERCLA and the Clean Water Act for natural resource injuries resulting from releases of mining-related metals contamination into the Coeur d'Alene Basin. Numerous natural resource injuries were demonstrated in the damage assessment and confirmed by the U.S. District Court in 2003[5]. Specifically, injury to Federal Lands and tundra swans were used to establish a claim. The named defendants settled with the Trustees, either separately or together, resulting in more than $140 million received by the Trustees from 1986 to 2011.

1.4 Formation of the Restoration Partnership

Based on joint Trusteeship over injured natural resources as well as the joint settlements, a memorandum of agreement was signed in 2012 by the Tribe, the U.S. Department of the Interior, the U.S. Department of Agriculture, and the State. This agreement addresses the planning and implementation of restoration of natural resources or natural resource services that were injured, destroyed, or lost as a result of the release of mining-related hazardous substances into the Coeur d'Alene Basin. The agreement establishes a process for coordinating and cooperating on the development and adoption of this plan, implementing the plan to accomplish restoration, and the expenditure of settlement funds.

The Trustees entered into this agreement to continue their respective responsibilities and authorities as natural resource Trustees in compliance with the CERCLA and other applicable laws and regulations.[6] The Trustees and representative agencies are:

- the Coeur d'Alene Tribe;
- U.S. Department of Agriculture (Forest Service);
- U.S. Department of the Interior (Fish and Wildlife Service and Bureau of Land Management); and
- State of Idaho (Idaho Department of Fish and Game and Department of Environmental Quality).

[5] *Coeur d'Alene Tribe v. Asarco Inc., et al.*, 280 F. Supp. 2d 1094 (D. Idaho 2003)
[6] Sections 107 and 111 of CERCLA, 42 U.S.C. § 9651(c); 43 CFR Part 11; and section 311(f) of the Clean Water Act, 33 U.S.C. 1321(f).

The Trustee Council is the decision-making body for implementation of the plan and it meets regularly to:

- collaborate with one another regarding natural resource restoration in the Coeur d'Alene Basin;
- collaborate with the public regarding natural resource restoration; and
- ensure the restoration process complies with all applicable laws and regulations.

To achieve its purpose, the Trustee Council formed the Natural Resources Restoration Team to provide technical expertise. The restoration team comprises natural resource specialists and technicians from each governmental entity of the Council. The Trustee Council, Restoration Team, and supporting agencies working towards Coeur d'Alene Basin natural resource restoration are referred to as the "Restoration Partnership." It is the intent of the Partnership to work collaboratively and inclusively with stakeholders to effectively implement restoration.

Mission Statement
The Trustees will develop and implement a restoration plan to help restore the health, productivity, and diversity of injured natural resources and the services they provide in the Coeur d'Alene Basin for present and future generations.

Vision Statement
The Trustees envision a Coeur d'Alene Basin where natural processes sustain clean, healthy, and diverse habitats that support fish and wildlife populations, and the human cultural, recreational, and economic benefits that derive from them.

1.5 Purpose of the Plan

The purpose of this restoration plan is to facilitate the restoration of the natural resources and services injured by the release of mining-related hazardous substances in the Coeur d'Alene Basin.

The Trustees developed this restoration plan to comply with the requirements for Natural Resource Damage Assessments and Restoration[7] considered the following:

- Technical feasibility
- The relationship of the expected costs of the proposed actions to the expected benefits from the restoration, rehabilitation, replacement, and/or acquisition of equivalent resources
- Cost effectiveness

[7] 43 CFR §11.82 (d)

- The results of any actual or planned response actions
- Potential for additional injury resulting from the proposed actions, including long-term and indirect impacts, to the injured resources or other resources
- The natural recovery period determined in the regulations for Natural Resource Damage Assessments and Restoration[8]
- Ability of the resources to recover with or without alternative actions
- Potential effects of the action on human health and safety
- Consistency with relevant Federal, State, and Tribal policies
- Compliance with applicable Federal, State, and Tribal laws

This restoration plan is intended to help return injured natural resources to baseline conditions.[9] Restoration toward baseline conditions can be measured in terms of physical, chemical, or biological properties.[10] Baseline is not necessarily pristine or pre-development conditions, but the condition that would have existed today with all of the other development and use in the Basin without mining contamination.

The restoration plan will enable prioritized implementation of restoration projects that will go beyond the source control and hazardous substance cleanup contemplated under the EPA's records of decision (EPA 1991, 1992, 2002, 2012, or any subsequent actions), by restoring, rehabilitating or replacing physical, chemical, biological, and ecological attributes of natural resources that contribute to functional ecosystems. The Trustees will implement the adopted restoration plan in coordination with the cleanup activities of the EPA, the State, and others in the Basin.

The following figure outlines the flow of the restoration plan.

[8] 43 CFR §11.73(a)(1)
[9] 43 CFR §11.14(e)
[10] 43 CFR §11.14(11)

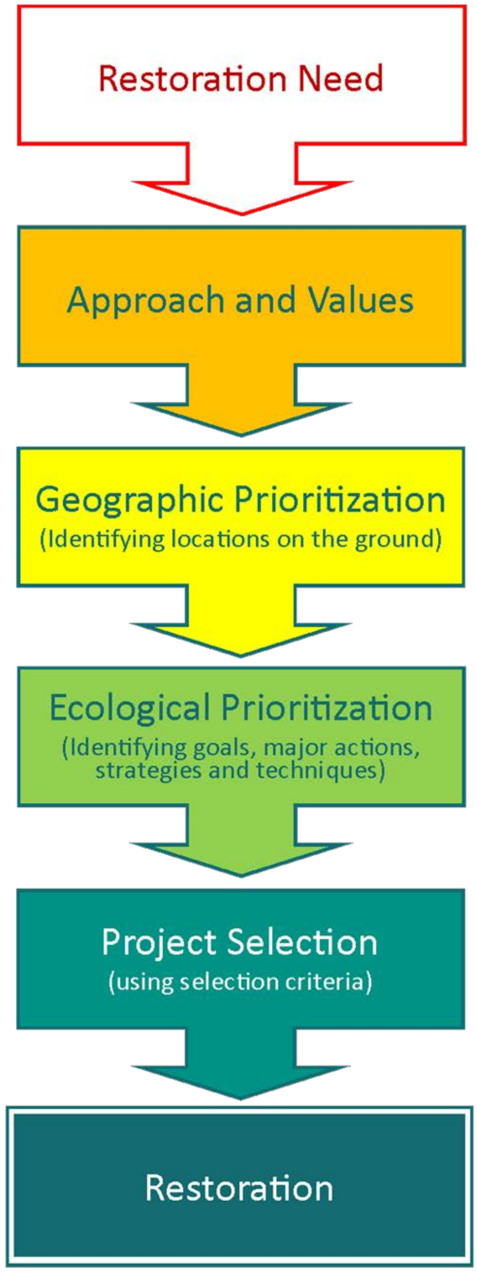

Figure 1. Schematic describing flow of the restoration plan

2. Restoration Approach and Values

When conducting restoration, the Trustees will be guided by the following values.

2.1 Link to Injured Resources

The Trustees are required by law to use settlement funds to "restore, rehabilitate, replace, and/or acquire the equivalent of the injured natural resources." Restoration with the strongest direct benefit to injured natural resources is preferable to restoration with minimal or indirect benefits.

2.2 Coeur d'Alene Basin Focus

The Trustees anticipate that restoration needs will exceed available financial resources from settlement funds. Restoration in the Coeur d'Alene Basin will improve natural resources and services where they were injured, and it will provide the most direct benefits for the public affected by these injuries. Therefore, the Coeur d'Alene Basin will be the primary focus of restoration under this plan (Figure 2). For the purposes of this plan, the "Basin" refers to the land area that drains into Coeur d'Alene Lake, as well as the portion of the Upper Spokane River Subbasin that occurs in Idaho. At the discretion of the Trustees, restoration will be considered outside of the Basin only when it occurs in the Hangman Creek watershed within the existing boundary of the Coeur d'Alene Reservation, and restores lost Tribal services where opportunities to address those lost cultural services in the Basin are very limited, untimely, or do not exist at all. Thus, the restoration planning area will encompass both the Coeur d'Alene Basin and the portion of the reservation as identified above.

2.3 Restoration in Contaminated Areas

The Trustee Council expects that restoration will occur where injuries took place. However, some sites impacted by mining may be so costly to remediate and restore, or the return on investment so low, that working there is unjustifiable. Similarly, some uncontaminated areas in the Basin may present restoration opportunities with low cost, high returns on investment, or special opportunities not available in mining-impacted areas. Thus, although restoration focuses on mining-impacted areas, this does not exclude work in other areas.

2.4 Emphasis on Ecosystem Processes

The Trustee Council will focus restoration on the biotic and abiotic processes that form and maintain functioning ecosystems that, in turn, provide habitat for wetland, aquatic, and riparian species. Desired habitats are self-sustaining and resilient to disturbance. Ecosystems comprise a biological community of interacting organisms and their physical environment. Because ecosystems integrate biotic and abiotic environmental elements and how they relate to one another, they provide the best frame of reference from which to engage in restoration.

Figure 2. The restoration planning area

2.5 Habitat Focus and Focal Resources

The Trustees recognize and value the complementary nature of habitat and target species approaches to ecosystem restoration. Although restoration implementation described below is primarily habitat focused (because it is the ecosystem element we can most directly and sustainably affect), restoration would in part be guided by conservation needs of key focal species or resources. Focal species were chosen so that restoration based on them will enhance several other natural resources as well.

2.6 Best Available Science

The Trustees will be guided by the best scientific information available when planning and conducting restoration. As new science and data become available, they will help to further refine and inform restoration efforts.

2.7 Cultural Focus

The Trustees value the Tribal and non-Tribal cultural significance of natural resources throughout the Basin, and will strive to restore them in a way that provides for traditional uses, subsistence uses, natural resource-based recreation, and other services. By keeping cultural values at the forefront, restoration will contribute to the ecological and socioeconomic well-being of the Basin for current and future generations.

2.8 Engagement with Stakeholders

The Trustees' partnerships with local governments, businesses, community groups, and private landowners will play a vital role during restoration. Public participation and values will be considered, and restoration will be implemented in a transparent manner. The Trustees will encourage long-term community stewardship of natural resources through education, partnerships, and public involvement.

2.9 Economic Resilience

The Trustees value restoring injured natural resources in a way that sustains regional cultures and economies and contributes to the health of the Basin as an ecological and socioeconomic region. Healthy, functioning ecosystems support local economies by increasing availability of clean soil and water, providing jobs to conduct restoration work, increasing tourism, improving community aesthetics, and providing increased recreational opportunities.

2.10 Human Uses of Natural Resources

As defined here, human uses are the tangible and intangible benefits people derive from natural resources such as hunting, fishing, subsistence, and scenery.[11] These uses are dependent on natural resources such as functioning watersheds, healthy fish and wildlife populations, and intact habitat. These natural resources were injured or lost by the release of mine waste contaminants. By restoring resources injured by this contamination, associated human uses of these resources can be restored as well. Where consistent with the plan, the Trustees value restoring human uses of natural resources as quickly as possible. In particular, the Trustees will seek opportunities to enhance cultural and recreational uses (such as hunting, fishing, and trapping), and environmental education closely related to restored natural resources in the Basin where such activities do not increase human health risks or conflict with cleanup and ecological restoration goals. Examples of such projects include:

- habitat restoration work (when priorities are based on Coeur d'Alene Tribal cultural services that have been injured),
- an educational placard describing restoration of an injured wetland and resulting bird habitat,
- enhanced public access,

[11] 43 CFR 1.14(nn) defines "services" lost from injured natural resources.

- a boat ramp, or
- a wildlife observation blind.

Where possible, restoration projects will be designed to permit public access to restored natural resources so people can enjoy the results of restoration work.

2.11 Integration

Where appropriate and where value can be added, restoration will be integrated with relevant aspects of other management plans throughout the Basin such as county comprehensive plans, the *Idaho Panhandle National Forests Land Management Plan*, the Bureau of Land Management's *Coeur d'Alene Resource Management Plan*, Idaho Fish and Game management plans, the Coeur d'Alene Tribe's *Integrated Resource Management Plan*, and other plans relevant to restoration of injured natural resources. In particular, restoration will be coordinated with ongoing cleanup under the EPA records of decision, the *Coeur d'Alene Lake Management Plan*, and cleanup at smaller sites within the Basin.

2.12 Cost-Effectiveness

Settlement funds for restoration are finite, and restoration needs exceed available funds. The Trustees will seek partnerships for cost-share opportunities to augment, match, or leverage settlement funds. The Trustees desire maximizing funds for on-the-ground restoration while keeping administrative and project operation and maintenance costs as low as possible.

2.13 Timing and Rate of Restoration

The Trustees prefer to initiate and conduct restoration work as soon as possible to restore injured natural resources and provide public benefits. However, the rate of restoration will be influenced by the availability of projects that meet the goals of this plan, capacity to complete projects, feasibility of working in priority areas, and status of cleanup. These factors may require the Trustees to slow the rate of restoration at times.

2.14 Monitoring and Adaptive Restoration

Monitoring is critical to evaluate whether the objectives of restoration were met. Results of monitoring will be used to inform restoration efforts as well as to modify existing projects to improve results.

2.15 Hierarchy of Preferred Restoration Approaches

A variety of restoration approaches is available, and it is important to retain a wide range of options. The Trustees will retain flexibility to use any legal means to accomplish restoration goals. Although any particular approach may be the right tool in a particular context or setting, not all approaches are equally desirable. The Trustees intend to place more effort and funding on higher priority approaches and anticipate some approaches may not be employed at all.

In descending order of preference, the Trustees prefer the following hierarchy for preferred restoration approaches:

1. Restoration at locations within the Basin where injury occurred and the restored natural resources or services are of the same physical, biological or cultural nature of those injured or lost.
2. Restoration at locations within the Basin where injury did not occur but the restored natural resources or services are of the same physical, biological or cultural nature of those injured or lost.
3. Restoration at locations within the Basin where injury occurred but the restored natural resources or services are of a different physical, biological or cultural nature of those injured or lost (for example, replacing fishing opportunities by constructing a fishing pond).
4. Acquisition of equivalent resources within the Basin where land with natural resources of the same physical, biological or cultural nature of those injured or lost is purchased and placed into public ownership, management, and protection. Acquisition may be considered more desirable when it facilitates or augments Trustees efforts at achieving higher restoration priorities and is not an end in itself.
5. Restoration outside the Basin will be considered at the discretion of the Trustees only when it occurs in the Hangman Creek watershed within the existing boundary of the Coeur d'Alene Reservation, and restores lost Tribal services where opportunities to address lost natural resources of cultural value in the Basin are very limited, untimely, or do not exist at all.

2.16 Types of Restoration Not Desired

Restoration projects considered under this plan must benefit natural resources injured by mine waste releases. Projects that will not be considered include, but are not limited to:

- Projects that impede ecological restoration or cleanup
- Projects that do not address injured resources or the services they provide
- Projects that address economic, infrastructure, or recreational concerns unrelated to injured natural resources
- Projects that increase human health risks in contaminated environments

3. Geographic Prioritization of Ecosystem Restoration

As noted previously, the Trustees recognize that the entire suite of injured resources cannot be restored with existing settlement funds. Therefore, the Trustees have selected wetland, stream, and lake ecosystems as the focus for restoration (Figure 3). These ecosystems provide the best frame of reference to engage in restoration of each of the injured resources because they integrate both biotic and abiotic environmental elements and because of the way they relate to one another. In the Basin, wetland, stream, and lake ecosystems have sustained substantial environmental injury. In their baseline condition, these ecosystems are highly productive, typically have high species diversity, and the presence of water attracts and concentrates human use. The Trustees choose to direct their limited resources to wetland, stream and lake ecosystems because of their history of injury and their importance to people and wildlife.

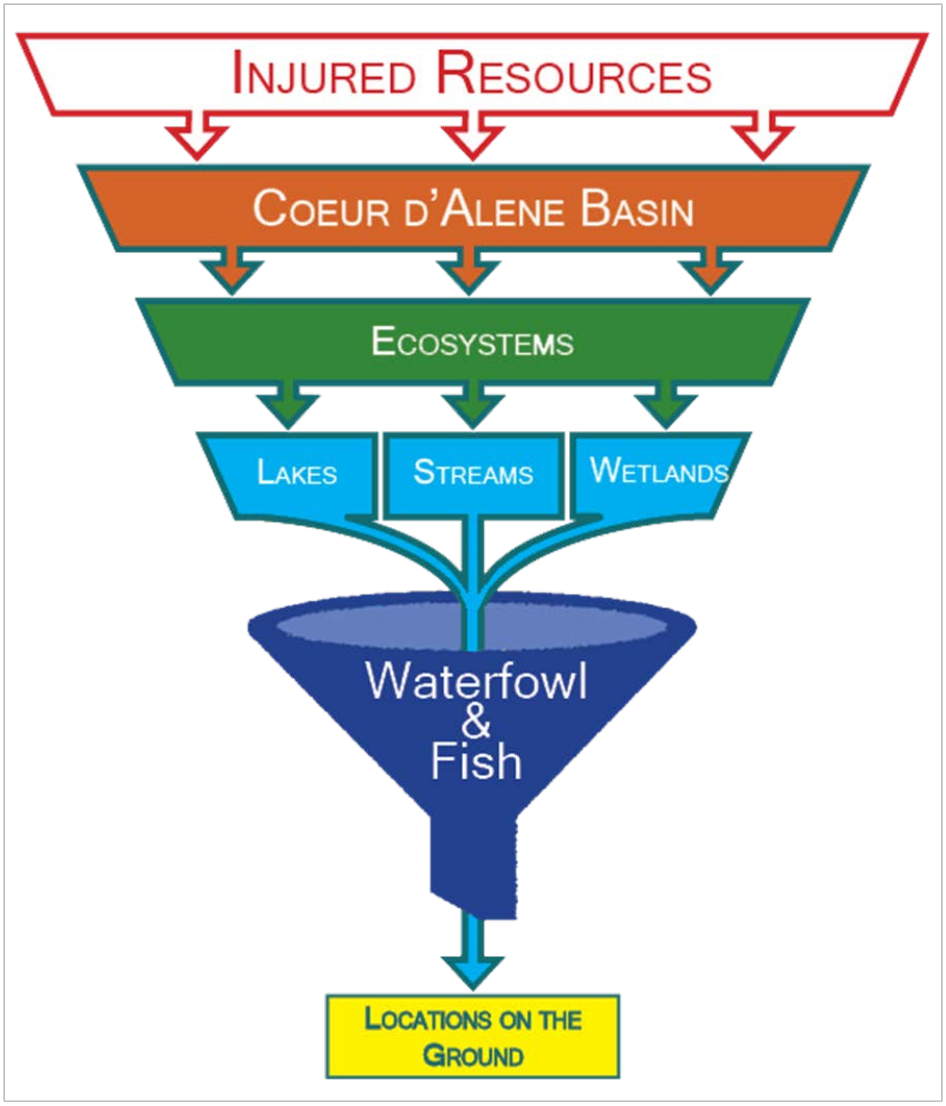

Figure 3. Geographic prioritization of restoration projects

The number of potential restoration opportunities in wetlands, lakes, and streams still exceeds available funds. Consequently, the Trustees identified a subset of resources—fish and waterfowl—to guide ecosystem restoration and facilitate geographic prioritization. Doing so will:

- *Ensure restoration integrates a full suite of ecosystem processes and functions*. Fish and waterfowl require intact, functioning ecosystems, including complexes of wetlands, streams, lakes, and riparian areas. They also require specific habitat features relative to other injured resources. Therefore, functioning streams, wetlands, and lakes are required to provide habitat for these and other injured natural resources.
- *Benefit many other injured resources in the Basin.* The ecosystems fish and waterfowl rely upon—streams, wetlands, and lakes—support other injured natural resources as well. For example, restoring a stream in an important area for fish will also improve soils and sediments, benthic macroinvertebrates, and riparian corridors used by songbirds and other wildlife.

3.1 Waterfowl

When evaluating where to do restoration in the Basin, waterfowl were chosen as a focal resource for several reasons:

- Waterfowl and the services they provide were injured by mine waste contamination
- Restoration that benefits waterfowl will benefit other injured natural resources. Waterfowl require high-quality wetlands and all of their inherent functions and services. Providing habitat for waterfowl will provide for many other bird and wildlife species that inhabit wetlands as well, including amphibians, and mammals. Also, injured resources such as soils and sediments, water quality, and recreational and cultural opportunities will be improved in conjunction with wetland restoration.
- Restoration of wetlands includes riparian margins, which benefit other injured resources, such as songbirds, fish, mammals, and amphibians.
- Waterfowl are highly visible and have strong cultural and recreational links. From bird watching to hunting, the public has enjoyed waterfowl in the Basin for centuries.
- There is already waterfowl monitoring in place. To gauge success of restoration, data collected before restoration is essential. A migratory waterfowl monitoring program in the Basin has been in place for the past 10 years and will be an important source of data in advance of any restoration projects as well as after restoration takes place.

3.2 Fisheries

To establish geographic priorities for aquatic restoration in the Basin, benefits to native fish communities, particularly bull trout and westslope cutthroat trout, will be a primary guide. Fish were chosen as focal resources for the following reasons:

- Fish and the services they provide were injured by mine waste contamination.
- Restoration that benefits fish is expected to benefit a wide range of aquatic resources. Westslope cutthroat and bull trout are highly sensitive to water quality and require high quality, functional aquatic habitats including lakes, streams, and floodplains. Restoring habitats for sensitive native trout will benefit many other fish and aquatic species as well as wildlife, human services, and other injured resources.
- Stream restoration includes watershed and riparian restoration, which benefit other injured resources including songbirds, waterfowl, mammals, and amphibians.
- Fish provide a direct link to services and potential economic opportunities.
- Fisheries monitoring is already conducted throughout the Basin and substantial information is available to guide restoration.

4. Proposed Restoration

This section describes the goals and major actions for wetlands, streams, lakes, and human services. In general, the Trustees are relying on focal resources (waterfowl and fish) to prioritize restoration geographically, and on-the-ground work will primarily involve physically manipulating habitats, rather than the fish and wildlife that depend on them. Focal resources will simply guide where and how that work is done. The Trustees' approach will be to restore function and process to habitats and services so they can support the focal resources. The primary focus of restoration will be on wetlands, streams, lakes, and associated riparian habitats. Where deemed appropriate by the Trustee Council, however, consideration will be given to funding fish and/or wildlife population management actions designed to provide long-term and lasting benefits to species identified as focal for restorations.

Riparian habitat is a key component of wetlands, lakes, and streams, and occurs as a transitional area between aquatic and upland ecosystems; it includes all land directly affected by surface water (Verry et al. 2000). Riparian habitats influence aquatic systems by controlling erosion and sedimentation, moderating water temperature, providing woody debris structure, and maintaining invertebrate communities that contribute to food chains in aquatic systems. In addition to these contributions, riparian areas provide habitat to a broad array of terrestrial reptiles, amphibians, birds, and mammals. Restoring riparian habitats will benefit those populations and enhance the many functions and services that riparian areas provide. Riparian restoration projects will be guided by and incorporated with wetland, lake, and stream restoration projects, and descriptions of riparian restoration are incorporated into those sections. Although the physical, biological, and cultural elements of wetlands, lakes, and streams in the Basin landscape are strongly interconnected (for example, riparian areas contribute wood structure to streams, which flow into wetlands), they are considered separately in this section because different strategies and techniques are used for each.

4.1 Wetlands

Wetlands are complex systems that provide many services to society and natural resources. In the Basin, they are characterized by shallow water and a variety of emergent and submergent plants and woody vegetation. Most wetland habitat in the Basin occurs along the Coeur d'Alene River floodplain an area known as the Chain Lakes. Because of contamination in the Basin and varying levels of wetland degradation, there is a variety of settings in which wetland restoration can occur, each requiring a different restoration approach.

The Trustees will implement a strategy to improve current ecological conditions and make progress toward reaching desired future conditions for injured wetland and riparian ecosystems within the Basin. The desired conditions include:

- Shallow water, which is able to support emergent and submergent wetland vegetation that provides cover and food for wetland wildlife
- Sufficient clean feeding habitat and a significant decrease in lead exposure and mortality of wetland wildlife
- Diverse native vegetation in wetland and riparian habitats
- A mixture of open water and vegetation that support optimal nesting and feeding conditions
- A variable hydroperiod with seasonal fluctuations which is necessary for optimum wetland productivity
- A complexity of wetlands with a diversity of conditions that collectively consist of individual wetlands, which vary in duration and frequency of flooding and vegetation communities

In general, properly functioning, natural wetlands should exhibit these characteristics with little need for maintenance. However, due to widespread contamination and extensive changes to wetland habitats over the past century, wetlands restoration in the Basin is likely to require long-term maintenance to achieve desired conditions. Maintenance and management in the form of water level management, invasive species control, and ditch and berm construction, will assist in reducing recontamination risk and maintaining the value of restored wetlands into the future.

WETLANDS GOAL: Restore injured wetland processes, functions, species, habitats, and services
Major Actions • Restore wetland process and function, including plant diversity and hydrology, to uncontaminated but degraded wetlands. • Construct new wetlands on low gradient uncontaminated sites with adequate water supply and low potential for contamination. • Restore wetland process, function, and diversity in conjunction with cleanup at contaminated wetlands that have low or controllable risk for recontamination. • Decrease waterfowl and wildlife exposure to harmful levels of mine waste contaminants where cleanup is cost prohibitive and recontamination risk is high or difficult to control. • Protect and preserve healthy functioning wetlands.

4.1.1 Major Actions for Wetland Restoration

Restore wetland processes and function, including plant diversity and hydrology, to uncontaminated but degraded wetlands.

The Trustees have identified opportunities in uncontaminated wetlands. Uncontaminated wetlands, especially where they would be valuable to waterfowl, are limited in the Basin. However, where uncontaminated wetlands are found in a degraded state, restoration can be cost effective relative to restoring contaminated wetlands. If they have not been contaminated over the past 100 years, recontamination is not likely to be an issue. Usually, wetlands in this category have been drained or modified for any number of human uses, or invasive vegetation has displaced native species. The majority of these opportunities will be outside of the floodplain. Strategies for these projects will be to restore natural hydrology and vegetation to a state preferred by wetland wildlife.

Construct new wetlands on low-gradient uncontaminated sites with adequate water supply and low potential for contamination.

These opportunities are in similar areas to uncontaminated wetlands; however, they occur where wetlands have not historically occurred. They represent opportunities to expand total wetland acres in the Basin and help offset or replace losses of wetlands where restoration is difficult or impossible because of contamination loads and a high risk for recontamination. If site conditions are favorable, it is possible to construct new wetlands where they have not existed. Because they did not occur naturally, it is difficult to create all of the functions of a native wetland, but some habitat quality can be created. Creating wetlands will involve a significant amount of excavation, by either building low-level berms to back up water or excavating shallow water areas to pool water. If this is done in low-gradient sites that have enough water input, hydric conditions can be created that will help wetland plants establish and provide habitat for wetland wildlife.

Restore wetland processes, function, and diversity in conjunction with cleanup at contaminated wetland sites that have low or controllable risk for recontamination.

Contaminated wetlands with low or controllable risk of recontamination are a high priority for restoration because they represent continuing injuries to waterfowl, as well as opportunities that most directly compensate for injury to wetlands from mine waste contamination. It is also perhaps the most difficult major action because, where wetlands are contaminated, the potential for recontamination is high. Restoring and maintaining wetlands in the contaminated zone along the Coeur d'Alene River will likely require the most intensive techniques to control water flow and prevent recontamination.

Priorities for cleanup are unknown and will become clear as more data are available to help make decisions. In the Coeur d'Alene River floodplain, it is particularly important to coordinate cleanup and restoration.

Decrease waterfowl and wildlife exposure to harmful levels of mine waste contaminants where cleanup is cost prohibitive and recontamination risk is high or difficult to control.

Because of recontamination potential, restoration may not be feasible in all contaminated wetlands. However, the Trustees still hope to reduce injury to waterfowl and other wildlife in these wetlands. Possibilities to reduce exposure are to manage water levels at strategic times to make them undesirable to waterfowl or to make vegetation and sediments inaccessible to feeding waterfowl. Tundra swans, one of the focal species in the Injury Determination, feed by burrowing their bills into sediment just below the water line where they feed on aquatic vegetation and roots. Sediments containing mine waste contamination coat this vegetation, which is then ingested by the swans (Sileo et al. 2001). If water is too deep to reach sediments or if wetlands are de-watered, exposure to contaminants will be reduced in the short term. Another possibility is managing vegetation to make habitat undesirable. When these projects are conducted, practices will be used that can easily be reversed if conditions improve and contamination is no longer an issue. For example, if a wetland is managed with a water control structure to raise water levels during waterfowl migration, the same structure either can be removed or can provide optimal water levels once contamination is at a tolerable level.

Protect and preserve healthy functioning wetlands.

Wetlands that fit this category are rare. If high-functioning wetlands exist without contamination, they are likely protected by land ownership or some other mechanism. In the rare case that there is a wetland in need of protection, that will be a high priority. Protection in some form will also be essential after restoration projects are complete to protect time and funding investments made by the Trustees. Protection can occur by land acquisition, conservation easements, or other means.

4.1.2 Priority Areas

The Trustees will focus wetland and riparian restoration in strategic locations that can support habitat characteristics beneficial to waterfowl and other wetland species. The highest priority for restoration will be areas where waterfowl are abundant and where sediment and water quality are impaired. In the restoration planning area, these are the wetlands and lakes along the Coeur d'Alene River. Wetland restoration outside of the wetlands and lakes along the Coeur d'Alene River will also be considered if they are in the restoration planning area, and if there is a high likelihood that waterfowl and other injured wetland wildlife can be restored as a result of the restoration.

The timing and location of priorities will also in part be determined by opportunities to coordinate with cleanup and to enhance habitats following cleanup. According to the EPA 2002 record of decision, priorities for cleanup in the Coeur d'Alene River floodplain are Harrison Slough, Killarney Lake, Canyon Marsh, Lane Marsh, Medicine Lake, Cave Lake, Bare Marsh, Anderson Lake, Thompson Lake, and Thompson Marsh. Another priority for cleanup is the conversion of agricultural land to wetlands. As more information becomes available regarding sediment movement, those priorities may be refined, and efforts are ongoing between the Trustees, EPA, and others to ensure that cleanup and restoration are coordinated where possible. Several sources were used to identify waterfowl priority areas:

- National Wetlands Inventory, Idaho GAP Analysis, and other wetland data to identify habitat types and drained wetlands
- Lead contamination data to determine what areas are above and below the 530 parts per million threshold for waterfowl, and the extent of contamination in waterfowl feeding areas
- Waterfowl abundance and use data from U.S. Fish and Wildlife Service to show where waterfowl are concentrated during spring migration
- Coordination with EPA and others to determine where cleanup is likely to occur and to ensure that restoration will be technically feasible

Priority areas were divided into three groups based on waterfowl use, contamination of wetlands, and where restoration is feasible.

Tier 1 priorities are those wetlands that are the highest priority for restoration (Figure 4). Some wetlands and waterbodies in the Coeur d'Alene River floodplain that are next to each other and can be connected by surface flow can be considered wetland complexes. Tier 1 wetland complexes are those that receive high waterfowl use and are contaminated above the threshold that causes injury to waterfowl (Table 1).

Table 1. Tier 1 wetlands and wetlands complex priority areas waterfowl observations, and additional restoration considerations

Wetland	Acres	Average waterfowl observations* per year (% of total survey)	Other Considerations
Lane Marsh Strobl Marsh Killarney Lake Complex	1,300	21,400 (22%)	High swan and other waterfowl use, high exposure to contamination, near existing restoration projects, potential to manage water levels.
Canyon Marsh	870	16,600 (17%)	High waterfowl use with ample restoration potential. Canyon Marsh is mostly private land, so this restoration priority is entirely dependent upon landowners being willing to participate. Any project done on private property is entirely voluntary on the part of the landowner.
Thompson Lake Thompson Marsh Harrison Slough Anderson Lake Complex	2,800	16,600 (17%)	High waterfowl use, high exposure to contamination, ability to manage water levels, clean water source, high contamination, accessible
Cave Lake Medicine Lake Complex	1,750	13,000 (13%)	High waterfowl use, clean water sources, accessible

* Waterfowl observations are averaged from surveys conducted by USFWS from 2005 to 2014 during spring migration (February-April).

Strategies for restoration in Tier 1 areas will depend on the site. For those sites that have a reasonable expectation of minimal recontamination, remediation and restoration can be done. For those sites in which recontamination cannot be controlled, steps can be taken to reduce exposure to wildlife, including water level and vegetation management. Most Tier 1 wetlands will fall under the major actions dealing with restoration following remediation or reducing exposure to waterfowl when exposure is high and recontamination cannot be controlled. Properties next to these wetland complexes will be considered part of the complex. Projects done in Tier 1 wetlands should reduce exposure or reduce contamination and restore habitat.

Tier 2 priorities are all other wetlands along the Coeur d'Alene River, Lower St. Joe River, the bays and backwaters of Coeur d'Alene Lake, and any wetlands along the lower North and South Fork corridors and Lower St. Maries. These areas are either directly affected by mine waste releases or contain valuable wetland resources near the affected wetlands. Projects involving Tier 2 wetlands could fall under any of the major actions outlined above. It is expected that many projects will occur in Tier 2.

Tier 3 priorities are any other wetlands in the Basin, which are primarily uncontaminated. There are likely wetland restoration opportunities outside of the priority areas described above, and those areas will be considered if there is a reasonable expectation that wetland processes and functions important to injured resources can be restored. These will likely be smaller projects.

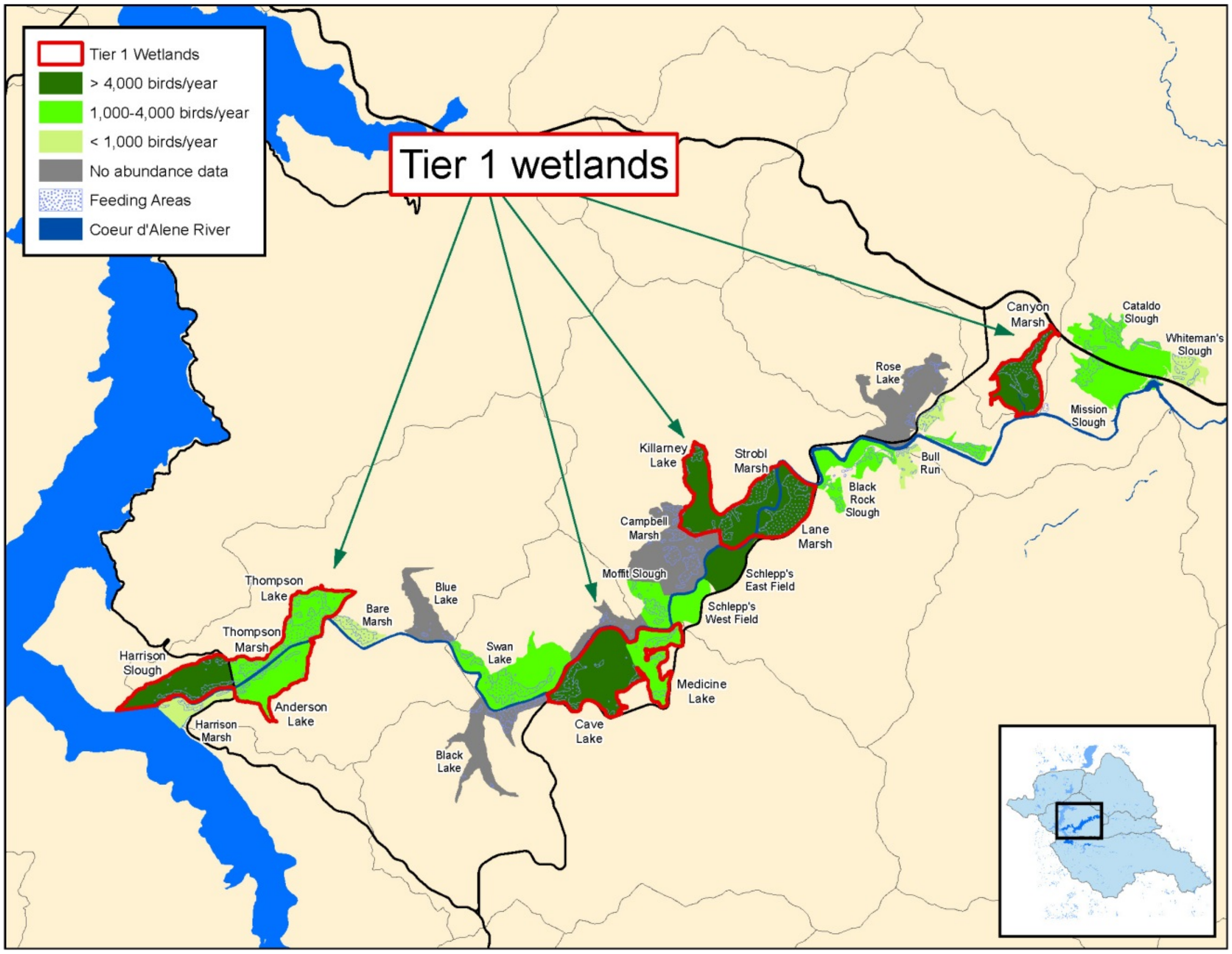

Figure 4. Tier 1 wetlands and complexes (outlined in red).

Waterfowl observation data was collected by the U.S. Fish and Wildlife Service from 2005 to 2014 during spring migration (February-April). Schlepp's east and west wetlands were surveyed from 2008-2014.

4.1.3 Strategies and Techniques

Many strategies and techniques are available to restore wetlands in priority areas. Each strategy listed in Table 2 can be accomplished with a number of on-the-ground techniques. The techniques used will depend on a variety of factors, including topography, existing hydrology, vegetation composition, proximity to other wetlands, engineering feasibility, and ability to manage water.

Which techniques are used in specific locations will be determined on a project-by-project basis.

Strategies define the general types of restoration project that may occur. ***Techniques*** describe practices on the ground that will be employed to accomplish various strategies.

Table 2. Strategies and techniques for wetland restoration

Strategy	Background	Technique
Restore hydrology	To restore wetlands that have been modified by land use changes, restoring hydrology (timing, depth, and duration of saturation) is essential. Hydrology will be different depending on the wetland type and location, but should include shallow water areas and fluctuating water depths. Hydrology will be encouraged that provides habitat for as many species as possible.	• Diking • Water control structure • Pump water • Shallow water excavation • Plug ditches
Water level manipulation	Many restoration projects will require the ability to manage water levels. Water level control is also an important management tool for controlling undesirable vegetation and encouraging desirable species.	• Diking • Water control structure • Pump water • Shallow water excavation • Plug ditches
Moist soil management	A common management scheme that employs dikes and water control structures to manipulate water levels that are optimal for waterfowl management and annual wetland plant production. Typically, the management scheme calls for shallow water in the late summer, spring, and fall, and lower or no water through the summer, which allows plants to germinate.	• Diking • Water control structure • Pump water • Shallow water excavation • Plant desirable vegetation • Control noxious weeds
Improve habitat structure	For a variety of reasons, habitat structure, including the composition of vegetation and how it is interspersed in a wetland, can be less than optimal. If a wetland has too much vegetation and too little open water, removing some vegetation can provide for more foraging and nesting habitat.	• Plant desirable vegetation • Control noxious weeds • Control other vegetation • Install nest boxes
Topography manipulation	Manipulating topography in effect manipulates water depths, a variety of which can support different species of wetland vegetation and provide habitat diversity.	• Diking • Shallow water excavation • Blasting • Island construction
Convert wetland type	It is possible to convert wetlands from one type to another, either to reduce exposure of contaminants or as a way to control invasive species.	• Plant desirable vegetation • Control noxious weeds • Shallow water excavation
Reconnection	Wetlands that have been separated by levees or roads can be reconnected to restore their hydrology and other functions.	• Breach levees • Plug ditches
Protection	Following restoration, or as the primary restoration tool, intact wetlands should be protected to provide long-term benefits to wildlife.	• Land acquisition • Easement • Fencing

Strategy	Background	Technique
Coordinate with cleanup programs	Because of widespread contamination in wetlands, restoration will rely on close coordination with cleanup. In addition, ongoing data collection on sediment transport and other parameters will inform restoration.	• Technical assistance • Joint prioritization • Cap, flip, or remove contaminated soil • Site equipment and material staging areas to avoid or minimize adverse impacts to natural and socioeconomic resources

4.2 Streams

Streams in the Basin range from small, steep, forested mountain streams to large, mainstem rivers in lowland valley bottoms. They vary greatly in their condition from nearly pristine to highly degraded by mine waste. Most of the Basin has not been affected by mine waste. Some areas have few human impacts while others have varying degrees of degradation unrelated to mining. However, more than 150 miles of streams and rivers are injured by the release, downstream transport, and deposition of mine waste contamination. Streams and associated aquatic life that are particularly affected include the South Fork Coeur d'Alene River, Canyon Creek, Ninemile Creek, and the mainstem Coeur d'Alene River. Adjacent to these affected areas are some stream systems uncontaminated by mine waste. Cleanup has already improved water quality and habitat in some parts of the Basin, and continues to be planned for many other areas in the future.

Within this diverse environment, the Trustees will work to restore the biotic and abiotic processes that form and maintain functioning stream ecosystems that, in turn, provide habitat for fish, wildlife, and plant species. Restoration also benefits human services derived from stream ecosystems such as fishing, swimming, and scenic riparian corridors.

The Trustees envision restored stream and riparian habitats that will provide a network of independent, functional conservation areas, linked by open migratory corridors. In these areas, sustainable processes will create and maintain the habitat required to support robust populations of native fishes and other aquatic and riparian species. This network will enable aquatic species to recolonize injured areas as water quality and habitat conditions improve, by providing a source of pioneer stock and open migratory corridors.

Characteristics of functional and sustainable stream and riparian ecosystems include:

- habitat components that recover natural stream processes and functions and support diverse aquatic communities;
- intact, protected strongholds and areas of refugia that will provide resiliency and protection to the aquatic community from natural and human-caused disturbance;
- open migratory corridors that will provide a linkage between areas for spawning, rearing, feeding, and overwintering for native fish and their varied life histories;
- riparian and floodplain habitat that will provide complexity for both aquatic and terrestrial species;

- improved water quality as a result of cleanup activities, natural reduction of contaminants, and restoration activities that are protective of the aquatic community; and
- stream ecosystems that support a variety of human services such as fishing, swimming, and drinking water.

STREAMS GOAL: Protect and restore injured streams and riparian habitats, species, and services.
Major Actions • Restore habitat function and processes in stream and riparian habitats injured by mine waste. • Protect and restore habitat function and processes in uncontaminated stream and riparian areas that will benefit injured resources. • Restore migratory corridors where doing so will benefit injured natural resources.

4.2.1 Major Actions for Stream Restoration

The Trustees have adopted three complementary major actions. These prioritize restoration of areas directly injured by mine waste contamination and incorporate an approach that affirms the important contribution of nearby uncontaminated tributaries to injured areas and migratory corridors in the recovery of injured streams. Together, these major actions will facilitate the restoration of streams and associated riparian habitats toward baseline conditions.

Restore habitat function and processes in stream and riparian habitats injured by mine waste.

Within the area of the Basin directly injured by mine waste contamination, streams and riparian areas range from systems where cleanup projects have been completed, are ongoing, or planned, to systems where cleanup may not be undertaken.

Cleanup projects have been completed in numerous places throughout the Basin. In most of the Bunker Hill site, cleanup for ecological improvement is ongoing or planned. The South Fork Coeur d'Alene River Subbasin is the primary source area for mining-related waste material present in the Basin and is the current focus for ongoing and future cleanup actions. Extensive site characterization and modelling indicate that the majority of metals loading are from sources within East Fork Ninemile Creek, Canyon Creek, and South Fork Coeur d'Alene River near Kellogg. These areas are not only major source areas affecting the South Fork Coeur d'Alene River and Coeur d'Alene River floodplain, but are also areas where significant injury has occurred and continues to affect fish and wildlife resources. The 2012 Record of Decision Amendment (EPA, 2012) outlines a 30 year timeline for cleanup actions in the Basin and the 2013 Implementation Plan (EPA, 2013) provides further detail on priorities within a 10 year sliding time window, identifying these locations as the initial priority areas for cleanup actions. Cleanup is also planned for streams adjoining the Coeur d'Alene River floodplain corridor.

Cleanup will address contaminant sources at specific locations resulting in significant improvements in sediment, soil, surface water, and groundwater metals contamination but will not fully address contamination at all locations in the Basin. In those areas where cleanup is not currently planned, cleanup activities at other locations and natural reduction of metals from dilution, flushing, and deposition of clean sediments will improve conditions over time. Although cleanup may not be conducted in these locations, these areas could provide important migratory corridors or other habitat functions that are crucial to establishing a network of restored aquatic and riparian habitat throughout the Basin.

Within the range of stream conditions described above, the Trustees propose to restore the natural processes that form, connect, and sustain habitats and the species associated with them. The work proposed in this plan is not intended to replace or duplicate efforts undertaken by EPA or other organizations, it is intended to complement cleanup by restoring additional features. Features such as diverse vegetation communities and complex physical structure will assist remediated systems more rapidly return to full ecological function and be capable of sustaining reestablished aquatic and riparian species. See Table 3 for a detailed list of specific techniques.

In areas not considered for cleanup, where water quality limitations may persist until natural reductions in contaminants proceeds, the Trustees propose to identify streams that will likely play an important future role in resource recovery. If restoration of basic ecosystem processes in these areas is postponed until water quality improves, there will be a substantial time lag before habitat quality and ecological function can catch up. The Trustees have identified these strategic areas, basic processes, and associated habitats that can be addressed now, thus setting the stage for a rapid return to ecological function when water quality improves. Additionally, restoring connectivity and access to clean water refugia for species occupying unremediated sites will likely be important so aquatic organisms can avoid metals and recolonize areas as water quality improves.

The decision to conduct restoration in these areas will depend on the actual or anticipated results of cleanup and whether concentrations of metals pose unacceptable risks to fish and wildlife. Timing of restoration in relation to cleanup, feasibility, and cost effectiveness will be particularly important considerations when selecting and planning projects. Additional project selection and implementation criteria are listed in section 5.

Protect and restore habitat function and processes in uncontaminated stream and riparian areas that will benefit injured resources.

Restoration of injured resources towards baseline conditions in contaminated and remediated streams will partially depend on the supporting role of ecologically important streams next to injured areas. Restoration outside of injured streams will target areas that have direct, strategic relevance to recovery of injured resources.

Basin strongholds and refugia will play an important role in restoring streams and aquatic life communities. A biological stronghold is a stream, watershed, or other spatial unit where biotic populations are strong and diverse, and the habitat has high intrinsic potential to support a particular species or suite of species. Refugia are distinct geographic areas or habitats organisms retreat to, persist in, and potentially expand from under changing environmental conditions or disturbance. The presence of strongholds and accessible refugia improves stability to plant and animal communities by helping to ensure they are resilient to disturbance, and allow species and ecosystems to persist in the face of landscape changes. Restoration and conservation of these areas provides the best opportunity for short-term persistence of fishes and will help ensure the availability of colonists to inhabit restored sites while additional restoration proceeds elsewhere in the Basin (Fausch et al. 2006; Margoulick and Kobza 2003; Gore and Milner 1990; Sedell et al. 1990; Huxel and Hastings 1999).

The Trustees propose to identify, conserve, and restore stream systems currently or potentially providing refugia or stronghold habitat for native fishes. This process is described in greater detail in section 5, "Implementation Strategy." Potential strongholds and refugia are not specifically identified or mapped in this document because the information to make a final selection of locations depends on data not yet fully assembled. The work will target streams that can make the greatest contribution to restoration of injured aquatic resources in contaminated or remediated areas, can be reasonably connected to disturbed areas based on value and practicality, or strongly support broader trustee restoration goals. Restoration activities will use the process-based techniques summarized in Table 3.

Restore migratory corridors where doing so will benefit injured natural resources.

Aquatic species require connected habitats to fulfill their diverse life histories, including spawning, rearing, and feeding. Fluvial and adfluvial westslope cutthroat trout and bull trout can migrate several hundred kilometers between adult and spawning and rearing habitats (Gowan et al. 1994, Fausch and Young 1995). Resident forms of these species also need the ability to migrate in a given tributary stream to spawn, rear, or seek overwintering habitat (Hoffman and Dunham 2007). Other aquatic species in the Basin such as macroinvertebrates, amphibians, and mollusks also rely on open migratory corridors to fulfill life history requirements (Vaugn et al. 2009).

Migratory corridors in the Basin have been fragmented by a range of man-made barriers including culverts, diversions, invasive species, and water quality conditions such as elevated water temperatures and high metals concentrations. Restoration of aquatic species throughout the Basin will depend on having open stream networks that allow species to migrate to breeding, feeding, and sheltering habitats. Likewise, recolonization of areas where populations have been reduced or extirpated by mine waste contamination will depend on removing barriers. Restoring access to refugia will be especially important for the survival and expansion of organisms into areas such as the South Fork Coeur d'Alene River where seasonal low flow can result in elevated metals concentrations that create pressures on aquatic organisms to temporarily move to areas with adequate water conditions. In other areas, barriers that block access to cold water side channels of rivers can be removed to allow fish into these refugia when water temperatures in the main channel become too warm.

In addition to supporting a diversity of aquatic organism life cycles, open migratory pathways and connectivity are essential for networks of strongholds and refugia to function effectively in support of restoration. The Trustees propose to identify and, where appropriate, remove migration barriers that limit the survival and restoration of injured native fishes. Restoration will focus on reestablishing migration corridors among clean water refugia, identified strongholds, and injured streams to facilitate reestablishing self-sustaining aquatic communities in metals contaminated areas. It may also be necessary to restore migration corridors at other locations in the Basin to achieve injured natural resources restoration goals.

The Trustees propose to identify and, where appropriate and feasible, remove migration barriers that limit restoration of native fishes in injured areas. In particular, the Trustees will focus on restoring connectivity between streams with high metals concentrations and clean water refugia, and restoring migration corridors between identified strongholds and injured streams to facilitate recolonization and reestablishment of self-sustaining aquatic communities.

Although ecosystem connectivity is important, in some instances it may be desirable to have barriers in place to intentionally isolate native fish populations if the threat of connectivity is deemed greater than the threat of isolation. Risks of connecting migratory corridors include potential invasion of disease or nonnative species bringing competition, predation, or hybridization. Risks associated with isolation include potential loss of populations caused by genetic, demographic, or environmental failures if the patch size and quality of isolated habitat are inadequate. Decisions regarding isolation and reconnection will be guided by the risks associated with each condition.

4.2.2 Priority Areas

The Trustees will focus on stream and riparian areas in strategic areas that are divided into three tiers of priority to geographically focus major stream restoration actions. These tiers are based on the needs of injured westslope cutthroat trout and bull trout and will enable restoration of habitat function and processes that will benefit aquatic and riparian communities. The highest priorities for restoration are areas directly injured by mine waste, or areas right next to stream segments contaminated with metals. Locations outside of injured areas will also be considered where restoration activities have the greatest chance of helping injured aquatic and riparian resources. The Trustees will identify and restore migratory corridors that are important for fish to move between contaminated and uncontaminated watersheds and allow for migratory life histories and future recolonization of areas where fishes have previously been extirpated or substantially reduced.

Tier 1 priorities are streams and riparian areas injured by mine wastes or directly adjacent to and ecologically important to those areas. These include injured stream segments and subwatersheds in the South Fork Coeur d'Alene River Subbasin, Coeur d'Alene River corridor, and outlying areas with metals contamination such as the Prichard Creek drainage. Metals-contaminated areas are the emphasis of this plan and are the highest restoration priority. Strategies to restore Tier 1 areas will depend on site-specific conditions. Restoration may take place at the same time cleanup occurs at some sites, after cleanup occurs at other sites, or at unremediated sites where concentrations of metals do not pose unacceptable risks to fish and wildlife.

Tier 1 priority areas also include stream segments such as habitat strongholds and species refugia directly next to injured areas. These include stream segments that are not injured by mine waste but are tributaries to injured waters that harbor migratory populations of westslope cutthroat trout (e.g., Coeur d'Alene Lake, South Fork Coeur d'Alene River). These nearby streams will play an important role to ensure remaining native westslope trout populations continue to persist in metals-contaminated areas, and provide a local source of colonizing fish to help reestablish native fisheries in these areas.

The start of restoration projects in Tier 1 priority areas will depend in part on the status and pace of cleanup; therefore, restoration may not begin for more than 10 years at some locations. Due to the effort required to restore highly disturbed remediated areas, projects in Tier 1 areas may be relatively costly. However, the Trustees believe it is very important in Tier 1 areas to restore injured natural resources and their associated services where the injury occurred and they will prioritize these projects when feasible. The Trustees anticipate the largest investment in restoration of streams and riparian areas will occur in Tier 1 areas.

Tier 2 priorities are watersheds and watershed complexes providing spawning, rearing, and other essential habitat for threatened bull trout. These areas occur in the upper St. Joe River Subbasin and are important to ensure these fish are not vulnerable to extirpation. Restoring these bull trout habitats will support increasing population trends and expanding distribution of bull trout within their historic range where they were extirpated by the releases of mine waste contamination (USFWS 2014).

Tier 2 priority areas have the smallest geographic extent, are generally in the best condition, and have the fewest stream restoration needs. However, they encompass the only opportunities for stream restoration in the Basin to benefit areas currently inhabited by bull trout. Consequently, the Trustees place a high priority on these projects but anticipate a smaller investment being needed.

Tier 3 priorities are areas in the Basin neither directly injured by mine waste nor directly adjacent to those areas. These areas primarily occur within the St. Joe River, St. Maries River, and North Fork Coeur d'Alene River watersheds. Tier 3 priorities include areas within bull trout historic range that are currently unoccupied and may serve as bull trout expansion watersheds. In particular, there are restoration opportunities in the St. Joe River Subbasin that have the potential for reconnection and population expansion for this species. Tier 3 priorities also include areas that support or could support stronghold habitat for westslope cutthroat trout populations that are migratory (fluvial or adfluvial), occupy a unique geographic location, and are important to strengthening injured fish resources.

Tier 3 encompasses the largest geographic extent and has a great amount of restoration potential. However, because this tier is the farthest removed from injured areas, projects here have the lowest potential to improve natural resources in injured areas and are the Trustee's lowest priority. Restoration projects will be funded in these areas when they provide unique or timely opportunities, rank highly in our selection criteria, and when such projects provide the greatest cost-effective benefit to injured resources.

4.2.3 Strategies and Techniques

Regardless of where they occur in the Basin, restoration strategies and techniques will target basic processes that create and sustain aquatic habitats and support biological integrity. Projects that restore basic ecosystem processes and functions will help ensure habitats are sustainable and are suitable for all stream species.

Many of the ecological processes that provide habitat for aquatic species in the Basin occur as the result of vegetation interacting with streamflow. Healthy riparian communities provide channel stability, protect water quality by filtering and storing sediment and providing shade, create physical habitat for fish (such as cover and channel complexity), and provide energetic inputs that sustain aquatic food webs. Therefore, riparian vegetation communities will be important to restoration success.

Restoration will target short-term and long-term ecological process as follows:

- Long-term processes: Actions designed to restore and support long-term ecological processes will have a primary focus on restoring native streambank, floodplain, and riparian vegetation communities. Some streams may require restoration of basic channel geometry or addition of roughness sufficient to trap sediment and create deformable beds and banks. These features will then provide the substrate and structure to help the growth of future streambank and floodplain vegetation.
- Short-term processes: In some cases, actions (such as direct placement of complex woody debris jams) will be taken to provide habitat-forming elements in the short term to improve conditions while longer-term approaches described above take effect.

See Table 3 for an overview of stream restoration strategies and techniques that support the ecosystem processes focus of this restoration plan. The following list is not intended to be comprehensive or exhaustive; rather it identifies broad approaches and common themes that will be promoted and practiced throughout stream restoration activities implemented under this plan.

Table 3. Stream restoration strategies and techniques

Strategy	Background	Techniques
Protection	Intact and newly restored riparian and aquatic habitats should be protected to ensure long-term function and persistence.	• Easements • Cooperative management agreements • Protective measures such as fencing and traffic control • Enhance stewardship through education and outreach • Acquisition
Passive Restoration	Some aquatic habitats may have many or all of the necessary ecological "building blocks" in place and require only time and the process of natural succession to reach function.	• In lieu of active restoration or rehabilitation, promote stewardship and protection through methods described above. • Eliminate or reduce environmental stressors that slow the rate of recovery.

Strategy	Background	Techniques
Restore diverse in-stream structure	Streams of the Basin need instream structure including boulders and woody debris jams to maintain natural bedform and to provide complex habitat for a variety of species. These structures are also critical to maintain a natural balance of trapping, sorting, and exporting sediment.	• Place woody debris jams; installed jams should approximate the level of structural diversity, dynamic function, and complexity present in natural debris jams present in reference areas. • Use streambank bioengineering and other soft techniques to restore roughness and vegetative structural complexity to banks.
Restore riparian and streambank vegetation	Many of the key habitat-forming processes that provide aquatic habitat occur as the result of plant materials interacting with streamflow. Riparian vegetation also provides the energetic inputs that sustain aquatic food webs.	• Using reference areas where available, restore mix of native species appropriate for the setting and community type. • Use snag creation and riparian silviculture to promote diverse horizontal and vertical structure. • Remove undesirable vegetation (e.g., noxious weeds). • Other noninvasive species may be desirable to plant to achieve short-term objectives such as temporary soil stabilization.
Restore channel geometry and sinuosity appropriate for the valley setting	Channels require stable bed forms on which to aggrade and store the deformable soft materials (e.g., gravels, sediment) that provide habitat and support vegetation.	• Construct/reconstruct channels that approximate the dimensions and migration patterns of geomorphically analogous reference reaches. • Install roughness (e.g., woody debris, bank toe fascines) on the beds and banks of reconstructed channels to trap sediment to support creation of key aquatic habitats and vegetative communities.
Restore natural resilience of streambanks to erosion and destabilization	Bank erosion and channel migration are natural aspects of stream function but rates can be accelerated due to watershed and streambank disturbances.	• Use vegetation-based bioengineering techniques (in lieu of hardening approaches such as rip-rap) to restore vegetative capacity of banks to resist erosion as well as the complex roughness and diverse habitats associated with natural banks. • Restore roughness of bank toes using vegetative material such as fascines and woody debris.
Connectivity	Expansion of aquatic species throughout the Coeur d'Alene Basin will depend on restoring open stream networks that allow species to migrate to key breeding, feeding, and sheltering habitats.	• Remove or provide passage through physical barriers, such as road crossings, tailings piles, dykes, levees, railroad grades, diversion structures, weirs, and other similar features. • Replace culverts with open-bottom structures that facilitate deposition of natural streambed materials. • If open-bottom structures are not feasible, culverts should be designed to trap bedload to facilitate passage for all aquatic organisms, including poorly mobile species.

4.3 Lakes

Basin lakes range from less than 5 acres in nearly pristine headwater settings to the 28,000-acre Coeur d'Alene Lake dotted with shoreline homes and communities. There is a series of lakes that border the Coeur d'Alene River called the "Chain Lakes." The lakes in the Basin provide habitat for plants, fish, waterfowl and wildlife, domestic drinking water, recreation, transportation, scenic beauty, spiritual and cultural values, and other important services.

The Trustees previously determined that the surface waters, sediments, benthic macroinvertebrates, zooplankton and phytoplankton in Coeur d'Alene Lake and several of the Chain Lakes have been injured by the release of hazardous mine wastes, affecting the plant, fish, wildlife, and human services associated with lakes (Stratus Consulting 2000). Furthermore, many of the shoreline and near-shore habitats of the area's lakes have been affected by hydrologic alterations, development, erosion, invasive species, and other factors.

The primary focus for lakes restoration will be lakes directly injured by mine waste, including the Chain Lakes and Coeur d'Alene Lake (Figure 6). The Trustees will support restoration projects using the framework provided in this plan for fish, waterfowl, wildlife, and human services priority areas.

4.3.1 Coeur d'Alene Lake

Coeur d'Alene Lake plays such a critical and unique role in the region's identity, culture and economy, and therefore, has unique restoration challenges. Coeur d'Alene Lake and its related resources have suffered significant injury due to contaminated sediments from mine wastes, which continue to be deposited from upstream sources. According to the U.S. Geological Survey, over 75 million tons of contaminated sediments exist at the bottom of Coeur d'Alene Lake (Horowitz and Elrick 1993). An additional 75 million tons are estimated to be located upstream in the Coeur d'Alene River floodplain. These contaminants are transported downstream, especially during floods, and are deposited in the bottom of Coeur d'Alene Lake or flow into the Spokane River. Coeur d'Alene Lake also receives significant nutrient loads on an ongoing basis (see page 310). Metals and nutrients in the lake interact in ways that could cause significant further injury to the lake and its related resources. A fish consumption advisory has been issued for Coeur d'Alene Lake by the State and the Tribe due to metals concentrations in fish tissues and associated human health risks (IDHW 2003 and 2014).

Cleanup plans approved by the 2002 record of decision include activities in and around the Chain Lakes; however, the EPA has deferred a remedy for Coeur d'Alene Lake. Instead, an alternative approach for lake management is being used to manage contaminated lakebed sediments through a Coeur d'Alene Lake Management Plan developed by the State and the Tribe. The overall goal of the Lake Management Plan is to protect and improve the water quality in Coeur d'Alene Lake by limiting Basinwide nutrient inputs that impair the lake's water quality conditions; these nutrients influence the solubility of the metals contamination in lake sediments (IDEQ and Coeur d'Alene Tribe 2009). The Lake Management Plan goals strategically align with the goals and major actions in this restoration plan, which make it appropriate for strategic integration with this restoration plan.

The 2011 Consent Decree between Hecla Mining Company and the Trustees states, "A minimum of $10,000,000 of natural resource damages will be used for restoration of Lake Coeur d'Alene" (*U.S. v. Hecla*, 2011, paragraph 21) in accordance with CERCLA Sections 107(f) and 111(i) and guided by the existing Memorandum of Understanding (paragraph 20) and future agreements. The Trustees will use 2011 Consent Decree funds designated for restoration of Coeur d'Alene Lake to strategically support the Lake Management Plan's programs and projects. Doing so leverages Coeur d'Alene Lake restoration funds with those of other partners, takes advantage of lake management plan staff expertise to help guide restoration of injured resources and prevent further injury to the Lake, and advances the goals and proposed action of this restoration plan.

LAKES GOAL: Protect and restore injured lake habitats, species, processes, and associated services.

Major Actions

- Protect and improve water quality in Coeur d'Alene Lake and other Basin lakes to benefit injured aquatic resources.
- Protect, preserve, and restore lake margin habitats valuable to fish, waterfowl, and other aquatic species.

4.3.2 Major Actions for Lake Restoration

Protect and improve lake water quality in Coeur d'Alene Lake and other Basin lakes to benefit injured aquatic resources.

Lakes are complex ecosystems that reflect various physical, chemical, and biological influences within them and their contributing watersheds. Conditions related to temperature, light levels, dissolved oxygen, and biological communities vary among lakes and within a single lake. Surface water quality is a natural resource injured by the release of mine wastes. In Coeur d'Alene Lake and several Chain Lakes, surface waters contain concentrations of dissolved metals sufficient to injure wildlife and aquatic biological resources (Stratus 2000; EPA 2002; IDEQ 2014). Therefore, protecting and improving water quality in Basin lakes is a key major action for restoration. Additionally, water quality is an important component of restoration because it:

- Integrates the basic physical, chemical, and biological properties of lake ecosystems and their watersheds which can be highly complex and variable. Therefore, it is an appropriate representative resource to target with restoration and measure effects.
- Is a vital component of fish and wildlife habitat in lakes, and it is a principal influence on trophic status, productivity, and food webs of lakes.
- Influences the further release of metals from lakebed (benthic) sediments in injured lakes.

Metals-contaminated sediments located in Basin lakebeds represent a significant risk to lake ecology when hypoxic conditions (low oxygen levels) occur in the overlying water column (Woods and Beckwith 1997). Excess nutrients, such as phosphorus and nitrogen, increase plant growth, which contributes to decreases in dissolved oxygen in the water column when the plants decompose (IDEQ and Tribe 2009). When dissolved oxygen is low, geochemical processes known as "benthic flux" release metals into the water column and can cause further ecological injury and human health risks. Zinc inhibits algae production (Kuwabara et al. 2007), reducing the food base for zooplankton that feed on the algae. A reduction in zooplankton ultimately affects fish like westslope cutthroat trout and kokanee that rely on it as a food source. Consequently, metals inhibition initiates a "trophic cascade" up the lake food web that can reduce production of fish. Improving water quality will promote adequate dissolved oxygen and healthy food webs needed for aquatic life. In lakes injured by metals, restoration activities can reduce the release of metals from contaminated lakebed sediments. Because nutrients are key determining factors for dissolved oxygen, food webs, and benthic flux, they will be a particular emphasis of water quality restoration for lakes.

Some characteristics that make water quality restoration an important action in this plan also make setting priorities and predicting outcomes challenging. Because water quality integrates such a complex and diverse set of conditions within lakes and their watersheds, it may be difficult or impossible to measure an ecological response from a single project. The scope and scale of water quality improvement opportunities for Basin lakes are extensive, particularly for Coeur d'Alene Lake, and the number of opportunities exceeds the available financial resources to effectively address them all.

Within the complex environment of Basin lakes, the Trustees propose a suite of restoration measures to improve water quality:

1. **Conduct source inventories and trend monitoring**
   Currently, insufficient information exists to support the Basinwide identification and prioritization of projects to improve water quality in lakes. Thus, a focus of this plan is to work with others to collect the information needed to identify, quantify, and inform prioritization of effective water quality improvement projects. This will include conducting Coeur d'Alene Lake water quality trend monitoring as identified in the Lake Management Plan for 5 years in order to evaluate trends and inform decisions.

2. **Reduce the input of pollutants relevant to injured lake resources**
   As information becomes available through nutrient source inventories, it will be used to accomplish on-the-ground restoration projects based on the following, in addition to the criteria of the implementation strategy in section 5:

   - Estimated reduction of nutrient inputs to lakes
   - Identification as priorities by the Lake Management Plan nutrient source inventory or other assessment
   - The extent to which the project provides additional fish and wildlife benefits
   - Project location within or outside of wetlands and streams priority areas

3. **Increase the natural capacity of lakes to filter pollutants**
   A naturally vegetated shoreline filters runoff, and can remove harmful chemicals and nutrients. See the "Lake Margin Restoration" section below.

4. **Integrate water quality protection and improvement in watershed restoration**
   Whenever possible, restoration implemented for wetlands and streams in other major actions of this plan will be designed to maximize water quality benefits to downstream lakes. Collectively, this will protect and improve water quality in lakes.

Protect, preserve, and restore lake margin habitats valuable to fish, waterfowl, and other aquatic species.

Lake margin habitats comprise the littoral and riparian zones (Figure 5).

- **Littoral zones** extend from the edge of the lake to the greatest depth occupied by rooted plants and include both an emergent and submergent zones. These areas are dominated by rooted, emergent, floating, and submersed vascular plants along with their attached flora and fauna (Coeur d'Alene Tribe 2012). The submerged aquatic vegetation within littoral areas provides feeding areas for fish and waterfowl, while emergent vegetation provides breeding and feeding habitat for songbirds.
- **Riparian zones** form the transitional area between dry land and water. Vegetation communities in this area provide important environmental functions, such as regulating water quality (including temperature, clarity, nutrients, and contaminants), providing aquatic habitat structure for fishes and other organisms, and contributing scenic beauty. Shorelines are the fringe areas along the edge of a lake and connect the aquatic portion of the waterbody to the adjacent upland. Shorelines provide an area of critical ecological interface where land meets water (Winslow et al. 2014). The complex habitats associated with shorelines support plants, microorganisms, insects, amphibians, birds, mammals, and fish.

Lake margins represent the most ecologically diverse habitats associated with lakes due to the pronounced "**edge effect**." Much of the energy for lake food webs is derived from the terrestrial plant and animals that reside by the shore. Generally, 90 percent of all lake life is born, raised, and fed in this area, and 70 percent of land-based animals rely on habitats found in lake margins for some or all of their life history (Kipp and Callaway 2003).

Many of the lake-associated injured resources include species and resources that rely on healthy lake margins, as do many of the human services provided by lakes (for example, clean water, scenic beauty, recreational fisheries, or waterfowl hunting). Therefore, protection and restoration of the riparian and littoral zones of injured lakes is a major focus of this plan.

> ***Edge effect:*** In ecology, an "edge" is the boundary or interface between two habitat types or biological communities. Edges are typically characterized by greater species diversity and population density than occur in either of the individual communities.

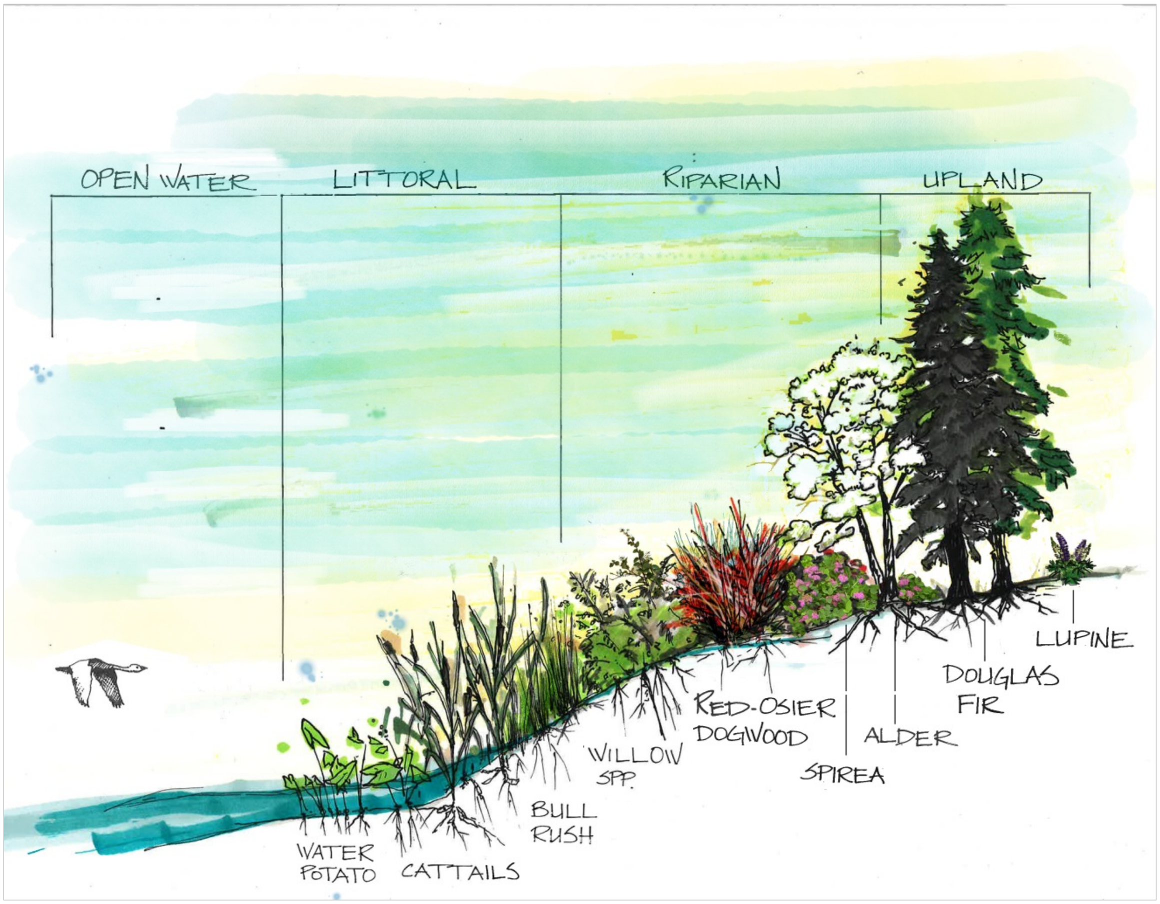

Figure 5. Lake margin habitats

Within lakes injured by mine waste contamination, the Trustees propose to restore the ecological functions and capabilities of lake margins habitats. Key actions include:

- **Protect and conserve intact lake margin habitats:** Intact shorelines and vegetation communities may serve as biological strongholds for populations of aquatic and terrestrial species, ensuring the persistence of these species while restoration improves conditions elsewhere. Intact lake margins may serve as reference areas to inform restoration design in other portions of the lake. The Trustees will work with partners and stakeholders to identify and map these areas, identify potential threats, and develop protection and conservation strategies to preserve ecologically significant habitats.
- **Restore riparian and littoral vegetation communities:** The intent of vegetation restoration is to protect and restore the ecological functions and ecosystemwide processes performed by vegetation along lake margins shorelines. Restoring lakeshore vegetation also improves the capacity of lakeshores to resist erosion. Vegetation restoration will also include preventing the introduction and spread of invasive plant species such as Eurasian watermilfoil.

- **Reduce the influence of point-source pollutants on lake margin resources:** Where inventory data described in the previous section indicate that point-source pollutants are affecting the restoration outcomes in injured lakes, the Trustees will work with others to reduce or eliminate these effects both at the source as well as through restoring the inherent natural capacity of lakeshores to filter out pollutants.

Facilitate restoring human uses associated with healthy lake margins: Where such projects will not impede ecological restoration, identify opportunities to enhance recreational conditions, access, education, and other human uses that benefit from restored lake margins (also see section 4.4 Human Uses of Natural Resources, page 319).

See Table 5 for a list of strategies and techniques related to lake restoration.

4.3.3 Priority Areas

Coeur d'Alene Lake

In this restoration plan, Coeur d'Alene Lake is treated as distinct and the highest priority for restoration due to its unique social and ecological context and regional importance as a lake resource. For example, it is the only lake in the Basin that still provides habitat for adfluvial bull trout as well as open water habitat for early season migratory waterfowl. The lake also provides important habitat for adfluvial westslope cutthroat trout. The lake's size (approximately 28,000 acres) and variety of uses make it socially, culturally, and economically important to the region. Coeur d'Alene Lake as a geographic priority area includes Chatcolet, Round, Hidden and Benewah lakes at the southern end of the lake because these lakes are hydrologically connected to Coeur d'Alene Lake and function as a single waterbody. These are **Tier 1** priorities.

Injured resources supported by Coeur d'Alene Lake will benefit from successful management of nutrient inputs. Effectively managing nutrients in the lake benefits injured coldwater fish species such as westslope cutthroat and bull trout by helping to maintain adequate oxygen levels in areas where temperatures are suitable for these species. Where nutrient management can be used to reduce excessive macrophyte growth in shallow areas or near the mouths of fish-bearing tributaries, there may be some benefits to migratory fish through a reduction in habitat for nonnative predators, such as northern pike. In addition, a myriad of chemical, physical, and biological changes have occurred within the lake, along its near-shore areas, and in adjacent uplands that further exacerbate the natural resource injuries.

Other Basin Lakes

Lake restoration priority areas for Basin lakes other than Coeur d'Alene Lake were guided by contamination levels and waterfowl and fish use (Table 4). Limited data are available for occurrence and strength of adfluvial trout populations. As more data become available, they will be used to better refine priority rankings. Other Basin lakes were divided into the following tiers:

- **Tier 2 priorities** are lakes or lake complexes with high waterfowl use, and/or native trout populations, and are directly impacted by metals associated with mine waste contamination.

- **Tier 3 priorities** are lakes that provide habitat for waterfowl and/or native trout, and are near metals-contaminated sites but may or may not be affected directly by metals.
- **Tier 4 priorities** are all other lakes. The Trustees do not anticipate restoration will occur for Tier 4 Lakes due to their distance from metals-contaminated sites, potentially low waterfowl and/or adfluvial trout use, or relatively healthy condition as compared with other tiers. Lakes in this category may be assigned to a higher priority tier if updated information indicates they provide important habitat for focal species or are necessary for the restoration of injured resources.

Table 4. Lakes assigned to four tiers of restoration priority areas

Tier	Lakes
Tier 1	Coeur d'Alene Lake (area includes Chatcolet, Benewah, Hidden, and Round lakes)
Tier 2	Anderson Lake, Black Lake, Cave Lake/Medicine Lake, Killarney Lake, Swan Lake, Thompson Lake
Tier 3	Fernan Lake, Hepton Lake, Bull Run Lake, Rose Lake, Blue Lake
Tier 4	Twin Lakes; Hauser Lake; Hayden Lake; Crystal Lake; Revett Lake; Elsie Lake; Lost Lake; Unnamed Lake – Gold Creek; Upper Stevens/Lone Lakes; Upper Glidden Lake, Lower Glidden Lake; Crater Lake; Crow Lake – Red Raven Creek; Halo, Bacon, and Forage Lakes; Saint Joe and Frog Lakes; Dismal Lake; Avondale Lake; Alpine Lake; Chilco Lake

Prioritization within Lakes

There are 150 miles of shoreline around Coeur d'Alene Lake alone in addition to shoreline adjacent to injured Chain Lakes. Restoration needs are therefore expected to exceed available resources. Thus, the following will be used to prioritize lake margin projects within lakes:

- The highest restoration priority will be areas identified as important for waterfowl and native fisheries.
- Restoration will also be considered where high visibility and access provide demonstration of innovative restoration techniques.
- Projects for near-term human services benefits will be considered where they overlap with focal resource priorities and demonstration opportunities.

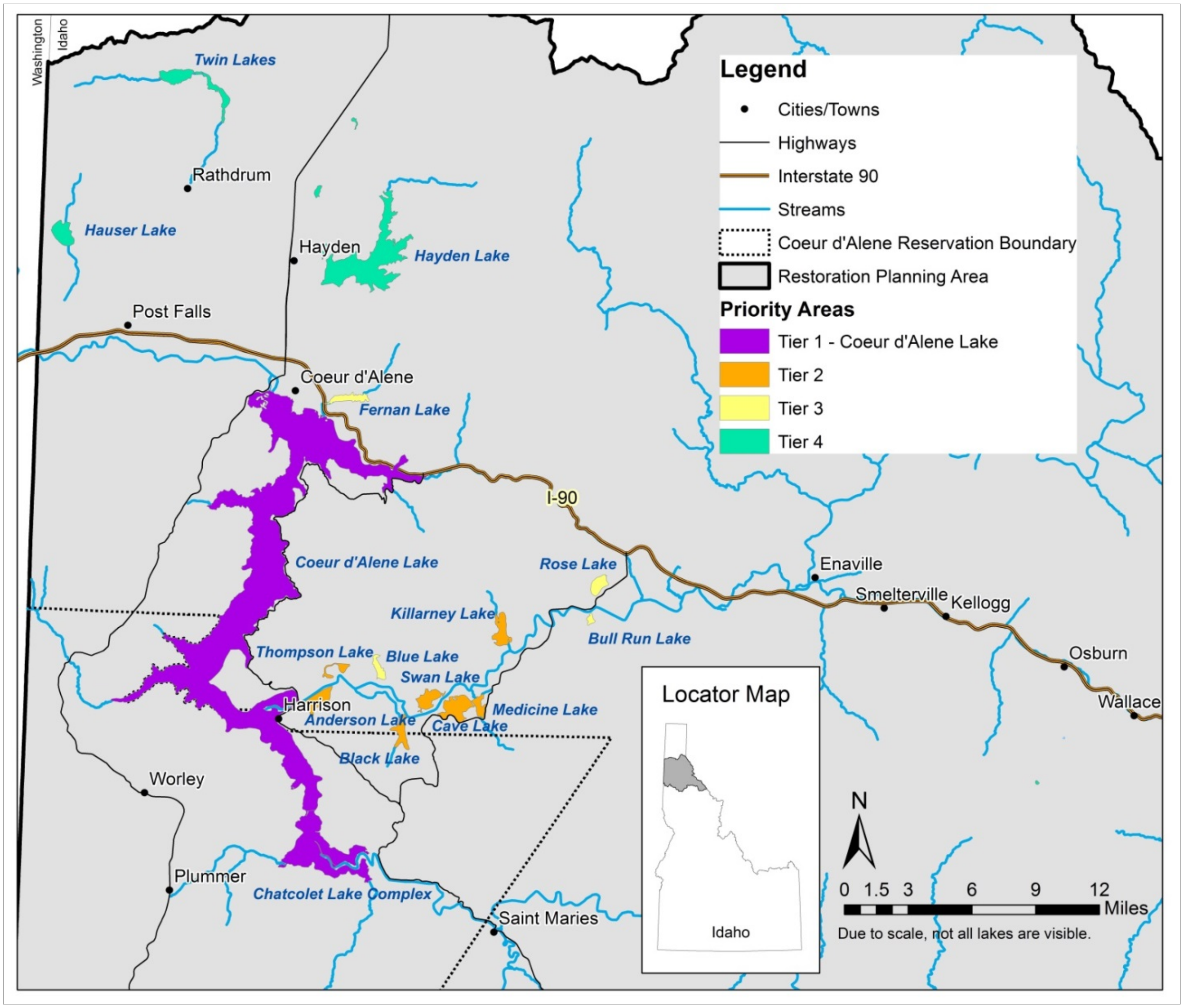

Figure 6. Lake restoration priority areas

4.3.4 Strategies and Techniques

Table 5. Lake restoration strategies and techniques

Strategy	Background	Technique
Support the development and refinement tools to predict, measure, and evaluate the effectiveness of lake restoration projects.	The ability to forecast water quality conditions and predict the effects of proposed restoration on lake water quality will help inform project selection, prioritization, and design. This information will also help predict the effects of the environmental changes on lake water quality that can help adjust restoration strategies and techniques.	• Support the data collection to further refinement of the ELCOM/CAEDYM model (ELCOM, Center for Water Research) or other analytical tools. • Support long-term water quality trend monitoring in Coeur d'Alene Lake.
Support the design and implementation of source inventories for nutrients relevant to priority lakes.	Given the ubiquitous nature of nutrients, a source inventory is necessary in order to identify priorities for reduction.	• Support efforts such as Lake Management Plan Section 5.3 Strategic components 1 and 2 - Design and conduct a nutrient source inventory and prioritize projects based on that inventory.
Increase understanding of nutrient cycling, food web dynamics, metals remobilization and other key processes	Better understanding will result in more effective lake restoration, particularly with respect to effects of metals and nutrients on water quality of injured lakes.	• Support research such as Lake Management Plan Section 3.1, Special Studies.
Increase public awareness of and engagement with stakeholders of lake conditions and actions they can take to improve lakes water quality.	Public awareness and community understanding is paramount for protecting and restoring lakes and its related resources. Engaging others increases restoration effectiveness, improves land management activities, and leverages restoration funds.	• Support symposia and other stakeholder engagement opportunities. • Support education outreach such as the Lake-A-Syst project.
Incorporate lakes water quality considerations into streams and wetlands habitat restoration projects conducted as part of this plan.	Influences on lake water quality are basinwide (EPA 2015). Restoration projects in streams and wetlands elsewhere in the Basin implemented as part of this plan will help improve water quality in downstream lakes.	• See Streams and Wetlands Strategies and Techniques tables.
Use source inventories and nutrient reduction action plans to identify and implement projects that reduce nutrient inputs where relevant to injured natural resources.	Reducing nutrient inputs to lakes can slow human-caused eutrophication and minimize solubility of metals to benefit injured natural resources and prevent further injury.	• Employ techniques in Streams and Wetlands sections. • Shoreline revegetation (see below) • Partner in cost-share agreements to reduce nutrient inputs from priority sources (e.g., improvements to waste water treatment plant discharges, failing septic tanks)

Strategy	Background	Technique
Restore the vegetation and physical structure of shorelines and near-shore areas.	Vegetation is the key functional element that protects water quality and lakeshore integrity as well as provides habitat for aquatic and terrestrial species.	• Plant desirable vegetation • Control undesirable vegetation • Reshape banks • Bioengineering, demonstration projects, etc. • Install log and rock structures • Move, remove, or improve roads adjacent to shorelines to reduce impacts to surface water and fish habitat.
Protect and preserve shorelines and other lake habitats.	Lake habitats will be protected and preserved from further degradation that could further harm injured resources.	• Acquisition • Easements • Fencing • Incorporate resource protective features at recreation sites such as light penetrating boardwalks.
Survey invasive species.	Early detection of invasive species is often necessary for successful control and removal. Mapping of existing populations is necessary to develop effective strategies to manage invasive species.	• Support ongoing efforts by other entities to detect, identify, and map invasive species presence and distributions. • Enlist the public's help to identify and manage nonnatives through supporting education and outreach programs about the potential threats posed to lakeshores from nonnative species.
Prevent the spread and establishment of invasive species.	The most effective strategy against invasive species is to prevent them from ever being introduced and established. Once they are established, the soil disturbance associated with many restoration projects invites colonization by invasive species that, once established, can undermine restoration efforts and lead to further spread of the invasive species.	• Ensure restoration produces rapid native species revegetation on disturbed soils • Use weed-free soils and fill in lakeshore restoration projects • Use native species plants and seed mixes in lakeshore revegetation • Support efforts to educate the public about potential threats posed to lakeshores from invasive species and measures they can take to avoid introduction.
Control and/or eradicate invasive species	Without eliminating the threats posed by invasive species, restoration efforts run the risk of being undermined by the effects of invasive species.	• Support efforts by other entities to reduce the spread of or eliminate invasive species that may affect restoration.

4.4 Human Uses of Natural Resources

Human uses are the tangible and intangible benefits people derive from natural resources, and include:

- ecosystem functions that are essential to human existence such as clean water, flood control, nutrient and sediment filters, and food web dynamics; and
- amenities shaped by individual and community values (including those values unique to Tribal culture), preferences, and demands, such as recreation opportunities, hunting, fishing, gathering, traditional ceremonial uses, scenic values, and maintaining a community's sense of place.

The Trustees intend to restore the human uses of injured natural resources. By restoring injured ecosystem processes, functions, and structures, natural resource-based services that people use are restored as well. However, this restoration may take a long time to be fully accomplished, and recent public comments showed interest in projects that can be completed in the near future to speed recovery of human uses.

To speed up the process of restoring human uses of natural resources, the Trustees would allocate up to 5 percent of the restoration funds to accomplish projects that could be both achieved in a relatively short time and connect humans to natural resource-based services. The CERCLA is clear that if a project only addresses the loss of human uses of natural resource-based services, it must have a close relationship to actual restoration of an injured resource, or at least have a related purpose for taking advantage of the restored resource. Projects that restore human uses must restore those specific uses lost due to contamination released by mining activities in the Coeur d'Alene Basin.

In addition to projects that focus on human uses of injured natural resources, the Trustees recognize that some ecologically driven restoration projects may have a minor component that restores human uses. An example might be a riverbank restoration project that includes improving an existing boat ramp to reduce sediment effects associated with the ramp. In order to support human uses of injured natural resources within ecologically driven projects the Trustees would additionally allocate up to 5 percent of the restoration funds to support these minor human use focused components.

Allocating up to 10 percent of restoration funds (up to 5 percent towards human use focused projects and up to 5 percent towards minor human use focused components of ecologically driven projects) for projects that restore both injured resources and human uses in a relatively short time would represent a direct and significant near-term investment. This approach allows Trustees to respond to public input requesting these types of restoration projects and ensure that restoration addresses the wide range of losses, both human use and ecological, stemming from natural resource injuries in the Basin.

These projects will typically improve access or use of natural resources, support environmental stewardship and education, and strengthen community heritage and cultural connections to natural resources. Examples of potential projects that would restore uses by the public include: describing the history of the Basin; providing scientific and educational information; improving water access for boating, swimming and fishing; enhancing the scenery of areas that have ecological value and support local tourism; and improving trail access and educational kiosks that interpret natural resources and support wildlife viewing.

The keys to these human use projects are that they have a direct link to injured natural resources and that they minimize harm to ecosystem integrity.

HUMAN USES OF NATURAL RESOURCES GOAL: Restore human uses that were lost due to the injured natural resources. This includes the cultural, recreational, and socioeconomic services that connect both basin residents and visitors to natural resources and contribute to a community's desired "sense of place."

Major Actions

- Restore and facilitate recreational and other opportunities associated with the use of restored natural resources.
- Enhance opportunities for people to connect to Tribal and non-Tribal cultural resources that contribute to local and regional heritage and sense of place.
- Provide targeted scenic improvements to viewsheds.
- Promote stewardship of natural resources and support education associated with cleanup and restoration.

4.4.1 Major Actions

Restore and facilitate recreational and other opportunities associated with the use of restored natural resources.

Natural resource-based recreation is an activity affected by the historic release of mine waste contamination that lends itself to projects that can be accomplished more quickly than others. Natural resource-based tourism and recreational opportunities can provide new and improved avenues for employment, positive economic impacts, and foster a broad local interest in environmental stewardship. Projects might include improved recreational access to waterways, observation blinds or platforms, and educational kiosks along improved trails. Natural resource-based tourism and recreation opportunities encompass traditional, new, and emerging trends in outdoor recreation and can meet the needs of diverse and dynamic public interests now and into the future.

Enhance opportunities for people to connect to Tribal and non-Tribal cultural resources that contribute to local and regional heritage and sense of place.

Residents of the Basin historically relied on the bounty of natural resources the area has provided. Protection or enhancement of culturally and historically significant natural resources can affirm a community's **sense of place** by honoring the local heritage of the Basin and the role that natural resources have played in the history and culture of the Basin. The Trustees recognize the cultural significance of the Basin to all members of the public and anticipate public stakeholder involvement to engage in highlighting the history of the Basin through natural resource restoration projects. Examples of how restoration efforts can help residents and visitors connect to the rich history of the area include using traditional Tribal subsistence plants in restoration projects involving revegetation, or highlighting historical mining areas with informational signs next to natural resource restoration projects.

Sense of Place is the geographic identity and human experience of a place; the where and how an individual–or a community—identifies with and experiences the natural landscape.

Provide targeted scenic improvements to viewsheds.

Injuries and some cleanup work have left portions of the Basin visually unappealing and natural recovery could take decades. Improving select viewsheds where injuries occurred can improve recreational experiences, foster increased tourism, and provide socioeconomic benefits to local communities. Consequently, visual enhancements to degraded viewsheds promote economic resilience, which is an important trustee value. Viewshed projects that have an ecological restoration component are of particular interest because they can accomplish multiple objectives.

Viewsheds are open spaces readily visible to the public where there is a particular interest or historic value deemed worthy of preservation.

Promote stewardship of natural resources and support education associated with cleanup and restoration

Education promotes stewardship of natural resource restoration. The Trustees recognize the community's desire to support natural resource education and outreach programs in basin area schools, summer camps, and after-school community youth programs. For example, there might be opportunities to engage youth groups to help plant vegetation as a component of a riparian restoration project while learning about the benefits of having a strong native plant community next to aquatic ecosystems.

4.4.2 Priority Areas

Priorities for where ecosystem restoration occurs are driven largely by the location of injured resources across the landscape and the biological and physical processes that influence them. In contrast, priorities for where human use projects can be accomplished relatively soon are driven largely by societal values, public input, the constraints of the purpose of this plan, and legal mandates. During the public comment period, the Trustees received input on local values and desired locations for restoration.

Some of the geographic areas and restoration approaches identified by the public during scoping included the following:

- **Coeur d'Alene Lake** – restore tributaries that flow into the lake that have potential to support native salmonid populations.
- **South Fork Coeur d'Alene River Subbasin** – to be cost effective, start restoration work upstream of where EPA is doing cleanup.
- **South Fork Coeur d'Alene River** – restore areas along the South Fork Coeur d'Alene River to provide safe public access that can serve as an asset rather than a liability.
- **North Fork Coeur d'Alene River** – restore areas in the North Fork Subbasin where there is a high use of rafting and tubing to make access safer for the public and protect existing riparian areas.
- **Coeur d'Alene River floodplain** – restore areas that do not pose a risk to recontamination and can limit human health risks to contamination exposure.
- **Basinwide** – focus on areas where public access can be enhanced or improved.
- **Trail of the Coeur d'Alenes** – partner on restoration projects along the trail to highlight the area's history.
- **Hangman Watershed**- restore areas that provide the Coeur d'Alene Tribe with natural resources and the human services derived from them that are analogous to natural resources and human services lost in the Basin due to mining contamination.

The Trustees value the engagement and input they received from the public and will continue to work with the Basin communities when identifying human-use projects as they relate to natural resource restoration. To better understand the social, economic, cultural, and recreational values of the community, the Trustees will use tools such as surveys, public meetings, and emerging technologies to guide geographic preference based on social values. These methods will provide information needed for decision makers and researchers to evaluate the social values as they relate to human uses of natural resources. These methods can help facilitate discussions with diverse stakeholders regarding the tradeoffs among different uses in a variety of physical and social contexts.

4.4.3 Strategies and Techniques

Table 6. Strategies and techniques for restoration of human uses

Strategy and Background	Techniques
Improve recreational infrastructure at contaminated sites and reduce exposure risks for human health.	• Construct or improve access sites and trails • Paving, boardwalks or other barriers • Partner with EPA, Panhandle Health District, land managers, and others
Improve infrastructure and provide recreational opportunities at uncontaminated sites.	• Construct or improve access sites and trails • Swimming areas in lakes and rivers • Partner with land managers • Land acquisition • Conservation easements
Improve scenery where doing so meets social and ecological objectives.	• Tree and shrub plantings • Promote environmental stewardship i.e. "Leave no Trace"
Enhance opportunities to learn about natural resources in the Basin.	• Observation blinds • Improved access • Educational kiosks
Support natural resource educational efforts with other Trustees.	• Assist with production of environmental curricula • Hands on demonstration projects • Outdoor classrooms
Enhance opportunities for people to connect with cultural resources.	• Restore, replace, and/or acquire the equivalent of natural resources in order to protect culturally significant areas for Tribal and non-Tribal community members • Work with Tribal elders and community leaders to develop interpretive programs to increase awareness of important cultural areas • Provide for subsistence hunting and fishing opportunities
Restore lost or degraded Tribal connection to injured natural resources.	• Conduct restoration projects near Tribal population centers to encourage and reinforce traditional cultural uses of natural resources • Inform Tribal members about uncontaminated areas within the Basin suitable for traditional use
Restore wildlife-based recreational opportunities and preserve natural open space.	• Interpretive trails • Viewing, hunting, fishing, and trapping opportunities

5. Implementation Strategy

This section details how the Trustees will implement the restoration plan, including the approach the Trustees will use to translate the broad-scale ecological objectives of the plan into on-the-ground restoration results. The implementation strategy describes how projects will be identified, prioritized, funded, and implemented.

5.1 Timing of Restoration

The timing of restoration will depend on balancing many factors:

- Strategic sequencing of projects to maximize efficiency and effectiveness
- Submission of quality proposals that meet the purpose, need, and priorities of the restoration plan, as well as statutory requirements
- Limits on the annual administrative capacity of agencies/governments to permit and initiate work
- A desire to initiate restoration quickly
- Limits on contractor capacity to get work completed
- Uncertain and dynamic future opportunities regarding the location of work and financial partnership opportunities
- Risk of recontamination
- Land use and natural disturbance
- Need to coordinate restoration efforts with co-occurring ground disturbing actions by other entities (for example, Avista, NRCS) to reduce likelihood of adverse cumulative effects

The Trustees anticipate, but are not constrained to, spending restoration funds at a rate of 2 to 6 million dollars per year, resulting in an approximate 20- to 30-year scope of work. This estimate is based on the construction capacity of local contractors and the administrative capacity of the managing agencies. The actual spending rate will depend on the submission of quality proposals, the scale of project work, and strategic partnership opportunities.

The Trustees will implement projects in a strategic sequence to minimize risk, improve operational efficiency, minimize costs, and reduce the overall time required to achieve restoration objectives. Typically, restoration follows cleanup and work proceeds in an upstream to downstream sequence to prevent recontaminating areas where work has been completed. However, while much of the restoration work will be focused on cleanup areas, the Trustees expect to direct an equal or larger portion of the restoration funds toward projects in areas of high ecological importance outside the areas being remediated. This approach may include projects both inside and outside contaminated zones that improve broader ecosystem functions for the benefit of injured resources.

Examples include but are not limited to:

- removing fish passage barriers to provide connectivity between restored areas and the broader watershed;
- improving habitats next to remediated sites that act as both source and refuge areas for fish and wildlife in remediated sites;
- preparing degraded portions of the ecosystem to be recolonized by species in anticipation of improved water and sediment quality that results from cleanup work, which shortens the time lag to full recovery (e.g., the South Fork Coeur d'Alene River); and
- improving degraded wetlands at sites with low or controllable risks of recontamination.

5.2 Integration of Restoration with Cleanup

Integrating restoration with cleanup is a strategic trustee priority and the Trustees intend to direct significant funding toward restoration projects that complement cleanup by EPA and others as it occurs. The Trustees will regularly review planned, active, and completed cleanup actions by EPA and others to determine whether such actions can be integrated with restoration projects. Restoration projects in locations where cleanup is planned, actively occurring, or completed are a priority for the Trustees when such projects support returning injured natural resources toward baseline condition. Likewise, where feasible, the Trustees would reduce the risk of short-term cumulative adverse impacts by coordinating the timing and nature of ground-disturbing restoration projects with projects being directed by EPA or others.

Planned cleanup activities include actions to benefit both human health and the environment. Cleanup activities targeting environmental improvements for the South Fork Coeur d'Alene River Subbasin include expanded water treatment, sites in Canyon Creek, Ninemile Creek, and others. Other activities primarily targeting human health include protection of existing remedies, treatment of contaminated roads, and the Basin Property Remediation Program.[12] Proposed cleanup activities for the Coeur d'Alene River floodplain include stabilizing banks, dredging contaminated sediments, and the excavation, removal, and capping of soils in wetlands (EPA 2002). The EPA and others continue to collect data, conduct analysis and modeling, and implement pilot projects in the Basin to support the future development and evaluation of cleanup alternatives. At many of these locations, restoration may be conducted at the same time as cleanup activities or once cleanup is completed.

EPA deferred a remedy for Coeur d'Alene Lake and supported the Lake Management Plan as an alternative approach to address metals contamination within the lake. Restoration affecting Coeur d'Alene Lake may occur while the Lake Management Plan is being implemented or during cleanup by EPA in the future, if warranted.

Although opportunities to integrate restoration with cleanup are a strategic priority in this plan, restoration will not be limited to locations where cleanup activities occur. Restoration in nearby areas of high ecological value can provide temporary refugia and source populations of species

[12] For more information, refer to EPA 2002, 2012, and 2013.

and can add physical and ecological connectivity that help stabilize, support, and enhance restoration in remediated areas. Furthermore, many areas within the Basin affected by mine waste contamination are currently not targeted for cleanup. Restoration efforts outside of cleanup are necessary to achieve the goals of this plan.

5.3 Project Solicitation and Workplans

Under this plan, the Trustees will solicit restoration project proposals through an open public process. Projects that help fulfill the restoration plan mission, achieve restoration goals, fit the criteria laid out in this plan, and satisfy the statutory requirements will be considered. Proposals will be evaluated according to the selection criteria, and the Trustees will determine which projects will be funded.

Project proposals can be submitted by the Trustees themselves, private citizens, businesses, nonprofit organizations, local, State and Federal agencies, Tribal government, and others. However, proposals must be co-sponsored by at least one of the Trustees for project administration purpose. Projects can be proposed on any lands in the Basin and will be given equal consideration regardless of ownership.

The solicitation process will consider all restoration project proposals. However, the Trustees will also conduct targeted solicitation for specific project types or projects in certain geographic areas and prioritize them for funding. For example, if a restoration priority is aquatic habitat connectivity in a particular subbasin, the Trustees could solicit projects that remove fish passage barriers in that area. If there are not enough proposed projects that meet the goals and objectives of this plan and fulfill the selection criteria, there may be periods of times when projects are not funded.

The Trustees will prepare short-term (3 to 5 years) strategic workplans based on this restoration plan to guide targeted solicitation of projects. The strategic workplans will describe focal natural resources and associated geographic areas to conduct restoration activities, monitoring, and education/outreach actions most appropriate for restoration during the timeframe based on cleanup progress, ongoing resource management in the Basin, and current data.

The strategic workplans will emphasize project types and geographic areas rather than specific projects; this is necessary because restoration will achieve ecologically and strategically complex goals based on information not fully available to develop portions of major actions. For example, this plan identifies migratory corridors as a restoration priority, but a comprehensive inventory of aquatic barriers is not available. The workplans may identify data gaps like this, facilitate data collection, and then identify priority watersheds for barrier removal. A targeted solicitation could then request proposals for those priority watersheds and project designs can be developed to remove the barriers.

Strategic short-term workplans will include streams, wetlands, lakes, and human use projects under this plan and restoration will likely focus first on projects ready for implementation with planning, designs, environmental analysis, and permitting (if applicable) largely complete. Restoration will also likely focus on capacity building for the future, strengthening partnerships, and unique opportunities, all of which are established as high priorities in this plan. During this time, the Trustees will use interagency coordination and public outreach to gather additional input and ideas to shape the next set of strategic plans. The workplans can be adaptable to changing circumstances within the overall guiding framework of this plan.

5.3.1 Ecological Projects

The goals of this plan are ecologically and strategically complex. Some of the major actions may be best accomplished through a coordinated set of individual actions that collectively accomplish a larger objective (for example, establishing a strategic network of interconnected native fish strongholds and refugia, connected by critical migratory corridors, that facilitate recolonization of injured streams). Accomplishing a coordinated set of projects may require integrating diverse technical components and complex, multi-project sequencing in order to be effective. In some cases, there may not be enough information to fully develop some portions of the major actions.

To help develop, prioritize, and select these projects, the Trustees will:

- identify spatial units (such as the South Fork Coeur d'Alene River Subbasin) where groups of strategically located projects can collectively achieve better results than individual, isolated projects;
- identify and work with partners to determine where additional data are needed to help identify and prioritize projects, and work with others to acquire that information;
- enlist the help of community members, stakeholders, partners, agency technical experts, and others to develop restoration strategies specific to the focus area and major action; and
- develop a portfolio of prioritized restoration projects that collectively accomplish broad-scale major actions of the restoration plan.

5.3.2 Projects Addressing Human Uses of Natural Resources

To identify, prioritize, and plan projects that restore human uses of natural resources, the Trustees will work collaboratively with local basin communities. The Trustees collaborative efforts will include:

- informing communities of interest about human use restoration opportunities;
- working with communities to identify local values regarding natural resources restoration;
- engaging local community members in planning and project development processes; and
- establishing collaborative working groups to develop projects that restore local resources and the communities' connection to those resources.

Once the Trustees select projects for funding, those projects will become part of the Trustees' annual operational plan. The annual operational plan will be a practical description of work to be completed in contrast to the aspirational strategic workplans.

5.4 Project Selection Criteria

Potential projects will be screened and ranked using the project selection criteria described in this section. These criteria are a tool the Trustees will use to assist decision making on how to best allocate limited funding to meet the purpose, need, goals, and objectives of the restoration plan in the face of opportunities that exceed the available funds. The criteria were developed using expertise from the Trustees as well as input received from the public. Selection criteria will ensure that funded projects reflect the restoration approach and values described in preceding sections. The criteria act as a set of filters that disqualify projects ineligible for funding under the law or that only marginally advance restoration goals. Conversely, the criteria identify and advance projects that substantially and efficiently meet those goals.

Biological systems are complex and involve too many variables and contextual nuances to design a completely objective set of project selection criteria. Some criteria are inherently qualitative, and a collaborative approach of expert opinion will be used to evaluate proposals. The goal of ranking projects is not to assign an exact score, but to help designate a relative priority for each project. As a tool, the set of criteria facilitates decision making but does not provide final decisions. Since there is a broad array of variables, contexts, and imperfect information, the Trustees will need to rely on professional judgment when making funding decisions.

The Trustees will use the selection criteria outlined below to evaluate proposals and designate projects as low, medium, or high priorities. Final project selection will be a result of: 1) ranking under the relatively objective selection criteria described here; 2) review, combined professional judgment, and recommendation of the Natural Resources Restoration Team; and 3) final review, approval, and authorization of funds obligated by the Trustee Council.

5.4.1 Eligibility Criteria

The eligibility criteria are a screening mechanism intended to determine whether project proposals are eligible for further evaluation and potential funding under this restoration plan. If the answer to every question is yes, the project will be considered and evaluated through a more detailed set of selection criteria. If the answer to any of these questions is no, the project is not eligible for funding and will not be considered.

Does the project meet goals and objectives of the restoration plan?

- The project occurs within the planning area.
- The project restores, replaces, and/or acquires the equivalent of natural resources or associated services that were injured by the release of mining wastes containing hazardous substances.

- The project does not expend settlement funds on physical structures and infrastructure improvements such as buildings or traditional public works projects, except for those physical structures that are a necessary part of the restoration project (such as road work, sediment reduction, erosion control, or drainage features).
- The project will not result in additional injury to natural resources, including long-term and indirect impacts, or impede further restoration.
- Restoration will complement and not replicate cleanup, will not be undone, negatively impact future cleanup or interfere with current cleanup, and not cause negative effects to cleanup already completed.
- Funds do not replace other obligated funds. The proposed project is not part of an independent, prior obligation resulting from a legal requirement such as a regulation, consent decree, or court order. Proposals that extend restoration benefits beyond legal obligations may be considered if the Trustee investment will substantially enhance injured natural resources.
- The project avoids or mitigates human health risks in contaminated environments.
- The project is consistent with applicable laws, regulations, and policy.

5.4.2 Project Selection Criteria

All eligible projects will be reviewed using selection criteria based on the Trustees' approach and values, goals and objectives of the restoration plan, and applicable regulations. The primary selection criteria are:

- Ecological benefits
- Technical feasibility
- Cost-effectiveness
- Local economies and social values
- Supplemental considerations

Projects that are technically feasible and cost effective, maximize ecological benefits, replace analogous injured resources in an alternate location within the planning area, and contribute to local economies and social values will be considered. The Trustees consider environmental compliance costs as part of project implementation costs and, as such, will be factored as part of cost effectiveness.

Ecological benefits – Projects must benefit injured natural resources and will be preferred when they:

- Contribute to accomplishing one or more major actions identified under the auspices of the restoration plan
- Occur in or targets a geographic priority area identified in the restoration plan

- Provide measurable and significant benefits to injured resources, especially when they involve more than one habitat type or multiple injured resources
- Protect unique, rare, or significant habitats and/or native species, especially when the project areas is under imminent threats that would degrade or preclude future restoration
- Degree to which project improves and protects water quality
- Restore long-term processes that create and maintain habitat and are implemented at the appropriate scale and setting
- Provide benefits to injured resources within a strategic context on the landscape
- Integrate strategically with cleanup actions to provide additional benefits to injured resources
- Reduce fish and wildlife exposure to contaminants
- Potential adverse effects of the project on natural resources are minimized or mitigated
- Increase rate at which project restores ecological function

Technical Feasibility – Projects must be technically feasible, and will be preferred when they:

- Use proven, accepted strategies and techniques with a high likelihood of achieving objectives
- Have clearly identified and achievable needs for designs, permits, and administrative approvals, if applicable
- Have operations and maintenance plans clearly identified and developed and are appropriate for the project Have protection through conservation easements, public ownership or other mechanisms to ensure long-term success
- Have low or controllable risks from metals contamination or recontamination.
- Have appropriate timing
- Have technical merit

Cost Effectiveness – Projects must have costs that are reasonable and proportional to the expected benefits, and will be preferred when they:

- Utilize cost-effective means including minimizing costs for environmental compliance, administration, and implementation
- The expected costs of the project are reasonable and proportional to the expected benefits
- Long-term operation and maintenance costs are minimized
- Additional funds (matching or scaled) are provided by proposal source (submitter) or to be pooled with other funding sources

Local Economies and Social Values – Projects will contribute to local economies and support community values, and are preferred when they:

- Provide for human uses derived from natural resource restoration
- Provides local economic benefits
- Has broad community support
- Include education and outreach components that are effective, appropriate, and encourage long-term community support and stewardship of natural resources

Supplemental Considerations – In addition to the above criteria, the Trustees will consider the following:

- *Demonstration and pilot projects:* Projects that are for demonstration purposes or propose innovative techniques may be desired and will be considered based on their technical feasibility, likelihood of success, public accessibility, and future application.
- *Integration with other plans:* Projects that are part of other relevant natural resource management plans developed with public input may be desirable when funding will speed the pace or enhance the magnitude of restoration.
- *Monitoring and special studies:* Projects will be preferred when they have included reasonable plans for implementation and effectiveness monitoring. When projects are special studies, the work must be relevant, needed, appropriately timed, and with strong technical merit.

5.5 Compliance and Permitting

Restoration projects implemented on public and private lands under this restoration plan will meet legal requirements. Some of the potential requirements are identified in this section; however, this includes requirements that may not apply to every project and the list is not all-inclusive. See Appendix 1 of the DEIS for potentially applicable laws and regulations that govern the restoration projects authorized and implemented under this plan. The Trustees will identify applicable requirements in the early stages of project design, and the project proponent will be responsible for documenting compliance with these requirements. There are Federal, State, Tribal, and local requirements that may apply. For example, many projects will require authorization from the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act.[13] Projects funded under this plan must also comply with the federal Endangered Species Act of 1973, as amended[14] and may be required to undergo consultation with the U.S. Fish and Wildlife Service on potential effects to federally listed and proposed species and designated and proposed critical habitat. In addition, projects must comply with the National Historic Preservation Act, which may require consultation with state and tribal historic preservation offices if a project may impact historic or archaeological resources.

[13] http://www.usace.army.mil/Portals/2/docs/civilworks/regulatory/materials/cwa_sec404doc.pdf
[14] 16 U.S.C. 1531 et. seq

Projects will be required to comply with the National Environmental Policy Act (NEPA) to evaluate potential environmental impacts. The appropriate level of analysis and NEPA report will be identified based on each project's scope and potential level of impact. NEPA compliance for individual restoration projects will be accomplished through tiered environmental assessments or other project-specific NEPA analyses. The environmental impact statement (EIS) for this Coeur d'Alene River Basin Restoration Plan is being prepared for the broad federal action of adopting the restoration plan, which authorizes the release of settlement funds for restoration projects. The EIS purpose is to expedite and provide a framework for environmental analysis of future site-specific projects. As projects are selected, subsequent project-specific NEPA analyses will be prepared as necessary. Some projects may not require further site-specific NEPA analyses. Other projects may have site-specific NEPA analyses completed prior to proposal submittal. For projects requiring site-specific NEPA analyses, potential reporting mechanisms include EISs, supplemental EISs, environmental assessments with findings of no significant impacts, determinations of NEPA adequacy, and categorical exclusions. Using the concepts developed in this restoration plan and the associated EIS, future environmental review of the Coeur d'Alene Basin Natural Resource Damage Assessment Restoration Programmatic EIS and Restoration Plan will focus on site-specific issues and impacts and will incorporate by reference the relevant aspects of the EIS.

5.6 Supplemental Monitoring and Investigation

Given the complexity of natural resources and their interactions in the Basin, there will likely be information needed that will not be captured by simply monitoring the implementation and effectiveness of each project. Information needs may include broader-scale questions than can be captured at the project scale, or monitoring at a finer scale than would normally be done if it can guide future restoration techniques, project types, and science. Supplemental investigations may also include consolidation and interpretation of basin-scale data or contributions to others' efforts in examining basinwide trends. Information obtained from supplemental studies may be needed to further plan or prioritize restoration, or to prioritize from within an array of projects in order to best allocate resources.

The following criteria would be used to evaluate proposals that consist solely of studies or monitoring programs that support restoration as opposed to the design and implementation of on-the-ground restoration projects. *Note: These general criteria will also be used to evaluate project-level monitoring when monitoring is included in restoration project proposals*.

Table 7. Supplemental monitoring criteria and guidelines

Criteria	Guidelines
Relevance	Monitoring projects or studies are relevant when: • the study purpose and question relate to the injury. • the information gathered directly advances identification, prioritization, and likelihood of success of restoration.
Need	Monitoring projects or studies are needed when they provide information: • that is unavailable elsewhere, is not being collected by another entity, or is the responsibility of another entity. • that is needed for strategic planning and prioritization.
Timing	Monitoring projects or studies are timely when they: • describe site conditions that need to be known in order to plan/prioritize restoration. • help prioritize an array of restoration projects to better strategize and allocate resources. • provide specific information needed for adaptive management.
Technical Merit	A study or monitoring plan has technical merit when: • the study design and methodology are appropriate to answer the question being considered (e.g., sampling strategy, sensitivity, frequency, management of variability). • the study question is asked at the proper spatial or temporal scale.
Integration	Studies or monitoring efforts will be preferred when they can be combined with complementary efforts for improved efficiency and understanding.
Cost Effective	Proposed studies or monitoring programs are cost effective when: • the study design effectively yields useful information while minimizing cost. • the proposal leverages additional funding or provides partner matches. • the proposal minimizes overhead or the acquisition of equipment.

5.7 Measuring Success

Monitoring will be an essential component to determine success of restoration projects. Monitoring may be required to determine if projects meet their objectives, what methods are the most effective, and if restoration is moving conditions closer to those desired. Restoration proposed in this plan is intended to improve conditions for species across the Basin; however, monitoring trends at the landscape scale is beyond the capabilities of the Trustees alone. Project-scale monitoring conducted under this plan is intended to combine with data collected throughout the Basin by others to address conditions and trends at the landscape scale.

Project-level monitoring focuses on questions and objectives that can be reliably answered. Beyond the project scale, determining significance at the landscape level may be impossible. The following are important considerations for project-level monitoring:

- *Scale appropriate:* extent and intensity of monitoring should be commensurate with the expected scale of effects.
- *Targeted:* monitoring should be well defined, focused on the most important questions that need to be answered, and tailored specifically to answer those questions.

- *Non-duplicative:* to make the most efficient use of time and resources, monitoring should not duplicate ongoing efforts of other organizations. In some cases, existing monitoring efforts can be extended or supplemented by the Trustees to make efficient use of existing resources.

5.7.1 Proposed Monitoring

Monitoring is done at different scales and is used to answer a variety of questions. Under this plan, monitoring will be used to determine if projects are completed according to plans and proposals, are effective at achieving their objectives, and contribute to basinwide trends of injured natural resources.

5.7.2 Implementation monitoring

Implementation monitoring is intended to determine whether projects were conducted according to stated project proposals, designs, and permits. Monitoring will be conducted through collaboration with the Trustees and project proponents. Information gathered with implementation monitoring will be used for programmatic and financial accountability, as well as design compliance.

5.7.3 Effectiveness monitoring

Effectiveness monitoring determines whether a project, as designed and implemented, accomplished identified objectives and advanced conditions towards a larger goal. Effectiveness monitoring is an important component of adaptive restoration because it provides information on what restoration techniques are working and how they can be adjusted to better meet objectives. Monitoring conducted before projects are done is also important, and the Trustees will take advantage of many monitoring efforts (such as EPA's monitoring program, Idaho Department of Fish and Game and Tribal fish population surveys, spawning surveys, waterfowl banding) throughout the Basin to characterize projects before they are implemented. This information may be needed for project planning and to evaluate the effects of completed projects.

Specific effectiveness monitoring plans or requirements cannot be determined now, due to the expected diversity and distribution of future projects. Also, the scale and intensity of effectiveness monitoring will vary and be commensurate with the expected scale of effects. For example, projects that use unique techniques or demonstration projects may be monitored more intensively in order to provide information for adaptive management. Projects repeatedly employing commonly used techniques in areas of similar geography may be monitored less intensively. These determinations will be made on a case-by-case basis.

The project submission process may require inclusion of a monitoring plan, including specific monitoring questions and a description of methods designed to answer those questions. The final plan will be the result of collaboration between project applicants, cooperators, and the Trustees.