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Forest Service

Biological Assessment for the Colville National Forest Land and Resource Management Plan Revision

Colville National Forest

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1.0 Introduction

This programmatic Biological Assessment (BA) assesses the effects of implementing the management activities proposed in the revised Colville National Forest Land and Resource Management Plan (revised Forest Plan). The planning area includes all federal land managed or administered by the Colville National Forest in Ferry, Pend Oreille, and Stevens Counties, Washington. The Colville National Forest includes 1.1 million acres of national forest lands located in northeastern Washington. Ranger district offices are located in Republic, Kettle Falls, Metaline Falls, and Newport, and the Supervisor's Office in Colville.

National Forest Land and Resource Management Plans provide broad guidance and information for project design and decision-making. The original Colville National Forest Plan was adopted in 1988, amended by East-side Screens and Infish aquatic strategy (USFS, 1988). The National Forest Management Act (NFMA) calls for plans to be revised every 15 years, to incorporate new information and to account for changed national policy and direction, and to address new issues and opportunities. The USDA Forest Service developed this Plan collaboratively with partners, other government agencies, members of user groups, interest groups, and local citizens.

The Colville National Forest (CNF or Forest) is revising its 1988 land management plan. The revised forest plan (Plan) will allocate National Forest System (NFS) lands to 13 management areas (MAs) including: Focused Restoration, General Restoration, Backcountry, Backcountry Motorized, Wilderness-Designated, Wilderness-Recommended, Eligible and Suitable Wild and Scenic Rivers, Scenic Byways, Administrative Recreation Sites, and Riparian Management Areas (see section 2.0). The proposed MAs represent different management themes with varying emphasis such as: vegetation management, watershed restoration, motorized and non- motorized recreation, or special designations designed to sustain the social, economic, and ecological attributes of the Forest.

The need for revision of the forest plan is based on legal requirements, changed economic, social and ecological conditions since the 1988 land management plan was adopted. These changes include new laws, regulations, and policies; Congressional direction and court decisions; and conservation agreements. Endangered Species Act (ESA) species listings and recovery plans have been updated and new information based on monitoring and scientific research is available. Revision is also warranted because the forest plan is beyond the 10- to 15-year duration provided by the National Forest Management Act 40 (NFMA) (16 U.S.C. 1606(e) (5) (A)).

The Forest identified five specific needs for change; wildlife habitat, vegetative systems, climate change, social systems, and aquatic and riparian systems.

Wildlife Habitat

The 1988 forest plan needs to be updated to reflect new species listings under the ESA, designated critical habitat, and current science relating to plant and animal species and their habitats. New information since 1988 includes viability assessments for the Interior Columbia Basin and for northeastern Washington. The viability of many of the species assessed is being influenced by habitat alteration due to timber harvest, wildfire, and other vegetation management activities; restoration of riparian and wetland habitats; and reduction of habitat effectiveness and connectivity due to the

potential impacts of roads. Climate change may alter how water systems function and it is projected to exacerbate the loss of old forest habitat due to increased fire rates. Therefore there is a need to restore watershed conditions to be more resilient to disturbances to provide for the recovery and viability of wildlife and plant species.

Vegetative Systems

There is a need to manage forest vegetation conditions to be more resilient to disturbances. The Douglas-fir dry and Northern Rocky Mountain mixed conifer forest types are susceptible to continued severe insect and disease outbreaks. The existing forest plan does not adequately address the factors that have created these unsustainable conditions, nor does it adequately address the varied nature of the landscape. In addition, climate change is predicted to make these conditions even more challenging to sustain. Thus, there is a need to revise the forest plan to focus restoration actions in Douglas-fir (*Pseudotsuga menziesii*) dry and Northern Rocky Mountain mixed conifer landscapes, and create conditions that are more resilient to anticipated disturbances. Lodgepole pine (*Pinus contorta*) forest types are also in need of updated management direction that addresses the challenges described above. For example, historically, frequent fires maintained low tree abundance on dry landscapes, but fire cycles have lengthened with Euro-settlement. Over time, stand density has increased due to fire suppression; increasing competition for water and nutrients, increased insect and disease mortality, greater numbers of shade-tolerant species and an increased amount of dead material. In the past 10 to 15 years, fire acres in eastern Washington have increased with amplified severity, reflective of higher fuels levels and longer fire seasons.

Climate Change

There is a need to address climate change implications and vulnerabilities. The existing forest plan does not address the potential effect of climate change. Changing climate conditions have affected ecosystem composition, structure, process, and spatial pattern, altering the character and distribution of habitats for plant and animal species. In addition, climate change has altered, and will continue to alter disturbance regimes, including forest insects and diseases, fire, and hydrologic regimes. The full impact of climate change on ecosystems is uncertain, but an integrated management direction that provides flexibility to respond to a changing environment is needed to maintain or restore the resilience of the Forest in the face of these changes.

Social Systems

There is a need to address changed social and economic conditions and preferences in light of ecosystem capacity. Colville National Forest provides a variety of opportunities for recreating, working, and practicing cultural and spiritual traditions. In turn, communities provide infrastructure and skills to support forest management. Sustainable social and economic opportunities depend on well-functioning and resilient ecological systems. During the past 20 years, demographic and economic changes have altered how people use and access the Forest. The Plan revision needs to address changed social, economic, and ecological conditions. Social changes include an increasing demand, largely due to population growth, for a variety of recreation opportunities on public lands. An example of changes in recreation use and visitor preferences is a trend toward shorter-duration visits to the Forest compared to those in the past. A more ethnically diverse population is visiting the Forest and visitors are now more likely to stay for a day or weekend, rather than for longer periods. In addition, demand for recreation

opportunities in 'front country' areas is greater than for backcountry areas. New activities and modes of travel continue to appear (e.g., mountain bicycles with over-snow tires and snowmobiles that resemble motorcycles). Economic shifts in markets for timber products and declines in timber harvests have caused many eastern Washington wood processors to close. The Plan revision needs to address such changes within the capability of the available infrastructure and the ecosystem. The Plan revision also needs to address the types and extent of forest management activities that can be accomplished within projected budget**s.**

Aquatic and Riparian Systems

There is a need to focus efforts to accelerate and improve watershed condition across the Forest. The current forest plan and amendments do not adequately provide integrated management direction to maintain and restore properly functioning watersheds that provide a range of benefits on and off the CNF within a timeframe that is meaningful. This is supported by new science, the listing of bull trout (*Salvelinus confluentus*) under the ESA, designation of critical habitat for bull trout, information provided by the bull trout recovery plan, and the results of new assessment tools such as the national Watershed Condition Framework. Properly functioning watersheds provide productive ecological systems and allow for conditions that support aquatic species viability and self-sustaining populations, contribute to the recovery and de-listing of threatened and endangered species, and help meet Washington State water quality standards.

Colville Forest Plan was completed in 1988, and was amended in 1995 by the Inland Native Fish Strategy (INFISH; USDA Forest Service 1995). Since 1988, the Aquatic Restoration Strategy (ARS; USDA Forest Service 2007), the Aquatic and Riparian Conservation Strategy (ARCS; USDA Forest Service 2008, USDA Forest Service 2016) and the Watershed Condition Framework (WCF; Potyondy and Geier 2010) have been developed to reflect management direction recommended by current research and supported by regional and national policy. The ARS (see section 2.2.4) is a Forest Service, Pacific Northwest Regional operational strategy that reinforces the foundation of existing forest plan strategies, including broad-scale passive restoration, and strategically focused active restoration. The ARS guides implementation through establishment of specific goals and objectives and a formal process for near-term active restoration. The 2010 National Watershed Condition Framework process evaluated current conditions at the subwatershed scale and identified priority subwatersheds where focused restoration can improve watershed condition on NFS lands.

The ARCS (section 2.2) is a refinement of previous forest plan strategies (the Northwest Forest Plan; USDA Forest Service and USDI Bureau of Land Management 1994, PACFISH; USDA Forest Service and USDI Bureau of Land Management 1995 and INFISH; USDA Forest Service 1995) incorporating key concepts from the ARS and watershed condition framework, and is intended to provide the core set of desired conditions, suitable uses, objectives, standards and guidelines for aquatic and riparian management. ARCS provides additional watershed direction intended to restore and maintain watershed conditions and processes that sustain a full range of ecosystem services and support beneficial uses of water, with a focus on protection and restoration of native fish.

1.1 Statutory and Regulatory Background

The National Forest Management Act (NMFA) - The 1976 National Forest Management Act (NFMA 1976) requires the United States Department of Agriculture (USDA) Forest Service (USFS) to set up a

process for the development and revision of land and resource management plans (LRMP) for national forests and national grasslands throughout the United States.

The Planning Rule - The first planning rule, adopted in 1979 and amended in 1982 and 1983, known as the 1982 planning rule, has guided the development, amendment and revision of the majority of current land management plans in effect throughout the NFS lands. The 1982 planning rule (36 CFR 219.19) requires national forests to manage habitat in order "*to maintain viable populations of existing native and desired non-native vertebrate species in the planning area*", and further defines a viable population as "*one which has the estimated numbers and distribution of reproductive individuals to insure its continued existence is well distributed in the planning area*".

The USDA has attempted to revise the planning rule provisions several times since the original planning rule was implemented in 1982. Between 2000 and 2008, three new planning rules were proposed, challenged, and ultimately remanded back to the USDA by the US District Court. Direction for management of species differs between the 2000/2005/2008 and 1982 planning rules in regards to viability and sustainability of species. Under the 2000, 2005, 2008 Planning Rules, National Forests were required to assess "*the contribution of National Forest System (NFS) lands to the sustainability of ecosystems and species*" as opposed to "*maintaining viable population of species.*"

After the 2008 planning rule was remanded back to the USFS, the CNF was again revising the LRMP with the 1982 planning rule. Although a new planning rule was released in 2012, the CNF, which started plan revision under the 2000 planning rule, decided to complete their plan revision under the 1982 planning rule. The Plan is revised under the transition provisions of the 2012 Planning rule (36 CFR 219), which state that the responsible official may complete and approve the plan revision in conformance with the provisions of the prior planning regulation, including the transition provisions of the reinstated 2000 rule (36 CFR part 299, published at 36 CFR parts 200 to 299, revised as of July 1, 2010). The transition provisions allow the use of the 1982 planning procedures (See CFR parts 200 to 299, Revised as of July 1, 2000). Given that the 1982 planning rule was in place when the Forest began the Plan revision, the objective of this evaluation (starting in 2010) is to ensure the evaluation approach addresses "species viability" criteria of the 1982 planning, while meeting the intent of the 2012 planning rule.

Endangered Species Act of 1973 [ESA] (16 U.S.C 1531-1536, 1538-1540) – Provides for the conservation of species that are endangered or threatened throughout all or a significant portion of their range, and the conservation of the ecosystems on which they depend.

The purpose of the ESA is to conserve threatened and endangered species and their ecosystems. Section 7 of the ESA outlines procedures for interagency cooperation to conserve federally listed species and designated critical habitats. Section 7(a)(1) requires Federal agencies to use their authorities to further the conservation of listed species. Section 7(a)(2) requires Federal agencies to consult with the National Marine Fisheries Service (NMFS) or U.S. Fish and Wildlife Service (USFWS), depending upon the species, to ensure that they are not undertaking, funding, permitting, or authorizing actions likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat.

Section 9 of the ESA prohibits the taking of endangered species of fish and wildlife. Take includes any activity that may harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to

engage in any such conduct. Harm includes the significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. If a federal agency's actions may result in take that is incidental to an otherwise lawful activity then the agency needs to receive an incidental take permit, issued by the USFWS or NMFS during the consultation process conducted under section 7(a)(2).

Finally critical habitat for listed species consists of: (1) the specific areas within the geographical area occupied by the species, at the time it is listed, on which are found those physical or biological features (constituent elements) (a) essential to the conservation of the species and (b) which may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species at the time it is listed upon a determination by the Secretary (of the Department of Interior or the Department of Commerce) that such areas are essential for the conservation of the species. Critical habitat is formally designated and published in the Federal Register.

Clean Water Act of 1977 (33 U.S.C. §1251 et seq.) – Establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulates quality standards for surface waters.

National Environmental Policy Act of 1969 (42 U.S.C. § 4321 et seq) - Requires that all executive federal agencies prepare environmental assessments (EAs) and environmental impact statements (EISs) that report the potential environmental effects of proposed federal agency actions.

1.2 Purpose of the Biological Assessment

The revised forest plan provides land management direction for forest resources, both forest-wide direction and direction specific to management areas. The Plan is strategic in nature**.** It does not include decisions authorizing specific projects or activities. For example, the plan does not include decisions for building or closing specific roads or trails, specific vegetation management projects, or watershed restoration projects. Those decisions are made later, only after projects are proposed, analyzed, and there is the opportunity for public involvement.

The Plan includes plan components. These are desired conditions, objectives, suitability of areas, special areas, monitoring, and standards and guidelines. Plan components can only be changed by a Plan amendment. Within the requirements set forth in the NFMA planning rule, land management plans provide a programmatic framework and the sideboards to guide decisions for all natural resource management activities on a national forest or grassland. The plan components are discussed more thoroughly in Section 2.0.

The purpose of this biological assessment (BA) is to provide the basis for consultation with the USFWS on the revised Plan. The BA will evaluate the contribution of implementation of the Plan towards meeting the Forest Service's obligation to further the conservation of ESA listed and proposed species (ESA section 7 (a)(1)); and to assess the potential effects implementing the Plan may have on critical habitat (ESA section 7 (a)(2)). For Bull trout, the Columbia Headwaters Recovery Unit (CHRU) includes western Montana, northern Idaho, and the northeastern corner of Washington. The bull trout populations and critical habitat assessed in this BA are in the Lower Clark Fork geographic area and Lake Pend Oreille Core Area. The very eastern portion of the Forest is included in the Selkirk Grizzly Bear Recovery Area (USFWS 1993). The recovery area

is one of two in Washington and one of six in the coterminous US. The Forest also contains a recovery area and designated critical habitat for the last remaining herd of woodland caribou in the continental US. The recovery area for the Selkirk Mountain Woodland Caribou, the most endangered mammal in the continental US, includes a portion of the Colville National Forest. The Kettle Range was identified as a Core Area for Canada lynx (USFWS 2005) although there is no designated critical habitat for this species on the Forest (USFWS 2009). The Forest provides potential habitat for the yellow-billed cuckoo. The Colville National Forest provides habitat or potential habitat for the wolverine, which has been proposed for listing under the Federal Endangered Species Act. This programmatic Biological Assessment was prepared in accordance with the US Forest Service manual 2670 and is guided by requirements set forth in the National Forest Management Act. Determinations of effects by habitat and species are made based on best available information.

Table 1 - TEP Species and critical habitat assessed in the BA

Species	Status	Recovery Area/Critical Habitat Designation
bull trout (*Salvelinus confluentus*)	Threatened	The Columbia Headwaters Recovery Unit (CHRU) includes western Montana, northern Idaho, and the northeastern corner of Washington. The bull trout populations and critical habitat assessed in this BA are in the Lower Clark Fork geographic area and Lake Pend Oreille Core Area.
Canada lynx (*Lynx canadensis*)	Threatened	Current management direction is provided through the Canada Lynx Interagency Agreement that relies on the science summarized in the Canada Lynx Conservation Assessment and Strategy (ILBT 2013). No critical habitat was identified for Canada lynx on the Colville National Forest (USFWS 2009).
grizzly bear (*Ursus arctos*)	Threatened	The Selkirk Mountains Grizzly Bear Recovery Area has 3 Grizzly Bear Management Units (GBMU): LeClerc, Salmo=Priest, and Sullivan- Hughes. Critical habitat has not been designated for grizzly bear in any recovery area.
North American wolverine (*Gulo gulo luscus*)	Proposed	Proposed Species – No critical habitat designated.
Whitebark pine	Candidate	Candidate Species – No critical habitat designated
woodland caribou (*Rangifer*	Endangered	The caribou recovery area is divided into 17 Caribou Management Units, four of which occur on the Colville National Forest. Selkirk Mountains Woodland Caribou Recovery Area.

Species	Status	Recovery Area/Critical Habitat Designation
tarandus caribou)		Critical habitat has been designated for the woodland caribou on the Colville National Forest.
Yellow-billed cuckoo (*Coccyzus americanis*)	Threatened	No critical habitat designated.

As previously stated, the Plan is strategic in nature and does not specifically authorize any land management activity. The Plan, through the designation of management areas (MAs) identifies what types of management activities will be emphasized on different portions of the Forest. The Plan components describe the management intent and sideboards placed on management activities either forest-wide or specific to a MA. This BA assesses the MAs and plan components. The plan components include an Aquatic and Riparian Conservation Strategy (ARCS) that will replace the current direction provided by INFISH. The plan components contained in the ARCS are assessed for their conservation value to bull trout and potential effects to bull trout and bull trout critical habitat. Because the Plan is strategic or programmatic in nature and does not authorize any actions, no take (ESA section 9) can be specifically, reasonably certain to occur by adopting the plan; and any future land management activities that occur through implementing the plan will be subject to ESA section 7(a)(2) consultation; the Plan is considered a *framework programmatic action* (80 FR 26832). Any future land management activities that occur through implementing the Plan will be subject to later site-specific section 7(a)(2) consultation as appropriate.

1.3 Framework for this BA

1.3.1 Bull Trout and Bull Trout Critical Habitat

As mentioned, this BA will assess the conservation value and potential effects to bull trout and critical habitat due to the designation of MAs and adoption of the Plan components. A key concept in this BA is the watershed hierarchy. Watersheds are natural divisions of the landscape and the basic functioning unit of hydrologic systems and processes.

Watersheds are hierarchical (smaller ones are nested within larger ones) making them an appropriate context for considering many ecological processes. Physical processes such as rainfall, runoff, erosion, and sedimentation interact within the watershed boundaries to shape the landscape. Biological processes also occur within watershed boundaries. Environmental changes commonly culminate and appear at the watershed scale. Changes in soil, vegetation, topography, and chemicals change the quantity and quality of water, sediment, and organic material that flow through a watershed influencing the characteristics of stream channels and aquatic habitat. The different watershed scales are identified through a numbering system called the Hydrologic Unit Code (HUC). The hydrologic unit system is a standardized watershed classification developed by the U.S. Geologic Survey (USGS). Hydrologic units

are watershed boundaries organized in a nested hierarchy by size. They range in size from regions to smaller units.[1] For this analysis three scales of watershed will be discussed in order of decreasing hierarchy (see Figure 1): subbasin (HUC 8), watershed (HUC10), and subwatershed (HUC 12).

Table 2 - Major Subbasin Hydrologic Unit Code (HUC), and Size

Subbasin Name (8th level HUC*)	HUC	Total Subbasin Size (Acres)	CNF Acres
Sanpoil River	17020004	627,732	105,291
Kettle River	17020002	659,201	321,743
Upper Columbia River-Lake Roosevelt	17020001	1,327,733	212,863
Colville River	17020003	650,712	145,579
Pend Oreille River	17010216	698,895	407,899

[1] See http://water.usgs.gov/GIS/huc.html.

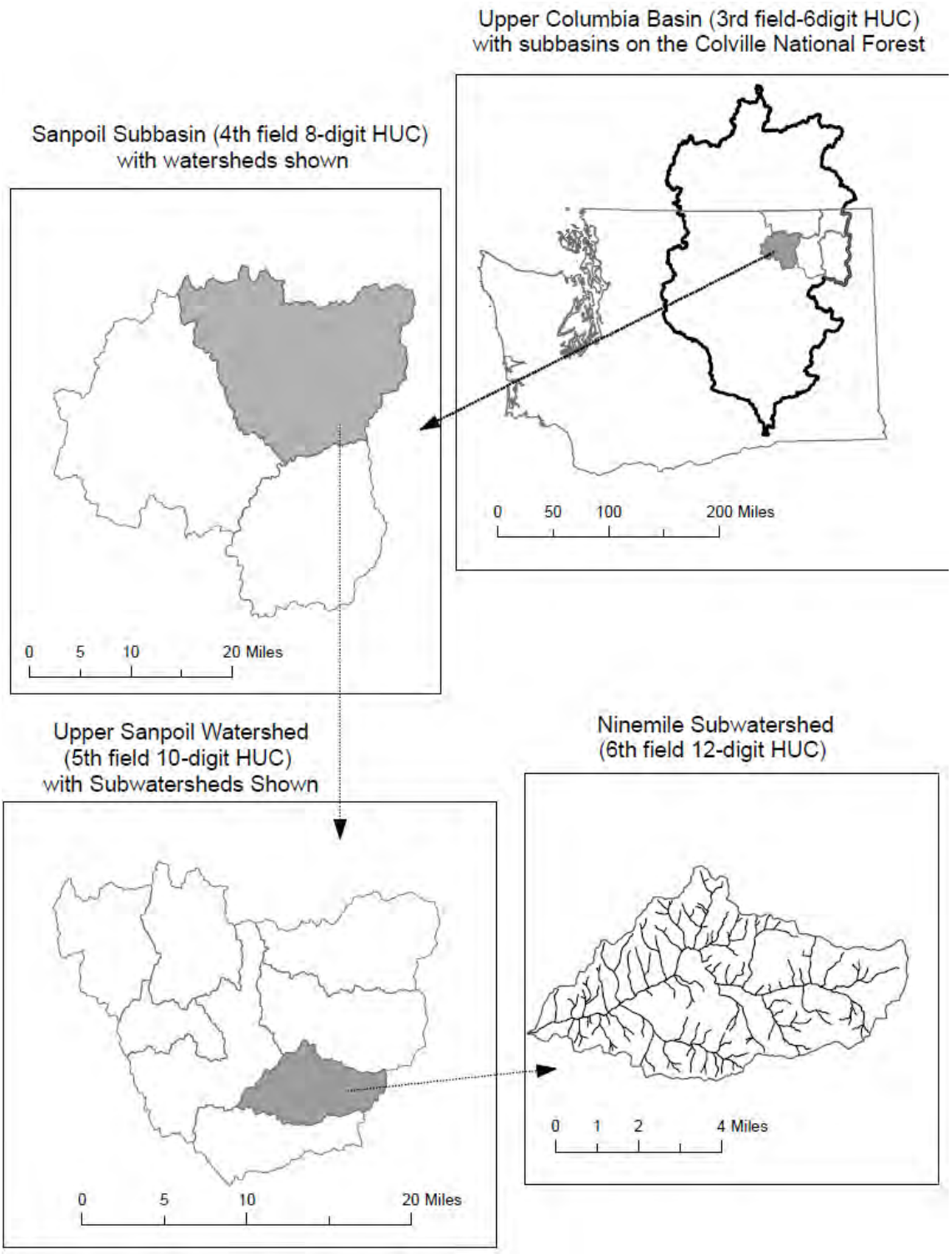

Figure 1 - Watershed Hierarchy

While the CNF includes 5 subbasins, the Forest expects bull trout presence in the Pend Oreille River watershed where bull trout critical habitat is designated. Bull trout are occasionally observed in Lake Roosevelt, and were historically present in the Kettle, and possibly in the Sanpoil and Colville subbasins. Bull trout critical habitat is not designated in Lake Roosevelt or its tributaries. There is very little known

about existing bull trout use of the Lake Roosevelt reservoir and its tributaries, there for it is identified as an area of research needs in the bull trout recovery plan. Given that bull trout have not been observed in Lake Roosevelt tributaries on the Forest, and the Forest Service does not expect any actions under the Plan to impact bull trout in Lake Roosevelt, the Plan will have no effect on bull trout in basins other than the Pend Oreille River.

This BA will assess the Plan at three scales, the subbasin (Pend Oreille River), watersheds, and subwatersheds within the Pend Oreille subbasin, with emphasis on the subwatershed and subbasin scales.

The remainder of this BA is organized into five major headings or sections. Section 2.0 will describe the MAs within the Pend Oreille subbasin including the emphasis of the MAs and plan components within the MAs relevant to potential effects to bull trout and critical habitat. Section 2.2 will describe the Plan components that are specific to the new ARCS that will be replacing the current INFISH direction.

Section 2.2 will also summarize the potential influence climate change may have, in general, on bull trout and bull trout critical habitat and provide a background for assessing how the Plan addresses the potential threats of a changing climate.

Section 2.3 will describe the resource programs in the Plan that may affect bull trout or bull trout critical habitat when carried out at the project level. Management direction or plan components, including but not limited to the ARCS that reduce the potential risks will be reviewed. The MAs that will have no effect to bull trout or critical habitat will also be discussed.

Section 3.0 will identify the action area that includes all areas to be affected directly or indirectly by the Plan. The section will include an overview of the ownership pattern within the action area to provide a context for the role of the Forest in the conservation of bull trout.

Section 4.0 will describe the status of bull trout and bull trout critical habitat to provide a context for the status of bull trout and bull trout critical habitat within the Pend Oreille Core Area. The discussion will include the general life history of bull trout, distribution, the population structure within the Core Area, the current status or viability of the species within the core area, the Physical and Biological Features of critical habitat, and describe the overall limiting factors and threats to recovery.

The environmental baseline will also be described in section 4.0. The discussion will describe the status of the species and critical habitat within the Pend Oreille subbasin. The environmental baseline will include an assessment of the watershed and habitat conditions within subwatersheds on the Forest within the Pend Oreille River subbasin, and current viability of the populations on the Forest.

Finally section 5.0 will assess the conservation value of the Plan by assessing the Forest's contribution to the conservation of bull trout including the consistency of the Plan with the bull trout recovery plan (USFWS 2015a). The potential effects to bull trout and critical habitat will be assessed programmatically based upon the distribution of the MAs within the Pend Oreille subbasin and the likely management actions that may occur, as well as a discussion regarding the potential effectiveness of the ARCS compared to the current INFISH direction.

1.3.2 Terrestrial Wildlife and Critical Habitat

The purpose of this analysis is to assess potential effects of federally listed Threatened, Endangered and Proposed wildlife species, and designated critical habitat, which occur or could occur within the planning area. The very eastern portion of the Forest is included in the Selkirk Grizzly Bear Recovery Area (USFWS 1993). The recovery area is one of two in Washington and one of six in the conterminous US. The Forest also contains a recovery area and designated critical habitat for the last remaining herd of woodland caribou in the continental US. The recovery area for the Selkirk Mountain Woodland Caribou, the most endangered mammal in the continental US, includes a portion of the Colville National Forest. The Kettle Range was identified as a Core Area for Canada lynx (USFWS 2005) although there is no designated critical habitat for this species on the Forest (USFWS 2009). The Forest provides potential habitat for the yellow-billed cuckoo. The Colville National Forest provides habitat or potential habitat for the wolverine, which has been proposed for listing under the Federal Endangered Species Act. This programmatic Biological Assessment was prepared in accordance with the US Forest Service manual 2670 and is guided by requirements set forth in the National Forest Management Act. Determinations of effects by habitat and species are made based on best available information.

1.4 Consultation History

In 2000, the USFWS and FS entered into an interagency Consultation Agreement to establish a general framework for conducting efficient and effective ESA Section 7 consultation on the revision of Colville, and the Okanogan and Wenatchee National Forest Land and Resource Management Plans. This was updated in 2013 with a signed agreement. In 2016, the CNF Forest Supervisor sent a letter to USFWS updating the information in the Consultation Agreement including contact information and clarification that this consultation will only include the CNF. In 2006, the Regional Interagency Executive Committee (RIEC) received an update on Forest Service (FS) Region 6 (R6) Forest Plan Revisions.

The Colville Forest Plan revision began in 2003, followed by public participation that began in 2004 with community workshops about the need to change the existing forest plan. Meeting and workshops were held throughout northeastern Washington, with additional workshops on specific topics such as wilderness and recreation from 2005 to 2008. During this time, meeting and discussions were held with US Fish and Wildlife Service field offices in Spokane and Wenatchee to share timelines, expectations, and gather feedback on issues and analysis approaches to address listed fish, wildlife and plant species. At this time, one Interdisciplinary Team was working to revise Forest Plans for both the Okanogan-Wenatchee National Forest and the Colville National Forest. In 2011, the Forest Service published a combined notice announcing that the proposed actions for the Colville and Okanogan-Wenatchee National Forests were available for public review and comment. At this time, the US Fish and Wildlife Service Wenatchee Field Office coordinated a review of the Proposed Action, incorporating comments from the Spokane (Eastern Washington) Field Office. Meetings were held to review comments and discuss how they could be incorporated into the draft Land Management Plan.

After the public comment period on the Proposed Action, the Regional Forester decided that the most effective process to move forward efficiently was to separate the Colville and Okanogan-Wenatchee National Forests' plan revision efforts. An updated consultation agreement between the Colville National Forest and the US Fish and Wildlife Service Eastern Washington (Spokane) Field Office reflected this change. The Forest met with the Eastern Washington Field Office 5 times (6/2005, 11/2012, 2/2015, 11/2015, 8/2016) to review the consultation process, provide updates, and discuss issues related to the release of the Proposed Revised Land Management Plan for the Colville National Forest and the Draft

Programmatic Environmental Impact Statement (as per the consultation agreement). The Forest provided email responses to requests for alternative maps, questions, updates on the Forest Plan process, and submitted draft copies of the fish, wildlife, and hydrology reports (2014-2016). The Forest requested a review of the Draft Environmental Impact Statement (DEIS), Draft Plan, and fish and wildlife specialists' reports on 2/16/16. The USFWS and Forest Service met on 2/17/16 to discuss the Forest Plan. Written comments were received from the US Fish and Wildlife Service, Eastern Washington Field Office on these draft documents on 15 August 2016. These comments were used to develop the final Proposed Revised Land Management Plan and Final Programmatic Environmental Impact Statement, upon which this Biological Assessment is based. The Forest Service and USFWS met on January 11, 2017 to discuss the draft BA.

2.0 Description of the Plan

2.1 Plan Components

The Plan includes plan components that will guide resource management projects during the life of the Plan. These plan components are desired conditions, objectives, and standards and guidelines and suitability.

Desired Conditions

The desired conditions are goals describing the social, economic, and ecological attributes toward which management of the land and resources of the CNF is to be directed.

To be consistent with the desired conditions of the Plan, a project or activity, when assessed at the appropriate spatial scale described in the Plan (e.g., landscape scale), must be designed to meet one or more of the following conditions:

- Maintain or make progress toward one or more of the desired conditions of a plan without adversely affecting progress toward, or maintenance of, other desired conditions; or
- Be neutral with regard to progress toward plan desired conditions; or
- Maintain or make progress toward one or more of the desired conditions over the long term, even if the project or activity would adversely affect progress toward or maintenance of one or more desired conditions in the short-term; or
- Maintain or make progress toward one or more of the desired conditions over the long term, even if the project or activity would adversely affect progress toward other desired conditions in a negligible way over the long-term.

The project documentation should explain how the project is consistent with desired conditions and describe any short-term or negligible long-term adverse effects the project may have concerning the maintenance or attainment of any desired condition. This description of the desired conditions for the Forest fulfills the requirement of section 36 CFR 219.11(b) of the 1982 planning regulations.

Objectives

Objectives are concise projections of measurable, time-specific intended outcomes. Objectives are the means of measuring progress toward achieving or maintaining desired conditions. The objectives

represent just some of the expected outcomes or actions required to accomplish movement toward desired conditions**.**

Variation in achieving objectives may occur during the next 10 to 15 years because of changes in environmental conditions, available budgets, and other factors. Objectives are strongly influenced by recent trends, past experiences, anticipated staffing levels, and short-term budgets.

A project or activity is consistent with the objectives of the Plan if it contributes to or does not prevent the attainment of any applicable objectives. The project documentation should identify any applicable objective(s) to which the project contributes and document that the project does not prevent the attainment of any objectives. In some cases, project or activities may not directly relate to any plan objectives. In that case, the project or activity must at least not hinder the attainment of plan objectives, or be inconsistent with the intent of plan objectives.

The objectives section provides a description of the potential outcomes or results that may be expected to be provided during the planning period, as required in 36 CFR 219.11 (b) of the 1982 Planning Rule.

Standards

Standards are constraints upon project and activity decision making. Standards are established to help achieve desired conditions and objectives, and to ensure project activities on NFS lands comply with applicable laws, regulations, Executive orders, and agency directives.

A project or activity must be consistent with all standards applicable to the type of project or activity and its location in the Plan area. A project or activity is consistent with a standard when its design is in exact accord with the standard; variance from a standard is not allowed except by plan amendment. The project documentation should confirm that the project is consistent with applicable standards (36 CFR 219.11).

Guidelines

Guidelines provide operational practices and procedures that are applied to project and activity decision making to help achieve desired conditions and objectives, to avoid or mitigate undesirable effects, or to meet applicable legal requirements.

A project or activity is consistent with a guideline in either of two ways:

1. The project or activity is designed exactly in accord with the guideline; or

2. A project or activity design varies from the exact words of the guideline, but it is as effective in meeting the purpose of the guideline to contribute to the maintenance or attainment of the relevant desired conditions and objectives.

Guidelines are explicitly identified in the Plan (36 CFR 219.11). Guidelines are constraints on project and activity decision-making that allow for departure from its terms, so long as the purpose of the guideline is met (36 CFR 219.15(d)(3)). Guidelines are established to help achieve or maintain a desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements.

Suitability of Areas

National Forest System lands are identified as “generally suitable” for various uses. Suitability describes the appropriateness of applying certain resource management practices (uses) to a particular area of land. An area may be identified as generally suitable for uses that are compatible with desired conditions and objectives for that area.

A project with the purpose of timber production may only occur in an area identified as suitable for timber production (16 U.S.C. 1604(k)). The documentation for the project should confirm the project area meets the suitability requirements.

Except for projects with a purpose of timber production, a project or activity can be consistent with plan suitability determinations in either of two ways:

1. The project or activity is a use identified in the plan as suitable for the location where the project or activity is to occur; or

2. The project or activity is not a use identified in the plan as suitable for the location (i.e., the plan is silent on the use or the plan identifies the use as not suitable), but the responsible official determines that the use is appropriate for that location’s desired conditions and objectives.

The project documentation should describe that the project or activity is either: (1) a use for which the area is specifically identified in the plan as suitable or (2) not a use for which the area is specifically identified in the plan as suitable, but it is nonetheless appropriate for that location.

2.1.1 Description of Management Areas

As described in section 1.2 consultation on the Plan is a framework programmatic action as the Plan is programmatic in nature and does not specifically authorize any land management activity. The federal action is the designation of the Management Areas (MAs) which are broadly described areas where general management intent is similar. The MAs have specific desired conditions. The purpose of MAs is to provide consistent guidance for similar portions of National Forest System lands when implementing or continuing management activities. Forest-wide plan components apply within the management areas.

Some management areas, such as riparian management areas, naturally overlap with other MAs. Combinations of activities or uses are dependent on site-specific conditions, making it unreasonable to include all combinations and the applicable plan direction within the forest plan. Therefore, applicability of plan direction is guided by the principle that, where management areas overlap, the most restrictive plan direction applies depending on site-specific conditions and the activity or use.

The Forest also includes Special Areas. Special Areas are management areas that are identified or designated because of unique or special characteristics. Formally designated by statute or through a separate administrative action, each area is recognized individually as a separate management area. Each Special Area may have specific management guidance (in addition to that listed in this plan) from underlying statute or other designation document, or in Forest Service directives. In addition to the previously described plan components there are plan components applicable to distinct Special Areas. In the event that a plan component for a Special Area and the forest-wide component in another section conflict, the more restrictive plan component prevails.

The MAs designated in the Plan within the Action Area are listed in Table 3 - Management Areas on the CNF and in the Pend Oreille River Subbasin. The Pend Oreille Subbasin acres are included because it is the only subbasin with critical habitat for woodland caribou and bull trout and core habitat for Grizzly bear.

Table 3 - Management Areas on the CNF and in the Pend Oreille River Subbasin

Management Area	CNF Acres	Pend Oreille Subbasin Acres
Backcountry	129,100	34,800
Backcountry Motorized	54,600	5,250
Focused Restoration	312,500	192,000
General Restoration	489,200	93,400
Research Natural Area	5,700	3,600
Scenic Byways	19,300	6,200
Wilderness-Congressionally Designated	31,400	31,400
Wilderness-Recommended	61,700	36,800
TOTAL	1,103,500	403,450

*Acres are approximate and vary due to GIS methodology

Backcountry and Backcountry Motorized

The Plan includes approximately 129,100 acres in the Backcountry and 54,600 acres in the Backcountry Motorized Mas. 27% of the Backcountry and almost 10% of the Backcountry motorized is within the Pend Oreille River subbasin. The only difference between the two areas is the suitability for non-motorized and motorized recreation. Backcountry emphasizes non-motorized recreation opportunities and can include foot, horse, and mechanized (e.g., mountain bikes) modes of travel. Backcountry motorized emphasizes summer and winter motorized recreation opportunities and can include off-highway vehicles, motorcycles, jeeps, and over-snow vehicles.

Backcountry and Backcountry Motorized are spatially defined by the upper reaches of watersheds in the 2001 Inventoried Roadless Areas, the potential wilderness areas identified in the Plan revision wilderness evaluation process, wildlife habitats that include grizzly bear and deer/elk winter range, and threatened, endangered, and sensitive plant communities.

The Backcountry MA emphasis is to provide non-motorized backcountry recreation opportunities in a natural-appearing landscape. Mechanized uses may be allowed. The MA is to contribute to habitat conditions for species that benefit from an unroaded and summer non-motorized landscape.

The emphasis in the Backcountry Motorized MA is to provide motorized backcountry recreation opportunities in a natural-appearing landscape. Summer motorized use is suitable and allowed where identified on the Forest's Motor Vehicle Use Map. Both cross-country and trail-based winter over-snow vehicle uses are suitable. Mechanized uses are suitable. The MA is to contribute habitat conditions for species that benefit from an unroaded landscape.

The desired conditions for both MAs are:

MA-DC-BC-BCM-01. Vegetation

The landscape is natural appearing. It contributes to the variety of native plant communities and the structure as defined in desired conditions for vegetation, aquatic, and wildlife habitats. The desired conditions for vegetation are achieved through a combination of ecological processes and management activities. While the landscape is predominantly natural appearing, a few locations have a vegetation structure that is altered to contribute to the recreational setting such as openings created and retained for scenic views.

MA-DC-BC-BCM-02. Habitat

The areas provide connectivity and contribute aquatic, plant, and wildlife habitat conditions for species that benefit from low human use (e.g., these areas provide a high level of habitat effectiveness).

MA-DC-BC-BCM-03. Recreation Setting and Activities

These areas provide an unroaded setting for a variety of summer and winter recreational opportunities. Seasonal use restrictions occur for the purpose of resource protection and recreation management. Human-caused changes from management actions related to recreation are limited in scale, generally not visibly evident, and reflect a semi-primitive recreational opportunity setting.

MA-DC-BC-BCM-04. Developments and Improvements

Facilities (whether Forest Service or under permit) are those necessary to protect resources, provide for safety, public benefit, or to enhance semi-primitive recreation experiences. Facilities are few and include such things as fire lookouts, radio repeaters, administrative buildings, trailheads, trails, signs, bridges, and shelters as well as facilities needed for resource protection such as toilets, stock containment systems, fences, or water developments.

MA-DC-BC-BCM-05. Travelways, Roads

There are no National Forest System roads. Other travelways, such as trails, are present.

The one standard for the two areas is:

MA-STD-BC-01. Motor Vehicle Use

Motor vehicle use is prohibited. The following vehicles and uses are exempt from the motor vehicle use prohibition:

- Aircraft
- Use of any fire, military, emergency, or law enforcement vehicle for emergency purposes
- Authorized use of any combat or combat support vehicle for national defense purposes
- Law enforcement response to violations of law, including pursuit
- Motor vehicle use that is specifically authorized under a written authorization issued under Federal law or regulations
- Limited administrative use by the Forest Service.
- Persons with valid or outstanding rights.

The Backcountry MA is considered not suitable for the following activities:

- Federal Energy Regulation Commission licenses or permits (recommend against)
- Motorized recreational use, summer, trails or play areas
- Motorized recreational use, winter, trails or cross-country
- Road construction, permanent or temporary
- Scheduled timber harvest
- Utility corridors

Management activates deemed not suitable within the Backcountry Motorized MA are:

- Federal Energy Regulation Commission licenses or permits (recommend against)
- Permanent or temporary road construction
- Scheduled timber harvest

Focused Restoration

The Plan includes approximately 312,500 acres in Focused Restoration. 61% (191,965 acres) of the Focused Restoration is within the Pend Oreille River subbasin and is the largest single MA. The management emphasis is to restore ecological integrity and ecosystem function at the landscape scale using both active management (mechanical treatment and prescribed fire) and passive management (natural processes including disturbances and succession), to restore management natural processes and improve resiliency, while emphasizing important fish and wildlife habitats. Focused Restoration areas are defined by the key watersheds, and grizzly bear and caribou recovery areas not included in Backcountry and Backcountry Motorized management areas. Important desired habitat conditions for aquatic, plant, and wildlife species are found in these areas. The active management focus in key watersheds is to promote riparian goals.

Desired conditions for Focused Restoration Areas, in addition to those for Key Watersheds (section 2.2.2 of this BA) are:

MA-DC-FR-01. Vegetation

The landscape is natural appearing to slightly altered and contributes to the variety of native plant communities and the composition, structure, and patterns as defined in desired conditions for vegetative systems, aquatic, plant, and wildlife habitats. The desired conditions for vegetation are achieved through a combination of ecological processes and management activities. While the landscape is predominantly natural appearing, there are some locations where the vegetation composition, structure, or pattern is altered. Vegetation management utilizes a “dynamic landscape” approach to achieve the desired conditions as opposes to using fixed reserves and tree diameter limits.

MA-DC-FR-02. Habitat

These areas contribute important habitat for plant, wildlife, and aquatic species that benefit from areas with relatively low road density and high habitat effectiveness (e.g., relatively low level of human disturbances).

Road interaction with surface and sub-surface water is such that it does not result in an increase in drainage density and/or accelerated or abnormal hill slope failure. Roads function in a hydraulic and geomorphic manner that provides watershed-scale aquatic habitat connectivity and contributes to attainment of state water quality standards.

MA-DC-FR-03. Recreation Setting and Activities

These areas provide a setting for a variety of developed and dispersed summer and winter recreation activities and contributes to wildlife-related recreational opportunities (e.g., wildlife viewing, hunting, etc.). Seasonal use restrictions occur for the purpose of resource protection and recreation management. Human-caused changes from management actions related to recreation are limited in scale, naturally appearing, and reflect a Roaded Natural recreational opportunity spectrum setting. There are some locations where the vegetation composition, structure, or pattern is altered to provide a recreational setting such as openings for scenic views.

MA-DC-FR-04. Developments and Improvements

Facilities (whether operated by the Forest Service or under permit) are those necessary to protect resources, provide for safety, public benefit, or to enhance Roaded Natural recreation opportunity spectrum experiences. Facilities should reflect the rustic style associated with the Rocky Mountain Province character type by using native materials, earth toned colors and blend into the natural landscape as much as feasible. Facilities include such things as campgrounds, boat launches, fire lookouts, radio repeaters, administrative buildings, trailheads, and trails. Improvements are evident and may include signs, bridges, fences, shelters, campsites, scenic pullouts/overlooks, interpretive displays, stock containment systems and water developments. Concentrated use by the public may occur at facilities associated with developed recreation sites.

MA-DC-FR-05. Travelways, Roads

Road densities vary across the management area; however, there are no more than 1 mile of NFS road per square mile within the focused restoration management area within each subwatershed. Total road density is calculated as miles of open and closed NFS road per square mile of NFS lands. This road density calculation does not include roads under another jurisdiction, or roads that have been hydrologically stabilized and effectively closed to vehicular traffic, or decommissioned

All management actions are considered potentially Suitable in the Focused Restoration MA.

General Restoration

The General Restoration MA, approximately 489,200 acres for the Forest and 93,433 acres (19%) within the Pend Oreille River subbasin, includes all areas not in another management area. The MA emphasis is to focus on enhancing ecological integrity and ecosystem function at the landscape scale using active management (mechanical treatment and prescribed fire) to restore natural processes and improve resiliency. The desired conditions are:

MA-DC-GR-01. Vegetation

The landscape is natural appearing and contributes to the variety of native plant communities and the composition, structure, and patterns as defined in desired conditions for vegetative systems, aquatic, plant, and wildlife habitats. The desired conditions for vegetation are achieved through a combination of ecological processes and management activities. While the landscape is natural appearing, there are locations that have a vegetation composition, structure, or pattern that is altered to provide a

recreational setting such as openings maintained for scenic views; or other desired conditions, such as vegetation fuel conditions adjacent to an urban interface.

MA-DC-GR-02. Habitat

These areas contribute habitat for plant and wildlife species that are relatively tolerant of human activities/disturbances. Habitat effectiveness is expected to be lower for species that are sensitive to human activities and disturbances. These areas provide wildlife-related recreational opportunities (e.g., wildlife viewing, hunting, etc.).

Road interactions with surface and sub-surface water is such that there is limited potential to increase drainage density and/or accelerated or abnormal hill slope failure. Roads function in a hydraulic and geomorphic manner that provides watershed and sub-basin scale aquatic habitat connectivity and contributes to attainment of state water quality standards.

MA-DC-GR-03. Recreation Settings and Activities

These areas provide settings for a variety of developed and dispersed summer and winter recreation activities. Seasonal use restrictions occur for the purpose of resource protection and recreation management. Recreation use is generally dispersed and/or located at recreation developments, such as campgrounds. Human-caused changes from management actions related to recreation are limited in scale, generally not visually evident, and reflect a roaded natural recreational opportunity setting.

MA-DC-GR-04. Developments and Improvements

Facilities (whether operated by the Forest Service or under permit) are those necessary to protect resources, provide for safety, public benefit, or to enhance roaded natural recreation experiences. Facilities include such things as campgrounds, boat launches, fire lookouts, radio repeaters, administrative buildings, trailheads, and trails. Improvements are evident and may include signs, bridges, fences, shelters, campsites or scenic pullouts/overlooks, interpretive displays, stock containment systems and water developments. Concentrated use by the public may occur at facilities associated with developed recreation sites.

MA-DC-GR-05. Travelways, Roads

Road densities vary across the management area; however, there are no more than 2 miles of NFS road per square mile within the general restoration management area within each subwatershed. Total road density is calculated as miles of open and closed NFS road per square mile of NFS lands. This road density calculation does not include roads under another jurisdiction, or roads that have been hydrologically stabilized and effectively closed to vehicular traffic, or decommissioned.

As with the Focused Restoration MA, the General Restoration MA is suitable for all management activities.

Research Natural Areas

Research Natural Areas (RNA), whether established or proposed, are a part of a national network of ecological areas designated in perpetuity for research and education and/or to maintain biological diversity on NFS lands. They are established to provide for study and protection of a full range of habitat types and remain in a relatively unaltered condition for non-manipulative research, observation, and study.

Management activities in an RNA must be consistent with the purposes for which the RNA was established (or proposed), or specifically to maintain the values of the RNA. Purposes and values specific to a RNA are identified in establishment reports. In the absence of an establishment report, purposes and values are those identified in the Forest Service directives for RNAs.

Forest Plan direction applies, whether the RNA is established or proposed. The Forest Supervisor approves or disapproves management activities within the areas in coordination with the Pacific Northwest Research Station director.

The Action area includes 3818 acres of RNAs and 2086 acres of proposed RNAs. The Salmo (1,410 acres), Halliday Fen (727 acres), Maitlen Creek (655 acres), Round Top Mountain (214 acres), and Bunchgrass (812 acres) RNAs cover approximately 3,818 acres in the Pend Oreille Sub-basin. There are no new RNAs proposed in the Pend Oreille Sub-basin. Outside of the Pend Oreille sub-basin are the proposed RNAs Fire Mountain (1,457 acres) and Hall Ponds (629 acres).

There is one desired condition and it should be protective of wildlife, watershed, aquatic and riparian habitats is:

MA-DC-RNA-01. Research Purposes - Native species and natural processes predominate. Research natural areas remain in a relatively unaltered condition for non-manipulative research, observation, and study. Human uses or activities consist mostly of occasional protection or restoration activities and low impact recreational use suited to the semi-primitive non-motorized recreation opportunity spectrum.

Uses and activities do not interfere with the objectives for which the research natural area was established. Vegetation, wildland fire, fuels, and recreation management protects, perpetuate, or restore the unique and/or representative ecosystems. Non-motorized, non-mechanized trails protect research natural area attributes. The hydrology of research natural areas is unaltered by water diversions, water developments, or mining-related subsidence in adjacent areas. The area is withdrawn from locatable mineral entry.

Suitable uses in RNAs and proposed RNAs are prescribed fire, unplanned wildfire, existing grazing, existing infrastructure, summer mechanized recreation, and non-motorized summer and winter recreation.

Riparian Management Areas (RMA)

The RMA management area is discussed in section 2.2.1 of this BA.

Scenic Byways

Two types of federally designated scenic byways are found on the Forest – an All-American Road and a National Forest Scenic Byway (designated by the Forest Service). The State of Washington also designated many of these byways as state scenic byways. Some roads have multiple designations.

A one-half mile strip on either side of the byway centerline defines the Scenic Byway Management Area.

Management direction applies only to portions of the byway within NFS lands. The Forest Supervisor authorizes management activities on the scenic byways regardless of designating authority unless especially reserved. There are three National Forest Scenic Byways, the North Pend Oreille Scenic Byway, the International Selkirk Loop, and the Sherman Pass Scenic Byway. The Plan does not propose any new scenic byways. The desired condition for the Scenic Byways, in summary, is to manage for high

quality natural scenery, historic and natural features with natural appearing landscapes, and enhance recreation tourism supporting the local communities. Scenic byways are to exhibit natural-appearing landscapes and provide Roaded Natural recreation settings. The only uses not suitable in Scenic Byways are Federal Energy Regulation Commission licenses or permits; above ground infrastructure, leasable minerals- surface occupancy, and saleable minerals.

Wild and Scenic River

Congress designates wild and scenic rivers as part of the Wild and Scenic Rivers System under the authority of the Wild and Scenic Rivers Act, as amended (1968). Currently, there are no congressionally designated rivers on the Forest. Two rivers are eligible or suitable for designation. The South Fork Salmo River is a 5 mile long river that runs through the Salmo-Priest Wilderness and is eligible for as a wild river. A three mile section of the Kettle River is eligible as a recreational river. Wilderness – Congressionally Designated

The Colville National Forest has one wilderness area, the Salmo-Priest. Wilderness areas are zoned using the Wilderness Resource Spectrum: pristine, primitive, semi-primitive and transition zones offer the spectrum of environmental and bio/physical settings typically found in wilderness. Due to the size, complexity and use patterns of the Salmo-Priest Wilderness, the area administered by the Colville National Forest (a portion of the Wilderness is administered by the Idaho Panhandle National Forest) is designated as “Primitive” in the Wilderness Resource Spectrum.

The desired conditions for Wilderness and other management direction includes:

Desired Conditions

MA-DC-WCD-01. Wilderness Character

Visitor use does not negatively affect the five qualities of wilderness character (untrammeled, undeveloped, natural, opportunities for solitude or a primitive and unconfined type of recreation) or other features of value.

Wilderness boundaries are posted and visible to visitors.

There are unconfined opportunities for exploration, solitude, risk, and challenge. The non-motorized and non-mechanized trail system enhances the wilderness character. To the extent necessary, where there is public demand, outfitters and guides provide services to visitors seeking a wilderness experience.

The Salmo-Priest Wilderness provides outstanding opportunities for solitude and isolation. Encounters with small groups or individuals are infrequent.

Wilderness areas maintain natural landscapes where generally only ecological changes occur (very high scenic integrity) and provide primitive and/or semi-primitive non-motorized and non-mechanized recreation opportunities.

The wilderness areas are free of invasive species.

Human-caused impacts are limited to relatively small areas along trails and campsites. The ecological, geological, scientific, educational, scenic, and historical values of wilderness are preserved and perpetuated.

MA-DC-WCD-02. Human Developments

Wilderness is undeveloped except for those facilities deemed necessary for administration of the area as wilderness or essential for accommodating provisional uses.

There is little evidence of human developments (e.g., stock tanks, stock corrals, fences).

There is little or no evidence of camping activity, unauthorized trails, trash, or other human impacts on the environment. Most campsites are relatively small and accommodate one to three small tents or one large tent. Large group campsites accommodate the needs of larger groups up to the maximum group size limit and these sites are generally out of view of focal areas such as where trails first arrive at a destination.

- Campsites generally have at least partial topographic or vegetative screening from the trail, viewpoints, or other sites.
- Vegetated areas (such as meadows) outside of campsites retain native plant communities that are not impacted.
- Social trails are the minimum necessary to access the system trail, water, other campsites, and viewpoints.

MA-DC-WCD-03. Ecological Processes

Ecological conditions are affected primarily by natural ecological processes, with the appearance of little or no human intervention.

Fire functions as a natural ecological process.

Wilderness contributes to preserving natural behaviors and processes that sustain wildlife populations.

Wilderness areas are free of invasive species.

Standard

MA-STD-WCD-01. Site Impacts

Human-caused disturbed areas that negatively affect wilderness character will be rehabilitated to a natural appearance, using species or other materials native to the area.

MA-STD-WCD-02. Group Size

Do not authorize wilderness group sizes that exceed the physical capacity, the number of available campsites or the social capacity of the specific area of use. Keep the network of large group campsites at a minimum necessary to provide for the travel patterns of large groups of up to the standard maximum group size limit. At a minimum, partially screen these sites from focal areas, such as where visitors first arrive at destinations. Allow no net increase in the number of large group sites from the date this plan is implemented.

Group size limit within the Salmo-Priest Wilderness is 12 combined people and stock.

MA-STD-WCD-03. Fire

Objective(s) and strategies for all wildfires shall be identified at the time of the fire.

Fire management activities shall be conducted in a manner compatible with the overall wilderness management objectives (minimum impact suppression tactics).

Use prescribed fire only in situations that meet all of the following criteria:

- There is an unnatural buildup of fuel.
- The treatment would increase the probability of accepting naturally occurring wildfire disturbance in wilderness when treating areas outside the wilderness boundary would not fully achieve this outcome.
- Strategies use minimum suppression techniques and are designed to maintain and restore the vegetation conditions that are characteristic of wilderness.

Guidelines

MA-GDL-WCD-01. Campsite Development

Areas appropriate for camping should only be designated if necessary to resolve resource issues and not to accommodate increasing levels of use. Generally limit recreational site structures to one fire ring and naturally occurring rock or log seats. Authorized recreation developments (such as hitch-racks, high-lines, or site hardening) should rarely be installed. These developments should only be used where they would reduce or eliminate a proliferation of resource impacts and only in locations where other less intrusive tactics (i.e., education and enforcement) would not contain the impacts. Development should be removed when no longer serviceable or needed.

MA-GDL-WCD-02. Communication Facilities

Permanent repeaters should not be authorized in pristine wilderness resource spectrum zones. Permanent Forest Service radio repeaters may be authorized in the primitive, semi-primitive, and transition wilderness resource spectrum zones when radio dead zones within the wilderness cannot be serviced by locations outside of wilderness, and other communication devices are ineffective options due to forest cover or topography. Installation of radio repeaters should be considered only after other mitigation efforts have been tried and proved to be ineffective. Repeaters should be out of sight of trails and destination areas. Communication facilities essential for provisional uses may be co-located with Forest Service repeaters.

MA-GDL-WCD-03. Pets

Pets (such as dogs or other domestic animals that are not categorized as stock) may be authorized so long as their presence does not interfere with wildlife or contribute to resource impacts or user conflicts. Pets should be fully controlled by their owner through voice commands, a leash, or other restraint (such as a shock collar).

MA-GDL-WCD-04. Research, Studies, and Data Gathering

Non-manipulative research or data gathering may be authorized where such use is reliant on a wilderness setting, contributes to the body of science that informs wilderness management and societal understanding of the benefits of wilderness, and where the benefits to preserving wilderness character outweigh the impacts on wilderness character.

Markings should be unobtrusive and not be viewed from trails or occupied areas. Permanent markings should only be authorized when there is a long-term need to relocate the site with a high degree of precision where other technologies are not sufficient. Other than unobtrusive markings, permanent installations should not be authorized.

MA-GDL-WCD-05. Caching

Caching of equipment or supplies should not be authorized in wilderness. Waivers to this guideline may be given when all of the following criteria are met.

1. The requested cache is administratively necessary for agency use or to support a scientific study
2. The cache location is hidden from public view and is non-damaging
3. The cache has an identified date for removal at the completion of the project

MA-GDL-WCD-06. Fish and Wildlife

Wilderness is generally not suitable for the introduction of non-indigenous wildlife species. Fishless waters should not be stocked. Fish stocking can continue where it was an established practice prior to wilderness designation. Stocking should be coordinated with the state to protect wilderness character including preservation of downstream native fish and amphibian populations. Stocked fish that adversely affect native fish and wildlife populations may be removed from lakes, rivers and streams.

MA-GDL-WCD-07. Wildland Fire

Fire camps, helispots, and other temporary facilities should be located outside the wilderness boundary to protect wilderness character.

Firelines and spike camps (i.e., a remote camp usually near a fireline) should not be constructed adjacent to trails or camp areas to protect wilderness character.

Planned ignitions should be considered to create favorable conditions that enable naturally occurring fires to return to their historic role or to achieve wilderness desired conditions.

Wildfires should be managed for the benefit of wilderness resources. A full suppression strategy may be used where or when a wildfire:

1. has a high potential to spread outside national forest boundaries, or into areas with extensive recreation or administrative developments;
2. is not meeting wilderness objectives;
3. would adversely affect an ESA-listed species.

MA-GDL-WCD-08. Use of Live Trees

Live trees that are not listed as a threatened, endangered, or sensitive species may be used for administrative purposes such as trail bridge construction.

MA-GDL-WCD-09. Invasive Plants

Manual, biological, cultural, or chemical treatments may be authorized to eradicate, reduce, or control populations of invasive plants.

MA-GDL-WCD-10. Environmental Clean-Up

Environmental clean-up projects (such as mine remediation, chemical spills, aircraft recovery, building removal) should occur promptly following an activity or incident. Project design should provide a greater long-term benefit than long-term impact.

MA-GDL-WCD-11. Trail Management

New trail construction may be considered if the objective is enhancement of the wilderness character (e.g., increase solitude opportunities, restore naturalness).Trails that have minimal use, detract from the wilderness character, or cannot practically be maintained or reconstructed should be obliterated.

MA-SU-WCD-01. Suitable Uses

Table 4 - Suitable uses for congressionally designated wilderness management area

Activity or Use	May Authorize	May not authorize
Facilities, administrative		X
Facilities, developed recreation		X
Federal Energy Regulation Commission licenses or permits		Recommend against
Prescribed fire	X	
Wildfire, use of unplanned ignition	X	
Forest products, commercial use (non-timber harvest)		X
Forest products, firewood, commercial use		X
Forest products, firewood, permitted personal use		X
Forest products, personal use	X	
Grazing, permitted		X (Salmo-Priest)
Infrastructure, above ground infrastructure associated with special use permits, such as communication sites, energy developments, and/or utility lines.		X Exception: USFS radio repeaters needed for dead zones within or adjacent to area
Mechanized recreational use, summer		X
Minerals, leasable		X
Minerals, locatable	Operations may be approved where valid existing rights are proven.	X (new operation)
Minerals, saleable		X
Motorized recreational use, summer, trails or play areas, off-highway vehicle use		X
Motorized recreational use, winter, trails or cross-country		X
Non-motorized recreational use, summer	X	
Non-motorized recreational use, winter	X	
Road construction, permanent		X
Road construction, temporary		X
Special use permits, recreational & research	X	
Timber harvest as a tool		X
Timber harvest, scheduled production		X
Utility corridors		X

Wilderness – Recommended (RW)

There are 44,230 acres of RW proposed within the Pend Oreille subbasin, Abercrombie-Hooknose and Salmo-Priest Adjacent. There is an additional 17,400 acres in the Bald Snow RW for a total of 61630 acres. These areas are lands that have been identified and evaluated through the forest planning process as suited for recommendation for addition to the national wilderness preservation system. Wilderness characteristics are protected until Congress either designates the area as part of the

National Wilderness Preservation System or the area is released from consideration. If Congress has not acted by the next planning effort, these areas may be further evaluated for wilderness designation.

Subject to the U.S. mining and leasing laws, recommended wilderness are open to mineral entry. Recommended wilderness must be segregated from mineral entry or withdrawn from mineral entry before congressional designation as "Wilderness." Until that time, mining claims may be filed in recommended wilderness areas. Upon designation as wilderness by Congress, designated wilderness areas are legislatively withdrawn from all mineral entry under the mining and leasing laws, subject to valid claims.

Management direction is to protect and maintain the social and ecological characteristics that provide the basis for the wilderness recommendation.

Desired Condition

MA-DC-RW-01. Uses Prior to Congressional Designation

Prior to congressional designation, uses continue that do not compromise wilderness eligibility.

MA-DC-RW-02. Retention of Wilderness Characteristics

Visitor use does not reduce the five qualities of wilderness character (untrammeled, undeveloped, natural, opportunities for solitude or a primitive and unconfined type of recreation) or other features of value associated with the existing condition identified in the forest plan wilderness evaluations.

There are unconfined opportunities for exploration, solitude, risk, and challenge. The non-motorized trail system enhances the wilderness character. To the extent necessary, where there is public demand, outfitters and guides provide services to visitors seeking a backcountry experience.

Recommended wilderness provides outstanding opportunities for solitude and isolation.

Recommended wilderness areas maintain natural landscapes where generally only ecological changes occur (very high scenic integrity) and provide primitive and/or semi-primitive non-motorized recreation opportunities.

Recommended wilderness areas are free of noxious weed species and other invasive species.

Human-caused impacts are limited to relatively small areas along trails and campsites. The ecological, geological, scientific, educational, scenic, and historical values of recommended wilderness areas are preserved and perpetuated.

MA-DC-RW-03. Natural Landscapes

Recommended wilderness areas display natural landscapes where generally only ecological changes occur (very high scenic integrity) and provide primitive or semi-primitive non-motorized recreation opportunities.

MA-DC-RW-04. Wildlife

Recommended wilderness contributes to preserving natural behaviors and processes that sustain wildlife populations.

Standards

MA-STD-RW-01. Existing and Proposed Uses

Management actions must maintain the wilderness characteristics of the recommended wilderness areas that were identified in the 2009 wilderness evaluations for the Abercrombie Hooknose, Salmo-Priest Adjacent, and Bald Snow recommended wilderness areas prior to designation by Congress or release from wilderness consideration.

MA-STD-RW-02. Site Impacts

Human-caused disturbed areas that negatively affect wilderness character shall be rehabilitated to a natural appearance, using species or other materials native to the area.

MA-STD-RW-03. Fire

Objective(s) and strategies for all unplanned ignitions shall be identified at the time of the fire.

Fire management activities shall be conducted in a manner compatible with maintaining wilderness characteristics (minimum impact suppression tactics).

Use planned ignitions only in situations that meet all of the following criteria—

- There is an unnatural buildup of fuel.
- The treatment would increase the probability of accepting naturally occurring fire.
- Strategies use minimum suppression techniques and are designed to maintain and restore the vegetation conditions that are characteristic of wilderness.

Guidelines

MA-GDL-RW-01. Wilderness Characteristics

The wilderness characteristics (untrammeled, undeveloped, natural, opportunities for solitude or a primitive and unconfined type of recreation) of each recommended wilderness should remain intact until a congressional decision on wilderness designation is made.

MA-GDL-RW-02. Trail Use

Mechanized use may not occur in RW. Non-motorized travel may occur in recommended wilderness.

MA-GDL-RW-04. Campsite Development

Areas appropriate for camping should only be designated if necessary to resolve resource issues and not to accommodate increasing levels of use. Generally limit recreational site structures to one fire ring and naturally occurring rock or log seats. Authorized recreation developments (such as hitch-racks, high-lines, or site hardening) should rarely be installed. These developments should only be used where they would reduce or eliminate a proliferation of resource impacts and only in locations where other less intrusive tactics (i.e. education and enforcement) would not contain the impacts. Development should be removed when no longer serviceable or needed.

MA-GDL-RW-05. Pets

Pets (such as dogs or other domestic animals that are not categorized as stock) may be authorized so long as their presence does not interfere with wildlife or contribute to resource impacts or user

conflicts. Pets should be fully controlled by their owner through voice commands, a leash, or other restraint (such as a shock collar).

MA-GDL-RW-06. Fire

Planned ignitions should be considered to create favorable conditions that enable naturally occurring fires to return to their historic role.

MA-GDL-RW-07. Use of Live Trees

Live trees may be used for administrative purposes such as trail bridge construction.

MA-GDL-RW-08. Invasive Plants

Manual, biological, cultural, or chemical treatments may be authorized to eradicate, reduce, or control populations of invasive plants

MA-GDL-RW-09. Environmental Clean-Up

Environmental clean-up projects (such as mine remediation, chemical spills, aircraft recovery, building removal) should occur promptly following an activity or incident. Project design should provide a greater long-term benefit than long-term impact.

Suitable and non-suitable uses in RW are listed in Table 5.

Table 5 - Suitable uses for Recommended Wilderness management area

Activity or Use	May Authorize	May not authorize
Facilities, administrative		X
Facilities, developed recreation		X
Federal Energy Regulation Commission licenses or permits		Recommend against
Prescribed fire	X	
Wildfire, use of unplanned ignition	X	
Forest products, commercial use (non-timber harvest)		X
Forest products, firewood, commercial use		X
Forest products, firewood, permitted personal use		X
Forest products, personal use	X	
Grazing, permitted	X	
Infrastructure, above ground infrastructure associated with special use permits, such as communication sites, energy developments, and/or utility lines.		X Exception: Only USFS radio repeaters needed for dead zones within or adjacent to area
Mechanized recreational use, summer		X new or additional use
Minerals, leasable – surface occupancy		X
Minerals - locatable	X	

Activity or Use	May Authorize	May not authorize
Minerals, saleable		X
Motorized recreational use, summer, trails or play areas		X
Motorized recreational use, winter, trails or cross-country off highway vehicle use		X
Non-motorized recreational use, summer	X	
Non-motorized recreational use, winter	X	
Road construction, permanent		X
Road construction, temporary		X
Special use permits, recreational & research	X	
Timber harvest as a tool		X
Timber harvest, scheduled production		X
Utility corridors		X

2.1.2 Plan Components Relevant to Terrestrial Wildlife

Below are the plan components that are relevant to the recovery and conservation of federally listed wildlife species on the Colville National Forest. These components were based on recovery plans, critical habitat (if designated), conservation assessments and strategies, status reviews, scientific literature, and comments received from the US Fish and Wildlife Service.

General:

Desired Condition

FW-DC-WL. Proper Storage of Human Food, Garbage and Other Wildlife Attractants

All administrative sites, developed recreation sites, and dispersed recreation sites where garbage disposal services are provided, are equipped with animal-resistant food and waste storage devices so that food, garbage, and other attractants can be made inaccessible to wildlife. Forest visitors are aware of the need to properly store all wildlife attractants through one-on-one contacts with campground hosts and agency employees, signage and the media. Compliance with the Forest's food storage order is increasing.

FW-DC-WL. Habitat Conditions for Threatened and Endangered Species

Habitat conditions (amount, distribution, and connectivity of habitat) contribute to the recovery of federally listed threatened and endangered species.

Guidelines

FW-GDL-WL. Federally Listed Species

Habitat for federally listed wildlife species within recovery areas that occur on National Forest System lands should be retained in public ownership.

Management Area Plan Components:

Backcountry and Backcountry Motorized Desired Condition

MA-DC-BC-BCM. Habitat

These areas provide connectivity and contribute aquatic, plant, and wildlife habitat conditions for species that benefit from low human use (e.g., these areas provide a high level of habitat effectiveness).

Focused Restoration Desired Condition

MA-DC-FR. Habitat

These areas contribute important habitat for plant, wildlife and aquatic species that benefit from areas with relatively low road density (<1 mile/square mile measured at the 5th field watershed) and high habitat effectiveness (e.g., relatively low level of human disturbances).

General Restoration Desired Condition

MA-DC-GR. Habitat

These areas contribute habitat for plant and wildlife species that are relatively tolerant of human activities/disturbances (road density <2 miles/square mile measured at the 5th field watershed). Habitat effectiveness is expected to be lower for species that are sensitive to human activities and disturbances. These areas provide wildlife-related recreational opportunities (e.g., wildlife viewing, hunting, etc.).

2.1.2.1 Woodland Caribou

Desired Condition

FW-DC-WL. Woodland Caribou Seasonal Habitat Components

For the desired conditions for caribou, manage toward the upper 10% of the desired conditions for vegetation in late-successional-closed forest within western hemlock/red cedar and spruce/subalpine fir, measured at the caribou management unit scale. Seasonal habitat components of well-connected, large blocks of late-successional forest provide essential habitat for caribou.

FW-DC-WL. Woodland Caribou Habitat – Forage Availability

Preferred lichens (Bryoria and Alectoria) are present in sufficient quantities for woodland caribou forage.

FW-DC-WL. Woodland Caribou Habitat – Winter Recreation

Winter recreation is managed so that woodland caribou are not displaced from suitable habitat and the caribou can make full use of existing habitat in the recovery area.

Objectives

FW-OBJ-WL. Restoration of Late-Successional Forest Habitat for All Surrogate Species

Within 15 years of plan implementation, restore western hemlock/western red cedar vegetation types within late-successional forest habitat for surrogate wildlife species on 1,400 acres within the following watersheds: Sullivan Creek (800 acres), LeClerc (600 acres). Generally focus activity in previously treated areas that are now early to mid-successional forest to enhance large tree development.

Standards

FW-STD-WL. Woodland Caribou Habitat – Management Activities

Management activities within lands identified as capable habitat for woodland caribou enhance or facilitate the development of suitable habitat. Management activities within stands identified as suitable habitat are avoided, except when a clear benefit of the activity to habitat conditions can be demonstrated. Management activities that cause disturbance shall be avoided in known caribou calving habitat from 1 June to 15 July.

FW-STD-WL. Woodland Caribou and Snowmobiles

Restrict over-the-snow vehicle use to designated routes within the caribou recovery area.

2.1.2.2 Grizzly Bear

Desired Condition

FW-DC-WL. Grizzly Bear Recovery Area

Key Habitat Components for Grizzly Bear. Key grizzly bear habitat components (such as whitebark pine, riparian habitats, berry-producing shrubfields, natural meadows, and forest cover) are available within core areas and in quantities that contribute toward a recovered bear population.

FW-DC-WL. Grizzly Bear Recovery Area – Core Areas

The amount of core areas available to grizzly bears within each grizzly bear management unit meets that standards in Table 6. Core areas are expanded where other forest access priorities/obligations can also be met.

Objectives

FW-OBJ-WL. Wildlife Habitats

Proper Storage of Human Food, Garbage, and Other Wildlife Attractants. Maintain the wildlife-resistant garbage storage devices installed in all developed campgrounds on the Colville National Forest, as needed. Within 15 years of plan implementation install at least 15 wildlife-resistant food storage lockers at developed campgrounds or heavily used dispersed campsites. Priority will be given to sites within or adjacent to the grizzly bear recovery area.

FW-OBJ-WL. Grizzly Bear Recovery Area

Habitat Restoration. Within 15 years of plan implementation, maintain or restore grizzly bear seasonal habitats on 900 acres in the following grizzly bear management units: LeClerc (300 acres), Salmo-Priest (300 acres), and Sullivan-Hughes (300 acres).

Standards

FW-STD-WL. Grizzly Bear Recovery Area

Road Densities. Within the grizzly bear recovery area, Federal actions shall not result in a net reduction of core areas below levels in Table 6. Discrete core areas shall remain in place for a minimum of 10 years in order for bears to find and use these areas. Federal actions shall not result in a net increase in open or total road densities above levels in Table 6. Total road densities do not include any physically undrivable roads (e.g., bermed or brushed-in).

Table 6 - Grizzly bear habitat standards for shared GBMUs of the Colville and Idaho Panhandle National Forests.

GBMU	Max. Open Motorized Route Density >1 mi./sq.mi.	Max. Total Motorized Route Density >2 mi./sq.mi.	Mimimum Percent Core Area
Salmo-Priest (99% NFS land)	33%	26%	64%
Sullivan-Hughes (99% NFS land)	24%	19%	61%
LeClerc (64% NFS land)	37%	58%	27%

Definitions for Core Area, Open Road and Total Road are from IGBC (1998): Core Area – areas with no motorized use of roads and trails, and restricted roads require effective physical closure devices; a minimum of 0.31 miles (500 m) from any open road or motorized trail. Open Road – a road without restriction on motorized vehicle use. Total Roads include open roads, restricted roads (a road on which motorized vehicle use is restricted seasonally or yearlong), roads not meeting all reclaimed criteria, and all motorized trails.

FW-STD-WL. Proper Storage of Human Food, Garbage, and Other Wildlife Attractants.

Forest Service contracts, permits, and agreements that include camping on NFS lands shall incorporate the requirement to follow the current Food Storage Order for the Colville National Forest. Apiaries shall not be placed where they would increase the potential for human-bear conflicts.

Guidelines

FW-GDL-WL. Proper Storage of Human Food, Garbage, and Other Wildlife Attractants

Agency employees and the public should be informed about the need to properly store food and other wildlife attractants. Once knowledgeable, compliance with the Forest's food storage order should be expected.

FW-GDL-WL. Grizzly Bear Recovery Area – Forest Management Activities

Management activities (such as timber harvest, road building, blasting, etc.) and helicopter use that may displace grizzly bears should be scheduled to occur outside of the critical period of den emergence (April 1 to June 15). Administrative, motorized vehicle entries on restricted-use roads should be managed to not exceed levels prescribed by the Interagency Grizzly Bear Committee.

FW-GDL-WL. Grizzly Bear Recovery Area – Hiding Cover

Hiding cover for grizzly bears is defined as topography or vegetation capable of screening 90% of a bear at a distance of 200 feet. Within the grizzly bear recovery area, no point in a created opening should be farther than 600 feet from forested hiding cover. Blocks of forested cover retained within harvest units specifically for grizzly bears should be at least 600 feet across. Hiding cover should be maintained where it exists along open road. Roadside cover can be provided by topography, or by patches of shrubs or trees retained within harvest units.

2.1.2.3 Canada Lynx

Desired Condition

FW-DC-WL. Habitat Components for Canada Lynx

Forest successional stages within lynx analysis units provide a mosaic of lynx habitat with landscape pattern that is consistent with the historic range of variability (see also Desired Conditions for Vegetation Structure).

Objectives

FW-OBJ-WL. Canada Lynx Habitat Restoration

Within 15 years of plan implementation, restore an average of 100 acres per year of snowshoe hare and/or lynx habitat within the lynx core area on the Kettle Crest.

Standards

FW-STD-WL. Canada Lynx – Vegetation Management within Identified Lynx Habitat

Management projects shall not reduce horizontal cover (snowshoe hare habitat) in late-closed structure Subalpine fir/Lodgepole or Spruce/Subalpine fir vegetation types unless: (1) the subalpine fir/lodgepole or spruce/subalpine fir vegetation types exceed Desired Conditions (historic range of variability); (2) the projects are within 200 feet of administrative sites, dwellings, out buildings, recreation sites and special use permit areas, including infrastructure within permitted ski area boundaries; or (3) for research studies or genetic tree test evaluating genetically improved reforestation stock.

FW-STD-WL. Canada Lynx – Rate of Change within Identified Lynx Habitat

Do not change more than 15% of lynx habitat within any single lynx analysis unit to an unsuitable condition in any 10-year period.

FW-STD-WL. Groomed and Designated Winter Routes in Identified Lynx Habitat

Allow no net increase in groomed or designated over-the-snow routes into lynx habitat at the lynx analysis unit scale. Access to non-recreation uses, such as mineral and energy exploration and developed sites, will be comprised of designated routes or designated over-the-snow routes. This does not apply to areas within permitted ski area boundaries, winter logging, trails that are rerouted for public safety, or to access private in-holdings.

FW-STD-WL. Canada Lynx – Vegetation Management within Identified Lynx Habitat

When conducting vegetation management of coniferous vegetation, do not reduce the suitability of lynx habitat within a lynx analysis unit below 70% of the area that is capable of providing suitable lynx habitat (subalpine fir associated forest types).

FW-STD-WL. Canada Lynx – Tree Stem Densities in Identified Lynx Habitat

Retain a minimum of 20 percent in untreated patches and do not reduce tree stem densities to less than 500 trees per acre in early structure subalpine fir/lodgepole pine or spruce/subalpine fir vegetation types through mechanical tree removal or prescribed burning, except within 500 feet of structures (i.e., administrative sites, dwellings, out buildings), developed recreation sites and special use permit areas (including infrastructure within permitted ski area boundaries), and along major highways and powerlines.

Guidelines

FW-GDL-WL. Canada Lynx – Vegetation

Vegetation management activities within identified lynx habitat should be focused in areas of poor snowshoe hare habitat (poorly developed understories that lack horizontal cover between 3 and 10 feet from the ground) to recruit understories that support dense, horizontal cover.

FW-GDL-WL. Canada Lynx – Alternative Prey within Identified Lynx Habitat

Habitat for alternative prey species, primarily red squirrel, should be available in each lynx analysis unit by providing cone bearing late, closed structure conifer forests with coarse woody debris consistent with Desired Conditions for vegetation structure (FW-DC-VEG-04) and snags and downed wood (FW-DC—VEG-06).

FW-GDL-WL. Canada Lynx – Recreation and Administrative Facilities within Identified Lynx Habitat.

Expansion or new construction of recreation facilities and administrative facilities within lynx habitat should be located in or adjacent to existing areas of development, rather than creating new developed recreation or administrative sites. Recreation developments and operations should be managed so as not to interfere with lynx movement and maintain the effectiveness of lynx habitat.

FW-GDL-WL. Canada Lynx – Transportation System within Identified Lynx Habitat

Road construction that results in increased traffic speeds and volume should be avoided. New permanent roads should not be located on forested ridge-tops, saddles, close to forest stringers or in other areas important for habitat connectivity.

FW-GDL-WL. Canada Lynx – Habitat Connectivity within identified Lynx Habitat

Large, permanent openings (generally greater than 300 feet wide with less than 10% overstory canopy) should not be created in prey habitat. When temporary openings (resulting from vegetation management treatments) are proposed, adequate forested habitat should be retained between these openings and natural openings to contribute to habitat connectivity.

FW-GDL-WL. Canada Lynx – Lynx Analysis Unit Adjustment

Lynx analysis unit boundaries should be adjusted based on scientific literature and coordination with the US Fish and Wildlife Service.

FW-GDL-LG. Lynx Habitat in Riparian Areas in Grazing Allotments

Livestock grazing within riparian areas in lynx habitat should be managed to maintain conditions that support snowshoe hares.

2.1.2.4 Yellow-billed Cuckoo

Desired Condition

FW-DC-WR. Self-Sustaining Native and Aquatic and Riparian-Dependent Species

National Forest System lands contribute to habitat and ecological conditions that are capable of supporting self-sustaining populations of native aquatic and riparian-dependent plant and animal species. Subbasin scale is used for Forest planning and 5th field watershed or subwatershed scale is used for project planning.

FW-DC-WR. Native Plant Communities

National Forest System lands contribute to the species composition and structural diversity of native plant communities in riparian management areas.

Riparian Management Area Plan Components (This is a partial list of the most relevant)

Standards

MA-STD-RMA. Aquatic and Riparian Conditions

When riparian management areas are properly functioning, project activities shall maintain those conditions. When riparian management areas are not properly functioning, and to the degree that management activities would drive or contribute to improper function, project activities shall be implemented to improve those conditions. Project activities in riparian management areas shall not result in long-term degradation to aquatic and riparian conditions at the watershed scale. Limited short-term or site-scale effects from activities in riparian management areas may be acceptable when they support, or do not diminish, long-term benefits to aquatic and riparian resources.

MA-STD-RMA. Timber Harvest and Thinning

Timber harvest and thinning can occur in riparian management areas only as necessary to move vegetation in riparian management areas toward historic range of variability, which maintains, restores, or enhances conditions needed to support aquatic and riparian-dependent resources.

MA-STD-RMA. Permitted Grazing Management – Allotment Management Planning

During allotment management planning, negative impacts to water quality and aquatic and riparian function from existing livestock handling or management facilities located within riparian management areas shall be minimized to allow conditions to move towards the desired condition or eliminated.

2.1.2.5 Wolverine

Some of the plan components for Canada lynx, grizzly bear, and woodland caribou would also contribute to the conservation of wolverine habitat.

Desired Condition

FW-DC-WL. Risk Factors for all Surrogate Species (Wolverine is a Surrogate Species)

Risk factors (e.g., roads, uncharacteristic wildfire, unregulated livestock use, introduced species, invasive species, etc.) for all surrogate species are reduced to contribute to the viability of surrogate species.

Management Area Plan Components:

Backcountry and Backcountry Motorized Desired Condition

MA-DC-BC-BCM. Habitat

These areas provide connectivity and contribute aquatic, plant, and wildlife habitat conditions for species that benefit from low human use (e.g., these areas provide a high level of habitat effectiveness).

Focused Restoration Desired Condition

MA-DC-FR. Habitat

These areas contribute important habitat for plant, wildlife and aquatic species that benefit from areas with relatively low road density (<1 mile/square mile measured at the 5th field watershed) and high habitat effectiveness (e.g., relatively low level of human disturbances).

2.1.3 Plan Components Relevant to Whitebark Pine

Below are the plan components that are relevant to the recovery and conservation of whitebark pine on the Colville National Forest. These components were based on recovery plans, critical habitat (if designated), conservation assessments and strategies, status reviews, scientific literature, and comments received from the US Fish and Wildlife Service.

FW-DC-VEG-01. Plant Species Composition

Native species and native plant communities are the desired dominant vegetation. National Forest System lands contribute to the diversity, species composition, and structural diversity of native upland plant communities. The full range of potential natural vegetation is maintained on the Forest where it supports plant and animal diversity including pollinators and other invertebrates, and robust ecological function.

FW-DC-VEG-02. Insects and Diseases

Native insects, diseases, fungi, bacteria, and viruses engage in their natural (endemic) role in contributing to ecosystem processes such as pollination, food webs, decay and nutrient cycling, providing habitats, and functioning as natural control agents. Landscapes provide a patchwork of varied structural, compositional, and successional stages that ensure the continuation of these processes.

FW-DC-VEG-03. Human Disturbance

Human influences play major or substantial roles in plant community composition, structural distribution, and disturbance intensities, patterns, and duration. Human activities (such as wood product removal, use of planned and unplanned ignitions, vegetation treatments, forage utilization, or recreation) are designed to meet desired conditions, move toward desired conditions, or not impair desired conditions.

FW-DC-VEG-04. Forest Structure

Forest structural classes are resilient and compatible with maintaining characteristic disturbance processes such as wildland fire, insects and diseases. Habitat conditions for associated species are present. Structure contributes to aesthetic settings, particularly along scenic byways and highways.

Forest openings would be commensurate with historical conditions for size and distribution to reflect natural disturbance processes. The historical range of variability for forest structure is the desired condition. Historical range of variability will be evaluated on National Forest system lands at the appropriate scale given vegetation type and natural disturbance history. Table 14 contains desired conditions for each vegetation type.

FW-DC-VEG-06. Biological Legacies

Large trees, snags, and down material are represented across the landscape and large tree habitat is maintained to support wildlife, aquatic and soil resources and support recovery processes in the post disturbance ecosystem.

FW-DC-VEG-10. Threatened, Endangered and Sensitive Plant Species – Special and Unique Habitats

Special and unique habitats support threatened, endangered, and sensitive plant species populations and contribute to high quality suitable habitat for these species. Degraded or diminished special and unique habitats are restored within their natural range of variation.

FW-DC-VEG-11. Threatened, Endangered and Sensitive Plant Species – Management-Related Disturbance

Ecological conditions and processes that sustain the habitats currently or potentially occupied by threatened, endangered, or sensitive plant species are retained or restored. The geographic distributions of sensitive plant species in the Forest Plan area are maintained. This includes sufficient seed or vegetative reproduction to maintain existing plant populations and associated native plant community biodiversity. Soil disturbance is managed to avoid degradation of threatened, endangered and sensitive plant species and their habitat as well as plant community composition, structure, and productivity.

FW-DC-VEG-12. Threatened, Endangered and Sensitive Plant Species – Habitat and Population Trends

Population trends, amount of occupied habitat, and amount of unoccupied suitable habitat are stable or increasing for threatened, endangered, and sensitive plant species.

FW-DC-VEG-13. Fuels Treatments in Wildland-urban Interface

Fuel treatments continue to reduce surface, ladder, and crown fuels that lower the potential for high-severity wildfires while providing for diversity within the stands. Generally, treated areas consist of open understories with overstory trees (conifers and hardwoods) populated by predominately fire resistant species, with scattered individual or small patches of shrubs and small trees in the understory, maintaining some cover in important wildlife corridors. Surface, ladder, and crown fuels have been treated and maintained to allow low-intensity surface wildland fires (flame lengths of 4 feet or less). Vegetation has been modified (interrupted) to improve community protection and enhance public and firefighter safety.

Crown base heights (height from the forest floor to the bottom most branches of the live tree crown) are managed to avoid crown fires. Crown cover of forest stands allow for adequate spacing between crowns to reduce crown fire potential while minimizing effects on surface wind speeds and drying of surface fuels.

FW-STD-VEG-02. Threatened, Endangered and Sensitive Plant Species – Surveys

Surveys for threatened, endangered, and sensitive plant species shall be conducted in suitable habitat on National Forest System lands before habitat-disturbing activities to identify and protect vulnerable populations. All existing sites are identified and managed to support rare species recovery on National Forest System lands. Suitable habitat shall be managed to enhance or maintain rare species occurrences on the Forest.

FW-GDL-VEG-01. Threatened, Endangered and Sensitive Plant Species – Disturbance in Occupied Habitat

Soil and habitat disturbance should be managed within occupied habitat to the extent practicable to maintain or enhance threatened, endangered, and sensitive plant populations and avoid invasive plant species establishment or spread. Consequently, occupied habitat should not be used for timber harvest, fuel breaks or developments associated with wildfire suppression, delivery of fire retardant or petroleum products, placement of stock-handling facilities, recreation, or special use developments. A 100-foot buffer between the occupied habitat and these management activities should be maintained.

Trees in occupied habitat that are felled for safety reasons should be retained on site as needed to maintain, protect, or enhance habitat unless such action is detrimental to the threatened, endangered, and sensitive species population or habitat and represents a threat through physical impacts or potential uncharacteristic wildfire.

All new road and trail construction should be designed to avoid the occupied habitat of threatened, endangered, and sensitive plant species (minimum 100-foot buffer).

Use of prescribed fire should be avoided in occupied habitat except in areas occupied by fire-dependent or fire-tolerant species. Habitat restoration activities may proceed when designed to avoid impacts to threatened, endangered, and sensitive plant species.

Slash piles and other fuels should be managed to avoid the occupied habitat of threatened, endangered, and sensitive species (minimum 100-foot buffer).

Grazing management (including timing, intensity, duration, frequency of use, and type and class of livestock) should allow for completion of threatened, endangered, and sensitive plant species annual life cycle and development and dispersal of reproductive materials like seed and spores. Salting or water developments should not be authorized or allowed such that they reduce threatened, endangered, or sensitive plant populations.

Mining operations should be authorized or allowed only if activities are planned to avoid threatened, endangered, and sensitive plant species.

FW-GDL-VEG-04. Habitat Rehabilitation

Appropriate seeding, planting, or mulching methods should be used to rehabilitate degraded sites resulting from invasive plants, forest activities, or other disturbances when necessary to prevent reinvasion and promote ecosystem resiliency. Rehabilitation seeding and/or planting using native plants can be used for invasive species projects in habitat occupied by threatened, endangered, and sensitive species or in species management areas where appropriate.

FW-GDL-VEG-08. Native and Non-native Insects and Pathogens

Intervention may occur when native and non-native insects and pathogens are not operating in their characteristic role or when site-specific objectives (ex: impacts to key watersheds, increased wildfire hazard, potential impacts to the recovery of threatened or endangered species, or maintaining late and old forest structure) are at risk.

FW-GD-VEG-09. Large Tree Management

Management activities should retain and generally emphasize recruitment of individual large trees across the landscape. Exceptions where individual large trees may be removed or destroyed include the following:

1. Trees need to be removed for public health or safety (such as, but not limited to, danger/hazard trees along roads or in developed or administrative sites)

2. Trees need to be removed to facilitate management of emergency situations such as wildfire response

The following exemptions apply only to situations where removal of smaller trees alone cannot achieve the stated desired conditions:

3. Trees need to be removed to meet, promote or maintain desired conditions for structural stages (see FS-DC-VEG-04. Forest Structure)

4. Trees need to be removed to control or limit the spread of insect or disease infestation

5. Trees need to be removed where strategically critical to reinforce, facilitate, or improve effectiveness of fuel reduction in wildland-urban interfaces

6. Trees need to be removed to promote special plant habitats (such as, but not limited to, aspen, cottonwood, whitebark pine)

A whitebark pine will be defined as a large tree when the tree is greater than 20 inches diameter at breast height (d.b.h.). However other standards and guidelines provide for buffers around whitebark pine. Whitebark pine will not be cut. Projects around whitebark pine are expected to improve whitebark pine by reducing competition from other species of trees.

2.2 Plan Components Relevant to Bull Trout - Aquatic and Riparian Conservation Strategy (ARCS)

The Plan includes plan components for managing watersheds, riparian and aquatic habitats. Collectively these plan components; desired conditions, riparian management areas, key watersheds, standards and guidelines, objectives, and suitability, as well as a monitoring plan comprise the Colville National Forest's Aquatic and Riparian Conservation Strategy (ARCS) that will replace the current INFISH (USDA Forest Service 1995) direction. The Plan ARCS is included in digital files.

The protection of riparian ecosystems is central to all salmonid conservation efforts (FEMAT 1993, Spence *et al.* 1996, and Quigley and Arbelbide 1997). As national forest LRMPs and Bureau of Land Management resource management plans were about to be revised the Interior Columbia Deputy Team[2] issued in 2003, the *Interior Columbia Strategy*, *A Strategy For Applying The Knowledge Gained By The Interior Columbia Ecosystem Management Project To The Revision Of Forest and Resource Management Plans And Project Implementation*. Direction for using the *Strategy* was clarified in August 21, 2008, when the Deputy Team issued further direction through a memo titled *A Framework for Incorporating the Aquatic and Riparian Component of the Interior Columbia Basin Strategy into BLM and Forest Service Plan Revisions* (hereafter referred to as Framework). The Strategy and Framework were updated in 2014.[3] The intent of the Framework is to include the information generated in the Interior Columbia Basin Ecosystem Management Project (Quigley and Arbelbide 1997) to facilitate consistency among plans in terms of the structure of riparian and aquatic components while providing for a high level of agency decision discretion in the substance of individual plan revisions. The Forest developed the ARCS using the August 21, 2008 framework but the 2008 and 2014 versions are similar.

[2] The Interior Columbia Deputy Team includes the Assistant Regional Director for the USFWS, the EPA Deputy Regional Administrator, the Deputy Regional Foresters for FS Regions 1, 4, 6, the BLM Idaho Deputy State Director for Resource Services, the BLM Oregon/Washington Deputy State Director for Resource Planning, Use and Protection, the NMFS Assistant Regional Administrator, the PNW and RMRS Deputy Station Director.
[3] BLM/FS/FWS/EPA/NOAA Fisheries-Memorandum Subject: Updated Interior Columbia Basin Strategy: A Strategy for Applying the Knowledge Gained by the Interior Columbia Basin Ecosystem Management Project to the Revision of Land Use Plans and Project Implementation. April 18, 2014

Consistent with the aquatic conservation strategies of the Northwest Forest Plan (USDA Forest Service and USDI Bureau of Land Management 1994), PACFISH (USDA Forest Service and USDI Bureau of Land Management 1995) and INFISH (USDA Forest Service 1995) strategies, and as suggested by Quigley and Arbelbide (1997), the Framework includes six components:

1. Riparian Conservation Areas, Riparian Management Areas or other land use allocations to provide direction regarding aquatic and riparian conservation. These special management areas are not "no management" zones but areas where riparian dependent species receive management emphasis. The riparian management and delineation of these areas needs to recognize the important functions they are established for including:
    a) The input of fine organic matter and nutrients to aquatic habitat.
    b) Providing for bank stability.
    c) Filtering sediment due to surface erosion thus controlling the amount reaching the aquatic system.
    d) A source of large woody debris.
    e) Shading the aquatic habitat thus helping to control water temperature.
    f) Controlling the microclimate within the riparian zone and adjacent to the aquatic habitat.
    g) Recognition of small and intermittent streams and managing unstable lands to account for aquatic function and values.
2. Protection of Population Strongholds for Listed or Proposed Species and narrow endemics. The revised plans should identify watersheds (HUC10 or HUC12) to be managed for the protection of ESA listed or proposed species. The intent is to identify habitat networks of existing strongholds with robust populations and high quality habitat for the species to support expansion and recolonization to adjacent watersheds.

Multiscale Analysis. Recognizing the hierarchical nature of watersheds, plans should describe how multiscale analysis was used in plan revisions and how multiscale analysis will be used in subsequent project-level decisions.

3. Restoration Priorities and Guidance. The plans should identify restoration priorities by general types and geographic areas.
4. Management Direction (desired conditions, objectives, management actions). The plans should provide management direction that identifies desired outcomes or future conditions (conditions and objectives) for aquatic resources.
5. Monitoring/Adaptive Management to:
    a. Determine if a plan is being implemented correctly and is achieving desired results
    b. Provide a mechanism for accountability and oversight,
    c. Evaluate the effectiveness of recovery and restoration efforts
    d. Provide a feedback loop so that management direction may be evaluated and modified.
6. Climate Change. The discussion of climate change was added by the Deputy Team to account for the effects of climate change on the success or failure of management actions to achieve an aquatic/riparian conservation strategy.

Region 6 of the Forest Service includes lands managed under the Northwest Forest Plan, PACFISH and INFISH. Based on broad-scale monitoring programs, the Aquatic Conservation Strategies of INFISH,

PACFISH and the Northwest Forest Plan appear to have been effective in improving aquatic habitat and watershed condition (Archer *et al*. 2009, Lanigan *et al.* 2012, Meredith *et al*. 2012). As forest plans were to be revised, Region 6 wanted a regionally consistent approach to the management of watersheds, and riparian and aquatic habitat. The Aquatic and Riparian Conservation Strategy (ARCS; USDA Forest Service 2008) was developed based upon the lessons learned implementing the Northwest Forest Plan, PACFISH and INFISH, and new information that had become available since the earlier strategies were developed; especially the roll of disturbance and the dynamic nature of watersheds, riparian and aquatic systems (see Reeves *et al.* 1995). The ARCS was subsequently revised in 2016 (USDA Forest Service 2016). [4]

The recognition of the role of natural disturbance and the dynamic nature of aquatic and riparian ecosystems in the Pacific Northwest (Reeves *et al.* 1995) are a key differences between the ARCS and past management direction. As stated in both the 2008 and 2016 ARCS documents, natural disturbances maintain ecologically healthy watersheds that create spatial heterogeneity and temporal variability in the physical components of the system watersheds and aquatic habitat. Natural disturbances have resulted in a mosaic of habitat conditions over time and native fish populations have adapted to this dynamic environment (Naiman *et al*. 1995, Reeves *et al*. 1995 as cited in ARCS 2008:2016). Aquatic and riparian ecosystems are most resilient[5] to the types of disturbances under which they have developed.

The ARCS recognizes that streams are dynamic, with periodic events such as wildfire, large storms and subsequent floods, hillslope failures, landslides, debris flows, and channel migration resulting in changing conditions in space and time. Another important consideration in the development of the ARCS is that streams and aquatic ecosystems are linked to the dynamics of both the riparian and upland communities, and the watershed and physical processes that shape them.

The two ARCS documents recognize the importance of small streams; also called headwater, intermittent, ephemeral, seasonal, low-order, and upper network streams as critical source areas for high quality water. Small streams make up most of the total catchment area in a watershed. Because the spatial extent of headwater streams makes up a major portion of the total catchment area, these and adjacent upland ecosystems are important sources of sediment, water, nutrients, energy, and organic matter for downstream systems (Sidle *et al.* 2000, Meyer and Wallace 2001 as cited in USDA Forest Service 2016).

The ARCS is designed to maintain and restore the ecological health of watersheds, and aquatic and riparian ecosystems on national forest lands. Naiman *et al*. (1992) define the components of ecologically healthy watersheds as the basin geomorphology, hydrologic pattern, water quality, riparian vegetation characteristics, and habitat characteristics. The management of ecologically healthy watersheds requires the preservation of the interactions between these components and accounting for spatial and temporal variability (Naiman *et al.* 1992). Another purpose of the ARCS is to develop networks of properly functioning watersheds that support populations of fish and other aquatic and

[4] Unless otherwise cited ARCS refers to the 2008 and 2016 versions collectively

[5] Resiliency of an ecosystem is the degree to which the system can be disturbed and recover to a state where processes and interactions function as before (Holling 1973, Reeves et al. 1995 as cited in USDA Forest Service 2008; 2016).

riparian-dependent resources across the Region. The intent of the ARCS is to maintain and restore the dynamic ecological processes responsible for creating and sustaining habitats over broad landscapes, as opposed to just at the individual project or small watershed scale. The ARCS is intended to provide a core set of desired conditions, suitability, objectives, standards and guidelines for aquatic and riparian management for national forests to design forest plan direction.

Consistent with the Interior Columbia Deputy Team Framework the ARCS includes five elements:

1. Riparian Management Areas (RMAs) along permanently-flowing stream, ponds, lakes, wetlands, seeps, springs, intermittent streams and unstable sites where management activities are to maintain, restore or enhance the ecological health of aquatic and riparian ecosystems and dependent resources.
2. Key watersheds. Key watersheds are a network of watersheds selected to serve as strongholds for important aquatic resources or having the potential to do so. Management emphasizes minimizing risk and maximizing restoration or maintaining ecosystem health. Key watersheds are selected based upon the requirements of the MIS/focal species (see section 2.2.2 of this BA). The Key Watershed concept has been found to be an effective strategy as in the Northwest Forest Plan area the watershed condition of Key Watersheds appears to be improving at a faster rate than non-key watersheds (Lanigan *et al*. 2012.)
3. Mid-Scale Analysis of Watersheds. Watershed or mid-scale analysis provides a basis for development of watershed-scale restoration strategies and provides the basis for defining desired conditions, management objectives and monitoring.
4. Watershed Restoration. Watershed restoration is defined as an integrated set of actions and treatments designed to facilitate the recovery of watersheds and related aquatic ecosystem structure and function.
5. Monitoring. Monitoring is a strategic assessment of the implementation and effectiveness of management activities and the ecological trends toward desired conditions.

The Forest has used both the 2008 and 2016 versions of the ARCS to develop the ARCS in the Plan. The Plan ARCS, based upon the Region 6 ARCS, includes a desired conditions, standards and guidelines, a key watershed network designed to provide the ecological conditions conducive to maintaining, restoring, and enhancing habitat necessary to sustain aquatic and riparian-dependent species on the Forest. The Plan ARCS is intended to provide both ecosystem and species diversity at watershed and landscape scales. [6]

The five elements of the Forest's ARCS include riparian management areas, key watersheds, watershed analysis, watershed restoration, and monitoring.

The following describes the Forest's ARCS in detail. These Plan components are designed to be implemented in an integrated manner to achieve the goal of a distribution of watershed conditions that are resilient to natural disturbance, thus maintaining, restoring and enhancing habitat for fish, other aquatic organisms, and a variety of wildlife and other riparian dependent resources on the Forest.

[6] A landscape is a collection of biophysical elements and ecosystem types that occupy relatively large (10^5-10^7 acres) contiguous areas (Hunter 1996, Concannon et al. 1999 as cited in USDA Forest Service 2008).

The expected effects of implementing the ARCS are discussed in section 5.1.

2.2.1 Riparian Management Areas (RMAs)

Riparian zones are the inter-faces between terrestrial and aquatic ecosystems. Found adjacent to streams, rivers, lakes and wetlands, riparian zones provide a transitional zone between terrestrial and aquatic components of the landscape (Gregory *et al*. 1991). Although riparian zones occupy a small part of the overall CNF land base; they support a diverse vegetation community not found in the upland areas. Riparian zones provide important foraging, cover, travel corridors, and nesting habitat for birds, small and large mammals, reptiles, and amphibians. Healthy riparian zones with an abundance of trees and other native woody species and forbs provide for channel and floodplain stability and integrity. Healthy riparian vegetation adjacent to streams and on floodplains slow flood waters and reduce the likelihood of downstream flooding.

Riparian zones improve water quality by filtering runoff, sediment, and nutrients from adjacent upland slopes. Riparian zones provide stream cover and shade which helps keep the summer water temperatures cool for salmonids and other aquatic species, and are a source of large woody debris to stream channels. Riparian zones also contribute to the aquatic food base as a source of terrestrial insects that fall into channels and by providing detritus input which is used by myriad of macroinvertebrate species, which in turn are forage for fish as well as certain bird species. Healthy, functioning riparian zones are vital for providing good water quality and diverse aquatic habitat (Naiman *et al*. 1992, FEMAT 1993).

RMAs include portions of watersheds where aquatic and riparian dependent resources receive primary emphasis and where special management direction applies. The designation of RMAs include the aquatic environment, the riparian zone and adjacent uplands. RMAs are designated for all permanently flowing streams, lakes, wetlands, seeps, springs and intermittent streams, and unstable sites that may influence these areas. RMAs are used to maintain and restore the riparian structure and function of intermittent and perennial streams, confer benefits to riparian-dependent plant and animal species, enhance habitat conservation for organisms that are dependent on the transition zone between upslope and riparian areas, and contribute to a greater connectivity of the watershed for both riparian and upland species.

RMAs are used as the primary framework (coarse filter) that provides for riparian and aquatic ecosystem diversity by conserving biophysical processes at the landscape and watershed scales. Management of RMAs focuses on ecological processes and conditions. Management activities within RMAs are to be designed to maintain or enhance existing desired conditions or restore degraded conditions for aquatic and riparian dependent species (USDA Forest service 2008; 2016).

As mentioned in section 2.2, RMAs are established to protect the ecological processes and conditions and the important functions of riparian zones provide to aquatic habitat including:

a) The input of fine organic matter and nutrients to aquatic habitat.

b) Providing for bank stability.

c) Filtering sediment due to surface erosion thus controlling the amount reaching the aquatic system.

d) A source of large woody debris.

e) Shading the aquatic habitat thus helping to control water temperature.
f) Controlling the microclimate within the riparian zone and adjacent to the aquatic habitat.
g) Recognition of small and intermittent streams and managing unstable lands to account for aquatic function and values.

RMAs include portions of watersheds where aquatic and riparian dependent resources receive primary emphasis and where special management direction applies. The RMAs are designated for all permanently flowing streams, lakes, wetlands, seeps, springs and intermittent streams, and unstable sites that may influence these areas. Riparian management areas are used to maintain and restore the riparian structure and function of intermittent and perennial streams, confer benefits to riparian-dependent plant and animal species, enhance habitat conservation for organisms that are dependent on the transition zone between upslope and riparian areas, and contribute to a greater connectivity of the watershed for both riparian and upland species.

RMA Description

Fish-bearing streams − RMAs consist of the stream and the area on each side of the stream, extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance (600 feet total, including both sides of the stream channel), whichever is greatest. It is expected that RMA widths along fish-bearing streams will not be less than described here.

Permanently flowing non-fish-bearing streams − RMAs consist of the stream and the area on each side of the stream, extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance (300 feet total, including both sides of the stream channel), whichever is greatest.

Constructed ponds and reservoirs, and wetlands greater than one acre – RMAs consist of the body of water or wetland and the area to the outer edges of the riparian vegetation, or to the extent of seasonally saturated soil, or the extent of unstable and potentially unstable areas, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance from the edge of the wetland greater than one acre or the maximum pool elevation of constructed ponds and reservoirs, whichever is greatest.

Lakes and natural ponds − RMAs consist of the body of water and the area to the outer edges of the riparian vegetation, or to the extent of seasonally saturated soil, or to the extent of unstable and potentially unstable areas, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance, whichever is greatest.

Seasonally flowing or intermittent streams, wetlands, seeps and springs less than one acre, and unstable and potentially unstable areas − This category applies to features with high variability in size and site-specific characteristics. At a minimum, these RMAs should include:

• The extent of unstable and potentially unstable areas (including earthflows).

• The stream channel and extend to the top of the inner gorge.

• The stream channel or wetland and the area from the edges of the stream channel or wetland to the outer edges of the riparian vegetation or wetland, extending from the edges of the stream channel to a distance equal to the height of one site-potential tree, or 100 feet slope distance, whichever is greatest. A site-potential tree height is the average maximum height of the tallest dominant trees for a given site class.

Intermittent streams are defined as any non-permanent flowing drainage feature having a definable channel and evidence of annual scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two physical criteria. Including intermittent streams, springs, and wetlands within RMAs is important for full implementation of aquatic and riparian plan direction. Accurate identification of these features is critical to the correct implementation of the strategy and protection of the intermittent stream and wetland functions and processes. Identification of these features is difficult at times due to the lack of surface water or wet soils during dry periods. Fish- bearing intermittent streams are distinguished from non-fish-bearing intermittent streams by the presence of any species of fish for any duration. Many intermittent streams may be used as spawning and rearing streams, refuge areas during flood events in larger rivers and streams or travel routes for fish emigrating from lakes. In these instances, the plan components for fish-bearing streams would apply to those sections of the intermittent stream used by the fish.

RMAs overlay all other MAs. Management within RMAs is guided by Desired Conditions, Standards and Guidelines.

The standards and guidelines cover a variety of management activities including: general riparian and aquatic conditions; chemical application within RMAs; fuelwood cutting; logging activities; road construction and maintenance and road/stream crossings; grazing management; fire and fuels management; lands and special use authorizations; hydroelectic development; and minerals management.

Suitability

Table 7 lists the management activities that are both suitable and non-suitable with the management intent of RMAs.

Table 7 - Suitable uses for Riparian Management Areas

Activity or Use	May Authorize	May not authorize
Facilities, administrative	Those needed for resource protection or those that inherently must be in RMAs.	X
Facilities, developed recreation	Those needed for resource protection or those that inherently must be in RMAs.	X
Federal Energy Regulation Commission licenses or permits		Recommend against
Fire, planned ignition	X	
Fire, use of unplanned ignition	X	
Forest products, commercial use (non-timber harvest)	X	
Forest products, firewood, commercial use	X	
Forest products, firewood, permitted personal use		X
Forest products, personal use	X	
Grazing, permitted	X	
Infrastructure, above ground infrastructure associated with special use permits, such as communication sites, energy developments, and/or utility lines.		X
Mechanized recreational use, summer	X	
Minerals, leasable – surface occupancy		X
Minerals, saleable		X
Motorized recreational use, summer, trails or play areas	X	X play areas not authorized
Motorized recreational use, winter, trails or cross-country	X	
Non-motorized recreational use, summer	X	
Non-motorized recreational use, winter	X	
Road construction, permanent	X	
Road construction, temporary	X	
Special use permits, recreational	X	
Timber harvest as a tool	X	
Timber harvest, scheduled production		X
Utility corridors	X	

2.2.2 Protection of Population Strongholds for Listed or Proposed Species

The Plan includes a network of Key Watersheds. As stated in the CNF ARCS, the key watersheds are areas that either provide, or are expected to provide, high quality habitat that will serve as source areas for threatened or endangered fish species, fish species of concern, and fish species of interest, and/or provide high quality water important to these populations downstream and/or their habitats. The key watersheds are expected to contribute to broad scale, ecosystem diversity by providing high quality habitat not only for the species of concern but for other aquatic and riparian dependent species, as well as to conserve or restore critical elements of riparian and aquatic habitat necessary for fish species habitat diversity. The key watersheds represent the fine-filter strategy of the ARCS. The key watersheds are to be managed to serve as refugia for maintaining and recovering habitat for at-risk fish populations on the Forest. The key watersheds can include areas of high quality habitat as well as areas of degraded habitat that have high potential to develop into productive habitat that can provide longer term expansion of populations and habitats. Key watershed networks should complement and support fish and water quality recovery plans. Management direction for habitat is intended to provide within key watersheds the highest relative level of protection and accepts the lowest relative level of risk from activities threatening their integrity and resiliency. Plan components include desired conditions, objectives and standards specific to key watersheds.

Colville National Forest Key Watersheds

The key watershed network was developed using the protocol provided by Reiss *et al*. (2008). The key watershed network is expected to remain relatively unchanged for the life of the Plan. Future adjustments may be necessary based on substantial, new information (e.g. populations and trends, life history characteristics and needs, distribution and use/non-use of habitats) or new listings of species. Detail of how key watershed were selected is located in the *Fisheries Report* prepared for the Final Environmental Impact Statement (MacDonald *et al.* 2016).

The CNF selected bull trout, westslope cutthroat trout (WSCT) and interior redband trout to base the key watershed network on. All watersheds with bull trout critical habitat and greater than 25% Forest Service ownership are key watersheds.

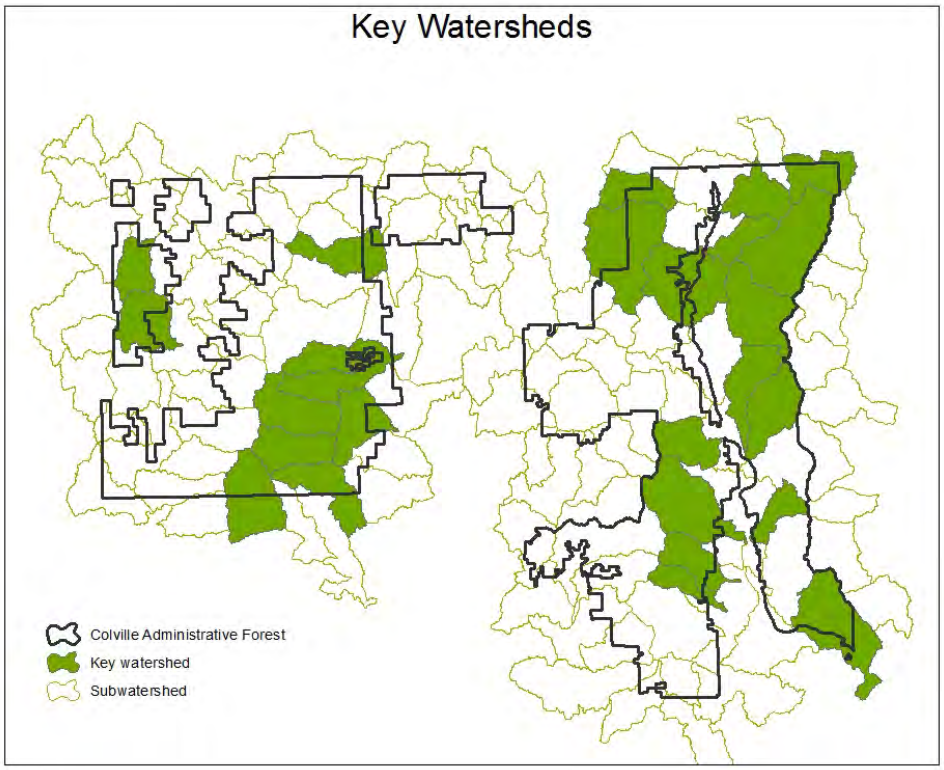

Figure 2 - Revised Forest Plan Key Watersheds

Table 8 - Forest Plan Key Watersheds (WSCT=Westslope Cutthroat Trout, IRT=Interior redband, BT=Bull Trout, CH=Bull Trout Critical Habitat

Subbasin	Key Watershed Number	Key Watershed Name	Total Subwatershed Acres	CNF Ownership Acres	Focal Species	Bull Trout Critical Habitat
Pend Oreille	170102160102	Winchester Creek	10,482	5,628	WSCT	+
Pend Oreille	170102160103	Smalle Creek	17,754	11,058	BT, WSCT	+
Pend Oreille	170102160201	Exposure Creek-Pend Oreille River	41,224	14,296	BT, WSCT	
Pend Oreille	170102160204	Cee Cee Ah Creek	12,063	6,500	WSCT	
Pend Oreille	170102160206	Tacoma Creek	39,519	27,182	BT, WSCT	+
Pend Oreille	170102160302	West Branch Le Clerc Creek	21,672	15,099	BT, WSCT	+
Pend Oreille	170102160303	East Branch Le Clerc Creek	26,663	11,145	BT, WSCT	+
Pend Oreille	170102160304	Ruby Creek	19,597	18,385	BT	+
Pend Oreille	170102160401	Harvey Creek	32,999	27,554	BT, WSCT	
Pend Oreille	170102160402	Headwaters Sullivan Creek	45,516	45,417	BT, WSCT	+

Subbasin	Key Watershed Number	Key Watershed Name	Total Subwatershed Acres	CNF Ownership Acres	Focal Species	Bull Trout Critical Habitat
Pend Oreille	170102160403	North Fork Sullivan Creek-Sullivan Creek	12,709	11,260	BT, WSCT	+
Pend Oreille	170102160702	Headwaters South Salmo River	20,697	12,472	BT	
Pend Oreille	170102160902	Sweet Creek-Pend Oreille River	41,832	28,905	WSCT	
Pend Oreille	170102160903	Slate Creek	20,195	19,907	BT, WSCT	+
Pend Oreille	170102161003	Cedar Creek	17,209	5,359	BT, WSCT	+
Upper Columbia River - Lake Roosevelt	170200011004	North Fork Deep Creek	49,257	26,634	WSCT	
Upper Columbia River - Lake Roosevelt	170200011301	South Fork Sherman Creek	22,004	21,899	IRT	
Upper Columbia River - Lake Roosevelt	170200011302	Upper Sherman Creek	26,381	26,260	IRT	
Upper Columbia River - Lake Roosevelt	170200011303	Lower Sherman Creek	20,987	15,998	IRT	
Upper Columbia River - Lake Roosevelt	170200011306	Barnaby Creek	23,108	14,299	IRT	
Upper Columbia River - Lake Roosevelt	170200011401	Upper Hall Creek	31,648	13,786	IRT	
Kettle River	170200021301	Trout Creek	23,435	14,122	IRT	
Kettle River	170200021701	Tonata Creek	14,453	13,781	IRT	
Kettle River	170200021907	East Deer Creek-Kettle River	23,385	15,443	WSCT	
Kettle River	170200022002	North Fork Deadman Creek	13,450	13,187	IRT	
Kettle River	170200022003	Deadman Creek	26,518	22,310	IRT	
		Total	654,757	**457,886**		

Key Watershed Plan Components and Restoration

The Plan includes three specific desired conditions for key watersheds:

FW-DC-WR-16. Key Watershed Network

Networks of watersheds with functional habitat and functionally intact ecosystems contribute to and enhance conservation and recovery of specific threatened, endangered, and/or sensitive aquatic species and high water quality and natural flow regimes. The networks contribute to short-term conservation and long-term recovery at the Recovery Unit or other appropriate population scale.

FW-DC-WR-17. Roads in Key Watersheds

Roads in key watersheds are not a risk to the function of soil and water resources. Roads do not disrupt hydrologic or aquatic habitat function or threatened and endangered species biological and behavioral attributes.

FW-DC-WR-18. Key Watershed Integrity

Key watersheds have high watershed integrity and contribute to resilient aquatic and riparian ecosystems.

The specific objectives for Key Watersheds are:

FW-OBJ-WR-05. Key Watershed Restoration Prioritization

Management in key watersheds focuses on restoration or preservation of watershed, aquatic, and riparian function and recovery of threatened and endangered species. Improve watershed condition class in key watersheds that are a priority for restoration within 15 years of forest plan implementation. Key watersheds that are a priority for restoration include:

> East Branch LeClerc Creek, West Branch LeClerc Creek, Deadman Creek, Barnaby Creek, Harvey Creek, North Fork Deadman Creek, North Fork Sullivan Creek, Sullivan Creek, Ruby Creek, Tonata Creek, Upper Sherman Creek, and South Fork Sherman Creek subwatersheds.

Additional key watersheds that are a priority for restoration will be identified, as appropriate, through the life of the plan through the WCF process.

FW-OBJ-WR-06. Key Watershed Road Treatments

Reduce road-hydrologic connectivity and sediment delivery on roads through storm damage risk reduction treatments, full hydrologic decommissioning, and other accepted treatment measures on 116 miles of hydrologically connected road within 15 years of forest plan implementation.

Restore or maintain aquatic organism passage and improve hydrologic and aquatic habitat function at 53 road/stream crossings for all native aquatic species, seasons, flows, and life stages in key watersheds within 15 years of forest plan implementation through culvert replacement or crossing improvement and natural channel design or other acceptable treatment measures that provide for natural stream channel function at all flows.

FW-OBJ-WR-07. Key Watershed Range Infrastructure Improvements

Improve hydrologic and aquatic function through range infrastructure improvements, including riparian fencing, movement and improvement of watering troughs, and other acceptable treatments over 240 acres within 15 years of plan implementation.

FW-OBJ-WR-08. Upland Vegetation Structure in Riparian Management Areas in Key Watersheds

Move upland vegetation within riparian management areas in key watersheds toward historic range of variability on 1,500 acres within 15 years of plan implementation.

FW-OBJ-WR-09. Stream Restoration in Key Watersheds

Restore hydrologic, geomorphic, and riparian process and function on 81 miles of stream within 15 years of forest plan implementation through activities including streambank stabilization, restoration of lateral and vertical hydrologic connectivity and improvement of stream channel and floodplain function.

Table 9 - Key watersheds that are priorities for restoration and projected restoration activities based on key watershed objectives

Key Watershed Prioritization	Road Treatments		Range Infrastructure Improvement (acres)	Riparian Vegetation Structure Improvement (acres)	Stream Restoration (miles)
	Road Improvements (miles)*	Aquatic Organism Passage Improvement (# of crossings)			
West Branch LeClerc Creek	3	5	20	0	10
East Branch LeClerc Creek	3	1	20	0	10
Deadman Creek	5	1	30	75-150	3
Upper Sherman Creek	5	5	0	75-150	2
South Fork Sherman Creek	5	9	0	75-150	4
Barnaby Creek	5	5	30	75-150	4
Harvey Creek	15	4	0	75-150	8
Tonata Creek	4	4	50	75-150	3
North Fork Deadman Creek	5	1	30	75-150	3
North Fork Sullivan Creek	1	2	0	0	1
Sullivan Creek	15	6	0	75-150	20
Ruby Creek	20	4	30	75-150	3
Treatments in additional key and/or priority watersheds (estimate addition 3 subwatersheds over 15 years)	30	6	30	75-150	10
Total for the life of the plan (essential)	116 miles	53 crossings	240 acres	750-1,500 acres	81 miles

Table 10 - Restoration priorities in key watersheds with bull trout or critical habitat

Key Watershed Prioritization	Road Treatments		Range Infrastructure Improvement (acres)	Riparian Vegetation Structure Improvement (acres)	Stream Restoration (miles)
	Road Improvements (miles)	Aquatic Organism Passage Improvement (# of crossings)			
West Branch LeClerc Creek	3	5	20	0	10
East Branch LeClerc Creek	3	1	20	0	10
Harvey Creek	15	4	0	75-150	8

Key Watershed Prioritization	Road Treatments		Range Infrastructure Improvement (acres)	Riparian Vegetation Structure Improvement (acres)	Stream Restoration (miles)
	Road Improvements (miles)	Aquatic Organism Passage Improvement (# of crossings)			
North Fork Sullivan Creek	1	2	0	0	1
Sullivan Creek	15	6	0	75-150	20
Ruby Creek	20	4	30	75-150	3
Total for the life of the plan (essential)	57 miles	22 crossings	70 acres	75-450 acres	52 miles

Finally, three standards specific to key watersheds are:

FW-STD-WR-05. Road Construction and Hydrologic Risk Reduction in Key Watersheds

In Key Watersheds and in subwatersheds with ESA critical habitat for aquatic species that are functioning properly with respect to roads, there will be no net increase (at least one mile of road-related risk reduction for every new mile of road construction) in system roads that affect hydrologic function. In Key Watersheds and in subwatersheds with ESA critical habitat for aquatic species that are functioning-at-risk or have impaired function with respect to roads, there will be a net decrease (for every mile of road construction there would be greater than one mile of road-related risk reduction) in system roads that affect hydrologic function to move toward proper function. Treatment priority shall be given to roads that pose the greatest relative ecological risks to riparian and aquatic ecosystems. Road-related risk reduction will occur prior to new road construction unless logistical restrictions require post-construction risk reduction.

FW-STD-WR-06. Hydroelectric and Other Water Development Authorizations in Key Watersheds

Hydroelectric and other water development authorizations shall include requirements for in-stream flows and habitat conditions that maintain or restore native fish and other desired aquatic species populations, riparian-dependent resources, favorable channel conditions, and aquatic connectivity.

FW-STD-WR-07. New Hydroelectric Facilities and Water Developments

New hydroelectric facilities and water developments shall not be located in a key watershed unless it can be demonstrated they have minimal risks and/or no adverse effects to fish and water resources for which the key watershed was established.

2.2.3 Multiscale Analysis

The ARCS 2016 (USDA Forest Service 2016) defines multi-scale or watershed analysis as an interdisciplinary evaluation of important geomorphic and ecological processes operating in specific watersheds. This analysis (1) evaluates the condition and trend of watersheds, riparian zones and aquatic ecosystems, (2) assesses connectivity of the watershed for terrestrial and aquatic flora and fauna species, (3) identifies and evaluates resource conditions and trends, and (4) provides the context for management. Watershed analysis provides a basis for development of watershed-scale management and restoration strategies and is a tool for more specifically defining desired conditions, developing management objectives and strategies, and designing monitoring strategies. The ARCS 2008 did not include multi-scale analysis (USDA Forest Service 2008).

As discussed in ARCS 2016, watershed, or multi-scale analysis is an interdisciplinary analysis of the status and trends of watershed and aquatic ecosystem conditions, key State-designated beneficial uses of water (e.g., municipal water supply), and the hydrologic, geomorphic, and biological processes that strongly influence them. Watershed analysis is intended to guide plan implementation by providing decision-makers: 1) information to identify activities that would maintain watershed and aquatic and riparian ecological conditions or move them towards desired conditions; and 2) the context for developing projects and evaluating their consistency, via the NEPA process, with plan direction (i.e., desired conditions, objectives, standards, and guidelines associated with watershed and aquatic resources). This includes ensuring that management activities in Key Watersheds and RMAs maintain, restore, or enhance aquatic and riparian resources (USDA Forest Service 2016, pages 60-61).

Multiscale analysis was used during the development of the Draft Environmental Impact Statement and Plan. The current status of the focal species and watershed and habitat conditions were assessed at the subwatershed scale and discussed by subbasin. Trend in habitat conditions were reported at the Forest and subbasin scales. The current viability of the focal species' populations and the Forest Service Contribution to Viability Assessment due to Plan implementation were assessed at the subbasin scale. The results of these subwatershed and subbasin assessments will be discussed further in section 5.0 (Environmental Baseline) and section 6.0 (Effects of the Action) of this BA.

In the future, assessing the status of the Plan watershed desired conditions (section 2.2.5 of this BA) is to happen at multiple scales depending on the specific desired condition. The scales at which the desired conditions are assessed imply that an analysis greater than the site scale will be required during project implementation. The Forest will be using the Watershed Condition Framework (WCF) approach to landscape and watershed restoration. Mid-scale watershed analysis will be critical to identify key ecological processes influencing watershed condition and function and will be important in identifying specific protection and/or treatment objectives. The Forest will complete a Forest wide review of the WCF every 5 years. Approximately every 2-3 years the Forest will complete a Watershed Analysis and Watershed Action Plan on a priority watershed.

The Watershed Condition Framework (WCF) was conceptualized at the National scale to change the Forest Service's approach to landscape and watershed restoration. The WCF established a nationally-consistent approach to classify watersheds based on underlying ecological, hydrological, and geomorphic functions and targets implementation of focused restoration activities in priority subwatersheds. The WCF provides outcome-based performance measures for documentation of improvement in watershed condition at Forest, Regional, and National scales (Potyondy and Geier 2010).

National Forests throughout the U.S. implemented the WCF process in 2010. Subwatersheds on the CNF were classified into three categories through the WCF based on classes described in FSM 2521.1 and Potyondy and Geier (2010):

- Class 1: Functioning Properly—Subwatersheds that exhibit high geomorphic hydrologic, and biotic integrity relative to natural potential conditions. The watershed is functioning similar to natural wildland conditions (Karr and Chu 1999, Lackey 2001). There are minimal adverse human impacts on natural physical or biological processes, and the watershed is able to naturally recover to previous condition in response to natural and human disturbance (Yount and Neimi 1990);

- Class 2: Functioning at Risk— Subwatersheds exhibit moderate integrity as described above;
- Class 3: Impaired Function— Subwatersheds exhibit low integrity as described above. Adverse human impacts have caused a threshold to be exceeded where the watershed is no longer as resilient to physical and biological processes.

Subwatersheds are classified by WCF based on geomorphic, hydrologic, and biotic integrity relative to potential natural condition, which relates to geomorphic, hydrologic, and biological watershed function. Integrity is evaluated in the context of the natural disturbance regime and geoclimatic setting and includes aquatic and terrestrial components because water quality and aquatic habitat are related to the integrity and functionality of the upland and riparian areas across the watershed (Potyondy and Geier 2010).

The WCF classification process includes four process categories including “aquatic physical”, “aquatic biological”, “terrestrial physical”, and “terrestrial biological”. These process categories are represented by 12 indicators comprised of attributes that represent underlying ecological function and processes that affect soil and hydrologic function (Potyondy and Geier 2010). Each indicator attribute receives a rating that is summed and averaged to produce an indicator score. The indicator scores within each process category are averaged, and the final watershed condition score is computed as a weighted average of the four process category scores. Process categories, attributes, and indicators used by WCF to assess condition are shown in Figure 5.

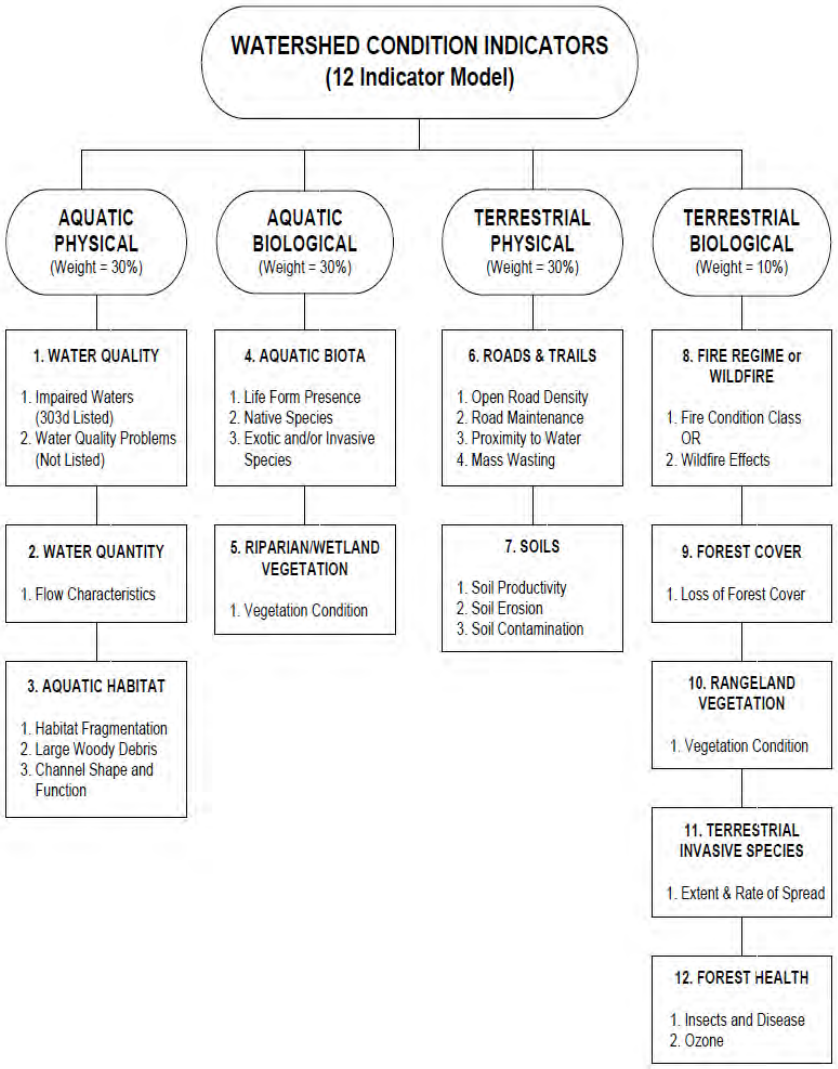

Figure 3 - WCF process category, indicator, and attribute results

2.2.4 Restoration Priorities and Guidance

Key watersheds are a priority for restoration and specific restoration objectives have been identified for key watersheds (section 2.2.2). Additionally there are what are called Priority watersheds and Focused subwatersheds that are also expected to have restoration actions implemented. Forest Service Region 6 recognized that the most efficient and effective way to improve watershed conditions and riparian and aquatic habitat would be to work with partners to target restoration efforts in specific watersheds. In these "targeted" watersheds restoration needs are identified and restoration efforts focused on the factors degrading watershed, riparian and aquatic habitat conditions within the identified watersheds that are technically feasible and socially acceptable before moving to restore other watersheds. The Forest Service Pacific Northwest Region developed the Region 6 Aquatic Restoration Strategy (ARS;

UDSA Forest Service 2007). The ARS was developed to provide guidance for watershed, riparian and aquatic habitat restoration at a regional scale using both passive and active restoration.[7]

Through implementation of the ARS, the region prioritized basins for active restoration. Forests identified focus watersheds at the 5th field watershed (HUC10) scale to be priorities for active watershed, riparian, and aquatic restoration. The Colville National Forest identified three focus watersheds: LeClerc-Pend Oreille River, Upper San Poil and Chewelah Creek- Colville River. Of these bull trout critical habitat is found in the LeClerc-Pend Oreille River watershed. Working with the partners, Forests are to then develop a WAP that identifies the needed restoration work that is technically and socially feasible.

In 2010, the national forests throughout the U.S. were mandated to assess the current condition of NFS watersheds utilizing the Watershed Condition Framework (WCF; Potyondy and Geier 2010). A full description of the WCF is available at:
http://www.fs.fed.us/biology/watershed/condition_framework.html.

The results of the WCF were used to identify priority subwatersheds where focused restoration over a 5- to 10-year period would improve impaired watershed condition. Once essential projects in existing subwatersheds are completed, additional priority subwatersheds will be identified. The current CNF Focus Watersheds are the LeClerc-Pend Oreille River (HUC 171021602), The Upper Sanpoil River (HUC 1702000401) and Chewelah Creek-Colville River (HUC 1702000301). Watershed Action Plans have been prepared for the Upper and West Forks Sanpoil River, and LeClerc Creek. A WAP has not been completed to date for the Chewelah Creek-Colville River.

In some cases, Focus Watersheds (e.g., LeClerc Creek-Pend Oreille River) include Key Watersheds and Priority Watersheds overlap with the identified Key Watersheds (West Branch and East Branches LeClerc Creek). Specific restoration objectives have been identified for Key Watersheds in the Plan and the Key Watersheds are the priority for active restoration. The Focus and Priority Watersheds that are not in the Key Watershed network are used to target implementation of short-term, opportunistic restoration work such as in subwatersheds that are a restoration priority for partners but not necessarily a priority to benefit the aquatic focal species.

Plan components for the Focus and Priority watersheds include one desired condition:

FW-DC-WR-19. Focus and Priority Watershed Network

Focus and priority watersheds contribute to the sustainability of aquatic and riparian systems and species and provide resilient, productive habitat and high water quality.

There is one objective specifically for Focus and Priority watersheds:

[7] Passive restoration is the broad-scale natural recovery of the ecosystem and includes coordination, analysis, planning, and design activities to maintain or improve habitat conditions while implementing projects across multiple resource areas.
Active restoration includes management actions with the specific goal of restoring the watershed processes that improve aquatic and riparian habitat function. Active restoration is focused on a more limited scale than passive restoration.

FW-OBJ-WR-10. Watershed Restoration in Focus and Priority Watersheds

Over 15 years, implement the watershed condition framework through completion of essential projects outlined in watershed action plans in existing focus and priority watersheds to improve watershed condition class. Focus watersheds designated at the 5th field watershed scale include Upper Sanpoil, Chewelah Creek-Colville River, and Le Clerc Creek-Pend Oreille River watersheds. Priority watersheds designated at the subwatershed scale include Ninemile Creek, and West Branch LeClerc Creek subwatersheds.

The Plan also includes forest-wide restoration objectives for Aquatic Invasive Species (AIS), fish habitat improvement, and RMAs.

FW-OBJ-WR-01. Aquatic Invasive Species

Within the next 15 years, implement aquatic invasive species prevention measures at all developed recreation sites providing direct and/or indirect access to water bodies, such as boat ramps, campgrounds, and day use areas that provide portal zones for hand carried watercraft. Implement aquatic invasive species prevention measures as part of all aquatic survey and inventory procedures and other management activities that pose high potential for invasion vectors to occur. For guidance on invasive riparian plants see Vegetation Desired Condition section.

FW-OBJ-WR-02. Aquatic Invasive and Non-Native Species

Within the next 15 years, implement aquatic invasive species control and eradication at 15 waterbodies (streams and lakes) where such invasions have become established and prevent attainment of listed fish recovery plan goals and/or effects to social, economic, and ecological systems are determined to be unacceptable.

FW-OBJ-WR-03. General Watershed Function and Restoration

Within the next 15 years, decrease sediment delivery from management activities on 1,000 acres including but not limited to roads, trails, livestock, unauthorized off-highway vehicle use, vegetation management, and dispersed and developed campsites. Restore hydrologic, aquatic and riparian processes through activities that stabilize stream bank erosion, and other accelerated channel destabilizing processes (i.e., headcutting), improve lateral and vertical hydrologic connectivity, and improve stream channel and floodplain function on 10 miles of streams.

FW-OBJ-WR-04. Fish Habitat Improvement

Within 15 years restore aquatic organism passage for all life stages of native species at 45 road/stream crossings and man-made instream structures such as water diversions and dams outside of key watersheds. Culverts and other passage improvements are to be designed to restore and maintain hydrologic and aquatic habitat function and stream channel resiliency to a range of flows through natural channel design and other acceptable treatment measures.

MA-OBJ-RMA-01. Improve Riparian Function at Dispersed and Developed Recreation Sites

Over the next 15 years, restore riparian processes and balance need for occupancy and access to water at 75 dispersed and developed recreation sites, through education, enforcement, and engineering where recreational use results in bank damage, reduction in water quality, and/ or a reduction in stream shade.

MA-OBJ-RMA-02. Restoration of Riparian Habitat and Process on Roads

Restore hydrologic and riparian habitat function within riparian management areas in non-key watersheds by reducing road-related impacts on 80 miles of road within 15 years.

MA-OBJ-RMA-03. Restoration of Late Forest Structure

Move upland vegetation within riparian management areas outside of key watersheds toward historic range of variability on 500 acres within 15 years of plan implementation.

2.2.5 Management Direction (Desired conditions, objectives, management actions)

Management direction including desired conditions and standards and guidelines for RMAs and key watersheds were discussed in sections 2.2.1 and 2.2.2 respectively. In addition to those Plan components there are desired conditions and standards and guidelines that are to be applied Forest-wide included in the Plan under the Water Resources Program. The Forest-wide desired conditions, standards and guidelines are to work in concert with the plan components for key watersheds and RMAs to establish the general direction and sideboards for managing for healthy watersheds and contribute to the viability of native aquatic and riparian species during Plan implementation.

In addition to the three key watershed and one focus and priority watershed desired conditions there are fifteen desired conditions that establish the goals of the plan for the ecological integrity of watersheds, riparian, and aquatic habitats. The desired conditions include a description of the scale for assessing attainment of the desired conditions.

FW-DC-WR-01. Natural Disturbance Regime of Aquatic and Riparian Systems

National Forest System lands contribute to the distribution, diversity, and resiliency of watershed and landscape-scale features, including natural disturbance regimes, of the aquatic, riparian, and wetland ecosystems to which plant and animal species, populations, and communities are adapted. Subbasin scale is used for Forest planning and 5th field watershed or subwatershed scale is used for project planning.

FW-DC-WR-02. Hydrologic and Aquatic and Riparian Habitat Connectivity

National Forest System lands contribute to uninterrupted physical and biological processes within and between watersheds. Floodplains, groundwater-dependent systems, upslope areas, headwater tributaries, and intact habitat refugia provide vertical, horizontal, and drainage network connections. These network connections provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic, riparian-dependent, and many terrestrial species of plants and animals. Subbasin scale is used for Forest planning, and 5th field watershed or subwatershed scale is used for project planning.

FW-DC-WR-03. Self-Sustaining Native and Aquatic and Riparian-Dependent Species

National Forest System lands contribute to habitat and ecological conditions that are capable of supporting self-sustaining populations of native aquatic and riparian-dependent plant and animal species. Subbasin scale is used for Forest planning and 5th field watershed or subwatershed scale is used for project planning.

FW-DC-WR-04. Physical Integrity of Aquatic and Riparian Habitat

National Forest System lands provide aquatic habitats in which the distribution of conditions (e.g., bank stability, substrate size, pool depths and frequencies, channel morphology, large woody debris size and

frequency) in the population of watersheds on the Forest is similar to the distribution of conditions in the population of similar, reference condition watersheds. Reference Conditions can be drawn from the Forest or Provincial scales. Conditions assessed at the subbasin scale for forest and project planning.

FW-DC-WR-05. Water Quality

National Forest System lands contribute to water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality is within the range that maintains the biological, physical, and chemical integrity and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities, and meets appropriate Washington State water quality standards. Subbasin scale is used for forest planning and 5th field watershed or subwatershed scale is used for project planning.

FW-DC-WR-06. Sediment Regimes

National Forest System lands contribute to the sediment regime within the natural range of variation. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport. Watershed scale is used for Forest planning and 5th field watershed or subwatershed scale is used for project planning.

FW-DC-WR-07. In-stream Flows

National Forest System lands contribute to in-stream flows and groundwater sufficient to create and sustain riparian, aquatic, and wetland habitats, retain patterns of sediment, temperature, nutrient, and wood routing, and provide for (permitted or certificated) consumptive uses. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows functions in concert with local geology, valley types, soils and geomorphology. Subbasin scale is used for Forest planning and 5th field watershed or subwatershed scale is used for project planning.

FW-DC-WR-08. Floodplain Inundation

National Forest System lands contribute to the timing, variability, and duration of floodplain inundation that are within the natural range of variation. Fifth field watershed or subwatershed scale is used for both Forest and project planning.

FW-DC-WR-09. Groundwater-Dependent Systems: Seeps, Springs, and Groundwater-fed Wetlands

National Forest System lands contribute to the timing, variability, and water table elevation in groundwater-fed wetlands, seeps, springs and other groundwater-dependent systems. These features are within or moving toward proper functioning condition. Subwatershed scale is used for both Forest and project planning.

FW-DC-WR-10. Water Production for Downstream Uses

National Forest System lands produce high-quality water for downstream ecological communities (including human communities) dependent upon them. Watershed scale is used for both Forest and project planning.

FW-DC-WR-11. Native Plant Communities

National Forest System lands contribute to the species composition and structural diversity of native plant communities in riparian management areas (including wetlands). These contribute to adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration; and supply amounts and distributions of coarse woody debris and fine

particulate organic matter sufficient to sustain physical complexity and stability. Subbasin scale is used for Forest planning and 5th field watershed or subwatershed scale is used for project planning.

FW-DC-WR-12. Aquatic Invasive and Non-Native Species

Aquatic invasive species do not occur as a component of lake, stream, and other riparian-related ecosystems or compete with native species for critical resources. Subbasin scale is used for Forest planning. Fifth field watershed or subwatershed scale is used for project planning.

FW-DC-WR-13. Aquatic Threatened, Endangered, and Sensitive Species

National Forest System lands contribute to the recovery of federally threatened and endangered aquatic species and conservation of Regional Forester's sensitive aquatic species. Aquatic habitat supports spawning, rearing, and/or other key life history requirements. Subbasin scale is used for Forest planning and 5th field watershed or subwatershed scale is used for project planning.

FW-DC-WR-14. Resiliency to Climate Change

Aquatic and riparian ecosystems are resilient to the effects of climate change and other major disturbances. Subbasin is scale is used for Forest planning and 5th field watershed scale is used for project planning.

FW-DC-WR-15. Water Quality Standards in Source Water Protection Areas

National Forest system lands in ground and surface source water protection areas provide water that meets or exceeds state water quality standards for drinking water with appropriate treatment.

The Forest-wide objectives for controlling AIS, watershed, riparian and aquatic habitat restoration were discussed in section 2.2.4.

Standards and guidelines that are to be applied Forest-wide, in addition to those previously discussed for RMAs (section 2.2.1) and key watersheds (section 2.2.2).

FW-STD-WR-01. Properly Functioning Watersheds

When aquatic and riparian desired conditions are being achieved and watersheds are functioning properly[8], projects shall maintain[9] those conditions. When aquatic and riparian desired conditions are not yet achieved or watersheds have impaired function or are functioning-at-risk and to the degree that project activities would contribute to those conditions, projects shall restore or not retard attainment of desired conditions. Short-term adverse effects from project activities may be acceptable when they support long-term recovery of aquatic and riparian desired conditions. Exceptions to this standard include situations where Forest Service authorities are limited. In those cases, project effects towards attainment of desired conditions shall be minimized and not retard attainment of desired conditions to the extent possible within Forest Service authorities.

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[8] per Watershed Condition Framework Technical Guide (USDA Forest Service, 2011b) and/or subsequent versions. Other broad-scale or local inventory, assessment and monitoring data and analysis can be used to refine initial classifications made per WCF. The WCF categories "functioning properly", "functioning-at-risk", and "impaired function" are equivalent to the "functioning appropriately" "functioning-at-risk" and "functioning at unacceptable risk" categories within the matrix of pathways and indicators (USFWS 1998) and to the "properly functioning" or "at risk" and "not properly functioning" categories within the matrix of pathways and indicators used by USDC NMFS (1996).

9 See glossary for definitions of the terms "maintain", "restore", "degrade", and "retard attainment".

FW-STD-WR-02. Best Management Practices

All projects shall be implemented in accordance with Best Management Practices, as described in National and Regional Technical Guides.

FW-STD-WR-03. Aquatic Invasive Species - In-Water Work

Implement prevention measures for in-water projects to decrease the potential for aquatic invasive species transference into non-infested water bodies.

FW-STD-WR-04. Construction of New Roads, Trails and Developed Recreation Sites

New roads and trails will be designed to minimize disruption of natural hydrologic processes at perennial and intermittent stream crossings, valley bottoms, valley approaches and other over land drainage features. New roads, trails and developed recreation sites will integrate features, such as, but not limited to, rocked stream crossings, drain dips, sediment filtration, cross drains and crossings that minimize unnatural stream constriction, bank erosion, channel incision, sedimentation, or disruption of surface and subsurface flow paths.

FW-STD-WR-08. Aerial Application of Fire Chemicals

Aerial application of chemical retardant, foam, or other fire chemicals is prohibited within 300 feet (slope distance) of perennial and intermittent waterways. Waterways are defined as any body of water (including lakes, rivers, streams, and ponds) whether or not it contains aquatic life except in cases where human life or public safety is threatened and chemical use could be reasonably expected to alleviate that threat. This includes open water that may not be mapped as such on avoidance area maps and intermittent streams with surface water at the time of retardant use.

FW-GDL-WR-01. Aquatic Invasive Species - Wildfire Suppression Equipment

During wildfire suppression, cross contamination between streams and lakes from pumps, suction, and dipping devices should be avoided. Dumping water directly from one stream or lake into another should be avoided. Water storage and conveyance components of water tenders, engines, and aircraft should be disinfected prior to use on a new on-forest incident.

FW-GDL-WR-02. Aquatic Invasive Species - Aquatic Resource Sampling

Aquatic sampling equipment should be disinfected prior to use in new stream or lake locations.

FW-GDL-WR-03. Aquatic Invasive Species - Early Detection and Rapid Response

Principles and processes of early detection and rapid response (EDRR) to find, identify and quantify new aquatic invasive species occurrences should be utilized. EDRR should be coupled with other integrated activities to rapidly assess and respond with quick and immediate actions to eradicate, control, or contain aquatic invasive species.

FW-GDL-WR-04. Watershed Restoration

Use the restoration methods that maximize the use of natural ecological processes for long-term sustainability and minimize the need for long-term maintenance.

FW-GDL-WR-05. Hydrologic Function of Roads, Trails, and Developed Recreation Sites

Roads and trails should be maintained to minimize disruption of natural hydrologic processes at perennial and intermittent stream crossings, valley bottoms, valley approaches and other over-land drainage features. Roads and trails should integrate features, such as, but not limited to, rocked stream crossings, drain dips, sediment filtration, cross drains and crossings that minimize unnatural stream

constriction, bank erosion, channel incision, sedimentation, or disruption of surface and subsurface flow paths.

FW-GDL-WR-06. Chemical Fire Suppression

Whenever practical, as determined by the fire incident commander, use water or other less toxic wildland fire chemical suppressants for direct attack or less toxic approved fire retardants in areas occupied by threatened, endangered, proposed, candidate, or sensitive species, or their habitats.

2.2.6 Monitoring / Active Management

The Plan monitoring program was developed to provide feedback by testing assumptions, tracking relevant conditions over time, measuring management effectiveness, and evaluating effects of management practices. Monitoring information should enable the Forest to determine if a change in plan components or other plan management guidance may be needed, forming a basis for adaptive management.

The Plan monitoring program addresses the most critical components for informed management of the Forest's resources within the financial and technical capability of the agency. Every monitoring question links to one or more goals, desired conditions, objectives, standards, or guidelines.

Monitoring Component: this provides a monitoring program that evaluates how the on-the- ground management is maintaining or making progress toward desired conditions and objectives of this Plan. The Plan provides the items to be monitored per the monitoring and evaluation requirements found at 36 CFR 219.12(k) of the 1982 regulations. Details on methodology, data storage, and responsibility are not considered plan components and are not included in the plan. Specific monitoring items, such as measuring frequencies, methodologies, precision, and reliability are identified in the annual monitoring guide.

Monitoring Questions: Monitoring questions ask whether management in the plan area is maintaining or progressing toward desired conditions and meeting objectives. Monitoring questions may be designed to pertain directly to desired conditions or to relate to objectives or guidelines. Monitoring information in the plan set of documents may be changed or updated as appropriate. Such changes and updates require a plan amendment or revision.

Monitoring questions identify specific Plan direction to monitor and evaluate. The monitoring questions specify the information that is essential for measuring Plan accomplishments and effectiveness. The associated evaluation process determines whether the observed changes are consistent with the desired conditions and what adjustments may be needed, if any. The monitoring plan include monitoring conducted in compliance with other laws, policies, and site-specific decisions.

Evaluation: Evaluation reports keep the plan set of documents up to date. The Forest Plan annual and five year monitoring reports will be shared with the U.S. Fish and Wildlife Service. There are three types of evaluation reports.

1. Comprehensive − for plan development and revision. The purpose is to reflect any substantial changes that have taken place in the conditions and trends since the previous comprehensive evaluation report. Current social, economic, and ecological conditions and trends are evaluated in this report and are updated at least every five years.

2. Evaluations – for plan amendment. Evaluations analyze issues relevant to the purposes of the amendment and occur when the plan is amended.

3. Biennial – for evaluation of monitoring information. A biennial evaluation of results of monitoring the plan.

Table 11 - Watershed and Aquatic Monitoring Program

Resource	Monitoring Question	Reference to Forest Plan Direction	Indicator	Frequency of Measure
Watershed	MON-WTS-01: Are management actions contributing to improved watershed condition class within focus, key, and priority watersheds, and other watersheds identified for restoration?	FW-DC-WR-01, FW-DC-WR-02, FW-DC-WR-03, FW-DC-04, FW-DC-WR-05, FW-DC-WR-06, FW-DC-WR-07, FW-DC-WR-08, FW-DC-WR-16, FW-DC-WR-17; FW-OBJ-WR-03, FW-OBJ-WR-04, FW-OBJ-WR-05, FW-OBJ-WR-06, FW-OBJ-WR-07, FW-OBJ-WR-08, FW-OBJ-WR-09, FW-OBJ-WR-10; FW-STD-WR-02, FW-STD-WR-03; FW-STD-WR-GDL-04; MA-OBJ-RMA-01, MA-OBJ-RMA-02, MA-OBJ-RMA-03; MA-STD-RMA-04, MA-STD-RMA-05, MA-STD-RMA-06, MW-STD-RMA-07, MA-STD-RMA-08; MA-GDL-RMA-02, MA-GDL-RMA-03, MA-GDL-RMA-04, MA-GDL-RMA-05, MA-GDL-RMA-06, MA-GDL-RMA-07	MON-WTS-01-01: Change in watershed condition class	Every 5 years
Watershed	MON-WTS-02: Are management actions reducing road impacts to watershed and aquatic habitat function and water	FW-DC-WR-15; FW-OBJ-WR-03, FW-OBJ-WR-06, FW-STD-WR-02, FW-STD-WR-03; FW-GDL-WR-05;	MON-WTS-02-01: Miles of roads treated that are a high risk to watershed and aquatic habitat function.	Annual

Resource	Monitoring Question	Reference to Forest Plan Direction	Indicator	Frequency of Measure
	quality within all watersheds across the Forest? Within Key, Focus, and Priority Watersheds?	MA-DC-RMA-04, MA-DC-RMA-06, MA-RMA-07, MA-WR-RMA-08; MA-OBJ-RMA-02; MA-GDL-RMA-03, MA-GDL-RMA-04, MA-GDL-RMA-05, MA-GDL-RMA-06, MA-GDL-RMA-07		
Watershed	MON-WTS-03: Are management actions improving key riparian processes within Riparian Management Areas?	MA-DC-RMA-02; MA-OBJ-RMA-01, MA-OBJ-RMA-02, MA-OBJ-RMA-03; MA-STD-RMA-01, MA-STD-RMA-04, MA-STD-RMA-06, MA-STD-RMA-07	MON-WTR-03-01: Acres or miles of watershed restoration activities accomplished, by subwatershed MON-WTR-03-02: Percent of subwatersheds trended towards an improved condition.	Annual Every 5 years (PIBO EM-comparison of reference conditions, WCF
Watershed	MON-WTS-04: Are water resources and RMA standards, guidelines, and best management practices (BMPs) being implemented at project sites? Are standards, guidelines, and BMPs effective at achieving desired conditions?	All WR and RMA standards and guidelines	MON-WTR-04-01: Number of BMP evaluations completed and identification of BMPs that were implemented correctly and incorrectly, and identification of BMP effectiveness	BMP annual
Watershed	MON-WTS-05-01: What is the status and trend of water quality?	FW-DC-WR-05, All WR and RMA standards and guidelines	MON-WTR-05-01: Miles of state-listed impaired waters, miles of waters under an approved TMDL and WQIP.	Annual (WADoE 303(d) list, TMDLs, WQIP implementation and monitoring
Aquatic Habitat	MON-AQH-01: Are management activities across the Forest contributing to the viability of riparian and wetland-dependent TES	FS-DC-WR-02, FW-DC-WR-03, FW-DC-WR-05, FW-DC-WR-12, FW-DC-WR-14; FW-OBJ-WR-01, FW-OBJ-WR-02, FW-OBJ-WR-03,	MON-AQH-01-01: PIBO EM, updated Aquatic Ecological Condition [AEC]), Stream channel morphology surveys in	Every 5 years (PIBO EM, updated Aquatic Ecological Condition [AEC]), stream channel morphology

Resource	Monitoring Question	Reference to Forest Plan Direction	Indicator	Frequency of Measure
	and surrogate species?	FW-OBJ-WR-04, FW-OBJ-WR-05, FW-OBJ-WR-06, FW-OBJ-WR-07, FW-OBJ-WR-08, FW-OBJ-WR-09, FW-OBJ-WR-10; FW-STD-WR-03; FW-GDL-WR-04; MA-OBJ-RMA-01, MA-OBJ-RMA-02, MA-OBJ-RMA-03; MA-STD-RMA-08	monumented reaches MON-AQH-01-02: Acres or miles of treatments to improve hydrologic, aquatic, and riparian function	surveys), invasive species database. Annual
Aquatic Habitat	MON-AQH-02: Are management actions improving conditions within Riparian Management Areas where livestock grazing is permitted?	FW-OBJ-WR-07; MA-DC-RMA-03; MA-STD-RMA-09, MA-STD-RMA-10, MA-STD-RMA-11, MA-STD-RMA-11; MA-GDL-RMA-09, MA-GDL-RMA-10	MON-AQH-02-01: Acres of improvement within DMA locations. MON-AQH-02-02:Allotments managed to meet annual grazing management indicators	Annual, Every 5 years in conjunction with MON-WTR-03-02 above (PIBO EM & R-6 stream surveys Annual (PIBO & Forest monitored DMAs
Aquatic Habitat	MON-AQH-03: Are management actions preventing the spread of aquatic invasive species?	FW-DC-WR-11;FW-OBJ-WR-01, FW-OBJ-WR-02; FW-STD-WR-01; FW-GDL-WR-01, FW-GDL-WR-02, FW-GDL-WR-03; MA-GDL-RMA-08	MON-AQH-03-01: Acres of non-native invasive aquatic habitat treated MON-AQH-03-02: Number of sites of new non-native invasive aquatic species	Annual (R6 stream WIT); Annual, Every 5 years (PIBO EM)

2.2.7 Climate Change

Climate change is the largest unknown factor that may influence the contribution implementation of the Forest plan may have on bull trout recovery. There is a wide range of climate change models that give an equally wide range of future trajectories. There is general agreement that climate will warm but no certainty on rate. Major shifts in several tree species are expected by the end of the century as is a doubling of fire acres by 2040, and a tripling of fire acres by 2080 (see Vegetation section of the Final Environmental Impact Statement).

In addition to the potential changes to terrestrial vegetation and the resulting potential for increased wildfires, climate change may also produce profound impacts to fish and aquatic habitat. As summarized by Staab *et al.* (2014), climate change across the Pacific Northwest is expected to result in:

- declines in snowpacks;
- increased streamflow and associated flooding in the winter and early spring;

- decreased streamflow in the late spring, summer and fall;
- increased stress on scarce summer water supplies;
- increased stress on salmon and other cold-water species due to declining summer streamflows and rising stream temperatures.

Streamflow patterns are expected to change in northeastern Washington with decreasing snowpacks in mid-elevation and wetter locations. Most subbasins on the CNF have a mixed rain and snow winter precipitation pattern, with only the Pend Oreille River subbasin considered to be a snow dominated subbasin as a whole; however it may transition to a more mixed pattern by 2040 (Snover *et al* 2013). In the mountains of northeastern Washington, snowpacks are expected to persist at higher elevations but at diminished levels, with large portions of the mountains of northeastern Washington possibly losing their April 1 snow-water equivalent (see Staab *et al.* 2014), [10] which may result in lower summer flows and potentially an increase in stream temperatures that are stressful for native salmonids (Mantua *et al*. 2010). Additional changes in streamflow regimes that may be expected include peak streamflows occurring earlier in the spring, a slight increase in the 20-year recurrence interval flood, and some reduction in low flows (Mantua *et al*. 2010).

Although many biotic and abiotic factors interact to determine suitable habitats for different fish species at a specific location, warming streams, declining summer flows, and increasing flood risk are, in general, all expected to negatively affect coldwater fish populations. Bull trout are especially vulnerable given that spawning and rearing are constrained by their location in upper watersheds and the species' requirement for cold water temperatures. Warming water temperatures may reduce the miles of stream suitable for bull trout spawning and rearing (Rieman *et al.* 2007; Wenger *et al.* 2011). Increased water temperatures may also put bull trout at a competitive disadvantage with brook trout where the two species overlap (Rodtka and Volpe 2007, McMahon *et al.* 2007).

While climate change may give brook trout a competitive advantage over bull trout, climate change would also influence brook trout distribution. Like bull trout, Wenger *et al.* (2011) feel brook trout populations may also be negatively affected by climate change, which may be an advantage to westslope cutthroat trout whose distribution appears to be negatively influenced by the presence of brook trout. Rainbow and redband trout may not be as susceptible to warmer water temperatures as they generally are more tolerant of higher water temperatures (Bjornn and Reiser 1991). Issak *et al*. (2010) found over a 13-year period that increased stream temperatures, primarily driven by climate and to a lesser degree wildfires, minimally affected the thermal habitat for rainbow trout but reduced bull trout habitat.

Climate change would influence the distribution of non-native fishes as well. Warming water temperatures may increase the range of non-native predators such as smallmouth bass (*Micropterus dolomieu*) and northern pike (*Esox lucius*) from large rivers into tributaries.

The USFWS (2012) in their biological opinion for the Boundary Hydroelectric Project felt that if the current climate change models and predictions for Pacific Northwest aquatic habitats are relatively

[10] Snow Water Equivalent (SWE) is a common snowpack measurement. It is the amount of water contained within the snowpack. It can be thought of as the depth of water that would theoretically result if you melted the entire snowpack instantaneously (USDA Natural Resources Conservation Service, March 22, 2014) http://www.nrcs.usda.gov/wps/portal/nrcs/detail/or/snow/?cid=nrcs142p2_046155. (March 2

accurate, bull trout in the Pend Oreille River basin are likely to be impacted through at least one or more of the following pathways:

- Changes in distribution of bull trout within the core area, such as reduced spawning habitat, and/or seasonal thermal blockage in the migratory corridors associated with increased stream temperatures
- Disturbance or displacement of eggs, alevins, juveniles, and adults of resident and/or migratory adults during winter flooding events
- Short-or long-term changes in habitat and prey species due to stochastic events during winter floods
- Changes in flow/out-migration timing in the spring for bull trout and their prey species
- Increased migration stressors from lower stream flows and high stream temperatures during spawning migrations

The USFWS (2012) also judged some specific habitat effects may include:

- Changes in flows in Sullivan Creek due to altered snowpack and snowmelt, which may change the timing of higher flows in lower Sullivan Creek, resulting in a barrier to bull trout migration in July and August.
- Changes in temperature and flows within Sullivan and Slate Creeks may alter the species composition and abundance of the macroinvertebrate and fish populations with adverse consequences to bull trout food base.
- Increased temperatures in Boundary Reservoir would decrease the amount of time that the reservoir is suitable for bull trout migration. Increased temperatures could alter the migratory pattern of bull trout for times entering tributary streams to spawn as well as migration times to and from the Lake Pend Oreille system. Warmer temperatures within Boundary Reservoir would improve conditions for non-native predators.

Recent work by Isaak *et al.* (2016) however suggests mountain streams may actually provide refugia for cold water species. Analyzing stream temperature data from locations in Oregon, Washington, Idaho and western Montana they found that thermal habitat in mountain streams is highly resistant to temperature increases and that many populations of cold-water species exist where they are well-buffered from climate change. The resistance of these streams to warming is caused by strong local temperature gradients associated with topographic controls. Mountain landscapes will likely play an important role in the persistence of cold-water adapted native species, including bull trout (Isaak *et al.* 2016). As previously discussed, stream temperatures in these mountain streams are just one factor that may be affected by a changing climate. Larger uncertainties include the interaction with other climate stressors such as changes in precipitation patterns and snow accumulation in mountain environments, as well as the magnitude and timing of runoff. Stochastic disturbances such as more extreme or frequent droughts, wildfires, floods, and channel disturbances can be expected. While bull trout and other mountain stream fauna have evolved with dynamic habitats, populations confronted by changed disturbance regimes are likely to require larger habitats to persist than has historically been the case (Isaak *et al* 2016).

Bull trout on the Forest have been impacted by many factors including degraded habitat on and off the Forest; non-native trout, especially brook trout; lost population and habitat connectivity both within

watersheds, and between watersheds and mainstem Pend Oreille River (see section 5.0). Both the ISAB (2007) and Haak and Williams (2012) state that with changing climate efforts to conserve native fish species should focus on restoring degraded habitat, improving riparian vegetation, providing habitat and population connectivity, providing flows in stream for ecosystem purposes, and providing for a network of intact habitats to support large populations.

The Forest Plan, with the ARCS, is consistent with the recommendations of the ISAB (2007), Haak and Williams (2012) and with other agency recovery efforts. All bull trout critical habitat on the Forest is within key watersheds where the management emphasis is to minimize risk to and restore aquatic habitat, specific desired conditions, standards and guidelines, and restoration objectives apply. Objectives for road treatments, range infrastructure improvement and riparian vegetation structure improvement may be expected to improve watershed condition and resiliency to disturbance. Improving fish passage will make more habitat potentially available for restored bull trout populations and stream improvement objectives should improve habitat conditions. Additionally, all key watersheds are within the Focused Restoration MA where the goal for vegetation management is to improve the resiliency of the Forest by restoring Forest vegetation communities to conditions as may be expected under historic and anticipated disturbance regimes. The Focused Restoration also has a desired road density for CNF roads of 1.0 miles/mile^2 in a subwatershed and any new road construction within the key watersheds needs to result in a net decrease in roads miles.

There is no monitoring proposed specifically to track the effects of climate change. The monitoring program described in section 2.2.6 however will provide the Forest with information regarding trends in watershed and stream habitat conditions as the Plan is implemented over time.

Plan components that specifically speak to climate change are:

FW-DC-WR-14. Resiliency to Climate Change

Aquatic and riparian ecosystems are resilient to the effects of climate change and other major disturbances. Subbasin is scale is used for Forest planning and 5th field watershed scale is used for project planning.

2.2.8 ARCS – INFISH Comparison

The Plan replaces INFISH with a hybrid of the 2008 and 2016 Aquatic and Riparian Conservation Strategies. The Colville National Forest Aquatic and Riparian Conservation Strategy (Colville-ARCS) is a broad-scale strategy to maintain and restore the ecological health of watersheds and aquatic and riparian ecosystems on the Colville National Forest. The goal of the Colville ARCS is to develop networks of properly functioning watersheds that support populations of fish and other aquatic and riparian-dependent organisms, and State designated uses of water, while enabling provision of multiple other ecosystem services, including outdoor recreation, special uses, range, timber, and wildlife habitat. The strategy focuses on maintaining and restoring dynamic ecological processes responsible for creating and sustaining habitats and providing high-quality water at landscape scales, rather than the individual project or small watershed scale (USDA and USDI 1994a and b).

History

2008 ARCS

The Colville-ARCS is a refinement of several versions of the Forest Service Region 6 ARCS. The Aquatic and Riparian Conservation Strategy (ARCS) was developed by FS Region 6 in 2008 to consolidate

management direction from the Northwest Forest Plan, PACFISH, INFISH, and ARS into a framework document to be used as guidance for forest plan revision processes. ARCS includes five elements including; designation of riparian management areas (RMAs), designation of a key watershed network, mid-scale analysis of watersheds, watershed restoration, and monitoring. The interaction of these five elements forms the basis for watershed, aquatic, and riparian ecosystem management and restoration (USDA Forest Service 2008).

Scientific studies completed after the initiation of the Northwest Forest Plan, PACFISH, and INFISH support their assumptions and general framework, however there was a need for a unified aquatic conservation strategy that incorporated new science and addressed and clarified issues identified through more than a decade of field-level implementation (Naiman and Bilby 2000, Spence et al. 1996, Reeves 2006, Heller and McCammon 2004). Providing refinement to earlier strategies is the primary basis for the development of the original 2008 version of ARCS. ARCS-2008 includes better recognition of the role of disturbance in building ecosystem resiliency, consideration of scale effects on ecosystem processes, confirmation of the value of watershed-scale analysis, the need for better monitoring, and better establishment of the linkage between management intent and aquatic strategy. During the Forest Plan revision process the 2008-ARCS version was used to formulate the proposed action.

ARCS-modified

The 2008-ARCS supports forests adding specificity and local detail to tailor management of watersheds and riparian resources to local systems and conditions. Based on public and internal comments, best available science, and new policies on Forest Service management of aquatic and riparian resources, including the Watershed Condition Framework, and discussions with the Forest Plan interdisciplinary team, resource specialists in the Pacific Northwest regional office, and other reviewers of the revised forest plan, components in ARCS were updated and included in alternative R and alternative P in the Draft Forest Plan (ARCS-modified is not included in alternative P of the Final Environmental Impact Statement (FEIS). The updated plan components are referred to as “ARCS modified” in both the draft and FEIS.

Most of the updates made to ARCS plan components ARCS-modified add clarity to individual plan components (i.e. guidelines worded properly as guidelines, standards worded as standards). The IDT also considered operational constraints in the evaluation of each standard and guideline within ARCS. Specific differences between ARCS and ARCS-modified are discussed in the FEIS.

2016-ARCS

Since 2008, the RO worked to integrate recent policy direction, best available science, and better align ARCS with the 2012 Planning Rule into ARCS-2016 (currently in draft) (USDA FS 2016). While ARCS-2016 is tailored specifically for forest plan revisions completed under the 2012 planning rule, certain aspects of ARCS-2016 were incorporated into the Colville Plan in Alternative P in the FEIS. Plan components incorporated from ARCS-2016 provide greater clarity than what was contained in ARCS-modified.

Colville-ARCS

The overall strategy to maintain and restore the ecological health of watersheds and aquatic and riparian ecosystems on the Colville National Forest is incorporated throughout the Forest Plan (primarily in the Water Resources and Riparian Management Area sections). The Colville Aquatic and Riparian Conservation Strategy (Colville-ARCS) outlined in this document includes plan components (desired conditions, objectives, standards, guidelines), designation and discussion of Riparian Management Areas

and Key watersheds, and a discussion of how aquatic protection and restoration would be prioritized, completed, and monitored.

2.2.9 Resource Programs and Forest-wide Direction for Bull Trout

When implementing forest management activities in the future, projects will be designed to meet the forest-wide objectives, desired conditions, standards, and guidelines for multiple resource programs. However as previously stated these forest-wide objectives, desired conditions, standards, and guidelines authorize no immediate activities or changes to ongoing ones.

Many management activities allowed within the different MAs in the Plan have the potential to affect bull trout and their habitats, either directly or indirectly, where they overlap with occupied habitat or critical habitat. Land management activities that disturb the soil surface adjacent to or in occupied habitat have the greatest potential, and risk, of adverse effects.

Air Program

The Forest is responsible for protecting national forests and surrounding areas from the adverse effects of air pollution that are sourced from NFS land. This is predominantly accomplished by working with Washington State Department of Natural Resources Smoke Management to plan prescribed burning when weather conditions would prevent smoke impacts from exceeding established air quality standards. The air program primarily regulates the timing of prescribed fire to prevent air pollution from smoke.

Soils

Soils are an integral part of ecosystems, their function, and the above and below ground interaction of organisms. These functions all contribute to ecological resilience. Soil conservation and protection is needed to effectively maintain soil quality and productivity and improve or protect watershed conditions.

Desired conditions for the soils program include:

FW-DC-SOIL-01. Soil Productivity and Function

Soil productivity and function contributes to the long-term resilience of ecosystems. Management activities occur on soils with the inherent capability to support those activities.

FW-DC-SOIL-02. Detrimental Soil Conditions

Surface erosion rates are within the natural range of variation for a given biophysical setting. There is no degradation of aquatic habitat and water quality from surface erosion rates resulting from permitted uses and management actions. Ecological and hydrologic functions are not impaired by soil compaction.

FW-DC-SOIL-03. Soil Stability

Soil stability varies from minor soil creep to active land flows dependent on soil characteristics, soil moisture, and triggers. Management activities avoid or do not accelerate underlying soil movement rates.

The soil program includes one objective.

FW-OBJ-SOIL-01. Soil Productivity and Function

Within 5 years of plan implementation, stabilize, rehabilitate, or restore natural processes that support soil productivity and function on 20 to 30 acres per year.

The soils program includes three guidelines to minimize conversion of sites from a productive to a non-productive state (e.g. roads, administrative sites, developed campgrounds); maintaining effective ground cover; and using native topsoil where practical to meet project objectives.

FW-GDL-SOIL-01. Total Soil Resource Commitment

The Total Soil Resource Commitment is no more than 5 percent of the forest. The soil stability and support function is maintained within the Total Soil Resource Commitment.

Total Soil Resource Commitment is the conversion of a productive site to an essentially non-productive site (0 to 40 percent of natural productivity) for a period of more than 50 years. Examples include system roads, administrative sites, developed campgrounds, rock quarries, mine sites, livestock watering facilities[11].

FW-GDL-SOIL-02. Effective Ground Cover

Minimum effective ground cover following any soil-disturbing management activity should be as shown in the following table.

Table 12 - Minimum effective ground cover following any soil-disturbing activity

	Minimum percent effective ground cover	
Erosion hazard class	**1st year**	**2nd year**
Low (very slight-slight)	20-30	30-40
Medium (moderate)	30-45	40-60
High (severe)	45-60	60-75
Very High (very severe)	60-75	75-90

(source for erosion hazard classes: Forest Service Manual 2520)

FW-GDL-SOIL-03. Native Topsoil

Native topsoil should be used where practical to meet restoration project objectives.

Wildlife Habitats

Wildlife habitat desired future conditions, objectives, and standards and guidelines are discussed in section 2.1.2 of this BA.

Heritage Resource Program

The Heritage Resource Program primarily ensures forest management activities protect heritage resources and comply with applicable laws, regulations, executive orders and agency directives.

[11] Existing condition as of December 2016 is that less than 2 percent of lands managed by the Colville National Forest is dedicated to uses other than soil/vegetation productivity.

American Indian Rights and Interest

This program primarily functions to maintain the Forest's Federal Trust Duty and meets responsibilities to administer programs in a manner that does not interfere with tribal rights and resources as defined by laws and executive orders. There is one Desired Condition (*FW-DC-AI-01*) that includes all management actions give consideration for access to traditional resources and sacred places.

Public Awareness

The Plan Public Awareness guidance covers the information, education, collaboration, and interpretation activities the Forest engages in. Specific methods and materials used to accomplish the desired condition are under the discretion of the Forest and are guided by various rules, regulations, and policies. There is one desired condition for Information, Education and Participation (*FW-PA-DC-01*). The desired condition includes a multi-faceted outreach strategy to help the public understand Forest cultural and natural resources including fish and forest management

Scenery

Scenery is managed through the Scenery Management System. The valued landscape character descriptions do not replace other desired conditions, such as vegetation. Rather, the vegetation desired conditions are a key component of the valued landscape character.

Scenic Integrity Objective zones overlay the management areas. The direction for scenery management applies regardless of the management area boundary. Applicability of plan direction is guided by the principle that where there is an overlap of scenery management direction with other plan components, the most restrictive plan direction applies depending on site-specific conditions and the activity or use.

Renewable Forest Products

Forest products are products collected from the national forest for commercial, personal, Native American tribal, educational, and/or scientific purposes. There are two categories of forest products; those referred to as "special forest products" as defined by FSH 2409.18-80, 2008; and those considered merchantable wood products.

Examples of special forest products can include but are not limited to bark, berries, boughs, bulbs, burls, Christmas trees, cones, ferns, firewood, forbs, mushrooms, grasses, mosses, nuts, pine straw, roots, sedges, seeds, transplants, tree sap, wildflowers, fence material, posts and poles, shingle and shake bolts, and rails.

Examples of merchantable timber products can include, but are not limited to sawtimber, pulpwood, non-sawlog material removed in log form, biomass and other wood fiber products.

Collecting special forest products are regulated by permits. Special forest products, other than personal firewood, gathering may be authorized within RMAs subject to RMA standards and guides.

There are two desired conditions for Renewable Forest Products and one objective:

FW-DC-RFP-01. Commercial Products

Provide a sustainable level of timber products for current and future generations. Production of timber from National Forest System lands contributes to an economically viable forest products industry.

FW-DC-RFP-02. Products Available

A variety of renewable forest products of social, spiritual and economic value are reasonably available to the public. Special forest products and merchantable timber products are ecosystem services that contribute to economic sustainability, social desires, or cultural needs.

FW-OBJ-RFP-01. Planned Sale Quantity

As a result of vegetation treatments implemented over 6,000 to 12,000 acres, estimated volume of merchantable forest products, measured at a Forest scale, to be average of 62 million board feet per year over the next 15 years.

Scheduled timber harvest is not authorized within RMAs but timber harvest may be used to attain desired conditions for RMAs.

Vegetation Management

The vegetation management program is ground disturbing in nature. Even when managing for desired conditions for watersheds and RMAs potential short-term adverse effects may occur due to soil disturbance and the removal of the vegetation. The magnitude and extent of adverse potential effects will likely be influenced by the Plan components for the MAs within the Pend Oreille River subbasin and the amount of land in the MAs.

Conifer systems

The conifer vegetation on the Forest has been classified into five plant association groups based on the potential natural vegetation. The plant association groups are aggregations of plant associations defined in the plant association guide developed for the Forest. The conifer vegetation types for the Forest are:

- Douglas-fir dry
- Northern Rocky Mountain mixed conifer
- Western hemlock/Western redcedar
- Subalpine fir/Lodgepole pine
- Spruce/Subalpine fir

There are five vegetation structure classes based on tree sizes and canopy cover displayed in Table 13.

Table 13 - Forest structure classes

Structure	Definition
Early	Trees less than 10 inches d.b.h* or canopy cover less than 10 percent
Mid Open	Trees 10 to 20 inches d.b.h., canopy cover 10 percent up to 40 percent
Mid Closed	Trees 10 to 20 inches d.b.h., canopy cover 40 percent or greater
Late Open	Trees 20 inches or greater d.b.h., canopy cover 10 percent up to 40 percent
Late Closed	Trees 20 inches or greater d.b.h., canopy cover 40 percent or greater

*d.b.h. is defined as diameter at breast height

Non-Conifer Systems

Non-forested communities and deciduous forests are described by Clausnitzer et al. 2006.

Vegetation within the Wildland Urban Interface (WUI)

Wildland-urban interface (WUI) is defined as “the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels”

The prioritization of fuels treatments with WUI will follow the National Fire Plan, the Healthy Forests Restoration Act-PL108-148, and individual community wildfire protection plans. Individual fuels reduction projects and their relationships to WUI are defined on a project basis.

Vegetation management utilizes a “dynamic landscape” approach to achieve the desired conditions as opposed to using fixed reserves and tree diameter limits.

Desired conditions that are likely pertinent for potential effects to bull trout or critical habitat are:

FW-DC-VEG-03. Human Disturbance

Human influences play major or substantial roles in plant community composition, structural distribution, and disturbance intensities, patterns, and duration. Human activities (such as wood product removal, wildland fire use, vegetation treatments, forage utilization, or recreation) are designed to meet desired conditions, move toward desired conditions, or not impair desired conditions.

FW-DC-VEG-04. Forest Structure

Forest structural classes are resilient and compatible with maintaining characteristic disturbance processes such as wildland fire, insects and diseases. Habitat conditions for associated species are present. Structure contributes to aesthetic settings, particularly along scenic byways and highways. Forest openings would be commensurate with historical conditions for size and distribution to reflect natural disturbance processes. The historical range of variability for forest structure is the desired condition. Historical range of variability will be evaluated on National Forest system lands at the appropriate scale given vegetation type and natural disturbance history. Table 14 displays the desired conditions for each vegetation type.

FW-DC-VEG-09. Invasive Plant Species Integrated Management

Forest terrestrial and aquatic ecosystems are in an ecological condition that resists introduction, establishment, and spread of invasive plant species (from private lands to National Forest System lands, from National Forest System lands to private lands and from different areas within the boundaries of the Colville National Forest). Established invasive plant infestations are not increasing in number or size, occur at low densities, and are reduced or removed. Risk of invasive plant infestations is maintained at a low level due to the effectiveness of prevention actions and the success of restoration efforts.

FW-DC-VEG-13. Fuels Treatments in Wildland-urban Interface

Fuel treatments continue to reduce surface, ladder, and crown fuels that lower the potential for high-severity wildfires while providing for diversity within the stands. Generally, treated areas consist of open understories with overstory trees (conifers and hardwoods) populated by predominately fire resistant species, with scattered individual or small patches of shrubs and small trees in the understory, maintaining some cover in important wildlife corridors. Surface, ladder, and crown fuels have been treated and maintained to allow low-intensity surface wildland fires (flame lengths of 4 feet or less). Vegetation has been modified (interrupted) to improve community protection and enhance public and firefighter safety. Crown base heights (height from the forest floor to the bottom most branches of the live tree crown) are managed to avoid crown fires. Crown cover of forest stands allow for adequate

spacing between crowns to reduce crown fire potential while minimizing effects on surface wind speeds and drying of surface fuels.

FW-DC-VEG-15. Treatment Priorities in Wildland-urban Interface

Fuel treatments are emphasized in wildland-urban interface and areas that exhibit the potential for high-severity fire behavior that could impact private or other agency lands.

FW-DC-VEG-16. Maintenance in Wildland-urban Interface

A pattern of treatments are established and maintained that are effective in modifying fire behavior as identified in individual community wildfire protection plans.

Table 14 - Desired condition for forest structure

	Early %	Mid Open %	Mid Closed %	Late Open %	Late Closed %
Douglas-fir dry	6-16	2-8	4-13	38-78	1-32
Northern Rocky Mountain mixed conifer	9-25	1-3	18-30	4-6	44-60
Western hemlock / Western redcedar	4-24	0	7-27	0	55-83
Subalpine fir / Lodgepole pine	45-65	0	33-53	0	3
Spruce / Subalpine fir	14-46	0	13-41	0	29-57

The vegetation objective pertinent to this consultation is:

Initiate active management activities on 6 to 12 thousand acres per year over the next 15 years to move structure toward desired conditions at landscape scales in order to have landscapes dominated by Fire Regime Condition Class I, with the remainder in Fire Regime Condition Class II trending toward Fire Regime Condition Class I.

The vegetation standards and guidelines that may be particularly pertinent to this consultation are:

FW-STD-VEG-04. Timber Production

Regulated timber harvest activities shall occur only on those lands classified as suitable for timber production.

FW-STD-VEG-05. Harvest Openings

If individual harvest openings created by even-aged silvicultural practices are proposed that would exceed 40 acres, then NFMA requirements regarding public notification and approval shall be followed. These requirements do not apply to the size of areas harvested because of catastrophes such as, but not limited to, wildfire, insect and disease attacks, or wind storms.

FW-STD-VEG-07. Even-aged Management

Even-aged stands shall generally have reached or surpassed culmination of mean annual increment (95 percent of CMAI, as measured by cubic volume) prior to regeneration harvest, unless the following conditions have been identified during project development

When such harvesting would assist in reducing fire hazard within the WUI [wildland-urban interface]; and when harvesting of stands will trend landscapes toward vegetation desired conditions.

FW-STD-VEG-08. Even-aged Management

Even-aged prescriptions (clearcut, seed tree, shelterwood, etc.) shall be used when appropriate to meet Forest Plan direction.

FW-STD-VEG-09. Harvest Systems

Harvesting systems shall be selected based on their ability to meet desired conditions and not strictly on their ability to provide the greatest dollar return.

FW-GDL-VEG-06. Invasive Species – Early Detection and Rapid Response

Principles and processes of early detection and rapid response (EDRR) should be utilized to find, identify, and quantify new invasive species occurrences. EDRR can be coupled with other integrated activities to rapidly assess and respond with quick and immediate actions to eradicate, control, or contain invasive species.

FW-GDL-VEG-07. Invasive Species – Pesticide Use

Minimize use of pesticides (including herbicides), formulations or tank mixes where plausible exposures indicate potential harm to human health, wildlife, or fish. Design projects to minimize or eliminate risks of adverse effects from chemical use. Notify the public prior to using pesticides (including herbicides) within the national forest.

FW-GDL-VEG-08. Native and Non-native Insects and Pathogens

Intervention may occur when native and non-native insects and pathogens are not operating in their characteristic role or when site-specific objectives (ex: impacts to key watersheds, increased wildfire hazard, potential impacts to the recovery of threatened or endangered species, or maintaining late and old forest structure) are at risk.

National Forest Access System (AS)

All national forest roads, trails, bridges and docks that are managed by the Forest to provide access on National Forest System lands are referred to in the Plan as the access system. The AS management has some of the greatest potential for adverse effects to watershed conditions, riparian and aquatic habitats. As with Vegetation Management, the magnitude and extent of adverse potential effects will likely be influenced by the Plan components for the MAs within the Pend Oreille River subbasin and the amount of land in the MAs.

Desired conditions for AS include in summary:

FW-DC-AS-01. Access System

Providing an access system of authorized roads, bridges, trails, and docks is safe, affordable, and environmentally sound; responds to administrative and public needs to the extent practicable; meets obligations to public and private cooperators; supports forest management objectives and is efficient to manage address public needs and facilitate planned resource activities; is maintained commensurate with maintenance levels, levels of use, and available funding.

FW-DC-AS-02. Trail System Motorized and Non-Motorized

A variety of summer and winter system trails provide a range of difficulty and seclusion levels for the various user types; are located in diverse ecological, geological, and scenic settings; and minimize user conflicts; a maintained and environmentally sound trail system is in place, providing for user safety and access to locations of interest and the use (e.g., recreation, minerals, vegetation treatment, and fire protection) of the Colville National Forest.

FW-DC-AS-03. Connections

Where feasible, Forest Service recreation sites are connected to each other and to adjacent communities through pathways, trails, bike lanes, and waterways providing opportunities for both motorized and/or non-motorized modes of travel.

FW-DC-AS-04. Wilderness Trails

Wilderness trails provide for administrative and public use. They provide for the enjoyment of wilderness in a variety of settings and with varying degrees of challenge and opportunities for solitude.

FW-DC-AS-05. Developed Recreation Sites

Roads accessing developed recreation sites (such as campgrounds, day use sites, and trailheads) are maintained at a level generally accessible by passenger vehicle.

The AS objectives that are most pertinent to the potential effects to bull trout and critical habitat are:

FW-OBJ-AS-02. Trail Management

Within 15 years of plan implementation, improve drainage, water crossing and trail layout on 5 percent of the Forest's trail system designed for mountain bikes, motorized use, and pack stock.

FW-OBJ-AS-03. Trail Maintenance

Annually, maintain at least 20 percent of the Forest's motorized and non-motorized trail system.

The AS guideline that is most pertinent to the potential effects to bull trout and critical habitat is:

FW-GDL-AS-05. Motorized and Non-motorized Trails states in part; New trails should be located to avoid meadows, wetlands, riparian areas, stream bottoms, sacred sites, and areas with high concentrations of significant archaeological sites. The number of stream crossings should be minimized or mitigated to reduce impacts to aquatic species. Meadow crossings should be designed or redesigned to maintain or restore hydrologic function.

Lands and Special Uses

The Forest "Lands" program include activities such as Landownership Adjustment, Boundary and Title Management (including land exchanges and acquisitions, granting or accepting of easements), and other activities that are primarily real estate-type actions. The goals of this program include: (1) consolidating landownership patterns to meet the objectives of forest land and resource management plans and to improve land management efficiencies; (2) securing and protecting the rights, title, land, and resources of public land from unauthorized use and occupancy; (3) providing legally defensible boundaries and accurate, complete landownership records of National Forest System lands. A potential beneficial effect is one of the reasons for land acquisition is to maintain, restore, and enhance plant, wildlife, and riparian aquatic and riparian-dependent resources and habitat including aspects of connectivity, foraging and

reproduction for threatened and endangered and species of conservation concern. These program activities will continue and do not change as a result of the Plan.

All uses of National Forest System lands, improvements, and resources, except those provided for in the regulations governing the disposal of timber, minerals, and the grazing of livestock, are designated 'special uses.' The Forest administers a variety of uses under special use permits, leases, or easements. Management direction applies to the area authorized by the special use permit, lease, or easement.

Desired conditions that are most pertinent to the potential effects to bull trout and critical habitat are:

FW-DC-LSU-02. Authorization

All occupancy and use of National Forest System lands is properly authorized. Facilities and improvements that are not owned, managed or maintained by the Forest Service are either removed or authorized through the appropriate special use authorization when they meet forest plan direction and are feasible within resource constraints (examples include roads, utility lines, or communication sites).

FW-DC-LSU-03. Utility Corridors and Communication Sites (in summary)

Utility corridors and communication sites provide for the movement and distribution of electricity, petroleum products, water, other lineal special uses, and communication signals across National Forest System lands. Existing utility corridors are used to maximum capacity, where feasible, before additional corridors are considered. New high-voltage electricity corridors would be located in a way that minimizes effects to forest resources and values. Forest corridor designations are consistent with such designations on adjacent federal lands.

Utility corridors and communication sites are permanently altered areas, used for operating and maintaining the infrastructure associated with these corridors and sites. Vegetative conditions within corridors or communication site areas ensure operation of permitted uses and blend with the surrounding desired vegetative pattern where possible. Vegetation around utility corridors and communication sites would be managed to improve safety and resilience to wildland fire, provide screening, and contribute to a natural appearing landscape character setting appropriate to the surrounding scenic integrity objective.

FW-DC-LSU-04. Water Collection and Delivery Systems

Existing water diversions or developments do not measurably alter natural processes of aquatic ecosystems. Effects to other resources are minimized by incorporation of best management practices and other resource protection measures. New water developments, diversions, or allowance for occupancy to divert water from National Forest System lands generally do not occur in wetlands and their water source areas, and are discouraged in habitats where endangered, threatened, or species of conservation concern reside.

FW-DC-LSU-05. Recreation and Special Uses

Approved recreation special use authorizations support activities that enhance or expand the variety of recreational opportunities available on the Forest, are compliant with the Forest's recreation strategy, and are dependent on the resources and settings found within the Forest's boundary. Lands where special use activities have occurred show little evidence of impacts.

There are no objectives, standards, or guidelines with potential effects to bull trout and critical habitat.

Livestock Grazing

Livestock grazing within RMAs can potentially adversely affect bull trout and bull trout critical habitat. There are 9 allotments within the Pend Oreille River subbasin. Three allotments contain critical habitat.

Permitted livestock grazing on National Forest System lands is managed through a permit system that identifies allotments and specific conditions for use of the allotments. The Plan provides overall guidance for grazing, with allotment management plans providing specific guidance for each allotment. Recreational grazing is an activity associated with the recreational use of pack and saddle stock such as horses, mules, llamas, and goats. Plan components apply to both commercial and recreational grazing unless specifically stated otherwise. The Plan does not change any existing allotments or propose new allotments.

The Livestock Grazing desired conditions that or most pertinent to the bull trout and critical habitat effects discussion are:

FW-DC-LG-01. Plant Community Structure and Diversity

The desired structure and diversity of native herbaceous plant communities (including highly palatable forage species) are maintained or enhanced through proper livestock management principles. Rangelands consisting of native plant communities such as open conifer forests, low- elevation grasslands, shrub-steppe plant communities, and meadows have few to no invasive plant species, have stable or improving ecological conditions, and are resilient to disturbance events. Rangelands with significant non-native plant components (seeded meadows or historically overgrazed sites) have stable or improving soil stability.

FW-DC-LG-02. Economic and Social Contributions

The desired condition states in part that consistent with sustaining other resource desired conditions, a viable level of forage is available for use under a grazing permit system where use generally occurs on an annual basis generally between June and October. Riparian and upland areas within allotments reflect ecological conditions supporting the desired conditions, including those described in the Wildlife, Aquatic and Riparian, Soil, and Vegetation Desired Conditions.

MA-DC-RMA-03. Livestock Grazing

Livestock grazing of riparian vegetation retains sufficient plant cover, rooting depth and vegetative vigor to protect stream bank and floodplain integrity against accelerated erosional processes, and allows for appropriate deposition of overbank sediment.

There is one objective for rangeland improvement in addition to the watershed objective for range improvements discussed in previous sections.

FW-OBJ-LG-01. Range Improvement Projects

Within 15 years of plan implementation, recondition or reconstruct an average of 1 to 4 percent of the existing range infrastructure on National Forest System lands annually. Such range infrastructure would include water developments, livestock handling facilities and fences. Within 5 years of a decision being made to implement an Allotment Management Plan, relocate, when necessary, 75 percent of range infrastructure (ex. water developments, fences, loading chutes, holding structures) that has become non-functional or in need of replacement that have been identified (as problem areas) in an Allotment Management Plan or during monitoring.

The Plan includes standards and guidelines specifically developed to prevent or minimize the potential adverse effects grazing can have on riparian and aquatic habitat.

MA-STD-RMA-09. Management of Livestock Grazing to Attain Desired Conditions

Manage livestock grazing to move toward aquatic and riparian desired conditions. Where livestock grazing is found to prevent or retard attainment of aquatic and riparian desired conditions, modify grazing management. If adjusting practices is not effective, remove livestock from that area using appropriate administrative authorities and procedures.

MA-STD-RMA-10. Recreational and Permitted Grazing Management-Livestock Handling, Management, and Water Facilities

New and replaced livestock handling and/or management facilities and livestock trailing, salting, and bedding are prohibited in riparian management areas unless they do not prevent or retard attainment of aquatic and riparian desired conditions, inherently must be located in an RMA, or are needed for resource protection.

MA-STD-RMA-11. Permitted Grazing Management - Allotment Management Planning

During allotment management planning, negative impacts to water quality and aquatic and riparian function from existing livestock handling or management facilities located within riparian management areas shall be minimized to allow conditions to move toward the desired condition.

MA-GDL-RMA-10. Annual Grazing Use Indicators

The purpose of this guideline is to manage livestock grazing to help attain and maintain aquatic and riparian desired conditions over time. Specifically, it is intended to maintain or improve vegetative and stream conditions, help ensure the viability of aquatic species, provide important contributions to the recovery of ESA-listed species, and facilitate attainment of State water quality standards.

The annual livestock use and disturbance indicators described below should be applied to help achieve, over longer timeframes, conditions at site and watershed scales that enable attainment and maintenance of desired conditions. The values specified below are starting points for management. Only those indicators and numeric values that are appropriate to the site and necessary for maintaining or moving towards desired conditions should be applied. Specific indicators and indicator values should be prescribed and adjusted, if needed, in a manner that reflects existing and natural conditions for the specific geo-climatic, hydrologic and vegetative setting in which they are being applied[12] . Indicators and indicator values should be adapted over time based on long-term monitoring and evaluation of conditions and trends. Alternative use and disturbance indicators and values, including those in current ESA consultation documents, may be used if they are based on best available science and monitoring data and meet the purpose of this guideline.

[12] For example, the stubble height values contained herein may not be appropriate for some sites (e.g., those with short graminoids)

1. In subwatersheds that are functioning properly[13] for water quality, aquatic habitat, and riparian and wetland vegetation, maintain those conditions by managing annual livestock grazing use and disturbance as follows[14] :

    - Maintain a minimum of 6-inch residual herbaceous stubble height on the greenline[15] , except for sites in late-seral conditions[16] being managed under any grazing system that supports a late-seral ecological stage, where a minimum of 4-inch to 6-inch stubble height should be maintained

    - Utilize no more than 30-45% of deep-rooted herbaceous vegetation in the active floodplain and, as needed, in other critical portions of the riparian management area

    - Alter no more than 20-25% of streambanks[17]

    - Limit use of woody species to no more than 30-40% of current year's leaders along streambanks and, as needed, in other critical portions of the riparian management area

2. In subwatersheds that are functioning-at-risk or that have impaired function for water quality, aquatic habitat, and/or riparian and wetland vegetation and where grazing contributes to those conditions, enable recovery by managing annual livestock grazing use and disturbance as follows:

    - Maintain a minimum of 6-inch to 8-inch residual herbaceous stubble height on the greenline;

    - On sites with late-season grazing[18] and where willow is or should be an important component of the riparian vegetation community, maintain a minimum of 8-inch residual herbaceous stubble height;

    - Utilize no more than 30-35% of deep-rooted herbaceous vegetation in the active floodplain and, as needed, in other critical portions of the riparian management area;

    - Alter streambanks no more than 15-20%;

[13] Subwatershed classification as properly functioning, functioning-at-risk, or impaired function should be determined based on a weight-of-evidence approach that considers, at a minimum, the water quality, aquatic habitat, and riparian/wetland vegetation indicators of the Watershed Condition Framework (WCF). Only WCF water quality parameters relevant to livestock grazing (e.g., temperature, nutrients, bacteria, sediment) need be considered. Local inventory, assessment and monitoring data and information (e.g., Multiple Indicator Monitoring, Proper Functioning Condition) can be used to refine initial classifications made per WCF.

[14] Per Pacfish/Infish Monitoring, Multiple Indicator Monitoring (BLM Technical Reference 1737-23) protocols or comparable methods for stubble height, streambank alteration, and use of woody species. Per Bureau of Land Management protocols (BLM/RS/ST-96/004+1730) or comparable methods for herbaceous utilization.

[15] Stubble height criteria apply at the end of the grazing period, when that period ends after the growing season. When the grazing period ends before the growing season does, stubble height criteria can be applied at the end of the grazing period or the end of the growing season.

[16] 'Late-seral' means the existing riparian vegetation community is >60% similar to the potential natural community composition (per Winward 2000).

[17] Streambank alteration criteria apply within 1-2 weeks of removal of livestock from each pasture.

[18] Late season grazing generally begins after sugar storage in woody vegetation is complete and leaf fall has started. Upland plant seeds have shattered and mean air temperatures begin to cool.

- Limit use of woody species to no more than 20-30% of current year's leaders along streambanks and, as needed, other critical portions of the riparian management areas.

More conservative values, within and potentially beyond the ranges described above, should be used when: (1) relevant indicators (e.g., water quality, aquatic habitat, riparian vegetation) are highly departed from desired conditions and not improving due to livestock influence; (2) ESA-listed aquatic species or critical habitat sensitive to grazing impacts are present and conditions are not improving; or (3) grazing-related requirements of water quality restoration plans for impaired waters (e.g., site potential shade) are not being met and conditions are not improving.

Implement other applicable actions contained in ESA Recovery Plans and water quality restoration plans.

MA-GDL-RMA-11. Recreational and Permitted Grazing Management – Livestock Handling Activities

Livestock trailing, bedding, loading, and other handling activities should be avoided in riparian management areas, except for those that inherently must occur in a riparian management area.

MA-GDL--RMA-12. Recreational and Permitted Grazing Management - Fish Redds

Prohibit livestock trampling of Federally-listed Threatened or Endangered fish redds.

Minerals

These plan components cover mineral and geological activities that take place within National Forest System lands. The Forest is mainly involved in the surface resource management and protection aspects of locatable mineral exploration and development. Due to the structure of mineral laws and regulations, the Forest Service cooperates with the U.S. Department of Interior in administering lawful exploration and development of leasable minerals on National Forest System lands. The Forest manages saleable mineral activities, which includes the sale or free use of mineral materials such as sand, gravel, stone, and common materials. The Forest also manages a number of abandoned mine sites resulting from historical mining activities. There is currently one large mining operation near Metaline Falls where the operations have actually tunneled under the Pend Oreille River. There is also a slate rock mining operation on private lands in the Indian Creek drainage and suction dredging is common in Sullivan Creek. The Plan does not authorize any specific new mineral activities.

The three Mineral desired conditions are relevant to watershed, riparian and aquatic resources.

FW-DC-MIN-01. Mineral Materials Availability

Saleable mineral materials are available based upon agency needs, public interest, material availability, resource protection and capability.

FW-DC-MIN-02. Reclamation and Extraction

Operations include interim and post-operation reclamation measures to ensure the long-term function and stability of resources including, but not limited to, soil; vegetation; water quality; aquatic, riparian and upland habitats; and scenic integrity objectives.

FW-DC-MIN-03. Abandoned Mine Sites

Abandoned mine sites pose no major environmental or public safety risk

MA-STD-RMA-17. Mineral Operations in RMAs

For operations in RMAs, ensure operators take all practicable measures to maintain, protect, and rehabilitate water quality and habitat for fish and wildlife and other riparian-dependent resources affected by the operations. Ensure operations do not retard or prevent attainment of aquatic and riparian desired conditions. Exceptions to this standard include situations where Forest Service has limited discretionary authorities. In those cases, project effects shall be minimized and shall not prevent or retard attainment of aquatic and riparian desired conditions to the extent possible within those authorities.

MA-STD-RMA-18. Operating Plans for Existing Activities

Work with permittees to adjust their mineral operations to minimize adverse effects to aquatic and riparian-dependent resources in RMAs. Require BMPs and other appropriate conservation measures to mitigate potential mine operation effects.

MA-STD-RMA-19. Structures and Support Facilities

Work with operators to locate structures, support facilities, and roads outside RMAs. Where no alternative exists, work with operators to locate and manage them to minimize effects upon aquatic and riparian desired conditions. When structures, support facilities, and roads are no longer required for mineral activities, reclaim sites to achieve aquatic and riparian desired conditions.

MA-STD-RMA-20. Mine Waste

Do not locate mine waste with the potential to generate hazardous substances (as defined by CERCLA) within RMAs and/or areas where groundwater contamination is possible. The exception is short-term staging of waste during abandoned mine cleanup.

MA-STD-RMA-21. Leasable Exploration and Development

Consent decisions to allow mineral leasing will provide Bureau of Land Management (BLM) stipulations for lease management. Once leased, the Forest will actively coordinate and consult with BLM regarding lease exploration and development activities. In consultation with the BLM, the Forest will recommend BMPs and mitigation as Conditions of Approval to support attainment and maintenance of aquatic and riparian desired conditions.

MA-STD-RMA-22. Saleable Minerals

Prohibit saleable mineral activities such as sand and gravel mining and extraction within RMAs unless no alternatives exist and if the action(s) will not retard or prevent attainment of aquatic and riparian desired conditions.

MA-STD-RMA-23. Inspection and Monitoring of Mineral Plans, Leases, and Permits

Conduct inspections, monitor, and annually review required monitoring for mineral plans, leases, and permits. Evaluate inspection and monitoring results and require mitigations for mineral plans, leases, and permits as needed to eliminate impacts that retard or prevent attainment of aquatic and riparian desired conditions.

MA-STD-RMA-24. Suction Dredge and Placer Mining

Mineral activities on NFS lands shall avoid or minimize adverse effects to aquatic threatened or endangered species/populations and their designated critical habitat.

- All suction dredge mining activities in occupied habitat for aquatic threatened or endangered species/populations and in their designated critical habitat shall be evaluated by the District

Ranger to determine if the mining activity is causing or "will likely cause significant disturbance of surface resources"[19] . A likelihood that a threatened or endangered species "take" (defined in Section 3[18] of the ESA of 1973 as amended) incidental to the mining activity is an example of a significant resource disturbance. Other significant disturbances that do not involve incidental take might involve effects on channel stability or stream hydraulics.

- If the District Ranger determines that placer mining operations are causing or will likely cause significant disturbance to surface resources, the District Ranger shall contact and inform the operator to seek voluntary compliance with 36 CFR 228 mining regulations and to cease operations until compliance.

Recreation

Recreation is a large program with the potential to effect bull trout and critical habitat. The Recreation guidance applies to recreational settings and natural resource-based recreational activities offered on the Forest, from developed opportunities to those that are primitive.

The one desired conditions Recreation that has some relevance to potential effects to bull trout and critical habitat is:

FW-DC-REC-01. Recreation Settings and Experiences (in part)

The Forest provides a spectrum of high quality, nature-based outdoor recreational settings and opportunities varying from primitive to urban and dispersed to developed where visitors can experience the biological, geological, scenic, and cultural resources of the Forest, with an emphasis on the natural-appearing character of the forest.

Dispersed recreation opportunities are available (e.g., camping, backcountry skiing, boating, mushroom and berry picking, hunting, and fishing) and dispersed recreation sites (e.g., campsites, vistas, parking areas) occur in a variety of recreation opportunity spectrum classes throughout the forest.

Facilities for dispersed recreation activities are appropriate for the recreation opportunity spectrum class and scenic integrity objective of the location and are designed to the minimum necessary to protect natural and cultural resources.

There is one guideline regarding dispersed recreation that is pertinent to bull trout.

FW-GDL-REC-02. Dispersed Recreation

In dispersed areas, the priority for facilities or minor developments should be access and protection of the environment, rather than the comfort or convenience of the visitors.

Dispersed campsites should not be designated in areas with sensitive soils or within 50 feet of streams, wetlands, or riparian areas to prevent vegetation and bank damage, soil compaction, additional sediment, or soil and water contamination.

[19] The phrase ''will likely cause significant disturbance of surface resources'' means that, based on past experience, direct evidence, or sound scientific projection, the District Ranger reasonably expects that the proposed operations would result in impacts to NFS lands and resources which more probably than not need to be avoided or ameliorated by means such as reclamation, bonding, timing restrictions, and other mitigation measures to avoid or minimize adverse environmental impacts on NFS resources.

3.0 Action Area

The section 7 implementing regulations define the "action area," which includes all areas to be affected directly or indirectly by the Federal action, not merely the immediate area involved in the action (50 CFR §402). The planning area includes all federal land managed or administered by the Colville National Forest which occupies about one-third of the total area in Ferry, Pend Oreille, and Stevens Counties, Washington. The Colville National Forest includes 1.1 million acres of national forest lands located in northeastern Washington. To the north, the Forest is border by British Columbia, the Okanogan-Wenatchee National Forest to the west, the Idaho Panhandle National Forest to the east, and to the south a portion of the Colville Confederated Tribes Indian Reservation and Pend Oreille National Wildlife Refuge.

Two north-south oriented mountain ranges comprise the bulk of the Colville National Forest. The 7,000 foot Selkirk Range lies on the eastern edge of the Forest, while the Kettle River Range lies in the western portion. The Pend Oreille River, flowing along the western edge of the Selkirk Range is surrounded mostly by private lands. The 130 mile long Lake Roosevelt National Recreation Area, a portion of the Columbia River reservoir behind Grand Coulee Dam, divides the national forest and separates the Selkirk and Kettle mountain ranges.

Three vegetation zones comprise the Colville National Forest, each with a unique climate and topography. Dry forests of ponderosa pine and Douglas-fir dominate the rolling landscape of the Okanogan Highlands west of the Kettle Crest. The subalpine fir types occur along the Kettle Crest. Western redcedar and western hemlock forests occur along the western portion of the Selkirk Range where rainfall reaches 50 inches a year.

The very eastern portion of the Forest is included in the Selkirk Grizzly Bear Recovery Area (USFWS 1993). The recovery area is one of two in Washington and one of six in the US. The Forest also contains a recovery area and designated critical habitat for the last remaining herd of woodland caribou in the continental US. The recovery area for the Selkirk Mountain Woodland Caribou, the most endangered mammal in the continental US, includes a portion of the Colville National Forest. The Kettle Range was identified as a Core Area for Canada lynx (USFWS 2005) although there is no designated critical habitat for this species on the Forest (USFWS 2009). The Forest provides potential habitat for the yellow-billed cuckoo. The Colville National Forest provides habitat or potential habitat for the wolverine, which has been proposed for listing under the Federal Endangered Species Act on October 18, 2016 (Federal Register 81, 71670-71671).

Bull trout population numbers on the CNF are very small and local populations may not currently exist, although occasional individuals are observed in streams on the Forest within the Pend Oreille River subbasin. In the United States, the Pend Oreille River subbasin (17010216) encompasses 698,895 acres of which 407,899 acres are managed by the CNF. All designated bull trout critical habitat on the Forest is within the Pend Oreille River subbasin. These tributaries lie within the Lower Clark Fork Geographic Region, Pend Oreille Core Area. The large Pend Oreille Core Area has been divided into three parts. The streams tributary to the Pend Oreille River flowing off the Forest are in LPO-C, which includes the Lower Pend Oreille basin downstream of Albeni Falls Dam to Boundary Dam (1 mile upstream from the Canadian border) and bisected by Box Canyon Dam; including portions of Idaho, eastern Washington,

and the Kalispel Reservation (USFWS 2015a). There are thirty subwatersheds, eighteen of which have streams with designated critical habitat. Of the 228 miles of critical habitat in the subwatersheds approximately 98 stream miles are within the CNF boundary.

Table 15 - Subwatersheds within the Pend Oreille subbasin

HUC12 Number	HUC12 Associated With Pend Oreille HUC8	Total HUC 12 Acres (Within the US)	HUC 12 Acres Inside CNF	Miles of Stream Bull Trout Critical Habitat Total/CNF
170102160901	Big Muddy Creek	17,661	11,628	0/0
170102160104	Calispell Creek	27,377	1,109	7/0
170102161003	Cedar Creek	17,150	5,359	0/0
170102160204	Cee Cee Ah Creek	12,063	6,500	0/0
170102160207	Cusick Creek-Pend Oreille River	30,687	10,018	12/0
170102160203	Davis Creek – Pend Oreille River	32,667	0	0/0
170102160303	East Branch LeClerc Creek	26,663	11,145	21/10
170102160201	Exposure Creek-Pend Oreille River	41,224	14,463	16/2
170102160904	Flume Creek-Pend Oreille River	20,453	14,231	5/.2
170102160401	Harvey Creek	32,999	27,554	0/0
170102160702	Headwaters South Salmo River	15,849	15,849	0/0
170102160402	Headwaters Sullivan Creek	45,516	45,417	18/18
170102160306	Lost Creek	20,007	17,741	0/0
170102160307	Maitlen Creek-Pend Oreille River	33,608	18,070	10/0
170102160301	Middle Creek-Pend Oreille River	23,209	5,066	11/3
170102160101	North Fork Calispell Creek	35,963	23,848	0/0
170102160403	North Fork Sullivan Creek-Sullivan Creek	12,709	11,259	5/3
170102160704	Outlet South Salmo River	3,549	3,549	0/0
170102161004	Pend Oreille River	4,308	2,474	0/0
170102160905	Pewee Creek-Pend Oreille River	20,499	16,023	5/.3
170102160304	Ruby Creek	19,597	18,385	13/12
170102160202	Skookum Creek	31,811	14,192	0/0
170102160903	Slate Creek	19,922	19,922	1/.6
170102160103	Smalle Creek	17,754	11,058	11/3
170102160902	Sweet Creek-Pend Oreille River	41,832	28,890	21/6
170102160206	Tacoma Creek	39,519	27,182	38/25
170102160205	Trimble Creek	7,102	917	0/0
170102160302	West Branch LeClerc Creek	21,672	15,099	15/11
170102160102	Winchester Creek	10,482	5,628	10/4
170102160305	Yokum Lake-Pend Oreille River	15,044	5,323	9/0
	Grand Total	698,895	407,899	228/98

4.0 Status / Environmental Baseline of the Species and Critical Habitat

Regulations implementing the ESA (50 CPR 402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed federal projects in the action area that have undergone section 7 consultation, and the impacts of state and private actions which are contemporaneous with the consultation in progress.

4.1 STATUS / ENVIRONMENTAL BASELINE - Bull Trout

4.1.1 Current Status and Conservation Needs

The following information was input directly from the Biological Opinion for the Box Canyon Dam Upstream Passage Facility (USFWS 2015c; per instruction by Erin Kuttel, USFWS Eastern Washington Field Office.[20] All references in this section are as cited by USFWS (2015c). Note at the time USFWS (2015c) was completed the bull trout recovery plan was not final. The recovery plan (USFWS 2015a) has since been finalized, therefore the information for the Columbia Headwaters Recovery Unit was input directly from the *Columbia Headwaters Recovery Unit Implementation Plan* (USFWS 2015a). See USFWS (2015a) for references.

The coterminous United States population of the bull trout (*Salvelinus confluentus*) was listed as threatened on November 1, 1999 (64 FR 58910). The threatened bull trout generally occurs in the Klamath River Basin of south-central Oregon; the Jarbidge River in Nevada; the Willamette River Basin in Oregon; Pacific Coast drainages of Washington, including Puget Sound; major rivers in Idaho, Oregon, Washington, and Montana, within the Columbia River Basin; and the St. Mary-Belly River, east of the Continental Divide in northwestern Montana.

Throughout its range, bull trout are threatened by the combined effects of habitat degradation, fragmentation, and alterations associated with dewatering, road construction and maintenance, mining, grazing, the blockage of migratory corridors by dams or other diversion structures, poor water quality, entrainment (a process by which aquatic organisms are pulled through a diversion or other device) into diversion channels, and introduced non-native species (64 FR 58910).

Although all salmonids are likely to be affected by climate change, bull trout are especially vulnerable given that spawning and rearing are constrained by their location in upper watersheds and the requirement for cold water temperatures. Poaching and incidental mortality of bull trout during other targeted fisheries are additional threats.

The bull trout was initially listed as three separate Distinct Population Segments (DPSs) (63 FR 31647; 64 FR 17110). The preamble to the final listing rule for the United States coterminous population of the bull trout discusses the consolidation of these DPSs with the Columbia and Klamath population segments into one listed taxon and the application of the jeopardy standard under section 7 of the Act relative to this species (64 FR 58910):

Although this rule consolidates the five bull trout DPSs into one listed taxon, based on conformance with the DPS policy for purposes of consultation under section 7 of the Act, the USFWS intend to retain

[20] Personal communication Erin Kuttel, USFWS Spokane, Wa with Karen Honeycutt, Colville National Forest (8/15/2016)

recognition of each DPS in light of available scientific information relating to their uniqueness and significance. Under this approach, these DPSs will be treated as interim recovery units with respect to application of the jeopardy standard until an approved recovery plan is developed. Formal establishment of bull trout recovery units will occur during the recovery planning process.[21]

On September 19, 2015, the USFWS announced the availability the final draft recovery plan for the coterminous U.S. population of bull trout. This revised recovery plan focuses on the identification and management of known threat factors in core areas in six recovery units. The final recovery plan updated the recovery criteria. The new recovery unit boundaries differ significantly to the 2002 draft recovery plan within the project area. Therefore, the analysis considers information based on both recovery plans and the delineations of recovery units.

In recognition of available scientific information relating to their uniqueness and significance, five segments of the coterminous United States population of bull trout are considered essential to the survival and recovery of this species and are identified as interim recovery units: 1) Jarbidge River, 2) Klamath River, 3) Columbia River, 4) Coastal-Puget Sound, and 5) St. Mary-Belly River. Each of these recovery units is necessary to maintain the bull trout's distribution, as well as its genetic and phenotypic diversity, all of which are important to ensure the species' resilience to changing environmental conditions.

A summary of the current status and conservation needs of the bull trout within the recovery units is provided below and a comprehensive discussion is found in the USFWS recovery plan for the bull trout.

The conservation needs of bull trout are often generally expressed as the four "Cs": cold, clean, complex, and connected habitat. Cold stream temperatures, clean water quality that is relatively free of sediment and contaminants, complex channel characteristics (including abundant large wood and undercut banks), and large patches of such habitat that are well connected by unobstructed migratory pathways are all needed to promote conservation of bull trout at multiple scales ranging from the coterminous to local populations (a local population is a group of bull trout that spawn within a particular stream or portion of a stream system). The recovery planning process for bull trout has also identified the following conservation needs: 1) maintenance and restoration of multiple, interconnected populations in diverse habitats across the range of each interim recovery unit, 2) preservation of the diversity of life-history strategies, 3) maintenance of genetic and phenotypic diversity across the range of each interim recovery unit, and 4) establishment of a positive population trend. Recently, it has also been recognized that bull trout populations need to be protected from catastrophic fires across the range of each interim recovery unit.

Central to the survival and recovery of bull trout is the maintenance of viable core areas. A core area is defined as a geographic area occupied by one or more local bull trout populations that overlap in their use of rearing, foraging, migratory, and overwintering habitat. Each of the interim recovery units listed above consists of one or more core areas. There are 121 core areas recognized across the coterminous range of the bull trout.

[21] The final recovery plan was completed September 29, 2015 (USFWS 2015a). The bull trout populations described in this BA are part of the Columbia Headwaters Recovery Unit.

4.1.2 Life History (from USFWS 2015c. See USFWS 2015c for references).

Bull trout exhibit both resident and migratory life history strategies. Both resident and migratory forms may be found together, and either form may produce offspring exhibiting either resident or migratory behavior. Resident bull trout complete their entire life cycle in the tributary (or nearby) streams in which they spawn and rear. The resident form tends to be smaller than the migratory form at maturity and also produces fewer eggs. Migratory bull trout spawn in tributary streams where juvenile fish rear 1 to 4 years before migrating to either a lake (adfluvial form), river (fluvial form)[22] (Fraley and Shepard 1989, or saltwater (anadromous form) to rear as subadults and to live as adults. Bull trout normally reach sexual maturity in 4 to 7 years and may live longer than 12 years. They are iteroparous (they spawn more than once in a lifetime). Repeat- and alternate-year spawning has been reported, although repeat-spawning frequency and post-spawning mortality are not well documented.

The iteroparous reproductive strategy of bull trout has important repercussions for the management of this species. Bull trout require passage both upstream and downstream, not only for repeat spawning but also for foraging. Most fish ladders, however, were designed specifically for anadromous semelparous salmonids (fishes that spawn once and then die, and require only one-way passage upstream). Therefore, even dams or other barriers with fish passage facilities may be a factor in isolating bull trout populations if they do not provide a downstream passage route. Additionally, in some core areas, bull trout that migrate to marine waters must pass both upstream and downstream through areas with net fisheries at river mouths. This can increase the likelihood of mortality to bull trout during these spawning and foraging migrations.

Growth varies depending upon life-history strategy. Resident adults range from 6 to 12 inches total length, and migratory adults commonly reach 24 inches or more. The largest verified bull trout is a 32-pound specimen caught in Lake Pend Oreille, Idaho, in 1949.

4.1.3 Habitat Characteristics (from USFWS 2015a. See USFWS 2015a for references).

Bull trout have more specific habitat requirements than most other salmonids. Habitat components that influence bull trout distribution and abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrate, and migratory corridors. Watson and Hillman concluded that watersheds must have specific physical characteristics to provide the habitat requirements necessary for bull trout to successfully spawn and rear and that these specific characteristics are not necessarily present throughout these watersheds. Because bull trout exhibit a patchy distribution, even in pristine habitats, bull trout should not be expected to simultaneously occupy all available habitats.

Migratory corridors link seasonal habitats for all bull trout life histories. The ability to migrate is important to the persistence of bull trout. Migrations facilitate gene flow among local populations when individuals from different local populations interbreed or stray to nonnatal streams. Local populations that are extirpated by catastrophic events may also become reestablished by bull trout migrants.

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[22]Adfluvial: Life history pattern of spawning and rearing in tributary streams and migrating to larger rivers to mature.
Fluvial: Life history pattern of spawning and rearing in tributary streams and migrating to larger rivers to mature.
Resident: Life history pattern of residing in tributary streams for the fish's entire life without migrating.

However, it is important to note that the genetic structuring of bull trout indicates there is limited gene flow among bull trout populations, which may encourage local adaptation within individual populations, and that reestablishment of extirpated populations may take a long time. Migration also allows bull trout to access more abundant or larger prey, which facilitates growth and reproduction. Additional benefits of migration and its relationship to foraging are discussed below under “Diet.”

Cold water temperatures play an important role in determining bull trout habitat quality, as these fish are primarily found in colder streams (below 15°C or 59°F), and spawning habitats are generally characterized by temperatures that drop below 9°C (48°F) in the fall.

Thermal requirements for bull trout appear to differ at different life stages. Spawning areas are often associated with cold-water springs, groundwater infiltration, and the coldest streams in a given watershed. Optimum incubation temperatures for bull trout eggs range from 2°C to 6°C (35°F to 39°F) whereas optimum water temperatures for rearing range from about 6°C to 10°C (46°F to 50°F). In Granite Creek, Idaho, juvenile bull trout selected the coldest water available in a plunge pool, 8°C to 9°C (46°F to 48°F), within a temperature gradient of 8°C to 15°C (4°F to 60°F). In a landscape study relating bull trout distribution to maximum water temperatures, Dunham et al. (2003) found that the probability of juvenile bull trout occurrence does not become high (i.e., greater than 0.75) until maximum temperatures decline to 11°C to 12°C (52°F to 54°F).

Although bull trout are found primarily in cold streams, occasionally these fish are found in larger, warmer river systems throughout the Columbia River basin. Availability and proximity of cold water patches and food productivity can influence bull trout ability to survive in warmer rivers. For example, in a study in the Little Lost River of Idaho where bull trout were found at temperatures ranging from 8°C to 20°C (46°F to 68°F), most sites that had high densities of bull trout were in areas where primary productivity in streams had increased following a fire.

All life history stages of bull trout are associated with complex forms of cover, including large woody debris, undercut banks, boulders, and pools. Maintaining bull trout habitat requires stability of stream channels and maintenance of natural flow patterns. Juvenile and adult bull trout frequently inhabit side channels, stream margins, and pools with suitable cover. These areas are sensitive to activities that directly or indirectly affect stream channel stability and alter natural flow patterns. For example, altered stream flow in the fall may disrupt bull trout during the spawning period, and channel instability may decrease survival of eggs and young juveniles in the gravel from winter through spring. Increases in fine sediment reduce egg survival and emergence.

Bull trout typically spawn from August through November during periods of increasing flows and decreasing water temperatures. Preferred spawning habitat consists of low-gradient stream reaches with loose, clean gravel. Redds are often constructed in stream reaches fed by springs or near other sources of cold groundwater. Depending on water temperature, incubation is normally 100 to 145 days. After hatching, fry remain in the substrate, and time from egg deposition to emergence may surpass 200 days. Fry normally emerge from early April through May, depending on water temperatures and increasing stream flows.

Early life stages of fish, specifically the developing embryo, require the highest inter-gravel dissolved oxygen (IGDO) levels, and are the most sensitive life stage to reduced oxygen levels. The oxygen demand

of embryos depends on temperature and on stage of development, with the greatest IGDO required just prior to hatching.

A literature review conducted by the Washington Department of Ecology indicates that adverse effects of lower oxygen concentrations on embryo survival are magnified as temperatures increase above optimal (for incubation). In a laboratory study conducted in Canada, researchers found that low oxygen levels retarded embryonic development in bull trout. Normal oxygen levels seen in rivers used by bull trout during spawning ranged from 8 to 12 mg/L (in the gravel), with corresponding instream levels of 10 to 11.5 mg/L. In addition, IGDO concentrations, water velocities in the water column, and especially the intergravel flow rate, are interrelated variables that affect the survival of incubating embryos. Due to a long incubation period of 220+ days, bull trout are particularly sensitive to adequate IGDO levels. An IGDO level below 8 mg/L is likely to result in mortality of eggs, embryos, and fry.

Migratory forms of bull trout may develop when habitat conditions allow movement between spawning and rearing streams and larger rivers, lakes or nearshore marine habitat where foraging opportunities may be enhanced. For example, multiple life history forms (e.g., resident and fluvial) and multiple migration patterns have been noted in the Grande Ronde River. Parts of this river system have retained habitat conditions that allow free movement between spawning and rearing areas and the mainstem Snake River. Such multiple life history strategies help to maintain the stability and persistence of bull trout populations to environmental changes. Benefits to migratory bull trout include greater growth in the more productive waters of larger streams, lakes, and marine waters; greater fecundity resulting in increased reproductive potential; and dispersing the population across space and time so that spawning streams may be recolonized should local populations suffer a catastrophic loss. In the absence of the migratory bull trout life form, isolated populations cannot be replenished when disturbances make local habitats temporarily unsuitable. Therefore, the range of the species is diminished, and the potential for a greater reproductive contribution from larger fish with higher fecundity is lost.

Diet (from USFWS 2015a)

Bull trout are opportunistic feeders, with food habits primarily a function of size and life-history strategy. A single optimal foraging strategy is not necessarily a consistent feature in the life of a fish, because this strategy can change as the fish progresses from one life stage to another (i.e., juvenile to subadult). Fish growth depends on the quantity and quality of food that is eaten, and as fish grow, their foraging strategy changes as their food changes, in quantity, size, or other characteristics. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macrozooplankton, and small fish. Subadult and adult migratory bull trout feed on various fish species. Bull trout of all sizes other than fry have been found to eat fish up to half their length. In nearshore marine areas of western Washington, bull trout feed on Pacific herring (*Clupea pallasi*), Pacific sand lance (*Ammodytes hexapterus*), and surf smelt (*Hypomesus pretiosus*).

Bull trout migration and life history strategies are closely related to their feeding and foraging strategies. Migration allows bull trout to access optimal foraging areas and exploit a wider variety of prey resources. Optimal foraging theory can be used to describe strategies fish use to choose between alternative sources of food by weighing the benefits and costs of capturing one source of food over another. For example, prey often occurs in concentrated patches of abundance ("patch model"). As the predator feeds in one patch, the prey population is reduced, and it becomes more profitable for the predator to seek a new patch rather than continue feeding on the original one. This can be explained in

terms of balancing energy acquired versus energy expended. For example, in the Skagit River system, anadromous bull trout make migrations as long as 121 miles between marine foraging areas in Puget Sound and headwater spawning grounds, foraging on salmon eggs and juvenile salmon along their migration route. Anadromous bull trout also use marine waters as migration corridors to reach seasonal habitats in non-natal watersheds to forage and possibly overwinter.

4.1.4 Effects of Climate Change on Bull Trout (from USFWS 2015a.)

The USFWS analyses under the Endangered Species Act include consideration of ongoing and projected changes in climate. The terms “climate” and “climate change” are defined by the Intergovernmental Panel on Climate Change (IPCC). The term “climate” refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used. The term “climate change” thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both.

Scientific measurements spanning several decades demonstrate that changes in climate are occurring, and that the rate of change has been faster since the 1950s. Examples include warming of the global climate system, and substantial increases in precipitation in some regions of the world and decreases in other regions. Results of scientific analyses presented by the IPCC show that most of the observed increase in global average temperature since the mid-20th century cannot be explained by natural variability in climate, and is “very likely” (defined by the IPCC as 90 percent or higher probability) due to the observed increase in greenhouse gas (GHG) concentrations in the atmosphere as a result of human activities, particularly carbon dioxide emissions from use of fossil fuels.

Scientists use a variety of climate models, which include consideration of natural processes and variability, as well as various scenarios of potential levels and timing of GHG emissions, to evaluate the causes of changes already observed and to project future changes in temperature and other climate conditions. All combinations of models and emissions scenarios yield very similar projections of increases in the most common measure of climate change, average global surface temperature (commonly known as global warming), until about 2030. Although projections of the magnitude and rate of warming differ after about 2030, the overall trajectory of all the projections is one of increased global warming through the end of this century, even for the projections based on scenarios that assume that GHG emissions will stabilize or decline. Thus, there is strong scientific support for projections that warming will continue through the 21st century, and that the magnitude and rate of change will be influenced substantially by the extent of GHG emissions.

Various changes in climate may have direct or indirect effects on species. These effects may be positive, neutral, or negative, and they may change over time, depending on the species and other relevant considerations, such as interactions of climate with other variables (e.g., habitat fragmentation). Identifying likely effects often involves aspects of climate change vulnerability analysis. Vulnerability refers to the degree to which a species (or system) is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the type, magnitude, and rate of climate change and variation to which a species is exposed, its sensitivity, and its adaptive capacity. There is no single method for conducting such analyses that applies to all

situations. The USFWS uses there expert judgment and appropriate analytical approaches to weigh relevant information, including uncertainty, in our consideration of various aspects of climate change.

Climate change is expected to make recovery targets for ACT-listed species more difficult to achieve. Actions improving freshwater and estuarine habitats can offset some of the adverse impacts of climate change. Examples include restoring connections to historical floodplains and estuarine habitats, protecting and restoring riparian vegetation, purchasing or applying easements to lands that provide important cold water or refuge habitat, and leasing or buying water rights to improve summer flows.

4.1.5 Columbia Headwaters Recovery Unit (from USFWS 2015a. See USFWS 2015a for references)

The Columbia Headwaters Recovery Unit (CHRU) includes western Montana, northern Idaho, and the northeastern corner of Washington. Major drainages include the Clark Fork River basin and its Flathead River contribution, the Kootenai River basin, and the Coeur d'Alene Lake basin. In this implementation plan for the CHRU we have slightly reorganized the structure from the 2002 Draft Recovery Plan, based on latest available science and fish passage improvements that have rejoined previously fragmented habitats. We now identify 35 bull trout core areas (compared to 47 in 2002) for this recovery unit. Fifteen of the 35 are referred to as "complex" core areas as they represent large interconnected habitats, each containing multiple spawning streams considered to host separate and largely genetically identifiable local populations. The 15 complex core areas contain the majority of individual bull trout and the bulk of the designated critical habitat.

However, somewhat unique to this recovery unit is the additional presence of 20 smaller core areas, each represented by a single local population. These "simple" core areas are found in remote glaciated headwater basins, often in Glacier National Park or federally-designated wilderness areas, but occasionally also in headwater valley bottoms. Many simple core areas are upstream of waterfalls or other natural barriers to fish migration. In these simple core areas bull trout have apparently persisted for thousands of years despite small populations and isolated existence. As such, simple core areas meet the criteria for core area designation and continue to be valued for their uniqueness, despite limitations of size and scope. Collectively, the 20 simple core areas contain less than 3 percent of the total bull trout core area habitat in the CHRU, but represent significant genetic and life history diversity. Throughout this recovery unit implementation plan, we often separate our analyses to distinguish between complex and simple core areas, both in respect to threats as well as recovery actions.

In order to effectively manage the RUIP structure in this large and diverse landscape, we have separated the core areas into the following five natural geographic assemblages (see Figure 4), largely reminiscent of the 2002 recovery planning structure. The bull trout populations and critical habitat assessed in this BA are in the Lower Clark Fork geographic area.

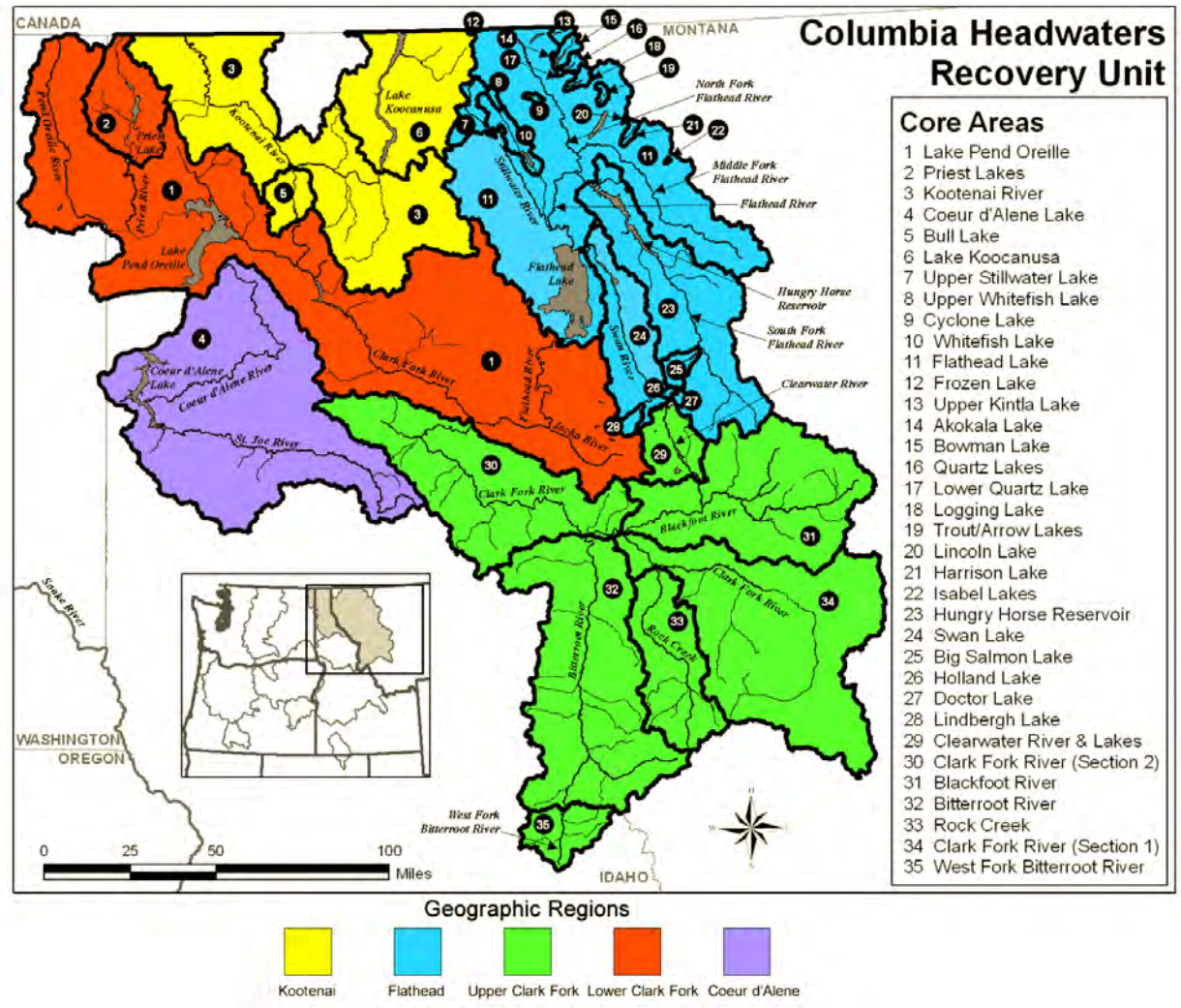

Figure 4. Map of the Columbia Headwaters Recovery Unit for Bull Trout (USFWS 2015a)

With the exception of much of the headwaters of the Clark Fork River drainage (upstream of Rock Creek) and portions of the Coeur d'Alene River system, both of which were severely degraded by contamination by heavy metals, bull trout continue to be present (albeit sometimes in low numbers) in most major watersheds where they likely occurred historically in the CHRU. Because bull trout exhibit a patchy distribution, even in pristine habitats, the fish are not expected to simultaneously occupy all available habitats. This patchiness is evident throughout the CHRU and, is largely tied to the presence of cold water spawning and rearing (SR) habitat.

In some watersheds within the CHRU, or portions of them, bull trout were probably never numerous because of natural habitat limitations. Despite the intact broad distribution of bull trout core areas, a number of local populations of bull trout have been extirpated in recent times. Examples include portions of the upper Clark Fork and lower Pend Oreille drainages. Bull trout numbers have also been reduced to remnant status in several simple core areas where lakes have been stocked with or invaded by nonnative lake trout (*e.g.*, Whitefish Lake, Upper and Lower Stillwater Lakes, and Logging Lake).

For the most recent bull trout 5-year status review, the Service concluded that bull trout core areas in the CHRU were at overall risk levels similar to those rangewide. This conclusion was based on a systematic core area status assessment using a modification of the Natural Heritage Program's ranking model. This analysis ranked the extirpation risk of bull trout by individual core area. Data used to rank the core areas consisted of information on population abundance, distribution, population trend, and threats to bull trout which were summarized by core area in the Core Area Templates document. Complete details of the assessment are described in the Bull Trout Core Area Assessment. Categories of risk were described as follows: *High Risk* – Core area at high risk because of extremely limited and/or rapidly declining numbers, range, and/or habitat, making the bull trout in this core area highly vulnerable to extirpation. *At Risk* – Core area at risk because of very limited and/or declining numbers, range, and/or habitat, making the bull trout in this core area vulnerable to extirpation. *Potential Risk* – Core area potentially at risk because of limited and/or declining numbers, range, and/or habitat even though bull trout may be locally abundant in some portions of the core area. *Low Risk* – Bull trout common or uncommon, but not rare, and usually widespread through the core area. Apparently not vulnerable at this time, but may be cause for long-term concern.

Conclusions from the 5-year review were that 13 of the CHRU core areas were at High Risk (37.1 percent), 12 were considered At Risk (34.3 percent), 9 were considered at Potential Risk (25.7 percent), and only 1 core area (Lake Koocanusa; 2.9 percent) was considered at Low Risk. Simple core areas, due to limited demographic capacity and single local populations were generally more inherently at risk than complex core areas under the model. While this assessment was conducted nearly a decade ago, little has changed in regard to individual core area status in the interim.

4.1.6 Status of the Species within the Lake Pend Oreille Core Area (from USFWS 2015a)

To understand the current status of bull trout in the action area, it is necessary to discuss the status within in the core area. In the 2002 Recovery Plan, this area was identified as the Lake Pend Oreille Core Area within the Clark Fork River Recovery Unit. In the revised draft recovery plan, the Lake Pend Oreille Core Area is included in a recovery unit identified as the Columbia Headwaters. The Lake Pend Oreille Core Area under the new delineation includes Lake Pend Oreille and the Lower Clark Fork River Drainage upstream of Lake Pend Oreille (and the action area) and the Pend Oreille River downstream of Lake Pend Oreille within the action area. The downstream portion (Pend Oreille River) was formerly its own recovery unit in the 2002 Draft Recovery Plan.

The 2002 Bull Trout Draft Recovery Plan identified one extant local population in LeClerc Creek that drains into Box Canyon Reservoir. However, the 2008 5-year Status Review, Northeast Washington Core Area Status Assessment Template states that the LeClerc Creek local population no longer exists. This determination is based on a lack of recent documentation since 2001 of juvenile fish or redds in LeClerc Creek when a bull trout was observed on a redd. In 2014, a single adult bull trout was observed in LeClerc Creek during redd surveys. When this population was active, individuals represented a unique life history strategy of moving from spawning areas in tributary streams downstream to the Pend Oreille River and then upstream to forage and overwinter in Lake Pend Oreille. For the LeClerc Creek population, the option to move up to Lake Pend Oreille was blocked by Albeni Falls Dam. The Pend Oreille River has been designated as foraging, migration, and overwintering habitat for bull trout, and likely provided those same functions under pre-dam conditions.

Specific factors known to be significant in the decline of bull trout populations in the lower Pend Oreille River within Washington State are: construction and operation of three hydroelectric facilities on the mainstem Pend Oreille River (Boundary Dam, Box Canyon Dam and Albeni Falls Dam), habitat degradation on the mainstem and within the tributaries; human-made fish passage barriers into tributaries to the Pend Oreille River; and nonnative fish species introduction and management. Recovery in the Lower Pend Oreille River is dependent on the reestablishment of the historic connection to Lake Pend Oreille.

The Lake Pend Oreille Core Area is one of the largest, most complex, and best-documented bull trout core areas in the upper Columbia River watershed. The Core Area includes the Pend Oreille River in northeastern Washington, a nearly 95,000-acres lake in Idaho (Lake Pend Oreille), and the Lower Clark Fork River in western Montana. Bull trout face a variety of threats across their range; however the biggest threats to bull trout status and distribution within the Lake Pend Oreille core area are believed to be from the following:

1. Introduced species/fisheries management;

2. Forest management practices and forest roads;

3. Fish passage issues (artificial barriers to migration), connectivity, and entrainment; and

4. Residential development and urbanization.

In 1925, the U.S. Fish Commission stocked 100,000 lake trout (*S. namaycush*) into Lake Pend Oreille and its tributaries. Additionally, lake trout may also have migrated downstream of Flathead Lake, where they were introduced 20 years earlier. Lake trout compete with native bull trout for food resources and are listed as one of the biggest threats to bull trout populations in the Lake Pend Oreille core area and in Lake Pend Oreille and studies suggest that bull trout will not persist in the presence of lake trout. For example, Priest Lake experienced dramatic declines in bull trout numbers as corresponding lake trout numbers increased.

However, efforts to reduce competition for food resources, which benefit lake conditions for bull trout in Lake Pend Oreille, are ongoing through predator removal programs. Considerable effort has been put into controlling the lake trout population in Lake Pend Oreille through angler incentive programs, and trap and gill netting projects. In 2011 netting operations successfully removed 5,841 lake trout from Lake Pend Oreille. However, a total of 113 direct mortalities of bull trout occurred. Despite the mortalities of bull trout, long term benefits to non-native species removal are positive. This program continues and is believed to be highly effective at reducing lake trout numbers. Since the program began, annual bull trout mortalities have ranged between 120 in 2006 to 525 in 2013, while lake trout population estimates have declined by more than 50 percent.

The Bull Trout Recovery Plan identified four elements to consider when assessing long-term viability (extinction risk) of bull trout populations: 1) number of local populations; 2) adult abundance (defined as the number of spawning fish present in a core area in a given year); 3) productivity, or the reproductive rate of the population; and 4) connectivity (as represented by the migratory life history form).

The recovery goals have been updated in the final recovery plan since USFWS (2015c) was prepared. The final recovery plan goal for recovering bull trout is to manage threats and ensure sufficient distribution

and abundance to improve the status of bull trout throughout their extant range in the coterminous United States so that protection under the Act is no longer necessary. When this is achieved, it is expected that:

Bull trout will be geographically widespread across representative habitats and demographically stable;

The genetic diversity and diverse life history forms of bull trout will be generally conserved; and

Cold water habitats essential to bull trout will be conserved and connected.

Specific actions to achieve the recovery goals are identified for the Lake Pend Oreille Core Area in the Recovery Unit Implementation Plan contained within USFWS (2015a).

The following is again from USFWS (2015c). To monitor bull trout population trends, an extensive redd count monitoring program in Lake Pend Oreille core area has been devised by Idaho Department of Fish and Game and has been in place since 1983. Based on 2010 surveys of the Lake Pend Oreille drainage, the adult bull trout spawning population consisted of at least an estimated 2,093 fish (compared to 2,771 in 2009). Survey results from 2009 also identified more than six local populations with greater than 100 individuals in each, estimated adult escapement (number of adults returning to spawn based on the number of redds observed during annual surveys) of 2,500 or more individuals, and increasing relative abundance measured as the trend in adult escapement. Recovery objectives were met for five years between 2002 and 2006, but estimated adult escapement was less than 2,500 in 2007, 2008 and 2010 and represented below average counts in several highly influential tributary spawning populations including Trestle Creek, Granite Creek, and Gold Creek. Despite this, regression analysis depicting trends in bull trout redds over time, demonstrates that trends in redd abundance are increasing annually throughout the core area. For example, in six consistently surveyed index streams in the Lake Pend Oreille core area, 333 redds were counted in 1992, compared to 456 in 2010. Similarly, for all streams combined in the Lake Pend Oreille core area, 447 redds were observed in 1992, compared to 654 in 2010.

Bull trout in the interconnected Lake Pend Oreille watershed appear to be entirely adfluvial. Adult bull trout make spawning migrations into the larger tributaries beginning in April, with juvenile outmigration occurring as early as March and lasting until June. Fall migrations (September-October) follow a similar pattern of movement with adults moving further upstream to spawn (then returning to Lake Pend Oreille to overwinter) and juveniles moving downstream into Lake Pend Oreille. Some of these migrations have also been shown to be very extensive. Migratory bull trout spawning in the Middle Fork East River and Uleda Creeks, tributaries to the East River downstream of Priest Lake, may exhibit an unusual life history strategy. These fish have been documented to migrate downstream out of Lake Pend Oreille into the Pend Oreille River, before ascending the East River drainage for spawning. It was previously believed that bull trout in this drainage were part of the Priest Lake core area. This life history was believed to also occur in tributaries downstream of Albeni Falls prior to construction of the dam.

Fish passage barriers also influence bull trout distribution throughout the core area. Log crossings, beaver dams, large alluvial deposits and culverts are recognized as fish passage barriers across the area. To improve fish passage, many of these barriers (i.e., culverts, log crossings, etc.) have been removed or replaced. While the aforementioned barriers influence fish passage on a local scale, large hydroelectric dams have had the greatest influence on bull trout distribution throughout the core area. Dams have

permanently interrupted established bull trout migration routes, eliminating access from portions of the tributary system to the productive waters of Lake Pend Oreille and Flathead Lake. Three dams on the lower Clark Fork River have significantly reduced the amount of spawning and rearing habitat available to Lake Pend Oreille bull trout. Other effects of these dams to bull trout habitat include changes in water quality (temperature, sediment, and nutrients) and quantity, lake drawdowns, a reduction in shoreline food sources, and direct losses of fish into water conveyance systems (turbines, spillways, or water delivery systems).

Within the action area, the Pend Oreille River has been significantly altered by residential development along the shoreline. Bank armoring and recreational docks have limited complexity and large wood recruitment, modified natural hydraulic processes, and removed vegetation that provide shade and forage. These actions have furthered limited the potential for bull trout use of the river, and the persistence of the species in the action area.

4.1.7 Environmental Baseline for Bull Trout

Bull trout are a native char species in the interior Columbia Basin. Bull trout exhibit a variety of life history strategies in the inland Columbia Basin: fluvial, adfluvial and resident, and all three life history strategies may be found within the same population (USFWS 2015a). Bull trout were once widely distributed in five of the six subbasins that overlay the CNF, but now populations are very small and are currently considered to be extirpated in the Sanpoil, and Kettle River, and Lake Roosevelt subbasins and now only inhabit the Pend Oreille Subbasin and the South Salmo River (USFWS 2015a). In the United States, the Pend Oreille River subbasin (17010216) encompasses 698,895 acres of which 407,899 acres are managed by the CNF. Native Americans historically fished for bull trout in the Sanpoil River, and LeClerc Creek.

Waters draining the Forest are in the Mid-Columbia Recovery Unit and the Columbia Headwaters Recovery Unit as defined in the recovery plan (USFWS 2015a). Within the recovery units, core areas have been identified. A core area represents the closest approximation of a biologically functioning unit consisting of habitat that could supply all the necessary elements for every life stage (*e.g.* spawning, rearing, migratory and adult) and include one or more groups of bull trout (USFWS 2015a). The Forest contains only one core area within the Mid-Columbia Recovery Unit, South Salmo River. The South Salmo River originates on the Forest within wilderness but primarily flows through Canada.

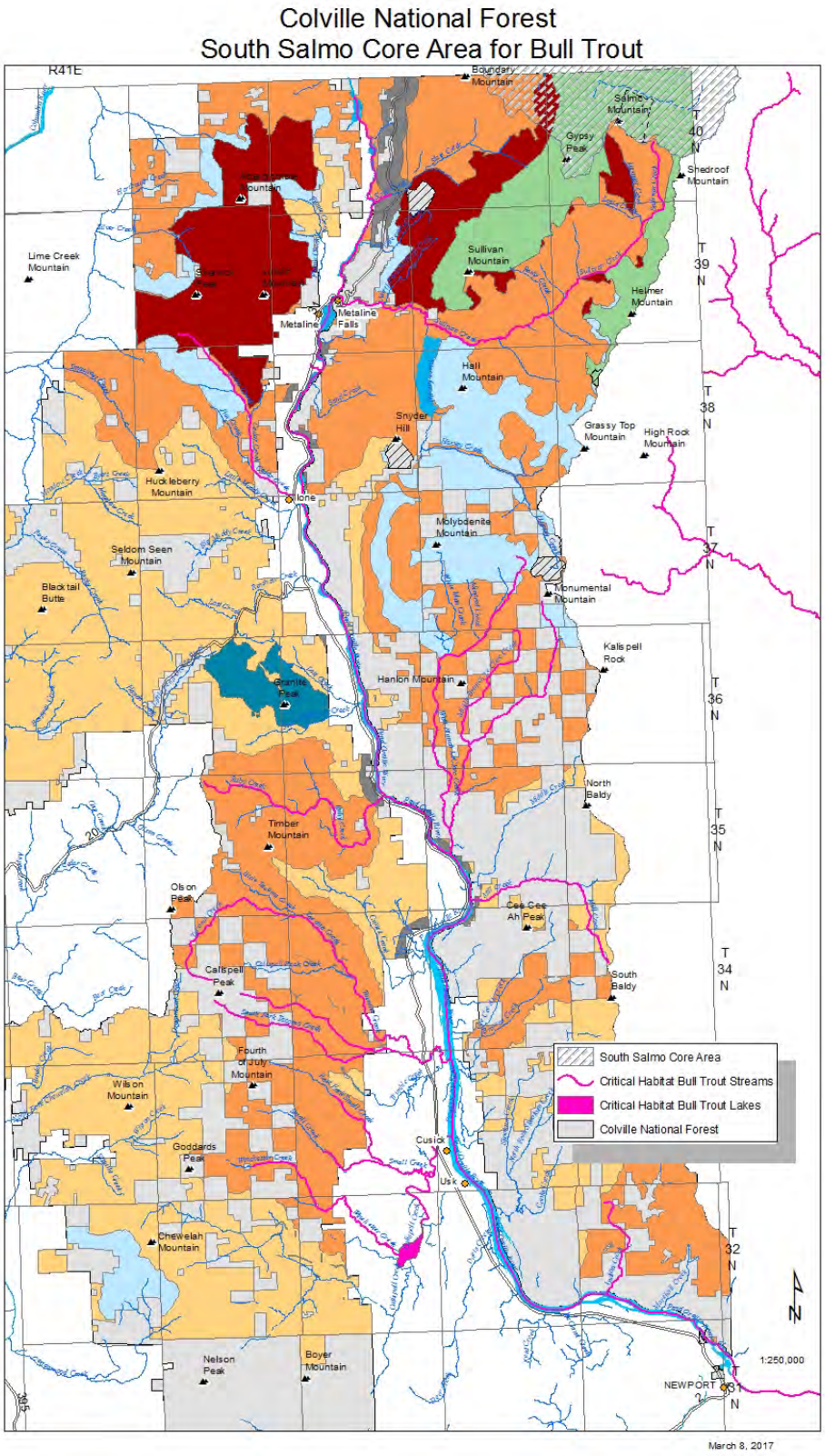

Figure 5 - South Salmo Core Area

Bull trout historically populated several streams flowing into Lake Roosevelt. These streams are included in the Northeast Washington Research Needs Area (USFWS 2015a). There are currently no spawning populations within the Northeast Washington Research Needs Area although there is suitable spawning habitat in several tributaries including the Sanpoil River (USFWS 2015b). Fewer than 25 bull trout have been documented at the mouths of tributaries to Lake Roosevelt or in Lake Roosevelt/Columbia River since 2011 and usually near the Canadian border. In 2012, a single bull trout was observed in the lower Sanpoil River. The bull trout currently observed in the Northeast Washington Research Needs Area are thought to be fish from local populations in the Couer d' Alene/Spokane River or Pend Oreille River basins, or from tributaries to the Columbia River in Canada that have been entrained over dams (USFWS 2015b).

Most recent bull trout observations, and all bull trout critical habitat on the Forest, are on tributaries to the Pend Oreille River. These tributaries lie within the Lower Clark Fork Geographic Region, Pend Oreille Core Area. The large Pend Oreille Core Area has been divided into three parts. The streams tributary to the Pend Oreille River flowing off the Forest are in LPO-C, which includes the Lower Pend Oreille basin downstream of Albeni Falls Dam to Boundary Dam (1 mile upstream from the Canadian border) and bisected by Box Canyon Dam; including portions of Idaho, eastern Washington, and the Kalispel Reservation (USFWS 2015a).

While overall the bull trout populations in the Pend Oreille Core area are considered stable with a moderate, but not imminent risk of extinction in the last status review (USFWS 2008), local bull trout population numbers on the CNF, if present, are very low and spawning populations likely do not currently exist (USFWS 2016). Even if a small remnant population exists, the very low numbers puts the population at high risk of extirpation (see Rieman and McIntyre 1993). There have been few recent observations of bull trout on the CNF. The most recent observations include:

1. Cedar Creek (Stevens County) - the watershed is primarily in the U.S. but the lower reaches are in British Columbia (B.C). Two juvenile bull trout were found in the lower portion of Cedar Creek in Canada by British Columbia biologists in 1996. There are numerous road crossings with the potential to block fish passage in the lower part of the drainage. Day snorkeling the East Fork Cedar Creek on National Forest System (NFS) lands in 1996 did not find bull trout presence. Environmental DNA [23]samples were taken in 2015. There were no detections of bull trout in Cedar Creek and East Fork Cedar Creek.
2. South Fork Salmo River - over 90% of the larger Salmo River watershed is in B.C. The Salmo River has a relatively healthy population of bull trout. Juvenile bull trout were observed while snorkeling in the Canadian portion of the South Fork in 1998. Juvenile and adult bull trout were captured as early as 1975 and as late as 1995 in the portion of the watershed within the U.S. This portion is within the Salmo-Priest Wilderness. Most of the Salmo River bull trout habitat is in Canada.
3. Slate Creek - Five individual bull trout were caught in the mouth of this creek between 1994 and 1997. One individual was caught twice. All were adult except for one juvenile.

[23] Environmental DNA (eDNA) is DNA extracted from an environmental sample, such as soil, water, or air, without directly sampling the target organism. In 2015, the Colville National Forest took eDNA samples from all streams with bull trout critical habitat (Carim 2016).

4. Sullivan Creek - one adult bull trout was found poached in lower Sullivan Creek in 1994 below Mill Pond Dam, an impassable blockage to fish approximately 3.25 miles from the mouth. Environmental DNA samples were taken in 2015. There were no detections of bull trout in Sullivan Creek.
5. Cedar Creek (Ione Creek) (Pend Oreille County) - one adult bull trout was observed while snorkeling in 1995 above the old municipal dam for Ione. The dam was removed in 2005. There were no detections of bull trout in Cedar Creek by environmental DNA samples taken in 2015.
6. LeClerc Creek - three juvenile bull trout were found while electrofishing in the East and West Branches in 1993. Two juvenile bull trout were observed during snorkeling in the East Branch in 1995. One juvenile bull trout was observed while snorkeling in the East Branch in 1998. According to USFWS (2012) there has been no recent documentation of bull trout juveniles or spawning since 2001 when a bull trout was observed on a redd and the population likely no longer exists. Environmental DNA samples were taken in 2015. There was a detection of bull trout in the West Branch of LeClerc Creek. In 2014 a single adult bull trout was observed in West Branch LeClerc Creek (USFWS 2016).
7. Mill Creek (Pend Oreille County) - One adult bull trout was observed during snorkeling within the lowest mile of the creek in 1995. Environmental DNA samples were taken in 2015. There were no detections of bull trout in Mill Creek.
8. Indian Creek - one bull trout was observed while snorkeling on the lowest mile of this creek on private lands in 1997.

Bull trout are threatened by historical and current land use activities. The construction and operation of Albeni Falls, Box Canyon, and Boundary Dams on the Pend Oreille River have fragmented habitat and impeded bull trout migration. The construction of other dams and diversions without fish passage in Pend Oreille River tributaries have further fragmented habitat and reduced connectivity. Habitat has been also degraded by past timber harvest and livestock grazing. The introduction of non-native species continues to impact bull trout populations through competition, predation, and hybridization (USFWS 2015a).

The presence of brook trout, which are widespread on the CNF, pose a particular threat to bull trout. Bull trout and brook trout will hybridize resulting in hybrid offspring that are often, but not always sterile. Where hybridization occurs declines in the bull trout populations or even local extirpations have occurred (see USFWS 2015a). Brook trout may have a competitive advantage over bull trout and displace bull trout into higher elevation streams, especially at warmer water temperatures (Rieman *et al*. 2006, McMahon *et al.* 2007, Rodtka and Volpe 2007).

The re-licensing terms for the Boundary Hydroelectric Project include programs to improve conditions for bull trout and aid recovery of the population. The programs identified include improving passage for fish both upstream and downstream of the dam; riparian and stream channel habitat improvement; improving road conditions; and non-native trout suppression and eradication programs (USFWS 2012). However, the USFWS (2012, page 160) acknowledges that it may take 14 years before benefits of the programs result in slow but steady increases in bull trout numbers.

The viability of bull trout on the Forest (and other MIS/Focal species) was assessed as described in Reiss *et al*. (2008) and documented in MacDonald *et al.* (2016). The viability assessment utilizes a decision support model (DSM), similar to what was used in the Aquatic Ecological Condition (AEC) model, to

determine the current status of the Management Indicator Species (MIS)/focal species only instead of using a DSM the information was put into an Excel spreadsheet, similar to what was done for the AEC.[24] The viability model however evaluates the conclusion that the MIS/focal species populations at the subbasin scale are sustainable or viable based on their current status. The HUC 12 AEC results are aggregated to the subbasin (HUC 8) scale to provide a broader assessment of population and habitat status, better capture the distribution and ability of the local populations to interact across a broader landscape, and allows a broader assessment of natural and human-made disturbance that may be missed if only the AEC results are considered alone (Reiss *et al.* 2008).

4.1.7.1 HUC 12 Focal Species Local Population Condition

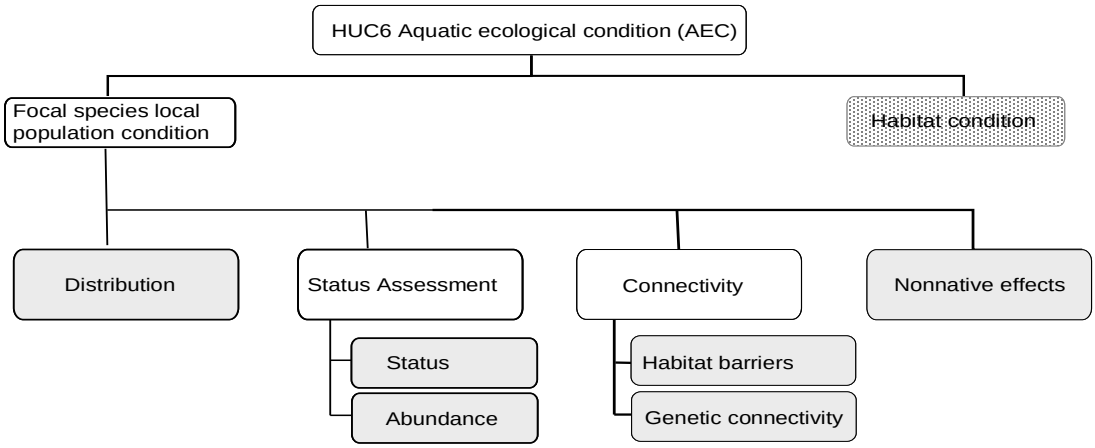

Figure 6 - Diagram of the MIS/focal species component of the HUC 12 AEC model

The distribution of MIS/focal species was primarily evaluated using "expert opinion" derived from biologists (and/or hydrologists) familiar with local conditions and studies.

The status assessment includes two attributes: status and abundance. Local spawning populations were characterized as strong or depressed based on current vs. historic abundance, full expression of life history traits, and population trends. When information was not sufficient to apply the criteria, "unknown status" was assigned. Some HUC12s were identified as exclusively non-spawning/rearing areas (i.e., migratory corridor, over-wintering, or foraging). We included an additional attribute: "genetically pure population". This attribute was evaluated for westslope cutthroat trout and interior redband trout based on assumptions about populations, and information from genetic studies.

The abundance attribute of the HUC12 MIS/focal species assessment describes local population status by addressing the average number of adults spawning annually. In many cases abundance was unknown so a score of 0 was applied.

Connectivity also includes two attributes; habitat barriers and genetic connectivity. Habitat barriers evaluates the degree to which access to habitat is limited by barriers to upstream and downstream fish movement within the HUC12. Only human-made barriers within the boundary of the HUC12 are

[24] 2014_11_19ViabilityAssessment-Excel

considered in this attribute, though natural barriers may limit access as well. Barriers that protect resident fish populations from an invasive species are scored as beneficial.

Genetic connectivity describes the degree of connectivity between local populations within the HUC8 and thus the potential for a functioning meta-population. Although data for this attribute were determined at the HUC8 scale, the impact of isolation was assessed for each local population. Connectivity was primarily evaluated through expert opinion.

Non-native effects assesses the effects of non-native species on MIS/focal species. We focused on threats via introgression and not competition because the effects of introgression are more direct and thus quantifiable. However we did consider competition where it appears non-native fish may have displaced a MIS/focal species population.

Results HUC 12 Pend Oreille Subbasin Local Population Status

Bull trout local population status and overall AEC scores are generally rated as properly functioning, not properly functioning, and at risk. The local populations in North Fork Sullivan Creek,-Sullivan Creek, Slate Creek, West Branch LeClerc Creek and East Branch LeClerc Creeks were rated at risk. The low population scores are due to low or unknown abundance, competition with non-native trout, and barriers.

Table 16 - Pend Oreille Subbasin Bull Trout AEC Scores

HUC 12 Number	HUC 12 Name	HUC 12 MIS/Focal Species Score	Watershed Condition Score	Final AEC Score
170102160702	Headwaters South Salmo River	0.16	0.90	0.5
170102160403	North Fork Sullivan Creek-Sullivan Creek	-0.29	0.70	0.2
170102160903	Slate Creek	-0.16	0.40	0.1
170102160201	Exposure Creek-Pend Oreille River	-0.56	-0.20	-0.4
170102160302	West Branch LeClerc Creek	-0.24	-0.10	-0.2
170102160303	East Branch LeClerc Creek	-0.24	-0.50	-0.4
170102160902	Sweet Creek-Pend Oreille River	-0.35	-0.20	-0.3
170102160102	Winchester Creek	-0.63	-0.50	-0.6
170102160103	Smalle Creek	-0.69	-0.40	-0.5
170102160206	Tacoma Creek	-0.53	-0.50	-0.5
170102160304	Ruby Creek	-0.63	-0.70	-0.7

HUC 12 Number	HUC 12 Name	HUC 12 MIS/Focal Species Score	Watershed Condition Score	Final AEC Score
170102160402	Headwaters Sullivan Creek	-0.94	-0.50	-0.7
170102160401	Harvey Creek	-0.75	-0.20	-0.5
170102160101	North Fork Calispell Creek	-0.88	-0.70	-0.8
170102160104	Calispell Creek	-0.50	0.00	-0.3
170102160202	Skookum Creek	-0.63	-0.50	-0.6
170102160207	Cusick Creek-Pend Oreille River	-0.53	-0.60	-0.6
170102160306	Lost Creek	-0.63	-0.40	-0.5
170102160901	Big Muddy Creek	-0.53	-0.50	-0.5
170102160904	Flume Creek-Pend Oreille River	-0.75	-0.10	-0.4
170102160905	Pewee Creek-Pend Oreille River	-1.00	-0.70	-0.9
170102160204	Cee Cee Ah Creek	-0.38	-0.40	-0.4
170102160307	Maitlen Creek-Pend Oreille River	-0.63	-0.50	-0.6

4.1.7.2 HUC 8 Viability

The viability of individual MIS/focal species populations is evaluated at the subbasin scale where the species is currently present. Ecosystems are dynamic over time so not all habitat within a subbasin will be in good condition all the time and even natural, undisturbed population numbers will be variable. MIS/focal species are judged to be viable when a large enough proportion of habitat is in good ecological condition, habitat forming processes are functional, and the local populations of a MIS/focal species (subwatershed scale) are not isolated; having access to other habitat and local populations (see Reiss *et al.* 2008). It should be noted that this viability assessment addresses the MIS/focal species' populations on the CNF only. While factors that may influence the larger population of a MIS/focal species are considered, this assessment is not as broad or inclusive as a viability assessment that the USFWS may undertake for an ESA status review.

The two attributes assessed to determine the population viability of the MIS/focal species within a subbasin on the CNF are; the Subbasin Condition and Connectivity within the subbasin. The viability was assessed in the manner described in Reiss *et al*. (2008) The attributes discussed below are aggregated to attain an overall subbasin viability score for the MIS/focal species ranging from +1 (high support for the conclusion that the MIS/focal species populations on the Forest are viable) to -1 (low support for the conclusion that the populations are viable). Unlike Reiss *et al.* (2008), we did not estimate the historic viability, assuming that before development by European man all the MIS/focal species were viable at the subbasin scale.

Condition

The Subbasin condition is assessed with three attributes; distribution, patch and the AEC. The distribution attribute assesses the percentage of the potential spawning and rearing habitat in the subbasin currently occupied by the MIS/focal species. The distribution reflects the impact of fragmentation and includes populations isolated by natural barriers. The patch attribute assesses the connected length of stream available to the MIS/focal species. Habitat patches within the subbasin are delineated by aggregating all connected stream kilometers of occupied habitat. If there are no barriers, the entire subbasin is one large patch. Where natural or man-made barriers exist, the occupied habitat above the barrier is its own patch. It is generally assumed that large, connected patches provide a better chance for a viable population over time than small isolated patches. Finally, the AEC attribute is the area-weighted average of the subwatershed scores within the subbasin.

Connectivity

The connectivity of river systems is a major factor determining the potential for viable populations. Where streams are connected, local populations have the potential to function as a meta-population with some degree of genetic exchange over generations. Connectivity also allows an adjacent population to re-found a local population that becomes extinct due to a disturbance such as a fire or flood. There are two connectivity attributes; population connectivity and habitat connectivity. Population connectivity evaluates the overall connectivity of each local population within the subbasin. The habitat connectivity evaluates the ability of MIS/focal species to access unoccupied, potential habitat in the subbasin (see Reiss *et al*. (2008). The MIS/focal species viability score for a subbasin species status can range from +1 (high support for the conclusion that the MIS/focal species populations on the Forest are viable) to -1 (low support for the conclusion that the populations are viable).

If one were to categorize the scores as +1 to +0.33 is viable, 0.33 to -0.33 as viability is at risk and > -0.33 as “not viable”, the viability of the bull trout on the Forest in the Pend Oreille subbasin is -0.42, or not viable. Patch size for bull trout in the Pend Oreille received a positive score, meaning there may be sufficient amount of connected habitat on the Forest to support bull trout populations. The not viable assessment on the Forest is due to low (or no) population numbers, impaired watershed functions and aquatic habitat generally in an impaired condition compared to reference streams; man-made barriers including those off the Forest; and the abundance of non-native fish, especially brook trout.

4.2 STATUS / ENVIRONMENTAL BASELINE OF BULL TROUT CRITICAL HABITAT

(Rangewide) (from USFWS 2015c. See USFWS 2015c for references).

4.2.1 Legal Status

Current Designation

The Service published a final critical habitat designation for the coterminous United States population of the bull trout on October 18, 2010 (70 FR 63898); the rule became effective on November 17, 2010. A justification document was also developed to support the rule and is available on our website (http://www.fws.gov/pacific/bulltrout). The scope of the designation involved the species’ coterminous range, including six draft recovery units [Mid-Columbia, Saint Mary, Columbia Headwaters, Coastal, Klamath, and Upper Snake (75 FR 63927)]. The Service’s 1999 coterminous listing rule identified five

interim recovery units (50 CFR Part 17, pg. 58910), which includes the Jarbidge River, Klamath River, Columbia River, Coastal-Puget Sound, and Saint Mary-Belly River population segments (also considered as interim recovery units). The five year review recommended re-evaluation of these units based on new information. However, until the bull trout draft recovery plan is finalized, the current five interim recovery units will be used for purposes of section 7 jeopardy analyses and recovery planning. The adverse modification analysis in this biological opinion does not rely on recovery units, relying instead on the listed critical habitat units and subunits.

Rangewide, the Service designated reservoirs/lakes and stream/shoreline miles as bull trout critical habitat (Table 17). Designated bull trout critical habitat is of two primary use types: 1) spawning and rearing, and 2) foraging, migration, and overwintering (FMO).

Table 17 - Stream/shoreline distance and reservoir/lake area designated as bull trout critical habitat by state (from Table 5 in USFWS 2015c, page 26)

State	Stream/Shoreline Miles	Reservoir/Lake Acres
Idaho	8,771.6	170,217.5
Montana	3,056.5	221,470.7
Nevada	71.8	-
Oregon	2,835.9	30,255.5
Oregon/Idaho	107.7	-
Washington	3,793.3	66,308.1
Washington/Marine	753.8	-
Washington/Idaho	37.2	-
Washington/Oregon	301.3	-
Total	19,729.0	488,251.7

The 2010 revision increases the amount of designated bull trout critical habitat by approximately 76 percent for miles of stream/shoreline and by approximately 71 percent for acres of lakes and reservoirs compared to the 2005 designation.

This rule also identifies and designates as critical habitat approximately 822.5 miles of streams/shorelines and 16,701.3 acres of lakes/reservoirs of unoccupied habitat to address bull trout conservation needs in specific geographic areas in several areas not occupied at the time of listing. No unoccupied habitat was included in the 2005 designation. These unoccupied areas were determined by the Service to be essential for restoring functioning migratory bull trout populations based on currently available scientific information. These unoccupied areas often include lower main stem river environments that can provide seasonally important migration habitat for bull trout. This type of habitat is essential in areas where bull trout habitat and population loss over time necessitates reestablishing bull trout in currently unoccupied habitat areas to achieve recovery.

The final rule continues to exclude some critical habitat segments based on a careful balancing of the benefits of inclusion versus the benefits of exclusion. Critical habitat does not include: 1) waters adjacent to non-Federal lands covered by legally operative incidental take permits for habitat

conservation plans issued under section 10(a)(1)(B) of the Endangered Species Act of 1973, as amended, in which bull trout is a covered species on or before the publication of this final rule; 2) waters within or adjacent to Tribal lands subject to certain commitments to conserve bull trout or a conservation program that provides aquatic resource protection and restoration through collaborative efforts, and where the Tribes indicated that inclusion would impair their relationship with the Service; or 3) waters where impacts to national security have been identified (75 FR 63898). Excluded areas are approximately 10 percent of the stream/shoreline miles and 4 percent of the lakes and reservoir acreage of designated critical habitat. Each excluded area is identified in the relevant Critical Habitat Unit (CHU) text, as identified in paragraphs (e)(8) through (e)(41) of the final rule. See Tables 6 and 7 in USFWS (2015c, pages 37-38) for the list of excluded areas. It is important to note that the exclusion of waterbodies from designated critical habitat does not negate or diminish their importance for bull trout conservation. Because exclusions reflect the often complex pattern of land ownership, designated critical habitat is often fragmented and interspersed with excluded stream segments.

4.2.2 Conservation Role and Description of Critical Habitat (from USFWS 2015c. See USFWS 2015c for references).

The conservation role of bull trout critical habitat is to support viable core area populations (75 FR 63898:63943 [October 18, 2010]). The core areas reflect the metapopulation structure of bull trout and are the closest approximation of a biologically functioning unit for the purposes of recovery planning and risk analyses. CHUs generally encompass one or more core areas and may include FMO areas, outside of core areas, that are important to the survival and recovery of bull trout.

The primary function of individual CHUs is to maintain and support core areas, which 1) contain bull trout populations with the demographic characteristics needed to ensure their persistence and contain the habitat needed to sustain those characteristics; 2) provide for persistence of strong local populations, in part, by providing habitat conditions that encourage movement of migratory fish; 3) are large enough to incorporate genetic and phenotypic diversity, but small enough to ensure connectivity between populations; and 4) are distributed throughout the historic range of the species to preserve both genetic and phenotypic adaptations.

Primary Constituent Elements (PCEs) for Bull Trout

Within the designated critical habitat areas, the PCEs for bull trout are those habitat components that are essential for the primary biological needs of foraging, reproducing, rearing of young, dispersal, genetic exchange, or sheltering. Based on our current knowledge of the life history, biology, and ecology of this species and the characteristics of the habitat necessary to sustain its essential life-history functions, we have determined that the following PCEs are essential for the conservation of bull trout. Recently new critical habitat regulations (81 FR 7214) replace the term PCEs with physical or biological features (PBFs). The term PCE is replaced with PBF throughout the rest of this document.

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

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

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

4. Complex river, stream, lake, reservoir, and marine shoreline 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.

5. 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. Specific temperatures within this range will depend on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shading, such as that provided by riparian habitat; streamflow; and local groundwater influence.

6. 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. A minimal amount of fine sediment, generally ranging in size from silt to coarse sand, embedded in larger substrates, is characteristic of these conditions. The size and amounts of fine sediment suitable to bull trout will likely vary from system to system

7. A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, minimal flow departure from a natural hydrograph.

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

9. Sufficiently low levels of occurrence of non-native predatory (e.g., lake trout, walleye, northern pike, smallmouth bass); interbreeding (e.g., brook trout); or competing (e.g., brown trout) species that, if present, are adequately temporally and spatially isolated from bull trout.

The revised PBF's are similar to those previously in effect under the 2005 designation. The most significant modification is the addition of a ninth PCE to address the presence of nonnative predatory or competitive fish species. Although this PBF applies to both the freshwater and marine environments, currently no non-native fish species are of concern in the marine environment, though this could change in the future.

Note that only PBFs 2, 3, 4, 5, and 8 apply to marine nearshore waters identified as critical habitat. Also, lakes and reservoirs within the CHUs also contain most of the physical or biological features necessary to support bull trout, with the exception of those associated with PBFs 1 and 6. Additionally, all except PBF 6 apply to FMO habitat designated as critical habitat.

Critical habitat includes the stream channels within the designated stream reaches and has a lateral extent as defined by the bankfull elevation on one bank to the bankfull elevation on the opposite bank. Bankfull elevation is the level at which water begins to leave the channel and move into the floodplain and is reached at a discharge that generally has a recurrence interval of 1 to 2 years on the annual flood series. If bankfull elevation is not evident on either bank, the ordinary high-water line must be used to determine the lateral extent of critical habitat. The lateral extent of designated lakes is defined by the perimeter of the waterbody as mapped on standard 1:24,000 scale topographic maps. The Service assumes in many cases this is the fullpool level of the waterbody. In areas where only one side of the

waterbody is designated (where only one side is excluded), the mid-line of the waterbody represents the lateral extent of critical habitat.

In marine nearshore areas, the inshore extent of critical habitat is the mean higher high-water (MHHW) line, including the uppermost reach of the saltwater wedge within tidally influenced freshwater heads of estuaries. The MHHW line refers to the average of all the higher high-water heights of the two daily tidal levels. Marine critical habitat extends offshore to the depth of 10 meters (m) (33 ft) relative to the mean lower low-water (MLLW) line (zero tidal level or average of all the lower low-water heights of the two daily tidal levels). This area between the MHHW line and minus 10 m MLLW line (the average extent of the photic zone) is considered the habitat most consistently used by bull trout in marine waters based on known use, forage fish availability, and ongoing migration studies and captures geological and ecological processes important to maintaining these habitats. This area contains essential foraging habitat and migration corridors such as estuaries, bays, inlets, shallow subtidal areas, and intertidal flats.

Adjacent shoreline riparian areas, bluffs, and uplands are not designated as critical habitat. However, it should be recognized that the quality of marine and freshwater habitat along streams, lakes, and shorelines is intrinsically related to the character of these adjacent features, and that human activities that occur outside of the designated critical habitat can have major effects on physical and biological features of the aquatic environment.

Activities that cause adverse effects to critical habitat are evaluated to determine if they are likely to "destroy or adversely modify" critical habitat by no longer serving the intended conservation role for the species or retaining those PCEs that relate to the ability of the area to at least periodically support the species. Activities that may destroy or adversely modify critical habitat are those that alter the PCEs to such an extent that the conservation value of critical habitat is appreciably reduced. The Service's evaluation must be conducted at the scale of the entire critical habitat area designated, unless otherwise stated in the final critical habitat rule. Thus, adverse modification of bull trout critical habitat is evaluated at the scale of the final designation, which includes the critical habitat designated for the Klamath River, Jarbidge River, Columbia River, Coastal-Puget Sound, and Saint Mary-Belly River population segments. However, we consider all 32 CHUs to contain features or areas essential to the conservation of the bull trout (75 FR 63898:63901, 63944). Therefore, if a proposed action would alter the physical or biological features of critical habitat to an extent that appreciably reduces the conservation function of one or more critical habitat units for bull trout, a finding of adverse modification of the entire designated critical habitat area may be warranted (75 FR63898:63943).

4.2.3 Current Critical Habitat Condition Rangewide (from USFWS 2015c)

The condition of bull trout critical habitat varies across its range from poor to good. Although still relatively widely distributed across its historic range, the bull trout occurs in low numbers in many areas, and populations are considered depressed or declining across much of its range (67 FR 71240). This condition reflects the condition of bull trout habitat. The decline of bull trout is primarily due to habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, past fisheries management practices, impoundments, dams, water diversions, and the introduction of nonnative species (63 FR 31647, June 10 1998; 64 FR 17112, April 8, 1999).

There is widespread agreement in the scientific literature that many factors related to human activities have impacted bull trout and their habitat, and continue to do so. Among the many factors that

contribute to degraded PCEs, those which appear to be particularly significant and have resulted in a legacy of degraded habitat conditions are as follows: 1) fragmentation and isolation of local populations due to the proliferation of dams and water diversions that have eliminated habitat, altered water flow and temperature regimes, and impeded migratory movements, degradation of spawning and rearing habitat and upper watershed areas, particularly alterations in sedimentation rates and water temperature, resulting from forest and rangeland practices and intensive development of roads; 3) the introduction and spread of nonnative fish species, particularly brook trout and lake trout, as a result of fish stocking and degraded habitat conditions, which compete with bull trout for limited resources and, in the case of brook trout, hybridize with bull trout; 4) in the Coastal-Puget Sound region where amphidromous bull trout occur, degradation of mainstem river FMO habitat, and the degradation and loss of marine nearshore foraging and migration habitat due to urban and residential development; and 5) degradation of FMO habitat resulting from reduced prey base, roads, agriculture, development, and dams.

4.2.4 Effects of Climate Change on Bull Trout Critical Habitat (from USFWS 2015c)

One objective of the final rule was to identify and protect those habitats that provide resiliency for bull trout use in the face of climate change. Over a period of decades, climate change may directly threaten the integrity of the essential physical or biological features described in PBFs 1, 2, 3, 5, 7, 8, and 9. Protecting bull trout strongholds and cold water refugia from disturbance and ensuring connectivity among populations were important considerations in addressing this potential impact. Additionally, climate change may exacerbate habitat degradation impacts both physically (e.g., decreased base flows, increased water temperatures) and biologically (e.g., increased competition with non-native fishes).

4.2.5 Environmental Baseline for Bull Trout Critical Habitat

As mentioned in section 4.2.2 of this BA, critical habitat for bull trout consists of: (1) the specific areas within the geographical area occupied by the species, at the time it is listed, on which are found those physical or biological features (primary constituent elements or PCEs): (a) essential to the conservation of the species and (b) which may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species at the time it is listed upon a determination by the Secretary (of the Department of Interior) that such areas are essential for the conservation of the species. The critical habitat includes the stream channels within the designated stream reaches and has a lateral extent as defined by the bankfull elevation on one bank to the bankfull elevation on the opposite bank.

The current condition of the PBFs on the Forest are influenced by water quality, the condition of riparian habitat, the stream channel conditions, watershed condition and non-native species. The future status of the PBFs will be determined by Forest management during plan implementation, natural disturbances and the degree to which stream channels and watersheds are resilient to disturbance and the influence of a changing climate. The current distribution of brook trout within potential bull trout habitat directly impacts PBF 9.

Water Quality

The following water quality discussion is summarized from Day (2016). Citations are included in Day (2016).

High quality water is usually produced in watersheds with undisturbed forest, but in managed watersheds water quality can be affected by land-use practices. Streams and lakes on the CNF generally have high quality water. The most widespread pollutants of concern on the CNF are fecal coliform bacteria and temperature. High summer air temperatures during summer low-flows and reduction in stream shading can increase summer stream temperature. Fecal coliform levels are elevated from both native mammals and livestock grazing both on and off NFS lands. Dissolved oxygen and pH are also pollutants of concern but are not as widespread as fecal coliform and temperature.

Sediment is also considered a pollutant if high levels of fine sediment accumulation are affecting aquatic habitat and channel function. Fine sediment accumulations that appear to be above natural levels are evident in some streams on the CNF from localized bank erosion and roads.

The principal law governing pollution in the nation's streams, lakes, and estuaries is the Federal Water Pollution Control Act (P.L. 92-500, enacted in 1972), commonly known as the Clean Water Act (CWA). The primary objective of the CWA is to restore and maintain the integrity of the nation's waters through regulation of point and non-point source water pollution.

The CWA mandates that each state provide guidance and direction for the protection and restoration of water bodies (40 CFR 131.12). In Washington State, the United States Environmental Protection Agency (EPA) has designated authority for compliance with the CWA to The Washington Department of Ecology (WADoE). As required under the CWA, WADoE identified beneficial uses and developed water quality standards to protect beneficial uses. Water quality standards for the primary pollutants on streams and rivers across the CNF are shown in Table 18. Designated beneficial uses established for national forests, wilderness areas, and national parks in Washington include:

- Salmon and trout spawning, core rearing and migration
- Extraordinary primary contact recreation
- Domestic, industrial, and agricultural water supply
- Stock watering
- Wildlife habitat
- Harvesting (fish, etc)
- Commerce and navigation
- Boating
- Aesthetic values

Table 18 - Water quality standards for waters of the CNF (WAC 173-201A-200) (From table 24 in Day 2016)

Parameter	Standard
Temperature	16 °C (60.8 ºF), 12 ºC (53.6 ºF) in bull trout critical habitat (7-day average of daily maximum temperature)
pH	6.5-9.0*
Fecal Coliform	geometric mean above 50 colonies per 100 milliliters with the 90th percentile of the samples not exceeding 100 colonies per 100 milliliters
Dissolved Oxygen	9.5 mg/L (lowest 1-day minimum)
Total Dissolved Gas	Shall not exceed 110% of saturation at any point of sample collection
+Turbidity	5 NTU over background when background is 50 NTU or less. A 10% increase in turbidity when background turbidity is more than 50 NTU.

*Based on naturally occurring dissolved calcite from regional limestone geology, the upper range of the standard for pH was raised from 8.5 to 9.0 (Wiley and Baldwin 2005).

+ Sediment in water bodies fits into two categories; suspended sediments (measured and regulated by the turbidity standard), and bedded sediments. There is no approved water quality standard for sediment in Washington.

Additional water quality standards apply specifically to aquatic life. Aquatic life uses are designated based on the presence of, or the intent to provide protection for key uses (WAC 173-201A-200. Available at: http://www.ecy.wa.gov/Programs/wq/swqs/currEPAapprswqs.htm. Accessed December 12, 2016).

Categories for aquatic life uses that apply to bull trout and apply to bull trout critical habitat critical habitat are: *Char spawning and rearing*. The key identifying characteristics of this use are spawning or early juvenile rearing by native char (bull trout and Dolly Varden *S.malma*), or use by other aquatic species similarly dependent on such cold water. Other common characteristic aquatic life uses for waters in this category include summer foraging and migration of native char; and spawning, rearing, and migration by other salmonid species. The bull trout water quality standards are (WAC 173-201A-260):

1. The water temperature criteria for bull trout is 12°C (53.6°F) as measured by the 7-day average of the daily maximum temperatures (7-DADMax).
    - When a water body's temperature is warmer than the criteria (or within 0.3°C (0.54°F) of the criteria) and that condition is due to natural conditions, then human actions considered cumulatively may not cause the 7-DADMax temperature of that water body to increase more than 0.3°C (0.54°F).
    - When the background condition of the water is cooler than the criteria in Table 18, the allowable rate of warming up to, but not exceeding, the numeric criteria from human actions is restricted as follows:
        - Incremental temperature increases resulting from individual point source activities must not, at any time, exceed 28/(T+7) as measured at the edge of a mixing zone boundary (where "T" represents the background temperature as measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge); and

    - Incremental temperature increases resulting from the combined effect of all nonpoint source activities in the water body must not, at any time, exceed 2.8°C (5.04°F).
  - Temperatures are not to exceed the criteria at a probability frequency of more than once every ten years on average.
  - Maximum 7-DADMax temperatures of 9°C (48.2°F) at the initiation of spawning and at fry emergence for char.
2. The dissolved oxygen (DO) bull trout criteria is 9.5 mg/L:[25]
  - When a water body's D.O. is lower than the criteria in Table 18 (or within 0.2 mg/L of the criteria) and that condition is due to natural conditions, then human actions considered cumulatively may not cause the D.O. of that water body to decrease more than 0.2 mg/L.
  - When a water body's D.O. is lower than the criteria in Table 18 (or within 0.2 mg/L of the criteria) and that condition is due to natural conditions, then human actions considered cumulatively may not cause the D.O. of that water body to decrease more than 0.2 mg/L.
  - For lakes, human actions considered cumulatively may not decrease the dissolved oxygen concentration more than 0.2 mg/L below natural conditions.
  - Concentrations of D.O. are not to fall below the criteria in the Table 18 at a probability frequency of more than once every ten years on average.
3. Turbidity is measured in "nephelometric turbidity units" or "NTUs." For bull trout waters the turbidity must not exceed:
    - 5 NTU over background when the background is 50 NTU or less; or
    - A 10 percent increase in turbidity when the background turbidity is more than 50 NTU.
4. Bull trout total dissolved gas (TDG) criteria**.** TDG is measured in percent saturation. For bull trout TDG shall not exceed 110 percent of saturation at any point of sample collection.
5. Bull trout pH criteria**.** Measurement of pH is expressed as the negative logarithm of the hydrogen ion concentration. For bull trout the pH shall be within the range of 6.5 to 8.5, with a human-caused variation within the above range of less than 0.2 units.

Section 303(d) of the Clean Water Act and EPA regulation (40 CFR 130.2(J), and 130.7), delegates the authority to list waters that do not meet water quality standards or beneficial uses to individual states. Washington determines its 303(d) list through the water quality assessment (WQA) process. Once a water body is listed as impaired on the 303(d) list WDoE is to develop a Total Maximum Daily Load (TMDL) for each pollutant of concern. A TMDL is a quantitative plan and analysis procedure for attaining and maintaining water quality standards and specifies the total load of pollutant a waterbody can carry and still meet beneficial uses. The TMDL and associated Water Quality Implementation Plan (WQIP) outline the process through which beneficial uses can be met through the identification of sources of pollutants, and actions that lead to improved water quality (40 CFR 130.2(H)).

The USDA Forest Service is designated as the management agency for meeting CWA requirements on NFS land through a 2000 Memorandum of Agreement (MOA) between WDoE and USDA Forest Service Region 6. The MOA stipulates that the Forest Service is responsible for ensuring that all waters on NFS lands meet or exceed water quality laws and regulations. National forest management activities are to

[25] Mg/L = milligrams per liter

be consistent with protections provided in Washington Administrative Code and relevant state and water quality requirements. The MOA states that the Forest Service and WDoE will collaborate to address 303(d) listings through the development of TMDLs and WQIPs (USDA Forest Service and WADoE, 2000). While the 2000 MOA has not been updated, the CNF and Ecology continue to manage CWA compliance under the MOA.

The 2008 WQA and 303(d) list was approved by EPA Dec. 21, 2012. The 2008 WQA and 303(d) list is considered the '2012 Water Quality Assessment' to reflect when the assessment was approved rather than when the assessment was scheduled for completion. The 2012 WQA 305(b) list and 303(d) list contains 42 stream reaches on the CNF that do not meet water quality standards and includes all impaired stream segments added to the 303(d) list since 2004 that are not under an approved TMDL. Impairment pollutants across the Forest include fecal coliform bacteria, dissolved oxygen, pH and temperature. Bead Lake is the only lake on the CNF on the 303(d) list and is listed for PCBs and dioxins found in fish tissue samples.

To meet the goals outlined in the MOA and comply with the CWA, WDoE and the CNF worked in 2002 on a TMDL for temperature, bacteria, pH, and dissolved oxygen and WQIP for waters across the Forest on the 1998 303(d) list. EPA approved the TMDL and WQIP for fecal coliform on eight waterbody segments and temperature on four segments from the 1998 303(d) list as well as 41 temperature-impaired waterbody segments added to the 303(d) list during the TMDL development process in 2005. The TMDL for pH and dissolved oxygen was not approved at this time because the submittal report lacked some of the required components in the dissolved oxygen and pH analysis.

Although water bodies added to the 303(d) list since TMDLs and WQIPs were finalized are not included in the TMDLs, they are included in monitoring plans on the CNF (discussed below). Miles of stream by pollutant within the Action Area covered under TMDLs and WQIPs, and not covered under TMDLs and WQIPs are shown in Table 19.

Table 19 - Miles of stream by pollutant in the Pend Oreille Subbasin on the Colville National Forest under an approved TMDL and WQIP, and miles of stream on the current 303d list not specifically covered under at TMDL and WQIP (Obtained from Table 25 in Day 2016)

	Pollutant by Miles of Streams Covered under a TMDL and WQIP (*Category 4a)		**Pollutant by Miles of Streams not Specifically Covered under a TMDL or WQIP (*Category 5)**			
Subbasin	Bacteria	Temperature	Bacteria	Temperature	pH	DO
Pend Oreille	0	2.2	2.2	3.3	11.0	20.1

* Category 4a waters have known pollution problems that have an approved TMDL being actively implemented. Category 5 waters are classified as polluted waters that require a TMDL or WQI plan and are traditionally known as the 303(d) list.

The CNF is working to reduce fecal coliform bacteria from varied sources, including recreation and livestock grazing. Outhouses in developed campgrounds have been replaced and sealed vault toilets have been installed at select dispersed recreation sites further from surface waters. Work also continues to improve management of active grazing allotments, including installation of off-stream watering and fencing. The CNF has been monitoring fecal coliform and in 2013 WDoE concluded that the

Forest has made significant progress in the last eight years toward meeting the requirements of the bacteria TMDL and improving water quality on the Colville National Forest.

The CNF is also working to monitor and improve temperature in impaired stream reaches. The WQIP and TMDL requires temperature monitoring and compliance at 37 sites by 2056. The CNF has temperature data for 78 streams with varying years of data. A subset of these 78 temperature monitoring sites are on temperature-impaired streams. Progress continues to increase temperature monitoring sites and to improve the factors that impair stream temperature.

Watershed Condition and Physical Aquatic Habitat

The current environmental baseline for physical aquatic habitat was assessed in two ways. The first was to determine the Aquatic Ecological Condition (AEC) of subwatersheds on the Forest and the second was using monitoring results from the PACFISH/INFISB Biological Opinion (PIBO) effectiveness monitoring program.

AEC

The AEC was developed in order to meet the sustainability requirements of the 2000 planning rule and the 1982 planning rule viability requirements. The CNF along with the Okanogan-Wenatchee National Forest and Blue Mountain National Forests, participated in a Region 6 pilot effort to develop a process to address the contribution of National Forest System lands to the "sustainability of aquatic species". The result of the regional pilot process is a paper titled, *Process for Evaluating the Contribution of National Forest System Lands to Aquatic Ecological Sustainability* (Reiss *et al*. 2008). The result of the pilot effort was the development of the AEC model to evaluate the status of local populations of focal/MIS species (bull trout, westslope cutthroat trout and interior redband trout; section 5.2) and their habitat at the HUC12 or sub-watershed scale. The results are then aggregated to produce an ecological sustainability or viability outcome for each focal species at the subbasin (HUC 8) scale. The following describes the habitat portion of the AEC, the species portion of the AEC and viability outcome are discussed in the next section, 5.2.

Reiss *et al.* (2008) utilized a decision-support model in order to formalize the assessment procedures, assumptions and factors that would contribute to healthy, ecologically sustainable aquatic species' populations and their habitat. The decision-support model (DSM) is a computer-based model (Netweaver) that applies a consistent evaluation process across time and space[26]. This type of model was chosen because it uses an explicit process for assessing condition and documents the data and relations between attributes assumed in the assessment. Decision Support Models use data to evaluate a conclusion. For the AEC model, the conclusion being evaluated is; Subwatersheds (HUC12) on the CNF provide Aquatic Ecological Conditions that are properly functioning and support viable populations of aquatic MIS/focal species. The HUC12 AEC assessment depends on two topics; MIS/focal species local population condition (section 5.2) and habitat condition within each subwatershed on the Forest. Both of these topics are dependency networks composed of aggregated evaluation scores from other attributes (shown below). These scores may be interpreted as strength of evidence, where +1 indicates strong evidence of the conclusion and -1 indicates no evidence of the conclusion. A score of 0 is assigned

[26] Documentation including the scientific rationale used to develop the AEC model can be found in Reiss *et al.* (2008)

by the model when the strength of evidence lies midway between the +1 and -1 scores and/or does not provide evidence for or against the conclusion. Scores from -1 to -0.34 were judged to be *NOT PROPERLY FUNCTIONING* for a model attribute or total AEC; scores from -0.33 to +0.33 are judged to be *FUNCTIONING AT RISK*; scores from +0.33 to +1.0 are *FUNCTIONING APPROPRIATELY*. The AEC model was originally run for the CNF in 2008. The CNF decided to not use the 2008 AEC model results due to a variety of factors including:

- Subwatershed boundaries have changed since the original assessment
- Documentation of the 2008 AEC modeling process for the Forest is not clear and the personnel who developed and ran the model have moved to other agencies or retired; thus it is difficult to analyze the model results without better understanding of the model inputs. This concern was further highlighted as the model results seem to over-estimate the number of watersheds in a "poor" condition given the more recent 2010 watershed condition framework (WCF; Potyondy and Geier 2010) effort.
- Existing information on in-stream habitat was not utilized in the 2008 model. Updating the 2008 analysis allowed the CNF to integrate the available stream habitat information and the WCF exercise to provide a more complete assessment of the current conditions across the Forest.
- Current fish distribution and status information is more robust than what was available in 2008.

A second exercise to assess the AEC was undertaken in 2014. For the 2014 AEC modeling, the CNF followed the basic procedures outlined in Reiss *et al.* (2008) but the information and analysis described below utilized EXCEL spreadsheets instead of the DSM. [27] A full description of the 2014 AEC developed for the CNF is contained in MacDonald *et al.* (2016).

The habitat condition component of the HUC12 AEC model was designed to assess ecological processes and watershed function, rather than evaluate the specific habitat needs of any particular species. Aquatic and riparian resources, water quality and species viability are dependent on the protection of naturally occurring processes. Processes such as, wildfire, flooding, sediment delivery to streams, natural flow regimes and retention of riparian vegetation (provides shade, moderates stream temperatures, provides recruitment of downed trees, etc.) are essential to the proper functioning of the stream channel and habitat that provides for the viability of aquatic species. Attributes were selected to serve as indicators of the routing of water, sediment, wood, and nutrients through the watershed—the processes that create and maintain the habitat conditions necessary to sustain healthy populations of aquatic- and riparian-dependent species. Channel shape and function, and the large woody debris attributes are included as indicators of current stream channel and overall aquatic habitat condition.

The following model and attributes and attribute weights were developed by the CNF based on Reiss *et al.* (2008), and with input from Forest Service Region 6 Regional Office fish biologist, hydrologist and planning staff.

[27] Kate_Aquatic_Function_9_22-14 and KeyWatershedSpreadsheet_9-29-2014-Excel

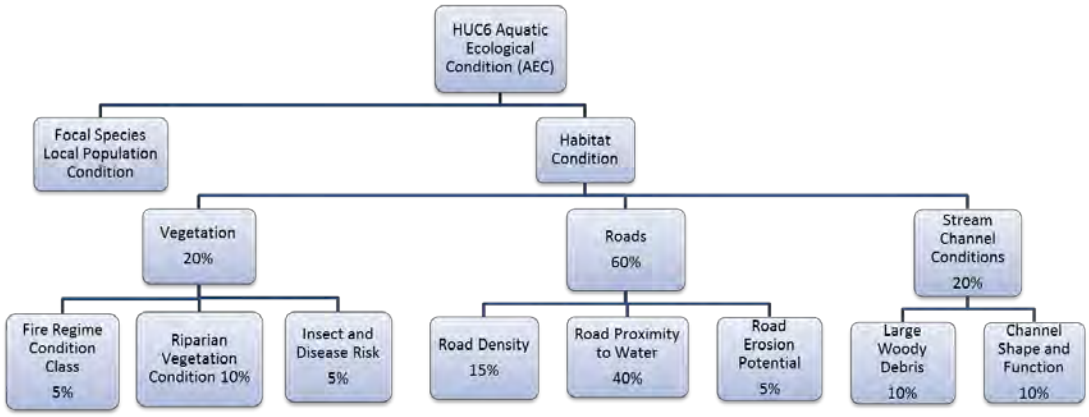

Figure 7 - Diagram of elements and weights used to assess habitat condition in the HUC12 AEC model

The road density attribute is used in the habitat condition model not only as an indicator of the potential risks roads present to aquatic habitat and watershed processes but as an indicator of the intensity of anthropogenic disturbances in a watershed, not just those risks due directly to effects of the roads themselves. Roads have been shown to affect the routing of water, sediment, wood, and nutrients to stream channels resulting in accelerated erosion and sediment delivery to stream channels; alter channel structure and impede lateral migration of the channel in the flood plain; reduce large wood recruitment into the stream channel and shorter residence times of wood in the stream; and alter flow paths leading to diversion or extension of channels onto un-channeled portions of the landscape (Furniss *et al* 1991; Gucinski *et al*. 2001)

Roads are also associated with activities, past and present, that create negative effects on watershed and aquatic conditions beyond those solely attributable to the road, such as fishing, fish stocking (particularly non-native species), disease introduction, beaver removal, timber harvest, splash-damming, permanent dams for water storage and power production, recreation (particularly dispersed recreation camping next to streams), livestock grazing, irrigation withdrawals, fire suppression and ignition, and mining.

The road density (miles/sq. mile) attribute was calculated by subwatershed by dividing the total miles of road under all jurisdictions within the CNF proclaimed boundary by the area of the proclaimed CNF boundary.

Roads in proximity to water attribute is similar to the channel constriction attribute described in Reiss *et al.* (2008), recognizing that roads near aquatic habitat can have additional effects to the habitat. Streamside roads can reduce stream shade and increase water temperatures, simplify channel form (cut off side channels, straighten streams through confinement), and create impediments to the movement of aquatic species. The rationale given in Reiss *et al.* (2008) is further supported by recent work specific to the interior Columbia Basin. Meredith *et al.* (2014) found the presence of roads adjacent to streams

resulted in significant reductions of in-channel wood. The proximity to water attribute by subwatershed was calculated by dividing total road miles of all roads under all jurisdictions in the Riparian Habitat Conservation Areas (RHCA) designated by INFISH (USDA Forest Service 1995) by the square mile of RHCAs.

The road attributes were categorized or "scored" consistent with the WCF, where a score of 1 is considered to be "good" condition, a score of 2 representing "fair" and a score of 3 is considered "poor" condition. Table 20 displays how the road density and proximity to water attributes were categorized.

Table 20 - Road Attributes Categories

Road Density (mile per square mile?)	Road Density Risk category	Riparian Road Density category
<1	1	1
1-2.4	2	2
>2.4	3	3

The roads attributes were further evaluated for erosion and sedimentation risk. High road densities in sensitive HUC12s can more severely disrupt watershed processes and potentially have more serious impacts to water quality, aquatic habitat, and the species themselves than the same densities in less sensitive HUC12s. The weight that the road density evaluation score receives in the model varies according to a HUC12's sensitivity to soil disturbance.

The roads in landtype associations (LTA) with high erosion and sedimentation potential attribute is similar to the road density by sensitive soils attribute in Reiss *et al.* (2008). LTAs are ecological land units delineated based on similarities in landform pattern, geomorphic processes, regolith and bedrock features and their influence on physical and biological processes, climate, and potential vegetation (Davis *et al.* 2004). The LTAs were rated based on erosion risk using the following factors:

- Sediment delivery efficiency
- Surface runoff from snowpack
- Surface runoff from summer storms
- Deep-seeded landslide risk
- Shallow, rapid landslide risk
- Soil erosion

Two upslope vegetation attributes were included in the AEC model: fire condition class, and insects and disease. The definitions, rating and scoring for the two attributes was obtained from the WCF database. These two attributes were chosen to help describe the health of forest vegetation as a component of a healthy watershed and to assess the potential risk of historically uncharacteristic wildfire, and insect and disease outbreaks.

The fire regime condition class (FRCC) measures the degree vegetation conditions have departed from a reference condition expected with natural fire frequency intervals. The departure from reference conditions may result in changes to key ecosystem components, such as vegetation characteristics

(species composition, structural stage, stand age, canopy closure, and mosaic pattern); fuel composition; fire frequency, severity, and pattern; and other associated disturbances, such as insect and disease mortality, grazing, and drought. The degree of departure may be due to (but are not limited to) fire suppression, timber harvesting, livestock grazing, introduction and establishment of exotic plant species, and insects and disease. The FRCC is a measure of ecological trend and the potential for uncharacteristic disturbance to the ecosystem from fire. There are three fire regime condition classes:

- FRCC 1 represents ecosystems with low (<33 percent) departure and that are still within the estimated historical range of variability during a specifically defined reference period.
- FRCC 2 indicates ecosystems with moderate (33 to 66 percent) departure.
- FRCC 3 indicates ecosystems with high (>66 percent) departure from reference conditions.

Insects and disease along with fire are important natural regulators of forest change. However, epidemic levels of insects and disease can negatively affect resource values and ecosystem functions including reducing the ability of forest canopies to intercept snow and prevent excessive runoff. Recent increases in forest area affected by insect outbreaks and possible links to fire suppression have created a resurgence of interest in their possible effects to water quantity, quality, and risks.

The riparian wetland vegetation attribute addresses riparian vegetation condition. Important functions of riparian vegetation include (Gregory *et al*. 1991, FEMAT 1993):

a. The input of fine organic matter and nutrients to aquatic habitat
b. Providing for bank stability
c. Filtering sediment due to surface erosion thus controlling the amount reaching the aquatic system
d. A source of large woody debris
e. Shading the aquatic habitat thus helping to control water temperature
f. Controlling the microclimate within the riparian zone and adjacent to the aquatic habitat

The riparian wetland vegetation attribute scores were obtained from the WCF database.

The CNF had recently assessed stream habitat in subwatersheds within the CNF administrative boundary with a consistent framework through the WCF exercise. The previously discussed attributes assess factors that influence aquatic habitat but do not specifically describe current aquatic habitat condition. The CNF included attributes to describe aquatic habitat conditions which when combined with the upslope and riparian attributes, and MIS/focal species status scores were felt to provide a fairly complete picture of the AEC.

Two in-channel attributes were chosen to describe in-stream habitat conditions:

- Channel shape and function
- Large woody debris

Stream channels are formed and shaped in response to the timing and quantity of flow and sediment delivery over time. Short-term changes in water or sediment delivery due to a disturbance such as a fire or flood may cause a channel response resulting in a changed condition. However if the channel forming

processes are intact and allowed to recover, the stream channels and aquatic habitat are usually resilient (see Leopold 1994, Rosgen 1996, Montgomery and Buffington 1998).

Allowing stream channels to interact with floodplains and preserving the lateral, longitudinal, and temporal variability between stream channels, floodplains and riparian habitats are paramount to maintain natural heterogeneity and complexity of aquatic habitat (Naiman *et al.* 1992). In-stream large woody debris, where it is a natural part of the aquatic system, is an important feature that creates complex channel structure and fish habitat by collecting sediment, forming riffles and pools, providing cover, and facilitating biological productivity (Naiman *et al*. 1992). Complex habitats that are resilient to disturbance are important for the survival and productivity of aquatic species populations (Reeves *et al.* 1995)

The scores for the habitat portion of the AEC were obtained by multiplying the score for each attribute by its weight and summing the scores for each subwatershed. The properly functioning, functioning at risk, and not properly functioning scores were then converted to a +1 to -1 scale and combined with the MIS/Focal Species Status to obtain the AEC score for a subwatershed (see section 5.2).

Pend Oreille Bull Trout Watershed Condition Results

The AEC habitat watershed condition scores are generally *not properly functioning* for CNF subwatersheds draining into the Pend Oreille subbasin. Watershed condition is rated as *properly functioning* only in the Headwaters South Salmo River, Outlet South Salmo, Slate Creek, and North Fork Sullivan Creek – Sullivan Creek subwatersheds. The *functioning at risk* and *not properly functioning* ratings are due to at risk or not properly functioning ratings for large woody debris (16 subwatersheds), channel shape and function (17 subwatersheds), riparian vegetation condition (18 subwatersheds), insects and disease (four subwatersheds), road densities (19 subwatersheds) riparian road densities (19 subwatersheds) and roads on sensitive soils (eight subwatersheds). Additionally all subwatersheds were rated *functioning at risk* for the fire regime attribute. The scores are in 92914KeyWatershedSpreadsheet.xls that were sent with this BA.

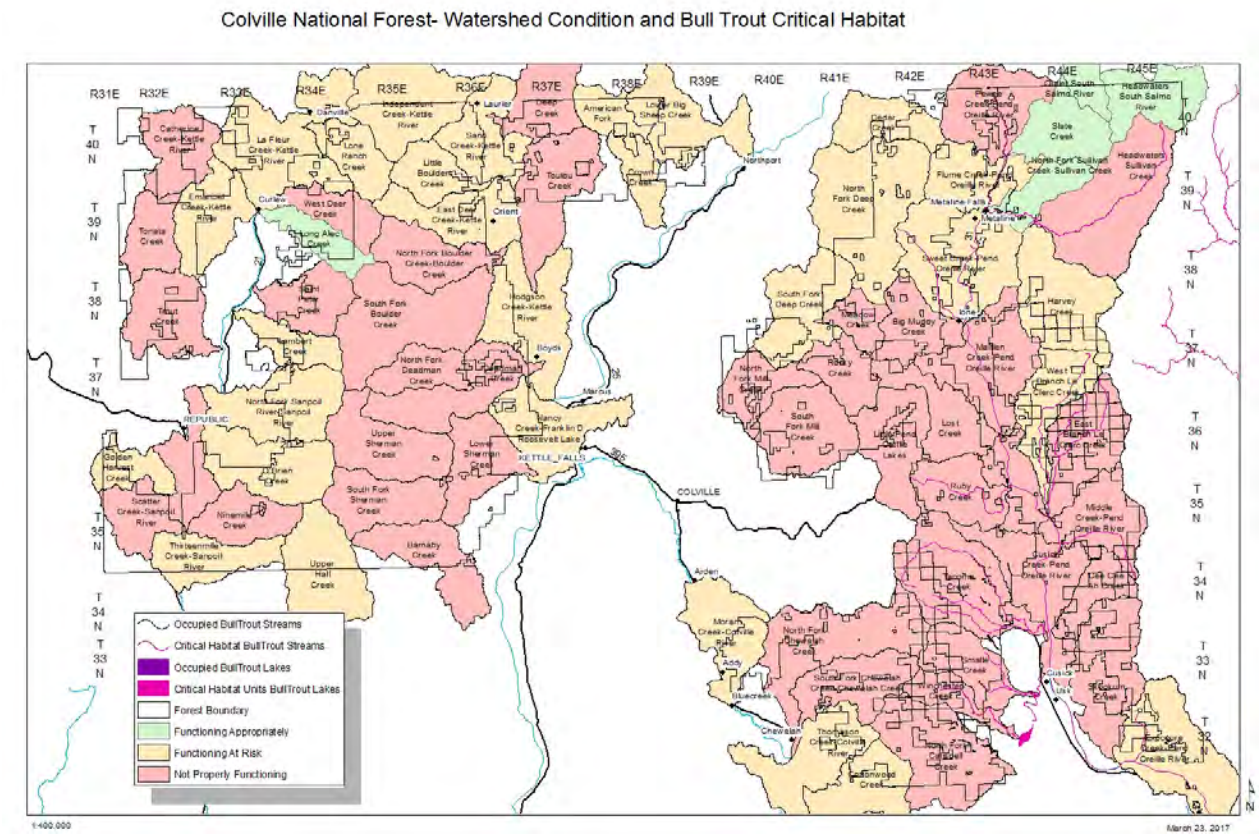

Figure 8 - Watershed Condition and Bull Trout Critical Habitat

PIBO Surveys

The AEC assessment provides information on the current status of MIS/focal species populations and watershed and stream channel condition. That assessment of current aquatic habitat condition on the CNF is further informed through habitat trend information provided by the PIBO Effectiveness Monitoring Program. PIBO began implementation in 2001 (while the CNF only comes under the INFISH strategy the PIBO program includes areas managed under both the PACFISH and INFISH strategies).[28] The monitoring program was designed to answer the question: "Are key biological and physical components of aquatic and riparian communities being improved, degraded, or restored within the range of steelhead (*O. mykiss)* and bull trout?" As the program has progressed, PIBO is using an "index" approach to answer the question.[29] The index approach to assessing status of habitat conditions outlined in Al-Chokhachy *et al*. (2010) was developed to account for some of the natural variability among sites due to geoclimatic and disturbance regimes. The PIBO approach (Archer *et al.* 2016), based upon Al-Chokhachy *et al*. (2010), compares the status of stream habitat conditions at sites in 'managed' subwatersheds (subwatersheds disturbed by various management activities) to habitat conditions at

[28] PIBO PacFish Infish Biological Opinion Monitoring http://www.fs.fed.us/biology/fishecology/emp/index.html)
[29] Personal communication, telephone conversation between Ken MacDonald and Eric Archer, PIBO (March 20, 2014) and email Eric Archer to Ken MacDonald (Preliminary Colville Results) (March 21, 2014)

sites within 'reference' or relatively pristine subwatersheds. Since all streams are affected by natural disturbance, status is determined by assessing how the range of habitat conditions at managed sites compares to what would be expected if the stream had only experienced natural disturbance. The PIBO approach compares five in-channel habitat attributes; residual pool depth, percent pools, D50[30], fines in pool tails, and large wood frequency. The individual attribute index scores are combined into a total index and there is an additional index for the aquatic macroinvertebrate community (observed/expected (O/E)). The index scores for the individual attributes and the final index are then compared to scores from reference stream reaches, in reference subwatersheds within the same ecoregion, and across the PIBO monitoring area.

PIBO also evaluated the data to determine if habitat trends on reaches where they had repeat surveys (often three) were improving (moving in a direction considered to be favorable habitat for salmonids). For the trend analysis, the attributes bank stability (% bank covered with plants or rock) and percent undercut bank were added to the five used to assess status. The index approach is felt to be good for determining status but may not be as useful for determining trends in habitat conditions over time as it averages conditions of several attributes that may be more responsive individually. Trends are therefore estimated by measuring the changes in the individual stream attributes over time (Archer *et al.* 2016).

In addition to the sites sampled to determine whether the "key biological and physical components of aquatic and riparian communities are being improved, degraded, or restored" (deemed PIBO effectiveness monitoring), PIBO samples sites in Designated Monitoring Areas (DMAs). The DMAs are located at sites within grazed subwatersheds that are representative of typical grazing impacts for the pasture (Archer *et al.* 2016).

In order to account for differences in stream types and geographic location, predictor variables were developed to provide the 'expected' stream habitat conditions (see Al-Chokhachy *et al*. 2010 and Archer *et al.* 2016). The predictor variables are:

- Catchment Area (km²)
- Average precipitation (m)
- Slope of valley along reach (%)
- Percent forested along reach (%)
- Drainage density in catchment (km/km²)
- Reach gradient (%)
- Elevation (m)
- Dominant geology type

The following summarizes the PIBO results from Archer *et al*. (2016) on a Forest-wide basis and within the Pend Oreille subbasin on the CNF. In all cases below, the "managed" stream results are compared to the results from similar reference streams, based on the landscape predictor variables, in the same ecoregion and through PIBO sampling area. The term significant refers to statistical significance ($p < .10$).

[30] D50 is a measure of the stream substrate median particle size of the stream substrate. Definitions for all the stream habitat attributes can be found in Kershner *et al*. (2004).

Colville National Forest

Consistent with the WCF ratings, the distribution of the total index scores for streams on the Forest are less (impaired habitat condition) than would be expected based upon the reference watersheds. The "scores" for most of the habitat attributes are also significantly lower ('impaired' condition) than what is expected compared to reference sites within both the ecoregion and reference sites across the PIBO sampling area. Only the residual pool depth index score is not significantly different than reference sites within the ecoregion but there is a relatively large confidence interval (confidence interval 15.8% of mean). The large wood attribute score is significantly higher than the reference sites. While the O/E index is significantly lower than reference sites, the score is still within the range that would be considered "good" as described in Archer *et al.* (2016). While the scores for most of the attributes are lower than reference sites, there are statistically significant positive trends in the overall index scores, and the bank stability, percent undercut bank, large wood frequency, bank angle, residual pool depth and percent pool attributes.

Similarly, the overall index scores within the sampled DMAs are significantly lower than reference reaches as are the median substrate size, fines in pool tail-outs, and bank angle habitat attributes. There appear to be significant positive trends in the bank stability and percent pool indices within the DMAs across the Forest, although the sample size is low.

Pend Oreille Subbasin

Within the Pend Oreille subbasin the overall index and the percent pool attribute scores are not significantly different than reference sites within the ecoregion but are significantly lower when compared to all reference sites. However the confidence interval for the managed sites in the Pend Oreille is 27% of the mean value and the confidence interval for the eco-region references sites is 10% of the mean, versus 3.5 percent for all reference sites. The sample size for all reference sites is considerably larger than the sample size for the reference sites within the eco-region (216 vs. 34) and with only 13 managed sites, the "no-significance" compared to the mean eco-region overall index may be due to relatively low sample size at this time and relatively large confidence intervals. Median substrate size and pool tail fine indices are both significantly lower (poor) compared to either reference. There are no significant differences in the status of the other attributes compared to the references. There are significant positive trends in the bank stability, large wood, pool-tail fines and residual pool depth attributes. There are not enough samples to determine either status or trend within the DMAs

Summary – Current Condition of the PBFs

The following summarizes the preceding information assessments in terms of the PBFs of bull trout critical habitat.

1. Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) to contribute to water quality and quantity and provide thermal refugia. - This PBF was not specifically assessed but 16 subwatersheds in Bull Trout Critical habitat were found in the AEC assessment to be functioning at risk or not properly functioning for the riparian road attribute indicating there may be some areas where subsurface water may be disconnected due to the presence of near stream roads.

Table 21 - AEC Riparian Road Density

Subwatershed Number	Subwatershed Name	Percent FS	Riparian Road Density	Critical Habitat
170102160403	North Fork Sullivan Creek-Sullivan Creek	100	Functioning Appropriately	yes
170102160702	Headwaters South Salmo River	60	Functioning Appropriately	no
170102160201	Exposure Creek-Pend Oreille River	57	Functioning At Risk	yes
170102160302	West Branch Le Clerc Creek	100	Functioning At Risk	yes
170102160903	Slate Creek	99	Functioning At Risk	yes
170102160904	Flume Creek-Pend Oreille River	86	Functioning At Risk	yes
170102161003	Cedar Creek	41	Functioning At Risk	no
170102160101	North Fork Calispell Creek	98	Not Properly Functioning	no
170102160102	Winchester Creek	83	Not Properly Functioning	yes
170102160103	Smalle Creek	81	Not Properly Functioning	yes
170102160202	Skookum Creek	100	Not Properly Functioning	no
170102160204	Cee Cee Ah Creek	99	Not Properly Functioning	no
170102160206	Tacoma Creek	92	Not Properly Functioning	yes
170102160207	Cusick Creek-Pend Oreille River	57	Not Properly Functioning	yes
170102160301	Middle Creek-Pend Oreille River	94	Not Properly Functioning	yes
170102160303	East Branch Le Clerc Creek	100	Not Properly Functioning	yes
170102160304	Ruby Creek	100	Not Properly Functioning	yes
170102160305	Yokum Lake-Pend Oreille River	73	Not Properly Functioning	yes
170102160306	Lost Creek	93	Not Properly Functioning	no
170102160307	Maitlen Creek-Pend Oreille River	77	Not Properly Functioning	yes
170102160401	Harvey Creek	100	Not Properly Functioning	no
170102160402	Headwaters Sullivan Creek	100	Not Properly Functioning	yes
170102160901	Big Muddy Creek	90	Not Properly Functioning	no
170102160902	Sweet Creek-Pend Oreille River	80	Not Properly Functioning	yes
170102160905	Pewee Creek-Pend Oreille River	71	Not Properly Functioning	yes

2. Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers. - Not directly assessed however there may be some impairment as approximately 5.5 miles of stream have a 303(d) water temperature impairment,

11.0 miles are impaired for pH and 20.1 miles are impaired for dissolved oxygen. Of these there is a TMD being actively implemented on 2.2 miles of the temperature impaired streams.

The Forest currently administers four dams including the West Branch LeClerc Creek Dam, Little Twin Lakes Dam, and Big Meadow Lake Dam, Bayley Lake Dam. There are an additional five dams within the administrative boundary of the Forest that are owned by public utilities or local governments. Additional details on dams on the Forest are shown in table 22. Management of these dams does not vary by forest plan alternative, and management and mitigation of effects of these dams is expected to continue under all alternatives.

Table 22. Dams in the Pend Oreille Subbasin on the Colville National Forest

Dam Name	Owner	Subbasin	Stream/River Name	Impairs Migration in Bull Trout Critical Habitat	Notes
West Branch LeClerc Creek Dam	Colville NF	Pend Oreille	West Branch LeClerc Creek	Yes	Log crib dam that does not create impoundment; filled with fine sediment. Removal is an essential project in the WB LeClerc Watershed Action Plan
Metaline Falls Municipal Water Dam	Metaline Falls	Pend Oreille	Tributary to Sullivan Creek	Yes	Diversion dam supplying water to the Community of Metaline Falls
Boundary Dam	Seattle City Light	Pend Oreille	Pend Oreille	Yes	
Mill Pond Dam	Pend Oreille PUD	Pend Oreille	Sullivan Creek	Yes	Scheduled for removal in 2019
Sullivan Lake Dam	Pend Oreille PUD	Pend Oreille	Harvey Creek/ Outlet Creek	Yes	Dam enhances the natural lake. Managed by Pend Oreille PUD for recreation, and water supply for interbasin transfers.
Conger Pond Dam	Colville NF	Pend Oreille	Trimble Creek	No	
Box Canyon Dam	Pend Oreille PUD	Pend Oreille	Pend Oreille	Yes	

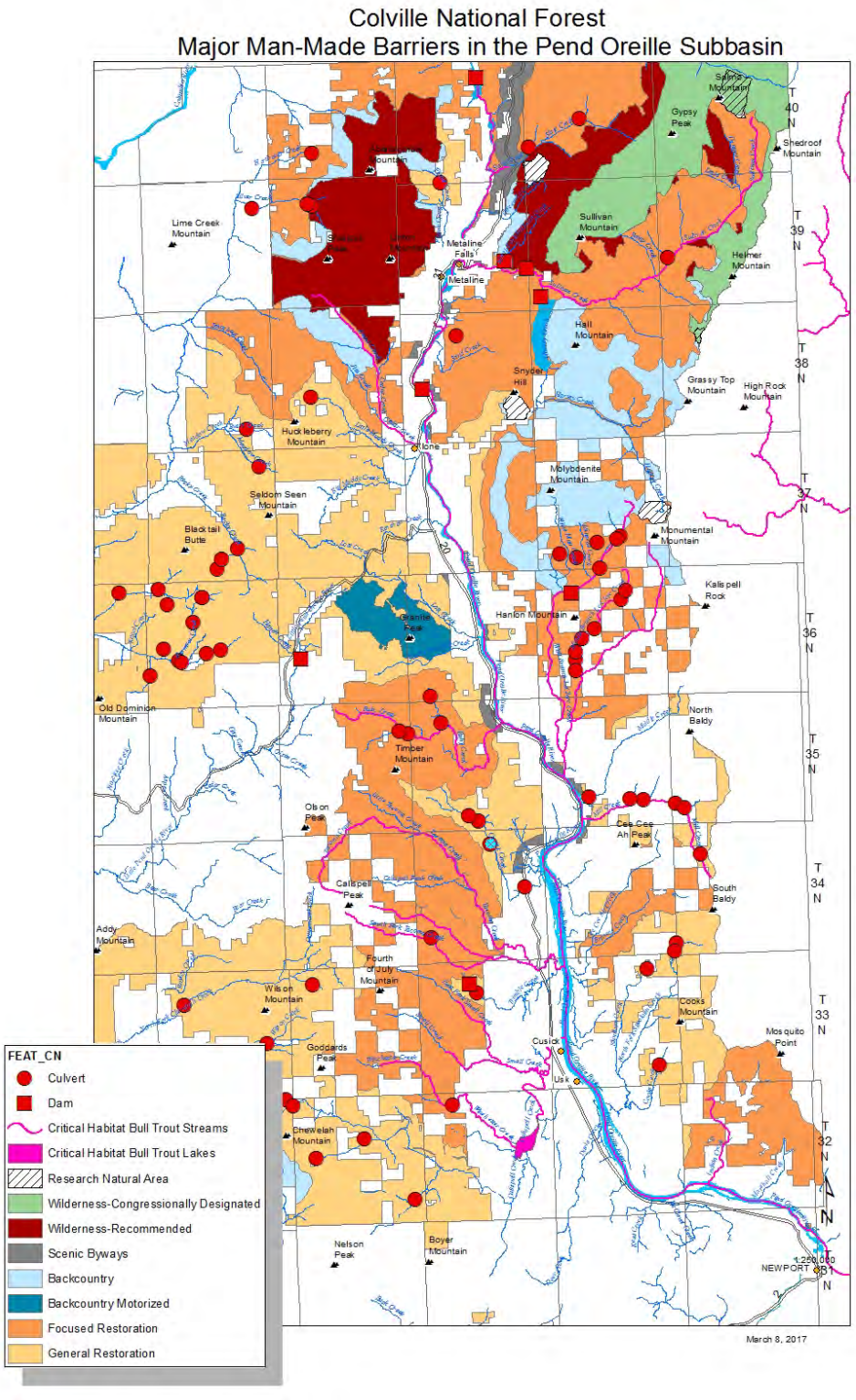

Figure 9 - Man-made barriers on the Colville National Forest

3. *An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.* - The PIBO information suggests the food base, at least the aquatic macroinvertebrate food base is sufficient to support this PBF as the macroinvertebrate community within sampled streams in the Pend Oreille subbasin are similar to what is expected based upon reference streams.

4. Complex river, stream, lake, reservoir, and marine shoreline 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. – The overall stream habitat indices and the percent pool indices within sampled streams in the Pend Oreille subbasin were was found by PIBO to be not significantly different than reference streams within the eco-region but are significantly lower when compared to all reference streams indicating this PBF may be "at risk". The AEC assessment found 17 subwatersheds to be functioning at risk or not properly functioning. Residual pool depths, the amount of large wood and bank angle attributes were not found to be significantly different than reference streams. There have also been statistically significant improving trends in bank stability, large wood and residual pool depths. The AEC assessment indicates that complex habitats may be at risk due to watershed conditions that may not be resilient to disturbance as the watershed condition is only considered to be properly functioning in the North Fork Sullivan Creek-Sullivan Creek and Slate creek subwatersheds. Interestingly in the AEC assessment large woody debris to be functioning at risk or not properly functioning in 16 subwatersheds. This seems to conflict with the PIBO information, possibly due to differences in methodology.

5. 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. Specific temperatures within this range will depend on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shading, such as that provided by riparian habitat; streamflow; and local groundwater influence. There are 5.5 miles of stream have a 303(d) water temperature impairment with an actively implemented TMDL on 2.2 miles. Additionally water temperatures may be "at risk" as riparian vegetation condition was judged to be functioning at risk or not properly functioning in 18 subwatersheds in the AEC assessment. The fire regime attribute was judged to be functioning at risk in all subwatersheds which may therefore have an increased risk of uncharacteristic wildfires that could remove shade.

6. 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. A minimal amount of fine sediment, generally ranging in size from silt to coarse sand, embedded in larger substrates, is characteristic of these conditions. The size and amounts of fine sediment suitable to bull trout will likely vary from system to system. – This PBF is considered to be at least "at risk." The PIBO results show that median substrate sizes were lower compared to reference streams and there are more percent fines in pools compared to reference streams. The AEC assessment found that watershed conditions that may cause increased sediment delivery to streams; road densities, riparian road densities and roads on sensitive soils were functioning at risk or not properly functioning on 19, 19, and 8 subwatersheds respectively.

7. A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, minimal flow departure from a natural hydrograph. – This PBF was not

directly assessed but with 23 out of 25 subwatersheds in the Pend Oreille subbasin functioning at risk or not properly functioning for road densities (2016 Watershed Condition Framework Reassessment) the PBF may be considered at risk. (Table 21 - AEC Riparian Road Density)

8. *Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.* - Not directly assessed however there may be some impairment as approximately 5.5 miles of stream have a 303(d) water temperature impairment, 11.0 miles are impaired for pH and 20.1 miles are impaired for dissolved oxygen. Of these there is a TMDL being actively implemented on 2.2 miles of the temperature impaired streams.

9. Sufficiently low levels of occurrence of non-native predatory (e.g., lake trout, walleye, northern pike, smallmouth bass); interbreeding (e.g., brook trout); or competing (e.g., brown trout) species that, if present, are adequately temporally and spatially isolated from bull trout. The current distribution of brook trout within potential bull trout habitat directly impacts PBF 9.

4.3 STATUS / ENVIRONMENTAL BASELINE OF Woodland Caribou

4.3.1 Current Status and Conservation Needs

The Woodland Caribou was federally listed as an endangered species in 1984 (USFWS 1994). Currently the entire global population of the mountain ecotype of woodland caribou occurs in 18 subpopulations within B.C.[31], Idaho, and Washington (Wittmer 2004). This includes the southern Selkirk woodland caribou subpopulation located along the Idaho, Washington, and B.C. border. There are currently about 1,700 mountain caribou (B.C. Ministry of Environment 2012), with many subpopulations experiencing declines of 50 percent or more in the past 10 years (B.C. Ministry of Environment Mountain Caribou Science Team 2005).

Records from the 1800s indicate that caribou were once abundant in the area now known as the South Selkirk Caribou subpopulation (Seton 1927, Flinn 1956, Layser 1974). However their number apparently declined rapidly in Washington after a major forest fire in 1915 (Taylor and Shaw 1929, Booth 1947, Dalquest 1948). Two estimates of the size of the subpopulations suggest only about 100 animals in the 1950s (Flinn 1956) and probably fewer than 50 animals from 1925 to 1971 (Freddy 1974, Wiles 2017). More reliable census methods were implemented in the early 1970s resulting in about 25 caribou in 1973-1974 (Freddy 1974) and 26-28 caribou annually from 1983-1985, with nearly all animals detected in British Columbia (Scott and Servheen 1985). Sixty caribou were translocated into the subpopulation from 1987-1990 which increased the herd size to 47 by 1991 and temporarily established a group on animals in Idaho (Warren et al. 1996).

The South Selkirk subpopulation ranged in size from 39-51 during the annual counts from 1991-1999 (Wiles 2017). Translocations of 11-19 animals annually from 1996 to 1998 helped to maintain numbers during this time. However, numbers fell to 33-36 caribou during 2000-2006, increased to 43-46 animals

[31] Mountain caribou were provincially 'red-listed" (considered to be threatened or endangered) by British Columbia in 2000. The population has been divided into 18 subpopulations, with the South Selkirk subpopulation being the only one that extends into the United States (Wittmer et al. 2005). Additionally, all woodland caribou located in the southern mountain national Ecological Area of British Columbia and Alberta, regardless of ecotype, are listed as threatened under the Canada Species at Risk Act (Mountain Caribou Technical Advisory Committee 2002).

from 2007 to 2010, then declined rapidly to just 12 caribou by 2016. Nearly all of the winter survey detections have been in British Columbia since about 1999, with no detections on the US side in five of six survey years since 2011 (Wiles 2017).

Winter recreational activities as an important issue to address in relation to caribou recovery (Mitchell and Hamilton 2007). Subalpine and alpine ridges provide late winter habitat for woodland caribou (Rominger et al. 1996). Snowmobile riders are attracted to these areas for the challenging slopes and the views that they often provide. Simpson and Terry (2000) characterized snowmobile riding as posing moderate to high risks to caribou in the South Selkirk Mountains Ecosystem. A primary concern related to this activity is animals being displaced from preferred late-winter habitat (Mitchell and Hamilton 2007).

Mortality due to poaching and vehicle collisions on B.C. Highway 3 were identified as primary risk factors for the Selkirk woodland caribou population in 1983 (Federal Register 1983, USDI Fish and Wildlife Service 1985). Poaching and accidental shooting have been a lesser concern in the past two decades. However, highway-caused mortality resulting from the caribou crossing Highway 3 in British Columbia remains a continued threat with three caribou killed by motorists during the 2008/2009 winter season (Quinn 2009).

Predation has been identified as the primary cause of caribou mortality over the entire distribution of woodland caribou across most of their distribution (Bergerud and Elliot 1986, Seip 1992, Stuart-Smith et al. 1997, Schaefer et al. 1999), and the mountain ecotype of woodland caribou throughout B.C.[32] (Wittmer 2004). Early studies on the Selkirk population (Freddy 1974) did not find evidence that predation was an issue in the early 1970s and this assessment was subsequently incorporated into the recovery plan augmentation effort (USDA Forest Service 1985). However, once caribou were translocated into Idaho, Compton et al. (1991), Zager et al. (1995) and Compton et al. (1995) concluded that adult mortality was limiting the population growth of the newly established herd, and predation by both mountain lions and bears were a contributing factor. The resulting steady decline in caribou located in Idaho during the winter census from 1994[33] on was likely due to an unsustainable level of predation in the ecosystem (Wakkinen and Johnson 2000). The recent increase in wolves in-and-around the recovery area (USDA Forest Service 2012) likely presents an additional predation threat (USDI Fish and Wildlife Service 2008).

Over the last three decades, several woodland caribou researchers have suggested that habitat modification may indirectly influence the population dynamics of large herbivores through changes in predator-prey relationships. More specifically, changes in habitat that lead to increases in early seral habitat conditions within woodland caribou habitat may lead to an increase in alternate prey species (e.g. moose or deer) which in turn, supports higher predator densities (Bergerud and Elliot 1986, Seip 1992). Wittmer (2004) quantified this association for seventeen populations of mountain caribou in B.C. and concluded that female adult survival rates were negatively associated with increasing amounts of young forest stands (Wittmer et al. 2007).

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[32] Wittmer's work included an assessment of all known mountain caribou subpopulations (total=17) EXCEPT the southern Selkirk subpopulation. In general, wolf and bear predation were the primary cause of death in northern subpopulations, while mountain lion, bear, and wolverine predation dominated in the southern subpopulations (ibid).
[33] Some transplanted caribou did emigrate out of the Idaho relocation site

The 30,010 acres that were designated as critical habitat for the woodland caribou occur above 5,000 feet in elevations and are all on federal lands. The land managers include the Colville National Forest and Idaho Panhandle National Forest. About 47 percent of the recovery area is in the US and 53 percent in British Columbia. The Idaho Panhandle National Forest recently revised the forest plan to address habitat and risk factors identified in the caribou recovery plan and critical habitat (USFS 2015). The caribou recovery team works cooperatively to address cumulative effects on woodland caribou.

Border Patrol activities on the Forest have the potential to cause disturbance through use of roads or trails that are normally closed to motorized use. The exact extent or amount of the impact over the life of the plan is difficult to predict because many factors could influence Border Patrol activities.

4.3.2 Life History

This Life History was taken from the Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Southern Selkirk Mountains Population of Woodland Caribou Federal Register 76(230): 74025-74026.

In general, seasonal habitats of the southern Selkirk Mountains caribou consist of early winter, late winter, spring, calving, summer, and fall habitats primarily within two vegetation zones: Western hemlock/western red cedar and subalpine Fir/Engelmann spruce forests (USFS 2004, p. 18; USFWS 2008a, p. 20). Caribou typically make the longest landscape movements during the early winter period, which may range from several miles (kilometers) to about 30 mi (48 km) (USFS 2004, p. 22). Early winter is a period of rapid snow accumulation and generally extends from November to mid/late January. During this time, the southern Selkirk Mountains caribou generally inhabit mature to old-growth western hemlock/western red cedar forests, the lower limits of the subalpine fir and Engelmann spruce forests, and the ecotone (a zone of transition between two different ecosystems) between these two forest types (USFWS 2008a, p. 20). These habitats generally occur between 4,000 and 6,200 ft (about 1,220–1,900 m) in elevation, and have a more closed-overstory canopy (70 percent or more) to intercept snow (USFS 2004, p. 18, USFWS 2008a, p. 20).

Caribou seek out these more closed timber stands where they feed on a combination of lichen on wind-thrown trees, and lichens that have fallen from standing trees (litterfall) (MCTAC 2002, p. 10). If available, shrubs and other forbs that remain accessible in snow wells under large trees are also consumed. A conifer canopy that intercepts snow and allows access to feeding sites is important (MCTAC 2002, p. 10) until the snow pack consolidates and the caribou can move to higher elevations (USFS 2004, p. 18). However, these elevational shifts can be quite variable within and between years, depending on snow levels (Apps *et al.* 2001, p. 67; Kinley *et al.* 2007; p. 94). All mountain caribou experience the poorest mobility and food availability of any season during early winter because of the typically deep, soft snow (MCTAC 2002, p. 10).

Late winter generally starts around mid-January and extends to approximately April. During this time, the snowpack is deep (up to 16 ft (5 m) on ridge tops) and firm enough to support the animal's weight, which allows easier movement. These upper slopes and ridge tops are generally higher than 6,000 ft (1,830 m) in elevation, support mature to old stands of subalpine fir and Engelmann spruce with relatively open canopies (approximately 10 to 50 percent canopy cover), and have high levels of arboreal lichen (USFWS 1994, p. 6; MCTAC 2002, p. 10; USFS 2004, p. 18; Kinley and Apps, 2007, p. 15; USFWS 2008a, p. 20).

In spring (May to July) the southern Selkirk Mountains caribou move to areas with green vegetation, which become the primary food source. These areas may overlap with early and late winter ranges at mid to lower elevations (Servheen and Lyon 1989, p. 235; MCTAC 2002, p. 11), and vegetation in these areas allow caribou to recover from the effects of winter (USFWS 1994, p. 7). Pregnant females will move to these spring habitats for forage, but during the calving season in early June to July, the need to avoid predators influences habitat selection. Areas selected for calving are typically at high elevation, old-growth forest ridgetops that can be food limited, but are more likely to be predator free (USFWS 1994, p. 8; MCTAC 2002, p. 11). Arboreal lichen becomes the primary food source for pregnant females and females with calves, since green forage is unavailable in these secluded and high-elevation habitats.

July to mid-October is considered to be the summer habitat season for caribou. Southern Selkirk Mountains caribou spend the summer in higher elevational alpine and subalpine areas with high forage availability (USFWS 1994, p. 8). Early summer in open-canopied stands provide forbs and huckleberry (*Vaccinium* spp.) leaves. Summer range includes Engelmann spruce/subalpine fir forests and western hemlock/western red cedar forests (Stevenson *et al.* 2001, p. 1; Kinley and Apps 2007, p. 15). In the Selkirk Mountains, the shallow slopes used in late summer are characteristically high-elevation benches, secondary stream bottoms and riparian areas, and seeps where forage is lush and abundant (Servheen and Lyon 1989, p. 236)

Fall habitat (generally October into November) use by southern Selkirk Mountains caribou is driven primarily by the availability of forage vegetation as vascular plants disappear. Caribou may gradually move to western hemlock dominated forests. It is during this time of year when southern Selkirk Mountains caribou are making the transition from green forage to arboreal lichens (Servheen and Lyon, 1989, p. 236). As winter nears, the annual cycle of habitat use by the southern Selkirk Mountains caribou population repeats itself. During the spring and summer, the southern Selkirk Mountains caribou move to lower elevations to forage on grasses, flowering plants, horsetails, willow and dwarf birch leaves and tips, sedges, and lichens in subalpine meadows (Paquet 1997, p. 13, 16), and on huckleberry leaves (USFS 2004, p. 18). The fall and early winter diet consists largely of dried grasses, sedges, willow and dwarf birch tips, and arboreal lichens.

4.3.3 Habitat Characteristics

Research on the Selkirk population of woodland caribou has documented their preference for mature and old growth subalpine fir forests, while mature and old growth western red cedar and western hemlock forests generally above 4,500 feet elevation, and the ecotone between these two communities, have been identified as important early winter habitat, October through early January (Freddy 1974, Scott and Servheen 1985, Rominger and Oldemeyer 1989, Servheen and Lyon 1989, Allen 1998b, Kinley and Apps 2007). Subalpine and alpine ridges provide late winter habitat for woodland caribou (Rominger et al. 1996).

4.3.4 Effects of Climate Change on Woodland Caribou

Climate change would likely alter the distribution and abundance of suitable caribou habitat, and would also change snow depths and persistence, which affect seasonal movements of mountain caribou (WDFW 2012). The potential effects of climate change depend on the interaction, not only of seasonal temperatures and snowfall patterns, but also occurrence of wildfires, outbreaks of forest insects, and diseases (Mountain Caribou Science Team 2005).

4.3.5 Selkirk Mountains Woodland Caribou Recovery Area

The caribou recovery area is 1,477 square miles in size and comprised of lands managed by the Colville National Forest, Idaho Panhandle National Forest, Idaho Department of Lands, and British Columbia. About 47 percent of the recovery area is in the US and 53 percent in British Columbia. The caribou recovery area is divided into 17 Caribou Management Units, four of which occur on the Colville National Forest. Each Caribou Management Units or CMUs is approximately the size of the average home range of woodland caribou in the Selkirk Mountains (about 30 square miles or 19,200 acres) (USDA Forest Service 1985).

4.3.6 Environmental baseline for the Selkirk Mountains Woodland Caribou

The South Selkirk subpopulation was estimated to be 33-36 animals during 2000 to 2006, increased to 43-46 animals from 2007 to 2010, then declined rapidly to just 12 caribou in 2016 (Wiles 2017). The proportion of calves in the subpopulation has been relatively low in recent years, averaging 9.9% per year from 2004 to 2016, which is below the estimated 12-15% needed to maintain a stable population with high adult survival (Wiles 2017). In recent years, nearly all of the caribou detections made during winter surveys occurred in British Columbia. This generally reflects the year-round occurrence of the animals in the subpopulation, with the remaining animals now spending little time in Washington or Idaho during any part of the year (Wiles 2017). However, occasional sightings of one or a few animals continue to occur annually in the US portion of the recovery area.

The caribou recovery area is 1,477 square miles in size and comprised of lands managed by the Colville National Forest, Idaho Panhandle National Forest, Idaho Department of Lands, and British Columbia. About 47 percent of the recovery area is in the US and 53 percent in British Columbia. The caribou recovery area is divided into 17 Caribou Management Units, four of which occur on the Colville National Forest. Most of the existing habitat in Washington and Idaho is considered to be in relative good condition for caribou, with about 65% of the forest now more than 100 years old (Wiles 2017)

In the mid-1990s, an interagency effort was started to augment caribou populations in the Selkirk Mountains of Washington in order to advance recovery efforts (Almack 1998). A caribou management area identified in the existing Forest Plan (completed in 1988) has been used to guide management. However, new science has identified winter recreational activities as an important issue to address in relation to caribou recovery (Mitchell and Hamilton 2007); this was not addressed in the existing land management plan. In 2001, the USFWS issued a new Biological Opinion on the 1988 Forest Plan with terms and conditions that required a winter recreation strategy be completed that balanced the needs of secure winter habitat for caribou with access for winter recreation activities (USFWS 2001). Thus, a recreation strategy was developed in 2003 (USFS 2003, Appendix C). In 2012, the USFWS designated 30,000 acres of national forest lands at or above 5,000 feet as critical habitat for woodland caribou (USFWS 2012).

Early winter caribou habitat consists of low to mid elevation, cedar/hemlock forest stands and stands on the ecotone with subalpine fir/spruce habitats (Rominger and Oldemeyer 1989). Mature and old stand conditions and good canopy closure (70 percent+) are important habitat components (Rominger 1995). Currently, the hemlock/cedar forest type is 21% early successional condition, 60% mid-successional condition, and 19% late-successional condition. Estimates of the range of variability show that 55-83% of these forest types were in a late-successional condition, indicating there is substantial potential to improve habitat conditions for woodland caribou.

There is less risk of caribou being disturbed by winter recreation activities on early-winter range. On the Sullivan Lake Ranger District, most off-road travel in these areas is precluded by the heavily wooded nature of the preferred forest stand types. The potential for disturbance to caribou exists mainly where roads bisect these stands.

4.4 STATUS / ENVIRONMENTAL BASELINE OF WOODLAND CARIBOU CRITICAL HABITAT

4.4.1 Conservation Role and Description of Critical Habitat

In 2012, the USFWS published in the Federal Register a revised designation of Critical Habitat for the southern Selkirk Mountains population of woodland caribou (Federal Register 77(229): 71042-71082). This resulted in the designation of 30,010 acres of Federal land in Boundary County, Idaho, and Pend Oreille County, Washington as critical habitat. The rule also identifies physical and biological features (PBFs) (1) which are essential to the conservation of the species and (2) which may require special management considerations or protections. The PBFs identified for the southern Selkirk Mountains population of woodland caribou in the critical habitat rule include:

- Space for individual and population growth and for normal behavior.
- Food, water, air, light, minerals, or other nutritional or physiological requirements.
- Sites for breeding, reproduction, or rearing (or development) of offspring.
- Habitats that are protected from disturbance or are representative of the historical, geographical, and ecological distributions of a species.

Based on the current understanding of the PBFs and habitat characteristics required to sustain the southern Selkirk Mountains population of woodland caribou's life-history processes, the primary constituent elements specific to the southern Selkirk Mountains population of woodland caribou are:

- Mature to old-growth western hemlock (Tsuga heterophylla)/western red cedar (Thuja plicata) climate forest and subalpine fir (Abies lasiocarpa)/Engelmann spruce (Picea engelmanni) climax forest at least 5,000 feet in elevation; these habitats typically have 26-50% or greater canopy closure. Currently, the hemlock/cedar forest type is 21% early successional condition, 60% mid-successional condition, and 19% late-successional condition. Estimates of the range of variability show that 55-83% of these forest types were in a late-successional condition, indicating there is substantial potential to improve habitat conditions for woodland caribou.
- Ridge tops and high-elevation basins that are generally 6,000 feet in elevation or higher, associated with mature to old stands of subalpine fir/Engelmann spruce climate forest with relatively open (approximately 50%) canopy.
- Presence of arboreal hair lichens.
- High-elevation benches and shallow slopes, secondary stream bottoms, riparian areas, and seeps, and subalpine meadows with succulent forbs and grasses, flowering plants, horsetails, willow, huckleberry, dwarf birch, sedges and lichens. These are used by woodland caribou, including pregnant females, for feeding during the summer seasons.

- Corridors/transition zones that connect the habitats described above. If human activities occur, they are such that they do not impair the ability of caribou to use these areas.

The caribou recovery area is 1,477 square miles in size and includes the Colville National Forest, Idaho Panhandle National Forest, Idaho Department of Lands, and British Columbia. About 47 percent of the recovery area is in the US and 53 percent in British Columbia. The Idaho Panhandle National Forest recently revised the forest plan to address habitat and risk factors identified in the caribou recovery plan and critical habitat (USFS 2015). The caribou recovery team works cooperatively to address cumulative effects on woodland caribou.

Border Patrol activities on the Forest have the potential to cause disturbance through use of roads or trails that are normally closed to motorized use. The exact extent or amount of the impact over the life of the plan is difficult to predict because many factors could influence Border Patrol activities.

4.4.2 Effects of Climate Change on Woodland Caribou Critical Habitat

Climate change would likely alter the distribution and abundance of suitable caribou habitat, and would also change snow depths and persistence, which affect seasonal movements of mountain caribou (WDFW 2012). The potential effects of climate change depend on the interaction, not only of seasonal temperatures and snowfall patterns, but also occurrence of wildfires, outbreaks of forest insects, and diseases (Mountain Caribou Science Team 2005).

4.4.3 Current Critical Habitat Condition Rangewide

This was taken from the Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Southern Selkirk Mountains Population of Woodland Caribou; Final Rule; Federal Register 77(229): 74029.

The Selkirk Mountains Critical Habitat Unit consists of 30,010 ac (12,145 ha) in Boundary County, Idaho and Pend Oreille County, Washington. Lands within this unit are at 5,000 ft (1,520 m) and higher in elevation. These lands are under Federal ownership, within the Colville and Idaho Panhandle National Forests. The Selkirk Mountains Critical Habitat Unit was occupied at the time of both the emergency listing on January 14, 1983 (48 FR 1722), and the final listing in 1984 (49 FR 7390; February 29, 1984), and is essential to the conservation of the species. This area also contains the PBFs essential to the conservation of the southern Selkirk Mountains population of woodland caribou and which may require special management considerations or protection. The primary land uses are forest management activities and recreational activities, which occur throughout the year. Recreational activities include, but are not limited to, snowmobiling, off highway vehicle (OHV) use, backcountry skiing, and hunting. Special management considerations or protection needed within the unit are required to address habitat fragmentation of contiguous old growth forests due to forest practices and activities, wildfire, and disturbances such as roads and recreation.

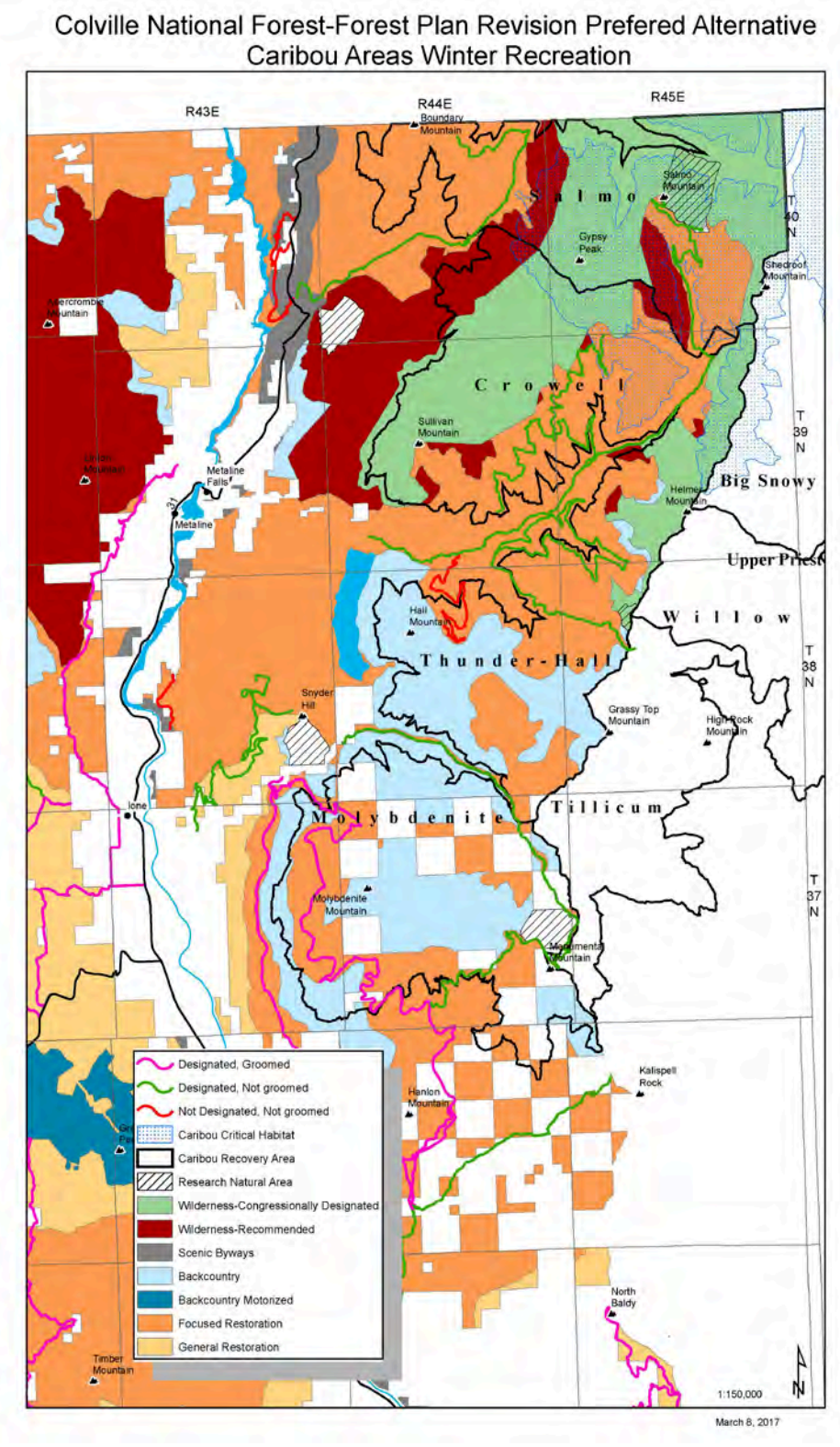

Figure 10 - Caribou Critical Habitat and Winter Recreation

4.4.4 Environmental Baseline for Woodland Caribou Critical Habitat

Based on the current understanding of the PBFs and habitat characteristics required to sustain the southern Selkirk Mountains population of woodland caribou's life-history processes, the primary constituent elements specific to the southern Selkirk Mountains population of woodland caribou are:

- Mature to old-growth western hemlock (*Tsuga heterophylla*)/western red cedar (*Thuja plicata*) climate forest and subalpine fir (*Abies lasiocarpa*)/Engelmann spruce (*Picea engelmanni*) climax forest at least 5,000 feet in elevation; these habitats typically have 26-50% or greater canopy closure.
- Ridge tops and high-elevation basins that are generally 6,000 feet in elevation or higher, associated with mature to old stands of subalpine fir/Engelmann spruce climate forest with relatively open (approximately 50%) canopy.
- Presence of arboreal hair lichens.
- High-elevation benches and shallow slopes, secondary stream bottoms, riparian areas, and seeps, and subalpine meadows with succulent forbs and grasses, flowering plants, horsetails, willow, huckleberry, dwarf birch, sedges and lichens. These are used by woodland caribou, including pregnant females, for feeding during the summer seasons.
- Corridors/transition zones that connect the habitats described above. If human activities occur, they are such that they do not impair the ability of caribou to use these areas.

4.5 STATUS / ENVIRONMENTAL BASELINE – Grizzly Bear

4.5.1 Current Status and Conservation Needs

The Grizzly Bear was federally listed as a threatened species in 1975 (USFWS 1975). There are six designated recovery areas that occur in the lower 48 states: North Continental Divide Ecosystem, Greater Yellowstone Ecosystem, Cabinet-Yaak Ecosystem, Selkirk Ecosystem, Bitterroot Ecosystem, and the North Cascades Ecosystem (USFWS 1993). The current status of grizzly bear populations and habitats within each recovery area are summarized in (USFWS 2011). Recovery criteria have been established for each of the six recovery areas (USFWS 1993), including the Selkirk Ecosystem.

The population demography recovery criteria for the Selkirk Ecosystem, established in the 1993 recovery plan are: 1) 6 females with cubs over a running 6-year average both inside the recovery area and within a 10-mile area immediately surrounding the recovery area, including Canada; 2) 7 of 10 GBMUs on the US portion occupied by females with young from a running 6-year sum of verified sightings and evidence; and 3) known human-caused mortality no to exceed 4% of the population estimate based on the most recent 3-year sum of females with cubs. Furthermore, no more than 30% of this 4% mortality limit shall be females. These mortality limits cannot be exceeded during any 2 consecutive years for recovery to be achieved. Presently, grizzly bear numbers are so small in this recovery area that the mortality goal is 0 human-caused mortalities. These progress in meeting these demographic recovery criteria were evaluated in 2011 by the USFWS (USFWS 2011). They found that none of the 1993 demographic recovery criteria have been met. The population goal of 6 females with cubs has not been met as the 6-year running average was 0.5 female with cubs. The distribution criterion has not been met as only 4 of 10 GBMUs occupied by females. The criteria of 0 human-caused mortality has not been met with the running 6-year average was 2.5 animals per year, including 1.2 females per year.

Forest management activities that influence the recovery of the grizzly bear identified in the grizzly bear recovery plan (USFWS 1993) include: human access that can displace bears from important seasonal habitats or increase the risk of bear-human interactions, disposal of livestock carcasses within range allotments to avoid attracting bears to a potential food source, placement of apiaries under special use permits, and the storage of food and garbage at recreation sites to reduce the potential for bears to associate humans with food sources. One of the key aspects of grizzly bear recovery is human access management. Access management remains one of the most influential tools used to contribute towards the recovery of grizzly bear populations (IGBC 1998). Proper management of stored food while working or recreating in bear habitat is an important factor in reducing bear-human conflicts.

4.5.2 Life History (1993 Grizzly Bear Recovery Plan)

Grizzly bears are relatively long-lived and individuals are known to have lived 40 years (Storer and Tevis 1955); a captive bear lived 47 years (Curry-Lindahl1972). Pearson (1975) listed the oldest age classes as 28 years for males and 23 years for females; and Craighead et al. (1974), working in Yellowstone, found the oldest age was 25.5 years for both sexes. A female grizzly bear in the Cabinet Mountains was 34 years old as of 1989.

Adult bears are individualistic in behavior and normally are solitary wanderers. Except when caring for young or breeding, grizzly bears have solitary patterns of behavior. Individuals probably react from learned experiences. Two individual bears may respond in opposite ways to the same situation (Scott 1964, Riegelhuth 1966). Strict territoriality is unknown, with intraspecific defense limited to specific food concentrations, defense of young, and surprise encounters.

Grizzly bears of all ages will congregate readily at plentiful food sources and form a social hierarchy unique to that grouping of bears (Homocker 1962, Craighead 1979). Mating season is the only time that adult males and females tolerate one another, and then it is only during the estrous period. Other social affiliations are generally restricted to family groups of mother and offspring, siblings that may stay together for several years after being weaned, and an occasional alliance of subadults or several females and their offspring (Murie 1944, 1962; Jonkel and Cowan 1971; Craighead 1976; Egbert and Stokes 1976; Glenn et al. 1976;Herrero 1978).

Mating appears to occur from late May through mid-July, with a peak in mid-June and estrus lasting from a few days to over a month (Craighead et al.1969, Herrero and Hamer1977). Females in estrus are receptive to practically all adult males (Homocker 1962). A male may isolate and defend a female in areas of low bear density; but in areas of high density, males and females both may be promiscuous (Craighead et al.1969).

Age of first reproduction and litter size varies and may be related to nutritional state (Herrero 1978, Russell et al.1978). Age at first reproduction varies from 3.5 to 8.5 years of age, and averages 5.5 years in the areas studied in the lower 48States. Litter size varies from one to four cubs with an average of approximately two throughout much of the range of the species. Reproductive intervals for females average 3 years, and animals that lose young early in the year may come into estrus and breed again that same year.

The limited reproductive capacity of grizzly bears precludes any rapid increase in the population. Grizzly bears have one of the lowest reproductive rates among terrestrial mammals, resulting

primarily from the late age of first reproduction, small average litter size, and the long interval between litters.

Assuming initiation of breeding at 4.5 years, a female grizzly bear would add her first recruitment to the population when she was 5.5 years. The age of second breeding likely would not occur until she is 7.5. Therefore, during the first 10 years of her life, a female grizzly bear is capable of adding only two litters to the total population. If there are litters of two cubs with a 50:50 sex ratio, and a 50 percent survivorship of young to age 5.5, at best she can replace herself with one breeding age female in the first decade of her life.

Assuming optimum conditions, 50 percent survivorship to age 5.5, equal sex ratios, and using the oldest documented female weaning her last litter at age 24.5 years (Craighead et al. 1974, Wakkinen, Idaho Department of Fish and Game, pers. comm. 1991), a single female would have the potential capability of adding only three and one-half females to the population during her lifetime. Given a normal rate of mortality for all age classes, a protracted reproductive cycle of 3.4 years to 7 years, and the increasing stresses of habitat encroachment by humans, actual reproductive expectancy is usually far less. Obviously, providing maximum protection for females is essential to recovery. Males are believed to mature sexually at 4.5 years, but larger, dominant males may preclude young adult males from siring many offspring (Hornocker 1962).

The time lapse from conception to birth of cubs is between 229 and 266 days (Banfield 1974). A delay in blastocyst implantation postpones embryonic development (following a mating season that extends from late May to mid-July) until late November or December, and is believed to be approximately Q-30 days after denning (Craighead et al.1969) with birth occurring near February 1.

The causes of natural mortality for grizzly bears or other bears are not well known. Bears do kill each other. It is known that adult males kill juveniles and that adults also kill other adults. Parasites and disease do not appear to be significant causes of natural mortality (Jonkel and Cowan 1971, Kistchinskii 1972, Mundy and Flook 1973, Rogers and Rogers 1976) but they may very well hasten the demise of weakened bears.

Human-caused mortality can be classified into six major categories. These categories include: (1) direct human/bear confrontations (hikers, backpackers, photographers, hunters, etc.); (2) attraction of grizzly bears to improperly stored food and garbage associated with towns, subdivisions, farms, hunter camps, campers, loggers, fishermen, backpackers, and other sources; (3) careless livestock husbandry, including the failure to dispose of dead livestock in a manner that minimizes grizzly interactions; (4) protection of livestock; (5) the eroding of grizzly bear habitat for economic values; and (6) hunting (lawful and illegal). The first five act to reduce space and increase the potential for human-bear conflicts.

4.5.3 Habitat Characteristics (1993 Grizzly Bear Recovery Plan)

Food

The broad historic distribution of grizzly bears suggests adaptive flexibility in food habits of different populations. Although the digestive system of bears is essentially that of a carnivore, bears are successful omnivores, and in some areas may be almost entirely herbivorous. Morphological adaptations include crushing molars and the greatest intestinal length relative to body length of any

carnivore (Mealey 1975). Although grizzly bears in many areas are almost entirely herbivorous, they are lacking in multiple stomachs and a caecum and are therefore unable to digest cellulose. Bears feed on animal matter or vegetable matter that is highly digestible and high in starch, sugars, protein, and stored fat (Stebler 1972, Mealey 1975, Hamer et al. 1977).

Grizzly bears must avail themselves of foods rich in protein or carbohydrates in excess of maintenance requirements in order to survive denning and post-denning periods. Herbaceous plants are eaten as they emerge, when crude protein levels are highest. These levels decline rapidly in many plant species as the plants mature (Mealey 1975, Hamer et al. 1977, Herrero 1978).

Grizzly bears are opportunistic feeders and will prey or scavenge on almost any available food including ground squirrels, ungulates, carrion, and garbage (Murie 1944, Hamer 1974). In areas where animal matter is less available, roots, bulbs, tubers, fungi, and tree cambium may be important in meeting protein requirements (Hamer 1974, Pearson 1975, Singer 1978). High quality foods such as berries, nuts, and fish are important in some areas (Cole 1972, Martinka 1972, Hamer et al. 1977).

The search for food has a prime influence on grizzly bear movements. Upon emergence from the den they seek the lower elevations, drainage bottoms, avalanche chutes, and ungulate winter ranges where their food requirements can be met. Throughout late spring and early summer they follow plant phenology back to higher elevations. In late summer and fall, there is a transition to fruit and nut sources, as well as herbaceous materials. This is a generalized pattern, however, and it should be kept in mind that bears are individuals trying to survive and will go where they best can meet their food requirements.

Cover

The relative importance of cover to grizzly bears has been documented by Blanchard (1978) in a 4-year study in the Yellowstone ecosystem. Ninety percent of 2,261 aerial radio relocations of 46 instrumented grizzly bears were in forest cover too dense to observe the bear. Whether grizzly bears use forest cover because of an innate preference or to avoid humans is unknown (Blanchard 1978). The importance of an interspersion of open parks as feeding sites associated with cover is also recorded in Blanchard's study: "Only 1 percent of the relocations were in dense forest more than a kilometer from an opening."

Forest cover was found to be very important to grizzly bears for use as beds. Most beds were found less than a yard or two from a tree (Servheen and Lee 1979, Blanchard 1978). Blanchard further records only 16 of 233 beds observed (6.7 percent) were without immediate cover. Schallenberger and Jonkel (1980) found grizzly bears preferring forest in over 80 percent of their radio relocations.

Timber management programs may negatively affect grizzly bears by (1) removing thermal, resting, and security cover; (2) displacement from habitat during the logging period; and (3) increases in human/grizzly bear confrontation potential or disturbance factors as a result of roadbuilding and management. New roads into formerly unroaded areas may cause bears to abandon the area. Positive aspects of timber management programs include an increase in bear foods (e.g., £orbs, berries, and grasses) in certain regions through vegetative manipulation (e.g., tree removal, riparian management, prescribed burning).

Denning

The unavailability of food, deep snow, and low, ambient air temperatures appear to make winter sleep essential to bears' survival (Craighead and Craighead 1972a, 1972b). When rodents and bats hibernate, they become periodically poikilothermic (Stringham, University of Tennessee, pers. comm.1980). Hock (1960) defined hibernation: "... aperiodic phenomenon in which body temperature falls to a low level approximating ambient; heart rate, metabolic rate and physiologic functions fall to a correspondingly minimum level..." By contrast, bears are homeo-hypothermic hibernators whose body temperature drops no more than 5 °C (approx. 10 degrees F) and is maintained there indefinitely. With normal fat reserves, bears are capable of fasting for 6 months with only slight reductions in body temperature. They do exhibit a "... marked depression in heart rate and respiratory frequency, but a relatively slight drop in body temperature." (Craighead and Craighead 1972a). A number of authors have documented that day length and inclement weather influence the onset of winter sleep or hibernation.

Grizzly bears excavate dens. The den digging is probably instinctive. It starts as early as September or may take place just prior to entry in late November. Dens are usually dug on steep slopes where wind and topography cause an accumulation of deep snow and where the snow is unlikely to melt during warm periods. Elevations of dens vary geographically, but generally they are found at higher elevations well away from development or human activity. Denning habitat descriptions and activity have been described for grizzly bears in the Mission Mountains of Montana by Servheen and Klaver (1981). Finding an isolated area that will be well covered with a blanket of snow to minimize the escape of body-warmed air and one that will provide a secure environment for a 5-month sleep appears to be a factor favoring survival of the species (Craighead and Craighead 1972b, Pearson 1975). Once denning areas are located, they must be given prime consideration by land management agencies. Craighead and Craighead (1972b), Servheen and Klaver (1981), and others have recorded prehibernation lethargy in bears that may start several weeks prior to denning. Bears exhibit no overt defense of their dens and several have been reported to abandon them because of human disturbance.

4.5.4 Effects of Climate Change on Grizzly Bears

Grizzly bears have been identified as having a low sensitivity to climate change because they are opportunistic, eat a diverse array of food resources, and are highly adaptable (Servheen and Cross 2010, CCSD 2013). Anticipated impacts may include changes in the timing of denning due to longer snow-free periods and reduced snowpack (Lawler et al. 2014) and changes in the availability of food sources (Servheen and Cross 2010). These changes may put bears at risk of negative human interactions for a longer period of time each year (Servheen and Cross 2010). This would make education, proper food and garbage storage, carcass disposal measures, and human access management that much more important.

4.5.5 Selkirk Grizzly Bear Recovery Area

The Selkirk Grizzly Bear Recovery Area is located in northeastern Washington and includes parts of northern Idaho, and southern British Columbia. The Selkirk recovery area was included in the original overall grizzly bear recovery plan for the US and included a portion of the Recovery Zone in Canada so that it was a size sufficient to support a population of 100 grizzly bears (USFWS 1993).

The Selkirk Recovery Zone encompasses 2,201 square miles of which 47% is in British Columbia and the remainder (53%) is in the US. Radio-collared bears are known to move back and forth across the border, indicating that the habitat is contiguous and they are considered to be one population (USFWS 1993). In the Canadian portion, land ownership is approximately 65% Crown lands and 35% private land. In the US portion, about 80% is federal lands, 15% State lands, and 5% private lands.

There is one cattle allotment on the Colville National Forest that occurs within the Selkirk Recovery Zone. There are currently no active sheep grazing allotments on the Colville National Forest.

The Selkirk recovery area has been stratified into management situation 1, 2, and 3 areas that are used to determine where management direction is applied. Areas outside of the recovery area but still on the Colville National Forest are managed as management situation 5. The effects of forest management activities on grizzly bears that may occur outside of the designated recovery area, especially if they are documented as regularly using an area, would be evaluated under section 7 consultation.

4.5.6 Environmental Baseline for Grizzly Bear

Proctor et al. (2012) estimated a population size of 88 grizzly bears in the Selkirk Mountains (30 in the US, 58 in Canada) using DNA-based population surveys (Proctor et al. 2007) and other data sources (Wakkinen 2010). Estimates of population trends have generally show an increasing population (Wakinen and Kasworm 2004, Kasworm 2013; however see Kasworm et al. 2012), which subadult female survival having the largest influence on overall population trend. Wakkinen and Kasworm (2004) reported that 80% of the known grizzly bear mortalities in the Selkirks were human-caused. In the Selkirks, the running 6-year average total human-caused mortality was 1.8 animals/year, including 0.7 females/year (Wakkinen et al. 2009, Wakkinen 2010).

For the first time in more than 30 years, a grizzly bear was captured on June 29, 2016 in Washington for radio-collaring and release (Kasworm 2016). The bear was captured southeast of Sullivan Lake, was estimated to be 5-years old, male, and weighed 365 pounds. This is only the second capture of a grizzly bear in Washington with the first occurring in 1985 near Huff Lake in the SelKirk Mountains (Kasworm 2016).

The Forest Plan revision area includes habitat outside of designated grizzly bear recovery zones, and specifically areas between the Selkirk Recovery Zone and the North Cascades Recovery Zone (USFWS 1993, 1997). For example, the action area includes the “Wedge” that is located at the northern end of the Kettle Range near the Canadian border. In 2011, five individual grizzly bears were observed in this area, including a sow and cubs that were seen on several dates in April and May of 2012 (WDFW 2013). A DNA hair sample was found to be a male grizzly bear in the Wedge near Sheep Creek in 2012. Grizzly bears are documented using the Wedge, particularly during the spring. There are other verified grizzly bear sightings between the Wedge and the Selkirk Recovery Zone, including a young female grizzly bear using the area in 2009.

Measures of the degree of human influence on grizzly bear habitat are based on methods developed by the Interagency Grizzly Bear Committee Access Management Task Force (IGBC 1998). Based on this approach, areas with relatively limited human access are referred to as core areas and are tracked in Grizzly Bear Management Units (GBMUs) that have been identified throughout the recovery area. Table 23 shows the current amount of Core Area, Open Motorized Route Density (OMRD), and Total

Motorized Route Density (TMRD) in the GBMUs within the Forest Plan Revision area and those in the Selkirk Ecosystem Recovery Area.

Table 23 - Current Percent Core Area, Open Motorized Route Density (OMRD), and Total Motorized Route Density (TMRD) within Grizzly Bear Management Units that occur in the Selkirk Recovery Area

Grizzly Bear Management Unit (GBMU)	Current Core Percent	OMRD Percent	TMRD Percent
Grizzly Bear Management Units in the Selkirk Ecosystem Recovery Area that are also on the Colville National Forest			
Le Clerc	>27%	37	58
Salmo-Priest (87,115 ac)	>64%	33	26
Sullivan-Hughes (78,210 ac)	>61%	24	19
Grizzly Bear Management Units in the Selkirk Ecosystem Recovery Area that occur outside of the Colville National Forest (on the Idaho Panhandle National Forests).			
Blue Grass (57,325 ac)	50	29	28
Long-Smith (65,735 ac)	73	21	14
Ball-Trout (57,907 ac)	72	17	11
Mytrle (63,781 ac)	60	30	20
Kalispell-Granite (85,641 ac)	50	33	28
Lakeshore (17,971 ac)	19	83	54

Expectations for Core, open motorized route/road density, and total motorized route/road density in each GBMU are listed below and described in the Revised Colville Forest Plan and in "Forest Plan Amendments for Motorized Access Management within the Selkirk and Cabinet-Yaak Grizzly Bear Recovery Zones on the Kootenai, Idaho Panhandle, and Lolo National Forests" (USFWS 2011). These Standards were set depending on the site-specific capability of each GBMU.

Table 24. Grizzly bear habitat standards for the shared BMUs of the Colville and Idaho Panhandle National Forests

Bear Management Unit	Maximum Open Roads >1 mi/sq. mi.	Maximum Total Roads >2 mi/sq. mi	Minimum Percent Core Habitat
Salmo-Priest (99% NFS land)	33%	26%	64%
Sullivan-Hughes (99% NFS land	24%	19%	61%
LeClerc (64% NFS land)	37%	58%	27%

On the Colville National Forest, there have been 23 miles of road constructed in the recovery zone and 150 miles of roads closed since 1975. In addition, any new roads constructed in the recovery zone on the Colville National Forest are closed to non-administrative motorized use. The Colville National Forest published a Motor Vehicle Use Map in 2008 following the culmination of a Travel Planning process. Off-road travel is prohibited except to access a campsite within 300 feet of a designate motorized route. There are few open roads identified on the Motor Vehicle Use Map in the recovery zone and no motorized trails in the recovery zone on the Colville National Forest. The Colville National Forest has met the Core, open road density, and total road density standards for their GBMUs.

Proper management of stored food while working or recreating in bear habitat is an important factor in reducing bear-human conflicts. The Colville National Forest has a “sanitation rule” that applies to contractors, campers, and others working or recreating in the recovery zone. Many of the recreation sites have been fitted with bear-resistant garbage and storage structures.

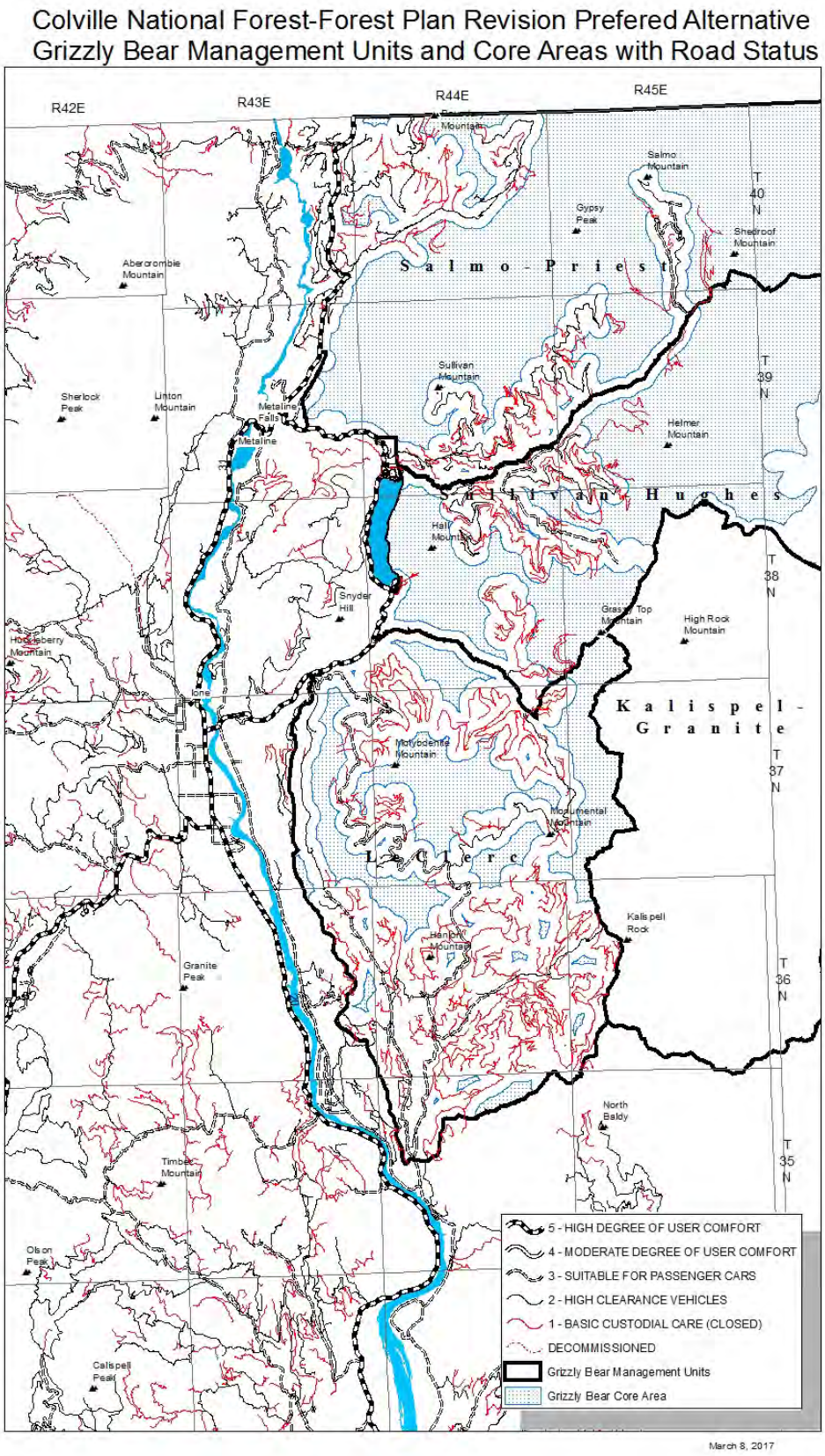

Figure 11 - Grizzly Bear Management Units and Core Areas with Road Status

4.6 STATUS / ENVIRONMENTAL BASELINE – Canada Lynx

4.6.1 Current Status and Conservation Needs

The Canada lynx historically occurred throughout the boreal forests within the Cascade Range and northeastern Washington (Lewis 2016). Numerous surveys have been conducted throughout the historical range of lynx in Washington and numerous research projects have also been conducted within western Okanogan County. These survey and research efforts indicated that a single resident population now occurs in Washington and is restricted mainly to western Okanogan County in the northeastern Cascades. The loss and fragmentation of habitat as a result of wildfires and the direct and indirect effects of climate change are considered substantial threats to this population. While lynx have been occasionally detected within their historical range in Ferry, Stevens, and Pend Oreille counties, these detections are too few to represent a resident population (Lewis 2016). In a recent status review, the WDFW concluded that given the 1) range contraction observed in Washington following protection efforts (federal listing in 2000), 2) the substantial loss of habitat in the last 20 years, and 3) the ongoing and anticipated threats to lynx population persistence, the State status of the lynx in Washington should be changed from State Threatened to State Endangered (Lewis 2016).

In 2000, the Canada lynx was listed as a Threatened species, and in 2005 core, secondary, and periphery areas were identified to emphasize their importance for the recovery of lynx (USFWS 2005). To date, no recovery plan for Canada lynx has been completed. Management direction has been provided through the Canada Lynx Interagency Agreement that relies on the science summarized in the Canada Lynx Conservation Assessment and Strategy (ILBT 2013). This agreement was intended to remain until it is replaced by management direction given in revised Forest Plans. The management guidance recommended in the Lynx Conservation Assessment and Strategy (ILBT 2013) provided the basis for the development of the management direction for Canada lynx in the revised Colville Forest Plan.

The forest management activities that influence the recovery and conservation of Canada lynx include: vegetation management that affect lynx habitat components, winter recreation that influences habitat connectivity and lynx habitat use, forest roads that can become sources of lynx mortality at high traffic volumes and speeds, and grazing effects to riparian areas that provide habitat for snowshoe hares, a primary food resource for lynx (ILBT 2013). The Interagency Lynx Biology Team (ILBT 2013) developed conservation measures for core and secondary areas (USFWS 2005, revised 2013) to address each of these forest management activities, and for planners to consult when revising forest plans. These were used to evaluate the potential contribution of forest management alternatives to the recovery of Canada lynx.

All federal lands within Canada lynx core and secondary areas would use the Lynx Conservation Assessment and Strategy (LCAS) (ILBT 2013) as best available science to guide project level consultation and land management planning. The North Cascades National Park Complex recently revised their management plan to include the LCAS (NPS 2012). The Idaho Panhandle National Forest land management plan was recently revised to address the conservation measures identified in the LCAS (USFS 2015). The conservation of lynx on WDNR lands is guided by the Department of Natural Resources Lynx Habitat Management Plan (WDNR 1996, updated in 2002). The management plan for the Pend Oreille National Wildlife Refuge provides conservation measures to contribute to the recovery and viability of Canada lynx (USFWS 2000). Collectively, these management plans have addressed many of the conservation measures identified for Canada lynx (ILBT 2013) and would help mitigate potential

cumulative effects that may occur from off-forest activities. In addition, no critical habitat was identified on the Colville National Forest or on adjacent lands (USFWS 2009).

4.6.2 Life History

The following is from the ECOS Environmental Conservation Online System – Species Profile for Canada Lynx[34].

Food Habits

Snowshoe hares are the primary prey of lynx, comprising the bulk of the lynx diet throughout its range. Without high densities of snowshoe hares, lynx are unable to sustain populations despite utilizing a multitude of other prey when snowshoe hare numbers are low. Other prey species include red squirrel (Tamiasciurus hudsonicus), grouse (Bonasa umbellus, Dendragopus spp., Lagopus spp.), flying squirrel (Glaucomys sabrinus), ground squirrel (Spermophilus parryii, S. Richardsonii), porcupine (Erethrizon dorsatum), beaver (Castor canadensis), mice (Peromyscus spp.), voles (Microtus spp.), shrews (Sorex spp.), fish. Ungulate carrion may also be consumed.

Movement / Home Range

Individual lynx maintain large home ranges generally between 12 to 83 square miles. The size of lynx home ranges varies depending on abundance of prey, the animal's gender and age, season, and the density of lynx populations. When densities of snowshoe hares decline, for example, lynx enlarge their home ranges to obtain sufficient amounts of food to survive and reproduce. Lynx also make long distance exploratory movements outside their home ranges. Preliminary research supports the hypothesis that lynx home ranges at the southern extent of the species' range are generally large compared to those in the core of the range in Canada, indicating a relative reduction of food resources in these areas.

Reproductive Strategy

Breeding occurs through March and April in the north. Kittens are born in May to June in southcentral Yukon. The male lynx does not help with rearing young. Yearling females may give birth during periods when hares are abundant. During periods of hare abundance in the northern taiga, litter size of adult females averages four to five kittens. Litter sizes are typically smaller in lynx populations in the contiguous United States.

4.6.3 Habitat Characteristics

The Canada lynx is associated with moderate and high elevation forests composed mostly of subalpine-fir forest associations (Ruediger et al. 2000, Stinson 2001, ILBT 2013). Squires et al. (2010) determined lynx primarily forage in subalpine fir forests with low topographic relief (Squires et al. 2013) during winter, in mid-to-high elevation forests of mature, multi-story conifer with high horizontal cover. These environments supported higher-density snowshoe hare populations and provided dense cover from young trees and conifer boughs touching the snow.

[34] https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=A073

4.6.4 Effects of Climate Change on Lynx

The potential effects of climate change on Canada lynx identified by the Interagency Lynx Biology Team (2013) included: 1) an upward shift in elevation or latitudinal distribution of lynx and prey, 2) a decrease in the amount of habitat and population size from reduced snow persistence and increased disturbance events (e.g., fires), 3) changes in demographic rates, such as survival and reproduction, and 4) changes in predator-prey relationships.

Climate change adaptations to address these effects include restoration of landscape-scale disturbance regimes to better mimic natural patterns and processes (Spies et al. 2010, Gaines et al. 2012), and maintaining or restoring habitat connectivity to allow Canada lynx to adjust their ranges to changing conditions (Heller and Zavaleta 2009, ILBT 2013, Squires et al. 2013). There is management direction in the Plan to implement these climate change adaptations through the emphasis on dynamic-landscape restoration, and the restoration of conditions that would enhance connectivity of habitats.

4.6.5 Canada Lynx in Northeast Washington

In 2000, the Canada lynx was listed as a Threatened species, and in 2005 core, secondary, and periphery areas were identified to emphasize their importance for the recovery of lynx (USFWS 2005). To date, no recovery plan for Canada lynx has been completed. Management direction has been provided through the Canada Lynx Interagency Agreement that relies on the science summarized in the Canada Lynx Conservation Assessment and Strategy (ILBT 2013). This agreement was intended to remain until it is replaced by management direction given in revised Forest Plans. The management guidance recommended in the Lynx Conservation Assessment and Strategy (ILBT 2013) provided the basis for the development of the management direction for Canada lynx in the revised Colville Forest Plan. On the Colville National Forest, the Kettle-Wedge area is identified as a Core Area for lynx, the Selkirk Mountains as Secondary Area, and the Okanogan Highlands (west of the Kettle Mountains) as Peripheral Area (USFWS 2005, ILBT 2013). No critical habitat was designated for Canada lynx on the Colville National Forest (USFWS 2009).

On the Colville National Forest, the Kettle-Wedge area is identified as a Core Area for lynx, the Selkirk Mountains as Secondary Area, and the Okanogan Highlands (west of the Kettle Mountains) as Peripheral Area (USFWS 2005, ILBT 2013). No critical habitat was identified for Canada lynx on the Colville National Forest (USFWS 2009). Lynx Analysis Units (LAUs) are intended to facilitate analysis and monitoring of the effects of management actions on lynx habitat (ILBT 2013). LAU boundaries are not adjusted for individual projects but remain in place and used to apply management direction and monitoring. LAUs are a tool to guide management that will support a reproductive population of lynx in core areas, and they are not designated in secondary or peripheral areas (ILBT 2013). There are 37 LAUs that have been identified on the Colville National Forest, and 13 within the Kettle-Wedge Core Area (see Map, Figure 12).

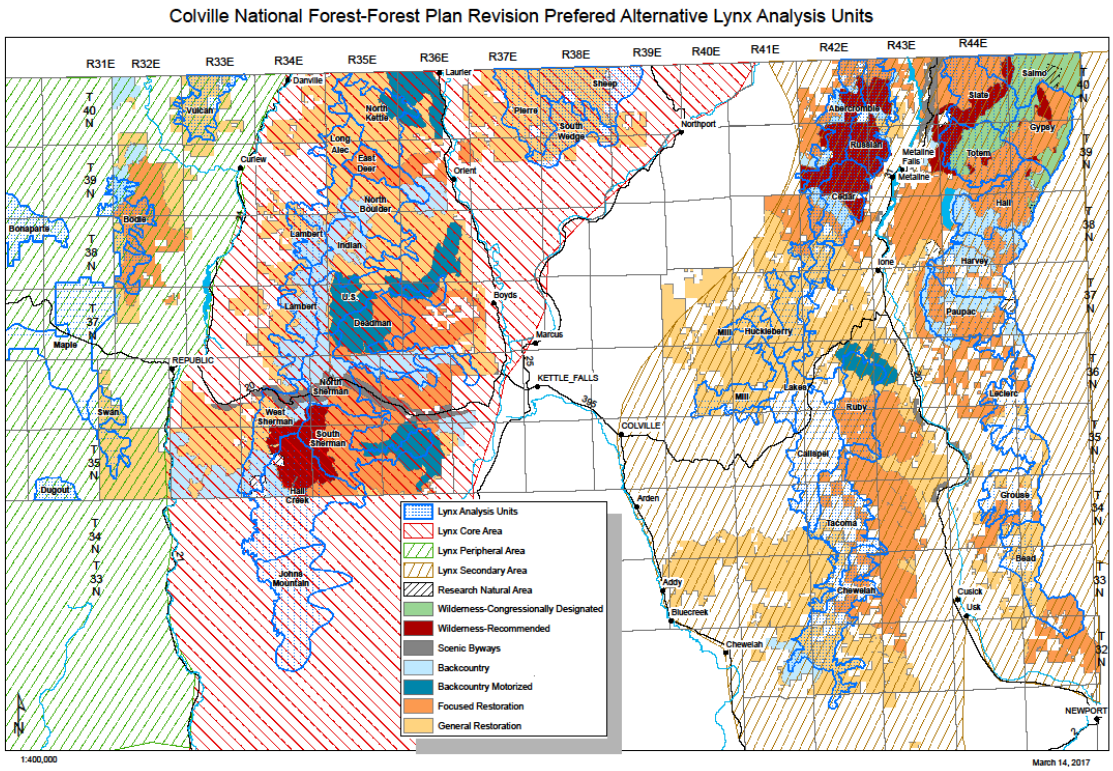

Figure 12 - Lynx Analysis units and Management Areas

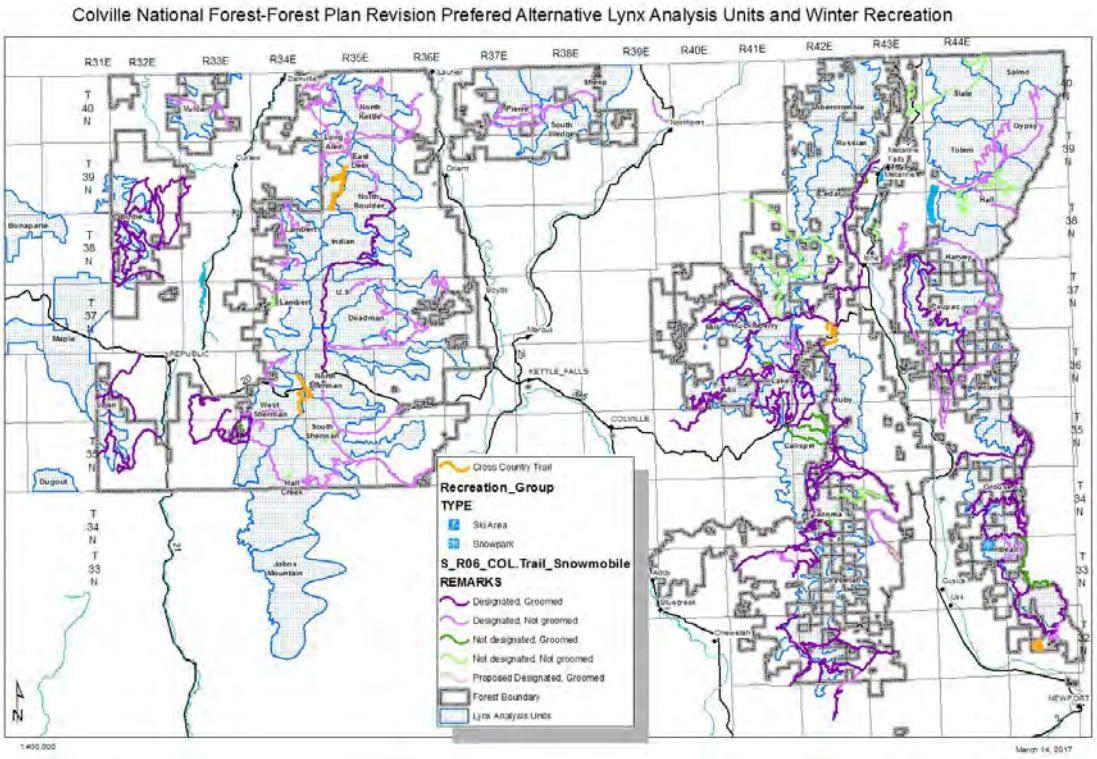

Figure 13 - Lynx Analysis Units and Winter Recreation

4.6.6 Environmental Baseline for Lynx

Lynx are considered a species of greatest conservation need in the state of Washington (Stinson 2001). Lynx occurrence, currently and historically, has been documented in the northeastern corner of the state (McKelvey et al. 2000). Stinson (2001) stated that the highest lynx harvest in Washington was from Ferry County (Kettle-Wedge Core Area). Lynx were present and reproducing in the Kettle Mountains through the 1970s (Stinson 2001), but subsequently were likely over-trapped. The Colville National Forest completed a three-year hair-snagging survey in 2011 to determine if a lynx population remained in the Kettle Range. No lynx were documented. Currently only occasional tracks or individuals are observed with no evidence of reproduction in northeastern Washington (Koehler et al. 2008, WDFW and USFS 2011, report on file with Colville National Forest, G.Green, pers. comm.). Recently, (summer of 2016) a photo of a lynx was captured on a remote camera while surveys were being conducted in the Kettle Range (D.Thornton, pers. comm.). There are currently no estimates of the number of lynx that may be present within the planning area but available evidence suggests that the number is quite small, and the number of lynx detections are too few to represent a resident population (Lewis 2016).

The current condition of habitat within the 13 Kettle-Wedge Core Area LAUs is summarized in Table 25. Six of the northern-most LAUs were influenced by the 2015 Stickpin Fire, resulting in a temporary reduction in the quality of the habitat for lynx.

Table 25 - The lynx analysis units (LAUs) within the Kettle-Wedge Core Area and a summary of the habitat quality within each LAU (based on Lyons et al. in prep.).

Lynx Analysis Unit	Size in Acres	Proportion of LAU in Low Quality Habitat	Proportion of LAU in Moderate Quality Habitat	Proportion of LAU in High Quality Habitat
North Kettle*	15,974	38%	37%	25%
Long Alec*	15,058	79%	13%	8%
East Deer*	8,230	58%	30%	12%
North Boulder*	13,659	56%	29%	15%
Lambert*	19,095	36%	33%	31%
Indian*	15,560	56%	26%	19%
U.S.	16,237	23%	36%	41%
Deadman	21,934	27%	36%	37%
North Sherman	18,108	19%	35%	47%
West Sherman	16,819	27%	42%	31%
South Sherman	21,737	26%	41%	33%
Hall Creek	35,567	26%	35%	39%
Johns Mountain	25,824	16%	40%	45%

*Habitat quality influenced by the 2015 Stickpin Fire.

Gaines et al. (2017) completed a viability assess for a wide-range of focal species in northeastern Washington, including Canada lynx, to establish baseline conditions and inform forest plan revision. Their viability assessment considered the current condition of vegetation, grazing impacts, and winter recreation routes on lynx habitats. They found that the current viability outcome scores were somewhat

lower than those estimated for historical conditions (pre-settlement). They made the following recommendations that were incorporated into the plan components of the revised Colville Forest Plan:

- Manage disturbance regimes toward the range of variability measured at the landscape scale so that Canada lynx habitat components are distributed across the landscape in a sustainable fashion (Agee 2000, Wisdom et al. 2000, ILBT 2013).
- Manage winter recreation for no net increase in groomed and designated snow routes that create snow compacting conditions (Ruediger et al. 2000).

4.7 STATUS / ENVIRONMENTAL BASELINE – Yellow Billed Cuckoo

4.7.1 Current Status and Conservation Needs

The western Yellow Billed Cuckoo was designated as a distinct population segment by the U.S. Fish and Wildlife Service in 2013 and was federally listed as a threatened species in 2014. The western population is migratory and overwinters in South America and formerly nested across much of the western United States and southern British Columbia (Wiles and Kalasz 2017).

Forest activities that directly influence the quality and availability of habitat for riparian dependent species such as the yellow-billed cuckoo include management of roads, recreation sites, and vegetation treatments that occur within riparian habitats.

The adjacent federal land managers include the Okanogan-Wenatchee National Forest to the west, the Idaho Panhandle National Forest to the east, and the Pend Oreille National Wildlife Refuge to the southeast. The Idaho Panhandle National Forest and the Pend Oreille National Wildlife Refuge have management plans that reduce the negative effects of roads on wildlife habitats and to protect and restore riparian habitats (USFWS 2000, USFS 2015). The Okanogan-Wenatchee National Forest's current plan provides limited management direction to reduce the effects of roads on wildlife habitat, and riparian habitat protections in the Forest Plan were found to be inadequate and were amended (INFISH, PACFISH-USFS 1995, ACS-USFS 1994).

4.7.2 Life History

The following is taken from the ECOS Environmental Conservation Online System – Species Profile for Yellow-billed Cuckoo.

Food Habits

Caterpillars top the list of Yellow-Billed Cuckoo prey: individual cuckoos eat thousands of caterpillars per season. On the East coast, periodic outbreaks of tent caterpillars draw cuckoos to eat as many as 100 caterpillars in one sitting. Fall webworms and the larvae of gypsy, brown-tailed, and white-marked tussock moths are also part of the cuckoo's lepidopteran diet, often supplemented with beetles, ants, and spiders. They take advantage of the annual outbreaks of cicadas, katydids and crickets, and will hop to the ground to chase frogs and lizards. In summer and fall, cuckoos forage on small wild fruits, including elderberries, blackberries and wild grapes. In winter, fruit and seeds become a larger part of their diet.

Movement / Home Range

Yellow-billed Cuckoos breed throughout much of the eastern and central U.S., winter almost entirely in South America east of the Andes, and migrate through Central America. The western subspecies (C.a. occidentalis) has disappeared over much of the western U.S. and now occurs as a rare breeder in California, Arizona, New Mexico, and west Texas.

Reproductive Strategy

The male and female Yellow-billed Cuckoo build a flat, oblong platform nest together constructed of loose sticks, using twigs collected from the ground or snapped from nearby trees and shrubs. The pair may line the nest sparingly with strips of bark or dried leaves. The male sometimes continues bringing in nest materials after incubation has begun. Pairs may visit prospective nest sites multiple times before building a nest together.

4.7.3 Habitat Characteristics

Yellow-billed cuckoos nest almost exclusively in riparian woodlands 50 acres or larger in size, over 300 feet wide, and dominated by cottonwoods and willows (WDFW 2012). These habitats generally do not occur on the Colville National Forest. A modeling exercise was done to produce the following map. The map was developed by buffering the national wetlands inventory map by 100 meters to account for riparian habitat. The polygons were dissolved together. Then only polygons that were 50 acres or more are shown on the map. There was no vegetation modeling involved, so many of these riparian areas may not have habitat for yellow-billed cuckoo because they do not have cottonwoods or willows. However areas like Sheep Creek in the Wedge, South Fork Sherman Creek, and Woodward Meadows may have suitable habitat based on vegetation.

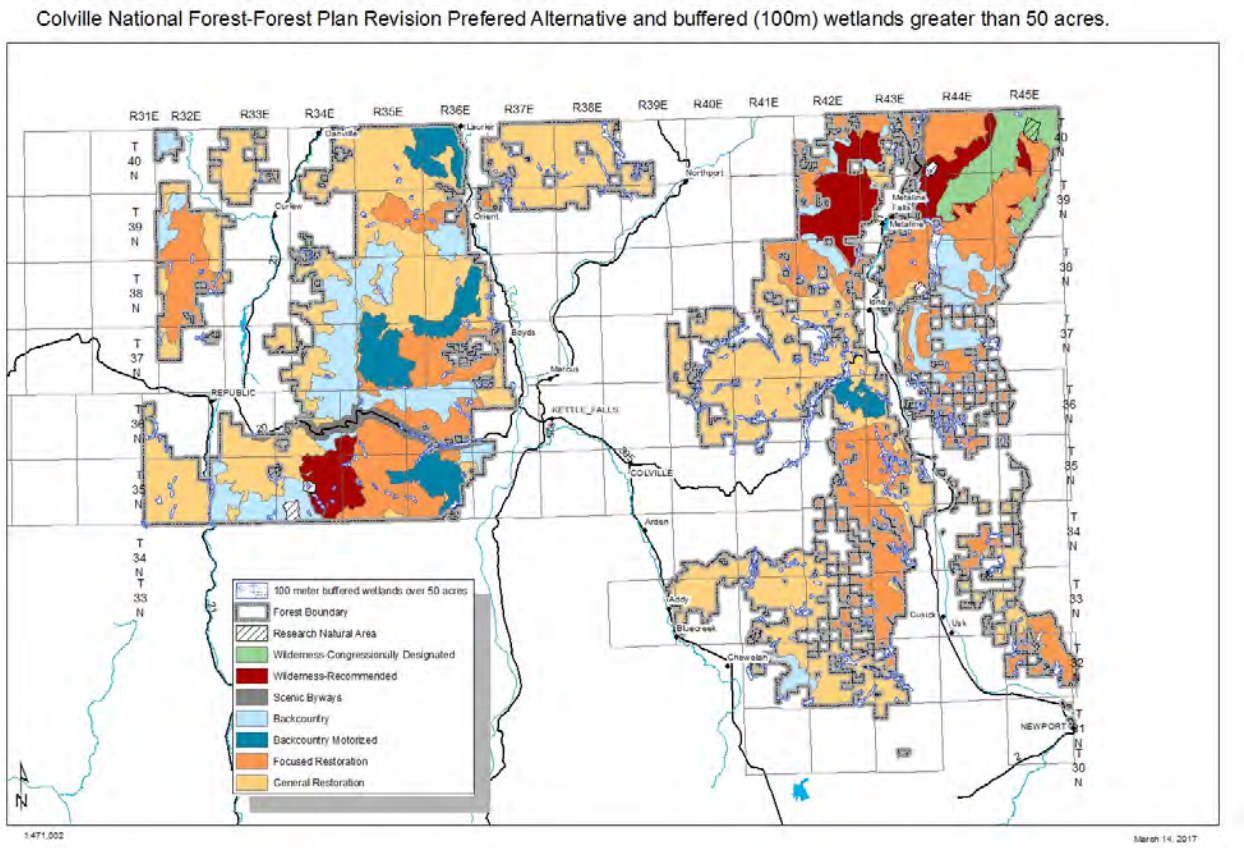

Figure 14 - Riparian Areas Greater than 50 Acres

4.7.4 Effects of Climate Change on Yellow-billed Cuckoo

Climate change is expected to have an overall negative effect throughout the range of the yellow-billed Cuckoo (Post et al. 2009, USFWS 2013). Riparian habitats are considered vulnerable to the anticipated effects of climate change (Lawler et al. 2014). The primary effect that is anticipated from climate change is the loss of habitat and reduced connectivity of riparian habitats due to altered hydrologic and disturbance (fire) regimes (Lawler et al. 2014). In addition, climate change could also negatively impact the timing of emergence of important food resources, resulting in a mismatch between when food is available and when it is most needed during the nesting season (USFWS 2013). The dynamic-landscape restoration approach that is emphasized in the Plan would result in landscapes, including disturbance regimes, that are more resilient to climate change through the application of strategically located restoration treatments in priority locations. In addition, emphasis of the Plan in reducing the negative effects of roads on riparian habitats and improving riparian habitat conditions would help to make them more resilient to disturbances.

4.7.5 Yellow-billed Cuckoo Critical Habitat

There is no critical habitat on the Colville National Forest.

4.7.6 Environmental Baseline for Yellow-billed Cuckoo

The yellow-billed cuckoo is a Threatened species under the Federal Endangered Species Act throughout much of the western United States. In the 1800s and early 1900s, yellow-billed cuckoos were locally

common in Washington, occurring on both sides of the Cascade Mountains and throughout the Puget Sound lowlands (WDFW 2012). The last confirmed breeding records in the Washington are from the 1930s. Yellow-billed cuckoos are now extremely rare in Washington, with only 12 observed between 1950 and 2000 (WDFW 2012). Eight of these occurred in eastern Washington, mostly near the Cascades (WDFW 2012). A single bird was observed on the Little Pend Oreille National Wildlife Refuge in 2012. The yellow-billed cuckoo has experienced a major decline in it breeding range since the 1800s and is now extirpated throughout most of its historical range in the western US. This decline has been attributed to habitat loss and pesticide use (Gaines and Laymon 1984, Laymon and Halterman 1987, Iten et al. 2001).

4.8 STATUS / ENVIRONMENTAL BASELINE – Wolverine

4.8.1 Current Status and Conservation Needs

Wolverine were Proposed for listing under the Federal Endangered Species Act on October 18, 2016 (Federal Register 81, 71670-71671). Wolverine habitat has been described as being primarily at high elevation and isolated from human activity (Carroll et al. 2001, Rowland et al. 2003, Aubry et al. 2007). Montane coniferous forests, suitable for winter foraging and summer kit rearing, may only be useful if connected with subalpine cirque habitats required for natal denning, security areas, and summer foraging (Copeland 1996, Copeland et al. 2010). The current distribution of wolverines is likely determined by the intensity of human settlement, the persistence of spring snow cover, and the distribution of alpine/subalpine habitats (Aubry et al. 2007, Inman et al. 2012). Several researchers have documented the effects of roads, and other human activities, on wolverines and their habitat and have included roads in models of source habitat (Carroll et al. 2001, Copeland et al. 2007, Krebs et al. 2007, Raphael et al. 2001, Rowland et al. 2003, Wisdom et al. 2000). Carroll et al. (2001) found areas with road densities <1 mile/square mile to be strongly correlated with the presence of wolverines. Rowland et al. (2003), in a test of the Raphael et al. (2001) source habitat model, found that road density was a better predictor of wolverine abundance than the amount of habitat when applied to a watershed scale.

Motorized recreation and the use of forest roads may influence the habitat use and populations of wolverines. These potential effects include displacement from key habitats, disturbance during critical periods, and an increased risk of mortality (see Wisdom et al. 2000 and Gaines et al. 2003 for a complete list of road and trail associated factors that influence wolverine). The effects of motorized recreation and roads can occur during the non-winter period or during the winter period when snowmobiling or ski-trail grooming occurs.

The adjacent federal land managers include the Okanogan-Wenatchee National Forest to the west, the Idaho Panhandle National Forest to the east, and the Pend Oreille National Wildlife Refuge to the southeast. The Idaho Panhandle National Forest and the Pend Oreille National Wildlife Refuge have management plans that reduce the negative impacts of roads on wildlife habitats and restore habitat effectiveness (USFWS 2000, USFS 2015). The Okanogan-Wenatchee National Forest's current plan provides limited management direction to reduce the effects of roads on wildlife habitat, mostly focused on big-game species.

The limited management direction in current Forest Plans to reduce the negative effects of roads on wildlife and continued development of private lands (located mostly in north-south valley bottoms that bisect the CNF) means that management of roads and motorized trails on federal lands is even more important for the habitat of wolverines.

Border Patrol activities on the Forest have the potential to cause disturbance through use of roads or trails that are normally closed to motorized use. The exact extent or amount of the impact over the life of the plan is difficult to predict because many factors could influence Border Patrol activities. Recreation is likely to increase on all land ownerships due to increasing demands. This would increase human disturbance and result in NFS lands that have relatively low human disturbance to become more important to wolverines.

4.8.2 Life History

Food Habits

Wolverines are opportunistic feeders, consuming a variety of foods depending on availability. They primarily scavenge carrion, but also prey on small animals and birds and eat fruits, berries, and insects (Hornocker and Hash 1981; Wilson 1982; Hash 1987; Banci 1994). Wolverines have an excellent sense of smell, enabling them to find food beneath deep snow (Hornocker and Hash 1981).

Movement / Home Range

Wolverines have large spatial requirements; the availability and distribution of food is likely the primary factor in determining wolverine movements and home range (Hornocker and Hash 1981; Banci 1994). Wolverines can travel long distances over rough terrain and deep snow, with adult males generally covering greater distances than females (Hornocker and Hash 1981; Banci 1994). Home ranges of wolverines are generally extremely large, but vary greatly depending on availability of food, gender, age, and differences in habitat. Home ranges of adult wolverines range from less than 100 square kilometers (km2) to over 900 km2 (38.5 square miles (mi2) to 348 mi2) (Banci 1994). Home range sizes are large relative to the body size of wolverines, and may indicate that wolverines occupy a relatively unproductive niche in which they must forage over large areas to consume the amount of calories needed to meet their life-history requirements (Inman et al. 2007a, p. 11).

Reproductive Strategy

Breeding generally occurs from late spring to early fall. Females undergo delayed implantation until the following winter to spring, when active gestation lasts from 30 to 40 days (Rausch and Pearson 1972). Litters are born between February and April, containing one to five kits, with two to three kits being the most common number (Hash 1987). Female wolverines use natal (birthing) dens that are excavated in snow. Persistent, stable snow greater than 1.5 meters (m) (5 feet (ft)) deep appears to be a requirement for natal denning, because it provides security for offspring and buffers cold winter temperatures (Pulliainen 1968, p. 342; Copeland 1996, pp. 92-97; Magoun and Copeland 1998, pp. 1317-1318; Banci 1994, pp. 109-110; Inman et al. 2007c, pp. 71-72; Copeland et al. 2010, pp. 240-242). Female wolverines go to great lengths to find secure den sites, suggesting that predation is a concern (Banci 1994, p. 107). Natal dens consist of tunnels that contain well-used runways and bed sites and may naturally incorporate shrubs, rocks, and downed logs as part of their structure (Magoun and Copeland 1998, pp. 1315-1316; Inman et al. 2007c, pp. 71-72). Occupation of natal dens is variable, ranging from approximately 9 to 65 days (Magoun and Copeland 1998, pp. 1316-1317).

4.8.3 Habitat Characteristics

Wolverines do not appear to specialize on specific vegetation or geological habitat aspects, but instead select areas that are cold and receive enough winter precipitation to reliably maintain deep persistent

snow late into the warm season (Copeland et al. 2010, entire). The requirement of cold, snowy conditions means that, in the southern portion of the species' range where ambient temperatures are warmest, wolverine distribution is restricted to high elevations, while at more northerly latitudes, wolverines are present at lower elevations and even at sea level in the far north (Copeland et al. 2010, Figure 1). Deep, persistent, and reliable spring snow cover (April 15 to May 14) is the best overall predictor of wolverine occurrence in the contiguous United States (Aubry et al. 2007, pp. 2152-2156; Copeland et al. 2010, entire). A map of potential wolverine habitat on the Colville Forest is shown in Figure 15.

4.8.4 Effects of Climate Change on Wolverine

The sensitivity of wolverine to the effects of climate change were considered to be high (CCSD 2013). An important climate change adaptation that has been recommended for wolverine is to reduce the negative effects of non-climate related stressors such as the effects of roads (and trails) on habitat (Gaines et al. 2012, Lawler et al. 2014). By reducing the negative effects of roads, habitats can become more resilient to the effects of climate change, and habitat connectivity can be restored allowing wolverines to adjust their ranges as conditions change.

4.8.5 Critical Habitat

As Wolverine is proposed, there is no critical habitat.

4.8.6 Environmental Baseline for Wolverine

Wolverines have been documented to occur in northeastern Washington, both historically and more recently (Aubry et al. 2007). A few documented sightings of wolverines exist from the Newport-Sullivan Lake Ranger Districts, mainly from high elevation areas like the Salmo-Priest Wilderness. In addition, potential habitat has been identified in northeastern Washington and in adjacent Canadian provinces (Aubry et al. 2007, LoFroth and Krebs 2007). Figure 15 - Potential Wolverine Habitat was developed by Bill Gaines, 2017. It also show wolverine observation points. Dates for the sitings were not available.

Gaines et al. (2017) completed a viability assess for a wide-range of focal species in northeastern Washington, including wolverine, to establish baseline conditions and inform forest plan revision. Their viability assessment considered the current condition of vegetation, potential denning, road and winter recreation routes on their habitat. The evaluated habitat conditions within 19 5th field watersheds that included some national forest lands and determined that all of the watersheds had a moderate habitat quality rating for wolverine. They found that the current viability outcome scores were considerably lower than those estimated for historical conditions (pre-settlement), largely due to the prevalence of roads. They made the following recommendations that were incorporated into the plan components of the revised Colville Forest Plan:

- Reduce road densities to increase the amount of source habitats for wolverine (Raphael et al. 2001, Wisdom et al. 2000) in the planning area.
- Limit recreational activities in potential and known denning habitat during the periods when dens are occupied (Banci 1994, Raphael et al. 2001).

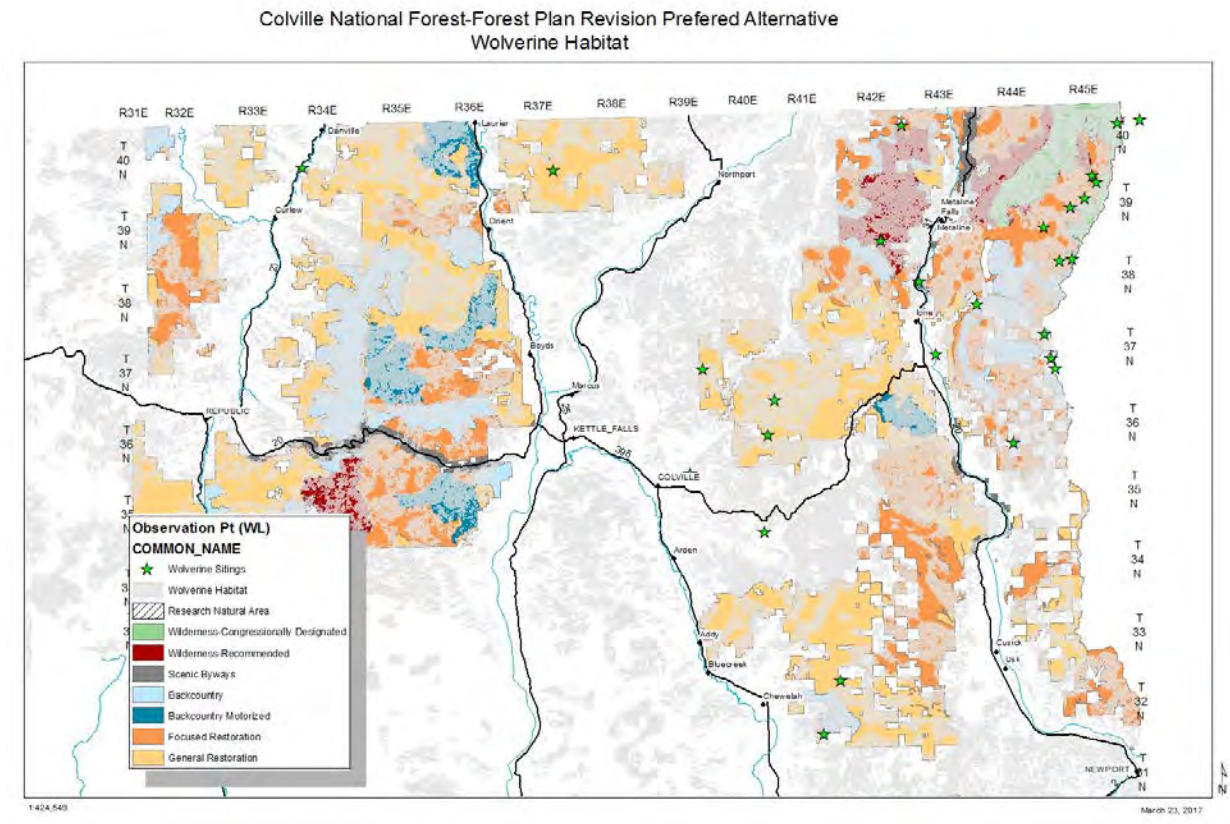

Figure 15 - Potential Wolverine Habitat

4.9 STATUS / ENVIRONMENTAL BASELINE – Whitebark Pine

4.9.1 Current Status and Conservation Needs

Pinus albicaulis is more widely distributed in subalpine forests and parklands where it establishes following fires and acts as a keystone species in these high elevation habitats. The risk to the continued existence of many whitebark pine populations is high enough to warrant ESA listing (USDI FWS 2011) and it is currently a federal candidate for listing. Threats to the whitebark pine include habitat loss and mortality from white pine blister rust, mountain pine beetle, catastrophic fire and fire suppression, environmental effects resulting from climate change, and the inadequacy of existing regulatory mechanisms. Whitebark pine is experiencing an overall long-term pattern of decline, even in areas originally thought to be mostly immune from the above threats. Recent predictions indicate a continuing downward trend within the majority of its range. While individual trees may persist, given current trends the Service anticipates whitebark pine forests will likely become extirpated and their ecosystem functions will be lost in the foreseeable future. On a landscape scale, the species appears to be in danger of extinction, potentially within as few as two to three generations. The generation time of whitebark pine is approximately 60 years. (ECOS Environmental Conservation Online System – Species Profile for Whitebark Pine)

4.9.2 Life History

Whitebark pine is a 5-needled conifer species placed in the subgenus *Strobus*, which also includes other 5-needled white pines. Whitebark pine is a stone pine (so-called for their stone-like seeds). Only five

species of stone pines are recognized worldwide, and whitebark pine is the only stone pine that occurs in North America. Characteristics of stone pines include five pine needles per cluster, cones that stay on the tree, and wingless seeds that remain fixed to the cone and cannot be dislodged by the wind. Because whitebark pine seeds cannot be wind-disseminated, primary seed dispersal occurs almost exclusively by Clark's nutcrackers (*Nucifraga columbiana*) in the avian family Corvidae (whose members include ravens, crows, and jays). This pine is a very long-lived species with some individuals documented at over 1,000 years old. (ECOS Environmental Conservation Online System – Species Profile for Whitebark Pine)

Whitebark pine is considered a keystone species in high elevation ecosystems because it increases biodiversity and contributes to critical ecosystem functions. It is frequently the first conifer to become established after disturbances like wildfires and subsequently stabilizes soils and regulates runoff. Snow will drift around whitebark pine trees, thereby increasing soil moisture, modifying soil temperatures, and holding soil moisture later into the season. Whitebark pine also provides important, highly nutritious seeds for numerous birds and mammals. In addition to these important contributions to high elevation ecosystems, whitebark pine forests have a high esthetic value that is prized by backcountry hikers and other recreational users. (ECOS Environmental Conservation Online System – Species Profile for Whitebark Pine.)

4.9.3 Habitat Characteristics

Roughly 44 percent of the species' range occurs in the United States in Wyoming, Montana, Idaho, Nevada, California, Oregon, and Washington. The remaining 56 percent of the species range occurs in British Columbia and Alberta, Canada. It typically occurs on cold and windy high-elevation or high-latitude sites. (ECOS Environmental Conservation Online System – Species Profile for Whitebark Pine.)

Pinus albicaulis is distributed in subalpine forests and parklands where it establishes following fires and acts as a keystone species in these high elevation habitats. Subalpine parklands are a mosaic of herbaceous or shrub communities with sparse, discontinuous tree cover of whitebark pine, lodgepole pine, subalpine fir, or Engelmann spruce, typically occurring as a small group of trees expanding centrifugally. It is a transition zone from the closed-canopy subalpine forest and the alpine zone upslope. At the upper end of this transition zone, krummholtz (climatically stunted and distorted trees) is the only form in which trees survive the harsh environment. Subalpine parkland is more widespread than alpine areas in the plan area.

4.9.4 Effects of Climate Change on Whitebark Pine

Climate change predictions for the Inland Pacific Northwest include average temperature increases, changes in precipitation amounts, precipitation patterns, snowpack accumulations, snowmelt, and run-off regimen. These changes would affect plant populations and habitat components resulting in shifting spatial physiological optimums and habitat effectiveness. High elevation subalpine habitats would shift upwards in elevation with increasing temperatures and result in loss of suitable habitat on the higher mountainous areas (Astrup Felde et al. 2012, Miller-Struttmann et al. 2015, Munson and Sher 2015, Walther et al. 2002).

In addition, climate change components would interact with pollinator ecology, plant phenology, invasive plant infestations, habitat connectivity, and fire regime shifts to indirectly impact existing populations and their habitats (Miller-Struttmann et al. 2015). Shifts in some of these habitat factors

may outpace the ability of plant species to adapt to changing environments (Walther et al. 2002). This leads to more isolated populations that increases stress in already vulnerable species. Condition and trend monitoring, and conservation of genetic material in seed banks have been identified as strategies to deal with these changing environments.

4.9.5 Critical Habitat

As Whitebark pine is a candidate species, there is no critical habitat.

4.9.6 Environmental Baseline for Whitebark Pine

Whitebark pine habitat (subalpine forests and parklands) can be found throughout the upper reaches of the peaks and ridges of the Selkirk Mountains and the Kettle Crest. Most of its occurrences are in a designated wilderness area, recommended wilderness, or backcountry. There are a few sites in focused and general restoration. There are about 12,500 acres of subalpine forests and parklands on the Colville NF. There are 37 sites and 1,651 acres of occupied habitat. The following map shows whitebark pine locations in relation to management areas.

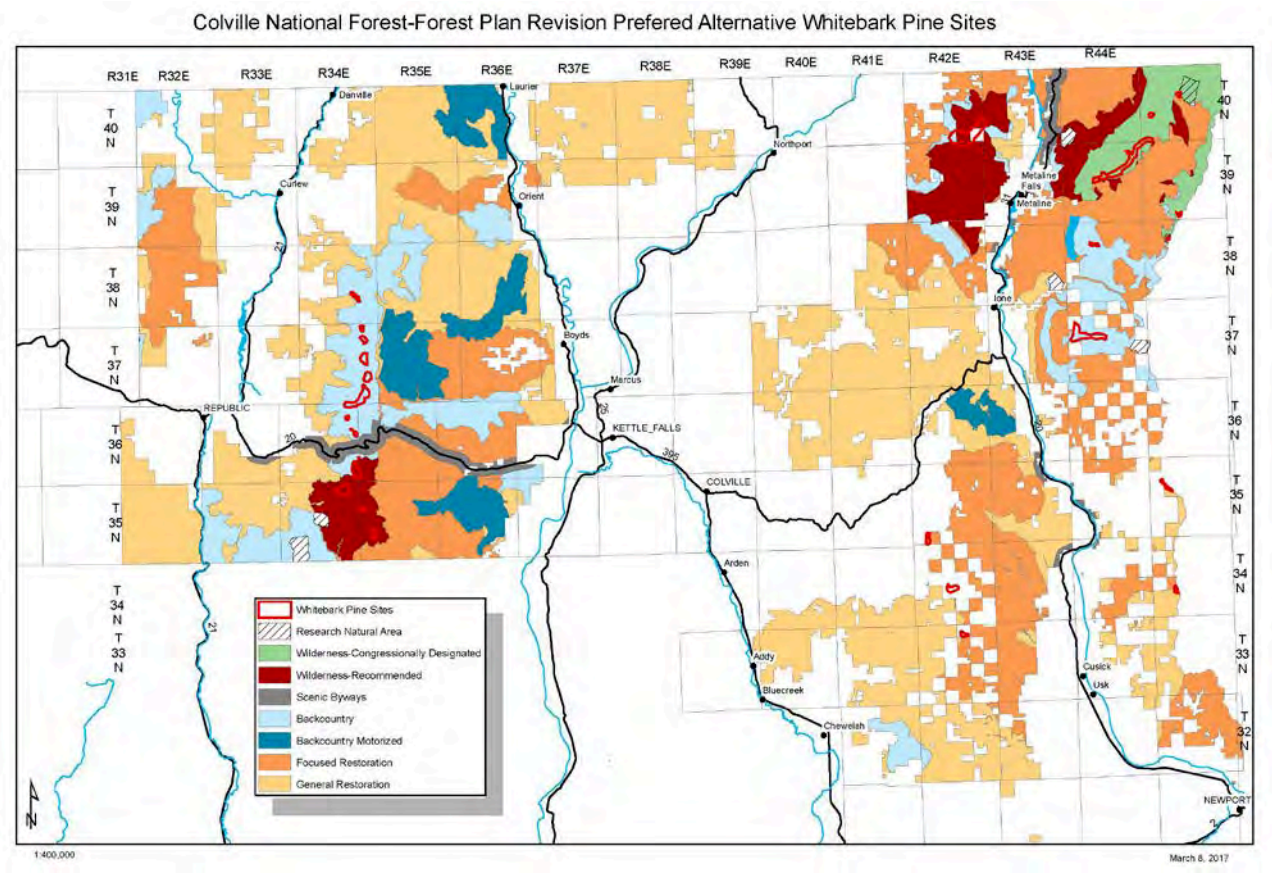

Figure 16 - Whitebark Pine Sites and the Preferred Alternative

5.0 Effects of the Action

Under section 7(a)(2) of the ESA, "effects of the action" refers to the direct and indirect effects of an action on the species or critical habitat, with the effects of other activities interrelated or interdependent with that action. Indirect effects are those caused by the action and are later in time, but still are reasonably certain to occur (50 CFR 402.02).

For purposes of consultation under section 7 of the ESA, the "action area" is defined by 50 CFR 402.02 as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action."

The Plan includes plan components; desired conditions, objectives, suitability of areas, special areas, monitoring, and standards and guidelines. The effects discussion will assess the contribution implementing the Plan will meet the Forest's obligation to further the conservation of threatened, endangered, and proposed species (ESA section 7 (a)(1)); and assess the potential future effects implementing the Plan may have on TEP species and critical habitat (ESA section 7 (a)(2)).

5.1 Bull trout

This section addresses the effects on bull trout and bull trout habitat related to the revision of the Forest Plan for the CNF.

As there are no bull trout populations or critical habitat on the CNF within the Mid-Columbia Recovery Unit, implementation of the revised Plan will have **No Effect** to the species in the Sanpoil and Upper Columbia River-Lake Roosevelt subbasins. There are no bull trout within the Kettle and Colville subbasins, therefore the Plan will have **No Effect** in the two subbasins.

The Plan, through the designation of MAs, identifies what types of management activities will be emphasized on different portions of the Forest. The decision, or 'Federal action' to designate the MAs will have no direct effects on bull trout or bull trout critical habitat. The Plan components describe the management intent and sideboards placed on management activities either forest-wide or specific to a MA. The plan components include the ARCS that will replace the current direction provided by INFISH. This BA assesses the MAs and plan components, in particular the plan components contained in the ARCS, for their conservation value to bull trout and potential effects (indirect effects of the Plan) to bull trout that may occur during future implementation of the Plan. Because the Plan is programmatic in nature and does not authorize any actions, no take can be specifically, reasonably certain to occur by adopting the plan; and any future land management activities that occur through implementing the plan will be subject to ESA section 7(a)(2) consultation; the Plan is considered a *framework programmatic action* (80 FR 26832).

5.1.1 Direct and Indirect Effects

Most management activities that will be implemented by the different management programs under the direction of the Plan have the potential to affect bull trout and their habitats, either directly or indirectly, in a beneficial or negative manner. Land management activities that disturb the soil surface and alter vegetation have the greatest potential for and risk of adverse effects. The management programs that have the greatest potential to affect, bull trout and bull trout habitat are Vegetation Management, the National Forest Access System, Livestock Grazing, Mining, Recreation, and Lands and Special Uses. As previously mentioned, the new Plan does not authorize any specific management

actions. The Plan designates MAs, where, depending upon the intent and Plan components for the MA, management activities will be implemented to achieve desired conditions of the MA within the constraints provided by the plan components for the individual programs.

The potential threats to bull trout recovery due to forest management activities will be avoided or greatly reduced by the Forest-wide Water Resource and RMA plan components (desired conditions, standards and guidelines) that have been previously discussed. The Water Resources and RMA standards and guidelines for specific management activities further help either avoid or minimize the potential effects to bull trout and bull trout habitat due to the specific activity. The following describes the potential effects of the above mentioned management programs and the ARCS plan components that will constrain or guide those activities to avoid or minimize effects to bull trout and bull trout habitat.

Aquatic and Riparian Conservation Strategy (ARCS) Effects

The Plan ARCS was developed based upon the U.S. Forest Service ARCS and is consistent with the Interior Columbia Deputy Team's documents; *Interior Columbia Strategy*, *A Strategy For Applying The Knowledge Gained By The Interior Columbia Ecosystem Management Project To The Revision Of Forest and Resource Management Plans* and *A Framework for Incorporating the Aquatic and Riparian Component of the Interior Columbia Basin Strategy into BLM and Forest Service Plan Revisions*. The ARCS plan components including desired conditions, standards and guidelines, objectives, the designation of riparian management areas and key watersheds, the identification of suitable uses within RMAs and monitoring provide a comprehensive approach for conserving and recovering populations of the MIS/Focal species and meeting the Clean Water Act. Consistent with the ARCS, the Plan ARCS has been developed to maintain and restore healthy watersheds, riparian areas and stream channels that are resilient to natural disturbance. Natural disturbances such as wildfire, large storms and subsequent floods, hillslope failures, landslides, debris flows, and channel migration create a mosaic of habitat conditions over time and space that native fish populations have adapted to. The ARCS also was developed recognizing that streams and aquatic ecosystems are linked to the dynamics of both the riparian and upland communities, and the watershed and physical processes that shape them.

The ARCS will replace INFISH. The CNF forest plan was amended by INFISH in 1995. INFISH was to be an interim strategy lasting 18 months. While INFISH has been in place considerably longer than 18 months, the strategy appears to have been successful effective in improving aquatic habitat (Archer *et al*. 2009, Meredith *et al*. 2012). Indeed the PIBO monitoring shows that although stream habitat on the CNF is generally in "degraded" conditions compared to reference streams, there are some improving trends. The ARCS, with more comprehensive set of desired conditions, standards and guidelines and objectives then included in INFISH is expected to be more effective at restoring ecologically healthy watersheds, riparian and aquatic habitats. The Plan_component_comparison_3_21_17_draft.docx in the bull trout digital files provides a side-by-side comparison of INFISH and the ARCS.

Forest-wide ARCS Plan Components

The Water Resources section of the Plan includes desired conditions and standards and guidelines that are to be applied Forest-wide in all MAs. The Forest-wide Water Resources plan components are in addition to plan components that are specific to RMAs and key watersheds. The Forest-wide desired conditions, standards and guidelines are to work in concert with the plan components for key watersheds and RMAs to establish the general direction and sideboards for managing for healthy

watersheds and contribute to the viability of native aquatic and riparian species during Plan implementation.

The fifteen desired conditions provide a more comprehensive description of the intent of the Plan to provide for the ecological integrity of watersheds, riparian, and aquatic habitats than the eight goals included in INFISH. As discussed in section 2.1 of this BA, to be consistent with the desired conditions of the Plan, a project or activity, when assessed at the appropriate spatial scale described in the Plan (each desired condition specifies the scale to be assessed at; subwatershed, watershed, subbasin), must be designed to meet one or more of the following conditions:

- Maintain or make progress toward one or more of the desired conditions of a plan without adversely affecting progress toward, or maintenance of, other desired conditions; or
- Be neutral with regard to progress toward plan desired conditions; or
- Maintain or make progress toward one or more of the desired conditions over the long term, even if the project or activity would adversely affect progress toward or maintenance of one or more desired conditions in the short-term; or
- Maintain or make progress toward one or more of the desired conditions over the long term, even if the project or activity would adversely affect progress toward other desired conditions in a negligible way over the long-term.

Therefore all management activities implemented during the life of the plan must be designed to meet the desired conditions.

The Plan desired conditions include ones that have no direct counterpart goal in INFISH and are a benefit to bull trout conservation. *FW-DC-WR-04. Physical Integrity of Aquatic and Riparian Habitat* states that CNF lands will provide aquatic habitats in which the distribution of stream channel conditions in watersheds across the Forest is similar to the distribution of conditions in similar, reference watersheds. *FW-DC-WR-05. Water Quality* states water quality is not only provided to a degree that provides for stable and productive riparian and aquatic ecosystems (INFISH Riparian Goal 1), but also to specifically benefit the survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities. There are currently approximately two miles of stream on the Forest within the Pend Oreille subbasin with an approved TMDL for temperature. An additional two miles, three miles, 11 miles and 20 miles are still on the 303(d) list for bacteria, temperature, pH and dissolved oxygen respectively (see Table 19). This desired condition reiterates the CNF intent to meet the Clean Water Act and the bull trout water quality standards.

The 2008 Water Quality Assessment (WQA) and 303(d) list was approved by EPA Dec. 21, 2012 (U.S. EPA 2012). The 2008 WQA and 303(d) list is considered the '2012 Water Quality Assessment' to reflect when the assessment was approved rather than when the assessment was scheduled for completion (WADoE 2014(b)). The 2012 WQA 305(b) list and 303(d) list contains 42 stream reaches on the Forest that do not meet water quality standards and includes all impaired stream segments added to the 303(d) list since 2004 that are not under an approved TMDL (WADoE 2014(a, b, and f)). Impairment pollutants include fecal coliform bacteria, dissolved oxygen, pH and temperature. Portions of Big Muddy Creek, Brown's Creek, Buck Creek, Middle and North Fork Calispell Creek, Cedar Creek, Cee Ah Creek, Cottonwood Creek, East Deer Creek, Exposure Creek, Fisher Creek, Halfmoon Creek, Harvey Creek, Lambert Creek and an unnamed tributary, East, West, Middle, and main stem LeClerc Creek, North Fork and main stem

Lone Ranch Creek, Lost Creek, McAhee Creek, Meadow Creek, Mill Creek, Pend Oreille River, Ruby Creek, Sandwich Creek, North Fork, South Fork, and main stem Sherman Creek, South Fork and main stem Skookum Creek, Slate Creek, Smackout Creek, North Fork St. Peter Creek, North Fork and main stem Sullivan Creek, Tacoma Creek, and Wilson Creek are on the 2008 303(d) list. Bead Lake is the only lake on the Forest on the 303(d) list and is listed for PCBs and dioxins found in fish tissue samples.

To meet the goals outlined in the MOA and comply with the CWA, Ecology began working with the Forest in 2002 on a TMDL for temperature, bacteria, pH, and dissolved oxygen and Water Quality Implementation Plan (WQIP) (WADoE 2006) for waters across the Forest on the 1998 303(d) list. EPA approved the TMDL and WQIP for fecal coliform on 8 waterbody segments and temperature on 4 segments from the 1998 303(d) list as well as 41 temperature-impaired waterbody segments added to the 303(d) list during the TMDL development process in 2005 (EPA 2005, Whiley and Baldwin 2005). The TMDL for pH and dissolved oxygen was not approved at this time because the submittal report lacked some of the required components in the dissolved oxygen and pH analysis (Baldwin 2006). EPA also approved a TMDL for the Colville River and its tributaries for fecal coliform in 2003 (Coots 2002, Murray and Coots 2003, Baldwin 2005). There are also several stream segments on the Forest included in the Colville River TMDL.

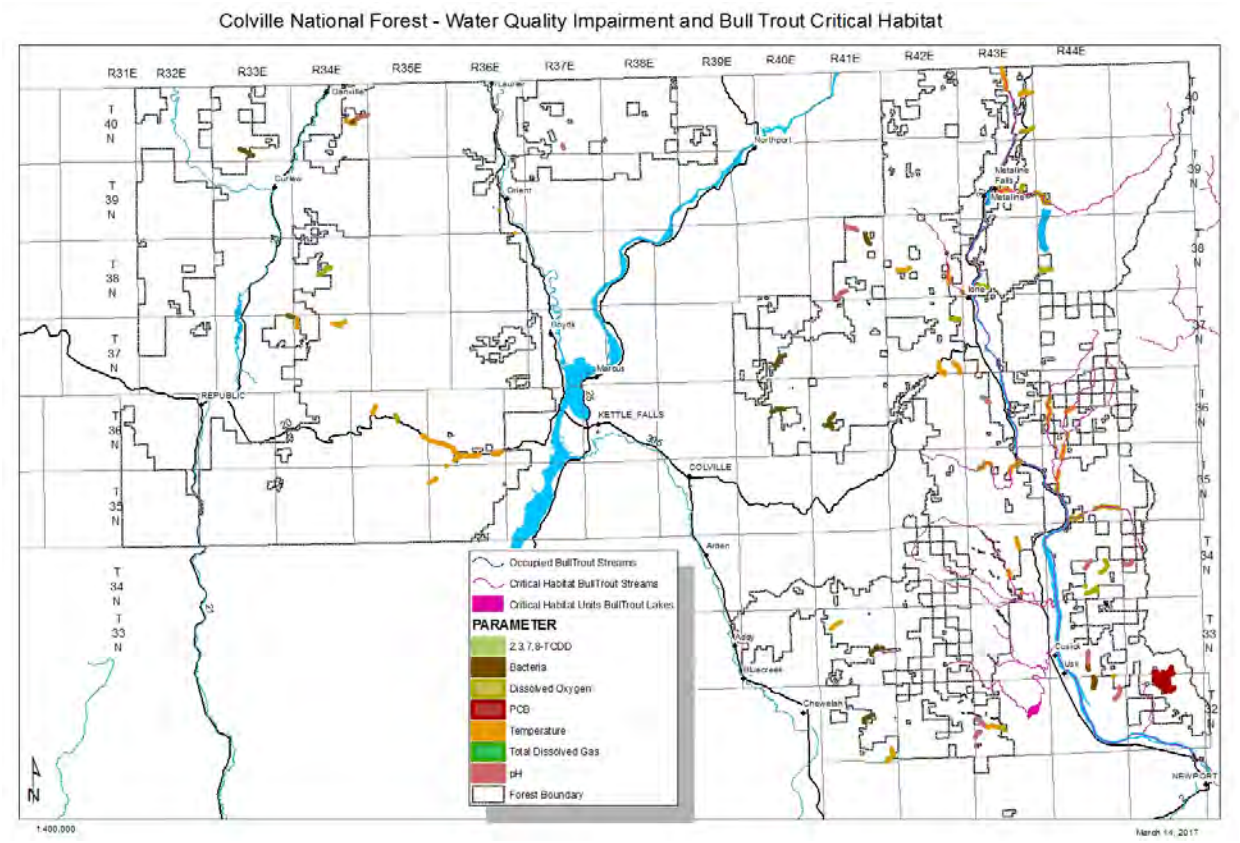

Figure 17 - Bull Trout Critical Habitat and Water Quality Impairment

FW-DC-WR-09. Groundwater-Dependent Systems: Seeps, Springs, and Groundwater-fed Wetlands recognizes the important role of groundwater to healthy watershed conditions. There is no counterpart Riparian Goal in INFISH. *FW-DC-WR-10. Water Production for Downstream Uses* recognizes the

importance of water flowing off the CNF downstream ecological communities, including human communities

FW-DC-WR-12. Aquatic Invasive and Non-Native Species – this desired condition brings management attention to the threat aquatic invasive species pose to native aquatic species. *FW-DC-WR-13. Aquatic Threatened, Endangered, and Sensitive Species* specifically identifies the Forest's intent to contribute to the recovery of bull trout and the other MIS/focal species (westslope cutthroat trout and interior redband trout). Finally *FW-DC-WR-14. Resiliency to Climate Change* – recognizes the need to be cognizant of the effects of climate change to aquatic and riparian resources.

The Plan includes five watershed standards that apply forest-wide. These five standards constrain management activities and will benefit the bull trout conservation. INFISH includes standards and guidelines for projects in riparian areas to achieve RMOs but no other forest-wide standards and guidelines.

The first standard; *FW-STD-WR-01. Properly Functioning Watersheds* – states that "when watershed function desired conditions are being achieved and watersheds are functioning properly projects shall maintain those conditions. When watershed function desired conditions are not yet achieved or watersheds have impaired function or are functioning-at-risk and to the degree that project activities would contribute to those conditions, projects shall restore or not retard attainment of desired conditions. Short-term adverse effects from project activities may be acceptable when they support long-term recovery of watershed function desired conditions. Exceptions to this standard include situations where Forest Service authorities are limited. In those cases, project effects towards attainment of desired conditions shall be minimized and not retard attainment of desired conditions to the extent possible within Forest Service authorities."

The assessment of Aquatic Ecological Condition (section 5.1.2 of this BA) found the condition of subwatersheds, on the CNF within the Pend Oreille subbasin are generally *not properly functioning* or *functioning at risk*. Only the Headwaters South Salmo River subwatershed, North Fork Sullivan Creek-Sullivan Creek, and Slate Creek subwatersheds are judged to be *properly functioning*. The *functioning at risk* and *not properly functioning* ratings are due to at risk or not properly functioning ratings for large woody debris (16 subwatersheds), channel shape and function (17 subwatersheds), riparian vegetation condition (18 subwatersheds), insects and disease (four subwatersheds), road densities (19 subwatersheds) riparian road densities (19 subwatersheds) and roads on sensitive soils (eight subwatersheds). Additionally all subwatersheds were rated *functioning at risk* for the fire regime attribute. Standard *FW-STD-WR-01* will require all management actions maintain properly functioning conditions where they exist, but importantly in most subwatersheds, projects will contribute to improved conditions by not retarding recovery towards the desired conditions or improving conditions to the extent possible given the project scope.

Standard *FW-STD-WR-02* will benefit bull trout conservation by requiring all projects to include National and Regional Best Management Practices which will reduce the risk of projects resulting in long-term adverse effects to bull trout. Standard *FW-STD-WR-03. Water Quality* – requires all projects to be implemented in a manner consistent with the Clean Water Act and Total Maximum Daily Loads established for the Forest is expected to benefit bull trout by reducing the stream miles with impaired water quality.

Forest wide standards FW-STD-WR-03 Aquatic Invasive Species In-Water Work and FW-STD-WR-05 Construction of New Roads, Trails and Developed Recreation Sites that are included in the Plan are also consistent with bull trout conservation. FW-STD-WR-03 Aquatic Invasive Species In-Water Work directs prevention measures be implemented for in-water projects to decrease the potential for aquatic invasive species transference into non-infested water bodies. INFISH does not include a similar standard or guideline. FW-STD-WR-04 Construction of New Roads, Trails and Developed Recreation Sites requires new road, trail, and recreation sites be designed to minimize disruption of natural hydrologic processes at perennial and intermittent stream crossings, valley bottoms, valley approaches and other over land drainage features. The standard should help reduce the risk of these specific management activities disrupting the processes controlling the flow of water and sediment into aquatic habitat.

There are four Forest-wide guidelines that are designed to reduce the risk of spreading AIS, a benefit to bull trout conservation. There are no similar guidelines in INFISH. *FW-GDL-WR-01 Aquatic Invasive Species Wildfire Suppression Equipment* – addresses the risk of cross contamination between streams and lakes from pumps, suction, and dipping devices during wildfire suppression by avoiding dumping water directly from one stream or lake into another and water storage and conveyance components of water tenders, engines, and aircraft should be disinfected prior to use on a new on-forest incident. *FW-GDL-WR-02. Aquatic Invasive Species - Aquatic Resource Sampling* reduces the risk of spreading AIS infestation by stating aquatic sampling equipment should be disinfected prior to use in new stream or lake locations. *FW-GDL-WR-03. Aquatic Invasive Species Early Detection and Rapid Response* – encourages using the principles and processes of early detection and rapid response (EDRR) to find, identify and quantify new aquatic invasive species occurrences; and coupling EDRR with other integrated activities to rapidly assess and respond with quick and immediate actions to eradicate, control, or contain aquatic invasive species.

Forest-wide guideline *FW-GDL-WR-04. Watershed Restoration* is similar to INFISH standard and guideline WR-1 by encouraging restoration methods be utilized that maximize the use of natural ecological processes for long-term sustainability and minimize the need for long-term maintenance.

The Forest-wide water resources direction is more comprehensive that INFISH and thus should provide more for bull trout conservation than INFISH.

Riparian Management Areas (RMAs)

The Plan RMAs are similar to the RHCAs of INFISH and are a MA that overlay all other MAs, therefore the RMA Plan components apply no matter what other MA the RMA is within. RMAs are used as the primary framework (coarse filter) to provide for riparian and aquatic ecosystem diversity by conserving ecological processes at the landscape and watershed scales. Management activities within RMAs are to be designed to maintain or enhance existing desired conditions or restore degraded conditions for aquatic and riparian dependent species. The ecological processes and conditions, and the important functions riparian areas provide to aquatic habitat that RMAs are designed to protect are described in section 2.2.1.

The Plan RMAs are similar to the INFISH RHCAs with two notable differences: 1) a RMA for lakes and natural ponds of at least 300 feet compared to INFISH riparian width of 150 feet; and 2) the RMA width of at least 100 feet for all seasonally flowing or intermittent streams, wetlands, seeps and springs less than one acre; compared to the existing direction of 100 feet in Priority Watersheds, and 50 feet in non-priority watersheds. The increase in RMAs, compared to the INFISH direction recognizes the importance

of these areas for maintaining watershed function and protecting downstream aquatic habitat as well as associated riparian dependent species.

Management within RMAs is guided by four Desired Conditions, 23 Standards and 24 Guidelines. Management direction for INFISH includes eight riparian goals, similar to the Forest-wide water resources goals discussed above, 39 standards and guidelines (INFISH did not distinguish between standards and guidelines: see the Plan_component_comparison_3_21_17_draft.docx in the bull trout digital files for a comparison to the Plan desired conditions, standards and guidelines with those of INFISH).

One difference between the INFISH and the Forest's ARCS is management activities within RHCAs as constrained by the standards and guidelines are to meet RMOs. The RMOs are specific, numeric descriptors for what was considered good fish habitat at the time (figure 2, in section 2.2.1). The RMOs were considered to be interim and a national forest could change the RMOs based on the results of a watershed analysis. The Forest has not changed the RMOs while implementing INFISH.

The Forest ARCS does not include RMOs. Streams and aquatic habitat conditions are expected to be dynamic, varying in time and space due to natural disturbance. The use of specific habitat standards or objectives does not recognize the dynamic processes that create and maintain ecologically complex and resilient watersheds (Reeves *et al*. 1995; Bisson *et al.* 1997, ISAB 2003, Al-Chokhachy *et al*. 2011). Management in RMAs is to maintain or restore desired conditions.

The Plan includes four desired conditions that are a benefit to bull trout conservation by accounting for maintaining natural processes and the functions of the RMAs:

MA-DC-RMA-01. Composition

Riparian management areas consist of native flora and fauna in a functional system and a distribution of physical, chemical, and biological conditions appropriate to natural disturbance regimes affecting the area.

MA-DC-RMA-02. Key Riparian Processes

Key riparian processes and conditions (including slope stability and associated vegetative root strength, capture and partitioning of water within the soil profile, wood delivery to streams and within the riparian management areas, input of leaf and organic matter to aquatic and terrestrial systems, solar shading, microclimate, and water quality) are operating consistently with local disturbance regimes.

MA-DC-RMA-03. Livestock Grazing

Livestock grazing of riparian vegetation retains sufficient plant cover, rooting depth and vegetative vigor to protect stream bank and floodplain integrity against accelerated erosional processes, and allows for appropriate deposition of overbank sediment.

MA-DC-RMA-04. Roads

Roads located in or draining to riparian management areas do not present a substantial risk to soil or hydrologic function. Roads do not disrupt riparian and aquatic function.

The first two desired conditions need to be considered in all land management activities that occur within an RMA. *MA-DC-RMA-01* focuses on maintaining natural processes are occurring with to ensure native flora and fauna are present in a functional system and the distribution of physical, chemical and biological conditions are appropriate to the natural disturbance regime affecting the area. *MA-DC-RMA-*

02 addresses the riparian processes and functions that are key to providing healthy riparian and aquatic habitats.

MA-DC-RMA-03 helps protect riparian areas during livestock grazing by maintaining riparian vegetation with sufficient plant cover, rooting depth and vigor thus protecting against accelerated erosion and allowing for the deposition of overbank sediment necessary to maintain stream banks. *MA-DC-RMA-04* will help conserve bull trout by requiring road maintenance activities account for reducing risk to soil, hydrologic function as well as riparian and aquatic function.

These two desired conditions aide in the conservation of bull trout.

MA-DC-WR-04. Aquatic habitats in which the distribution of conditions (e.g., bank stability, substrate size, pool depths and frequencies, channel morphology, large woody debris size and frequency) in the population of watersheds on the Forest is similar to the distribution of conditions in the population of similar, reference condition watersheds. (Reference Conditions can be drawn from the Forest or Provincial scales. Conditions are assessed at the subbasin scale for Forest and project planning). This desired condition basically replaces the INFISH RMOS and may provide a more ecologically relevant way to assess stream channel conditions. Currently the Forest will use an index approach as was discussed in section 5.1.2 to determine progress towards the desired condition.

MA-DC-WR-14– This desired condition was added to place emphasis on managing RMAs so they are resilient to climate change and other disturbances. Providing for resilient RMA conditions is key for providing productive bull trout habitat over time.

The ARCS standards and guidelines, as with INFISH, cover a variety of management activities including: general riparian and aquatic conditions; chemical application within RMAs; fuelwood cutting; logging activities; road construction and maintenance and road/stream crossings; grazing management; fire and fuels management; lands and special use authorizations; hydroelectric development; and minerals management. The RMA standards and guides specific to management activities associate with a program will be discussed in the effects discussion for the individual programs.

The following standard is important to the conservation of riparian and aquatic habitat and necessary to provide habitat conditions for bull trout recovery. *MA-STD-RMA-01*, makes it clear that: RMAs include portions of watersheds where aquatic and riparian-dependent resources receive primary management emphasis; that projects shall maintain RMA conditions where desired conditions are functioning properly; and that when riparian management area desired conditions are not yet achieved or RMAs have impaired function or are functioning-at-risk and to the degree that project activities would contribute to those conditions, projects or permitted activities shall restore or not retard attainment of desired conditions. Short-term adverse effects from project activities may be acceptable when they support long-term recovery of RMA desired conditions. Exceptions to this standard include situations where Forest Service authorities are limited. In those cases, project effects towards attainment of RMA desired conditions shall be minimized and not retard attainment of desired conditions to the extent possible within Forest Service authorities. The standard provides clear direction that riparian dependent resources are the management priority for all management activities within RMAs.

The CNF's RMA delineation follows the ARCS approach to riparian area management. Relatively large default RMAs are established to protect and restore water quality, provide for a wide range of aquatic

and terrestrial habitats and species, and critical ecological processes. As stated in the ARCS, the scientific basis for the size of the RMAs was originally established in FEMAT (1993). Everest and Reeves (2007) later concluded that there was no scientific evidence that either the default prescriptions or the options for watershed analysis in the NWFP (USDA and USDI 1994) provide more protection than necessary to meet stated riparian management goals ARCS 2016.

It needs to be emphasized that RMAs are not "no-touch" buffers. It is fully expected that management activities, especially those designed to benefit aquatic and riparian-dependent resources and move the landscape towards desired conditions are allowed and encouraged within them**.** Activities that do not degrade desired conditions or prevent the desired conditions from being attained are also allowed. Instead, a wide range of management activities, involving highly-varied prescriptions, are expected to occur within them. In order to achieve RMA desired conditions *MA-DC-RMA-01. Composition, MA-DC-RMA-02*. *Key Riparian Processes, and FW-DC-WR-14. Resiliency to Climate Change* - RMAs are resilient to climate change may require some active management of vegetation within RMAs.

Reeves (*et al.*) 2016 provide a review of the current science surrounding riparian functions and processes. As they state, and described in USDA and USDI (1994), most of the key ecological processes needed to be maintained within RMAs occur within a distance equal to one site potential tree height from a stream or the floodplain (when present), including the beneficial effects of root strength for bank stability, litter fall, shading to moderate water temperature, and delivery of coarse wood to streams. Most of the moderating effects of sediment delivery to streams from overland erosion that may be produced by upland management activities generally occurs within a distance of one site potential tree. Similarly an extensive literature review by Sweeny and Newbold (2014) of stream side buffers and concluded, overall, buffers ≥30 m (98 feet) wide are needed to protect the physical, chemical, and biological integrity of small streams. Sweeny and Newbold (2014) also state their review found that sediment trapping was ~65 and ~85% for a 10- and 30-m buffer, respectively, concluding the increased sediment removal attained by wider buffers may be small fraction of the total sediments (by mass), but probably a large fraction of the finer silts and clays, which are typically released from narrow buffers in concentrations high enough to impair water quality.

As explained in Reeves *et al.* (2016) the extension of the riparian reserve boundary in the Northwest Forest Plan (as can likely be said for INFISH) from one site-potential tree-height to two on fish-bearing streams was to protect and enhance the microclimate of the riparian ecosystem within the first tree-height. Reeves *et al* (2016) conclude, in some cases, one-site potential tree buffer may be enough to ameliorate increases in microclimate due to management activities, especially timber harvest. There are also concerns for decreasing the extent of the riparian reserves and the effects on stream temperatures (Reeves *et al.* 2016).

Given the above, plus the uncertainties, and that at a minimum an approximately 100 foot distance is needed to filter most but not all sediment delivered to streams via overland flow, the RMAs in the Plan, with the associated desired conditions, standards and guidelines plus standards and guidelines for specific management activities and programs (section 6.2) represent a precautionary approach for managing RMAs to protect fish habitat water quality. The RMAs will be equally as protective as the RHCAs of INFISH and allow for careful management within RMAs to achieve riparian, aquatic and landscape scale desired conditions while protecting the important ecological processes.

The Plan increases the RMAs along all non-fish bearing intermittent streams than currently designated by INFISH. All the ecological functions for which the RMAs are established for fish-bearing streams also apply to intermittent streams (Reeves *et al*. 2016). The RMA width of 100 feet or one site potential tree, plus protection of landslide prone areas should be protective of those ecological functions.

Population Strongholds/Restoration Priorities and Guidance – Key Watersheds/Aquatic Objectives.
The key watersheds and objectives will be discussed together as the two plan components are closely related. The key watersheds are areas that either provide, or are expected to provide, high quality habitat that will serve as source areas for threatened or endangered fish species, fish species of concern, and fish species of interest, and/or provide high quality water important to these populations downstream and/or their habitats. The key watersheds are also the priority for watershed, riparian and aquatic habitat restoration. Management direction for key watersheds is intended to provide the highest relative level of protection and accept the lowest relative level of risk from activities that may threaten watershed integrity and resiliency. The identification of key watersheds in the Plan gave high priority to supporting bull trout conservation in the Pend Oreille subbasin.

The Plan key watersheds are listed in Table 8, section 2.2.2 of this BA. The key watersheds include all of subwatersheds with bull trout critical habitat and $\geq$ 25% of the subwatershed within the CNF. There is critical habitat within the Calispell Creek, Cusick Creek-Pend Oreille, Maitlen Creek Pend-Oreille River, and Yokum Lake-Pend Oreille River subwatersheds, but the critical habitat is not within the Forest boundary. There is also possibly a very small amount (less than a mile) of critical habitat within the Forest in the Pewee Creek-Pend Oreille River subwatershed with greater than 25% CNF managed land (see Table 15 in section 3.0). Although these above mentioned subwatersheds are not included in the key watershed network, Forest-wide and RMA plan components are expected to provide high quality water and protect the riparian and watershed ecological processes that can contribute to providing downstream habitat conditions for bull trout as discussed in sections 6.1.2 and 6.1.2.

The emphasis on protection and restoration in key watersheds has been found to be an effective strategy in the Northwest Forest Plan area as the watershed condition of key watersheds appears to be improving at a faster rate than non-key watersheds (Lanigan *et al*. 2012). The Plan's key watershed desired conditions, standards and guidelines, and objectives as are to be implemented in the Pend Oreille subbasin (and other key watersheds on the Forest) were developed in the ARCS (USDA Forest Service 2008; 2016) and are based upon lessons learned in implementation of the Northwest Forest Plan. *FW-DC-WR-14. Key Watershed Network* and *FW-DC-WR-16 Key Watershed Integrity* provide a clear description of the purpose of the Plan key watersheds and that in the case of the key watersheds in the Pend Oreille subbasin, the key watersheds are to contribute to short-term conservation and long-term recovery of bull trout. Key watershed desired condition *FW-DC-WR-15 Roads in Key Watersheds*, addresses the threat roads, a key threat specific to bull trout in the lake Pend Oreille core area, pose to watershed processes and aquatic habitat (the potential threats of roads will be discussed in section 6.2.2 in the Access program discussion).

Minimizing the threat of roads in key watersheds is further emphasized with standard *FW-STD-07Road Construction and Hydrologic Risk Reduction in Key Watersheds*. In key watersheds with ESA listed fish critical habitat that are functioning properly with respect to roads, there will be no net increase is system roads that affect hydrologic function. In key watersheds with ESA critical habitat for aquatic species that are functioning-at-risk or have impaired function with respect to roads, there will be a net

decrease (for every mile of road construction there would be greater than one mile of road-related risk reduction) in system roads that affect hydrologic function to move toward proper function. Treatment priority shall be given to roads that pose the greatest relative ecological risks to riparian and aquatic ecosystems. Road-related risk reduction will occur prior to new road construction unless logistical restrictions require post-construction risk reduction.

In addition to the standard regarding roads in key watersheds, the Forest-wide and RMA standards and guidelines there are two additional standards specific to key watersheds, *FW-STD-WR-08 Hydroelectric and Other Water Development Authorizations in Key Watersheds* and *FW-STD-WR-09 New Hydroelectric Facilities and Water Developments*, that provide extra protection to key watersheds from potential adverse effects of hydropower and other water developments.

In addition to the protection or passive restoration benefits, key watersheds are a priority for active restoration for the conservation of bull trout. Since the development of the ARS, (USDA Forest Service 2007), Region 6 watershed and aquatic habitat restoration has been implemented a whole watershed approach where active restoration is focused within a watershed or subwatershed to address all restoration needs that are politically, economically, and technically feasible within a watershed before moving on to other watersheds or subwatersheds. Such a whole watershed approach is consistent with the findings of Roni *et al.* (2010) who found considerable restoration is needed to produce measurable changes in coho salmon (*O.kisutch*) and steelhead abundance (and presumably bull trout) at a watershed scale.

The key watershed objectives that have been identified for key watersheds with bull trout critical habitat include 57 miles of road improvements, improving fish and other aquatic organism passage at 22 road/stream crossings, 70 acres of range infrastructure improvement, improving riparian vegetation structure on between 75-450 acres, and restoring 52 miles of stream habitat. These objectives are identified by specific key watershed (Table 9, section 2.2.2).

In addition to the key watersheds there are what are called Priority watersheds and Focused subwatersheds that are also expected to have restoration actions implemented. These priority and focused watersheds were identified prior to development of the revised Plan through implementation of the Region Six ARS. The current CNF Focus Watersheds are the LeClerc-Pend Oreille River (HUC 171021602), The Upper Sanpoil River (HUC 1702000401) and Chewelah Creek-Colville River (HUC 1702000301). The LeClerc Creek-Pend Oreille River watershed includes bull trout critical habitat and the Forest along with partners has developed a watershed action plan.

The Forest has also identified Priority watersheds through the implementation of the Watershed Condition Framework (Potyondy and Geier 2010). The West Branch and East Branches LeClerc Creek are priority watersheds that are also key watersheds. While the key watersheds are the priority for restoration, the focus and priority watersheds that are not in the Key Watershed network are used to target implementation of short-term, opportunistic restoration work such as in subwatersheds that are a restoration priority for partners but not necessarily a priority to benefit the aquatic MIS/Focal species like bull trout.

Restoration objectives that apply to all watersheds including key watersheds that may directly contribute to bull trout conservation both on the Forest and to downstream critical habitat where implemented within the Pend Oreille River subbasin include; *FW-OBJ-WR-01 Aquatic Invasive Species*,

FW-OBJ-WR-02. Aquatic Invasive and Non-Native Species, FW-*OBJ-WR-03, General Watershed Function and Restoration* and *MA-OBJ-RMA-01. Improve Riparian Function at Dispersed and Developed Recreation Sites*.

Consistency of Restoration Objectives with Other Agency Restoration Programs or Plans

The USFWS released the final bull trout recovery plan in September 2015 (USFWS 2015a). Bull trout on the Forest fall within the Columbia Headwaters Recovery. Actions identified in the recovery plan to reduce habitat threats that are especially pertinent to the Forest include (USFWS 2015a):

- 1.1.2 Seattle City Light, Pend Oreille Public Utility District (POPUD), Forest Service and partners will improve habitat within streams through restoration actions and fencing to improve riparian habitat and sedimentation within streams identified as potential local populations (Including LeClerc Creek and Sullivan Creek).
- 1.2.2 Seattle City Light, POPUD, Forest Service, and partners will improve instream conditions restoration actions including but not limited to channel improvement floodplain connectivity, and floodplain restoration. Implement measures defined in the updated Forest Plan and FERC licenses to improve instream habitat.
- 2.1.1 Pend Oreille Public Utility District (PUD) and partners will remove Mill Pond Dam. The PUD, in partnership with Seattle City Light will remove Mill Pond Dam and the associated log crib dam, manage sediment, restore the Sullivan Creek stream channel, implement site restoration measures for the affected area, and conduct long-term monitoring and maintenance. This dam removal and restoration has already been required by FERC under the Pend Oreille PUD's surrender of its license to operate the Sullivan Project.
- 2.1.2 USFS and partners will remove historic water diversions and log crib dams on LeClerc Creek and the upper West Branch LeClerc Creek.
- 2.1.6 Maintain and enhance connectivity of cold water patches. Downstream of Albeni Falls and Box Canyon Dams cold water habitat is limited, but some patches persist in tributaries (e.g., LeClerc Creek (Box Canyon pool), Sullivan Creek (Boundary Pool), and others) which may, over time and with habitat improvement, support migratory bull trout. Maximizing the scope, resiliency, and connectivity of these patches is important in maintaining the migratory life history (downstream of Albeni Falls Dam).

Boundary Project - The USFWS issued a biological opinion for re-licensing the Seattle City Light's (SCL) Boundary Dam (Boundary Project) and decommissioning of Pend Oreille's Public Utility District's (PUD) Sullivan Creek Project (USFWS 2012). Mitigation measures expressed as terms and conditions included in the re-licensing for the Boundary Hydroelectric Project that will or may be implemented on the Forest (USFWS 2012) but at any rate the restoration objectives will complement include:

- Removing Mill Pond Dam on Sullivan Creek and installing a cold water pipe in Sullivan Lake.
- Providing upstream fish passage at Boundary Dam
- Eradicating non-native fish and supplementing the native WSCT and bull trout populations.
- Habitat improvement projects both on and off the Forest

Vegetation Management

While implementation of the Plan is intended to produce commercial timber (*FW-DC-RFP-01 Commercial Products* and *FW-OBJ-RFP-01Planned Sale Quantity*), the intent of the Vegetation

Management program is to create forest and non-forest vegetation structure that contributes to the species diversity, species composition, and structural diversity of native plant communities (*FW-DC-VEG-01*). The desired vegetation structure classes, identified by plant community type (Table 14) are to be resilient and compatible with maintaining characteristic disturbance processes such as wildland fire, insects and diseases (*FW-DC-VEG-04*). It is also the intent of the Plan that active management, such as wood product removal, wildland fire use, vegetation treatments will be used to meet desired conditions, move toward desired conditions, or not impair desired conditions (*FW-DC-VEG-03 Human Disturbances*).

Old Forest Management and Timber Production is one of the primary Needs for change leading to the revised Plan. It was identified due to the recent history of uncharacteristic levels of disturbances resulting from fire and insect and disease activity that would likely continue into the future; the interaction between disturbances and climate change elevates the importance of restoring landscape resiliency; and uncertainty about the recovery and viability of old forest-dependent species given the increased risk of uncharacteristically severe disturbances that is likely to be exacerbated by climate change impacts.

Most of the CNF is within what is termed a moderate- or mixed-severity fire regime. Mixed-severity fires are ones where 20–70% of the dominant tree basal area or canopy cover of a given patch of forest is killed by any single instance of fire. Mixed-severity fires commonly had fire severity patches between 100 and 103 ha (about 250 acres) with larger patches were also possible but historically rarer in number than those in this more common range of sizes. Mixed-severity fires greater than 250 acres did not burn with complete tree mortality, rather, individual trees and clumps of various sizes would have survived, creating an overall patchiness of a large landscape over space and time due to variation in disturbance severity. Mixed-severity fire regime forests were structurally diverse. Mixed-severity fire regime forests could have patches ranging from areas with relatively high tree survival after primarily surface fires, with only modest amounts of individual tree and group torching (i.e., 20–50% of the dominant tree basal area or canopy cover is killed), to mixed surface and crown fires, where more trees are killed than survive (i.e., 51–70% of the dominant tree basal area or canopy cover is killed) (see Hessberg *et al.* 2016).

The current conditions in many mixed severity fire regime forests have been broadly simplified by the combined effects of a century of fire suppression, fire exclusion, livestock grazing and road building, selection cutting in dry forests, and clearcut logging in more productive moist forests. Shade-tolerant Douglas-fir, grand fir (*Abies. grandis*), white fir (*A. concolor*), and subalpine fir (*A.lasiocarpa*) now dominate in many areas formerly occupied by fire-tolerant and shade-intolerant ponderosa pine, western white pine (*P. monticola*), and western larch (*Larix occidentalis*). This has simplified species diversity at patch and larger scales. Large, old trees that are naturally fire-tolerant today are often threatened by dense understory that create fuel ladders increasing the susceptibility of large trees to large, severe fires. Land management objectives for forests with mixed-severity fire regimes are increasingly to restore successionally diverse landscapes that are resistant and resilient to current and future stressors, such as climate change (Hessberg *et al*. 2016).

Large fires can result in accelerated erosion due to surface erosion or debris slides increasing the sediment supply to streams and changing channel structure (Wondzell and King 2003, Benda *et al.* 2003). However, disturbances such as fires and the resulting erosion processes also help create diverse fish habitat through the introduction of large woody debris and coarse substrates that maintain productive fish habitat (Reeves *et al.* 1995). Fires can cause direct mortality to fish resulting in local

extirpations. However, fish populations, especially salmonids, have been observed to rapidly recover after an episodic disturbance such as a wildfire; as long as the population and habitat are connected to adjoining populations, (Sestrich *et al.* 2011, Rieman *et al.* 2003, Rieman *et al*. 1995). As was discussed in the Affected Environment section, a number of the local populations for the MIS/focal species are isolated above barriers or in streams with little connectivity to adjacent populations and are therefore more susceptible to extirpation by a large disturbance. The concern therefore is not so much over the effects of "natural" fires but larger, possibly more severe fires than generally occurred historically, especially if the fires occur in subwatersheds with isolated populations.

There is also a desire to manage vegetation for natural watershed and riparian function as illustrated in forest-wide Water Resource and RMA desired conditions and objectives including; *FW-DC-WR-01, FW-DC-WR-11, MA-DC-RMA-01*; RMA objective, *MA-OBJ-RMA-03. Restoration of Late Forest Structure*; Key watershed objectives *FW-DC-WR-16. Key Watershed Integrity - FW-OBJ-WR-08. Upland Vegetation Structure in Riparian Management Areas in Key Watersheds and MA-OBJ-RMA-03. Restoration of Late Forest Structure – outside key watersheds.*

Vegetation management through timber sales for timber production or as a fuel treatment (e.g. thinning, prescribed fire) and managing wildfires to reduce the potential for uncharacteristically severe wildfires can adversely affect watershed processes, aquatic and riparian habitat (see Spence *et al.* 1996, Mehan 1991; and Day 2015). Removal of large trees through timber harvest or prescribed fire within the RMA reduces large wood input to stream channels that is necessary to create complex aquatic habitat. Removal of trees shading streams can result in increased summer stream temperatures. Accelerated erosion from ground disturbing activities associated with vegetation management such as skid roads and the transportation system, result in accelerated erosion and sediment delivery to stream channels. Pumps and other equipment used to deliver water for to manage prescribed fire or wildfire can also transmit AIS from infected waters to unaffected waters.

The potential for adverse effects is greatest on lands specifically allocated for timber production due to the emphasis on commodity production; potentially resulting in intense vegetation manipulation and more ground disturbance due to logging and roads than is expected where vegetation management emphasizes the restoration of forest vegetation. The RMA standards and guidelines that specifically constrain vegetation management activities to prevent or minimize adverse effects of vegetation management activities include:

- *MA-STD-RMA-02. Chemical Application*. Apply herbicides, insecticides, piscicides, and other toxicants, other chemicals, and biological agents only to maintain, protect, or enhance aquatic and riparian resources and/or native plant communities
- *MA-STD-RMA-03. Personal Fuelwood Cutting* that does not authorize personal fuelwood cutting within RMAs or source areas for large woody debris.
- *MA-STD-RMA-04 Timber harvest and Thinning* - directing that Timber harvest and other silvicultural practices can occur in riparian management areas only as necessary to attain desired conditions for aquatic and riparian resources and RMAs are not subject to scheduled timber harvest.

- *MA-STD-RMA-05. Yarding Activities* – requiring full suspension over wet and dry stream channels during yarding activities.
- *MA-STD-RMA-12. Wildland Fire and Fuels Management -Minimum Impact Suppression Tactics* directs that minimum impact suppression tactics (MIST) be used during wildland fire suppression activities in riparian management areas.
- *MA-STD-RMA-13. Wildland Fire and Fuels Management - Portable Pumps* directs portable pump set-ups shall include containment provisions for fuel spills, and fuel containers shall have appropriate containment provisions. Park vehicles in locations that do not allow entry of spilled fuel into streams.
- *MA-GDL-RMA-03. Landings, Skid Trails, Decking, and Temporary Roads* states landings, designated skid trails, staging or decking should not occur in riparian management areas, unless there are no other reasonable alternatives and provides conditions to be considered if such facilities must be located within an RMA:
- *MA-GDL-RMA-22. Direct Ignition* – discouraging direct ignition in RMAs unless effects analysis demonstrates that it would not retard attainment of aquatic and riparian desired conditions
- *FW-GDL-WR-01. Aquatic Invasive Species Wildfire Suppression Equipment* – avoid cross contamination between streams and lakes from pumps, suction, and dipping devices during wildfire suppression including dumping water directly from one stream or lake into another. Water storage and conveyance components of water tenders, engines, and aircraft should be disinfected prior to use on a new on-forest incident.

Vegetation management activities can cause adverse effects to bull trout, however the Water Resource and RMA desired conditions, standards and guidelines will greatly reduce the potential for long-term adverse effects. The AEC results show that a number of subwatersheds are *functioning at risk* or *not properly functioning* for the Fire Regime and Insects and Disease attributes. Vegetation management to create a vegetation composition and structure that is more characteristic of the natural fire regime and to promote late forest structure appropriate to the biophysical environment is a component of managing for natural watershed function and may result in terrestrial and aquatic ecosystems that are more resilient to disturbance from fires or insects and disease.

National Forest Access System (AS)

The desired conditions for the AS include: providing a safe, affordable and environmentally sound road and trail system and docks road and trail system that supports forest management objectives, provides for both administrative and public needs.

Roads can have numerous adverse effects on fish and fish habitat including the interruption or alteration of geomorphic and hydrologic processes. Geomorphic impacts of roads include chronic and long-term sediment delivery to aquatic habitat, accelerated mass failures of cuts and fills depositing large quantities of sediment, and altered channel morphology if the roads confine streams and prevent access to the floodplain. Roads constructed in riparian areas damage or remove vegetation thus reducing stream shade and large woody debris input. Roads constructed in the floodplain may inhibit natural stream channel migration processes (Gucinski *et al* 2001). Meredith *et al.* (2014) found that in

the interior Columbia Basin, the presence of near-stream roads resulted in reduced amounts of large woody debris in streams.

The effects of roads on hydrologic processes include the interception of rainfall directly on the road surface and road cutbanks affecting subsurface water moving down the hillslope; concentrating flow on the surface or in an adjacent ditch or channel; and diverting or rerouting water from normal flow paths were the roads not present. Trombulak, and Frissell (2000) in their review of the ecological effects of roads cite research on how roads directly change the hydrology of slopes and stream channels. Roads intercept shallow groundwater flow paths, diverting the water along the roadway and routing it efficiently to surface-water systems at stream crossings. This can cause or contribute to changes in the timing and routing of runoff, the effects of which may be more evident in smaller streams than in larger rivers. Hydrologic effects are likely to persist for as long as the road remains a physical feature altering flow routing.

Roads can deliver pollutants to aquatic habitat as the chemicals applied to roads or from vehicles runs off a road into a stream (Gucinski *et al* 2001). Additional discussion regarding the effects of roads on geomorphic and hydrologic processes is contained in the watershed section of Chapter 3 of the FEIS and in Day (2016).

Roads can influence fish populations by creating passage barriers at culverts at road/stream crossings. Blocking passage is a serious issue as maintaining connectivity between populations of a species and providing access to blocked habitat are important factors in a species' long-term persistence, such connectivity to adjacent populations and habitat may be an important strategy for species to persist in a changing climate (ISAB 2007).

In addition to the effects of the roads on the physical environment and passage, roads are an indicator of the level of potential human uses or management intensity that may affect fish population. Lee *et al*. (1997) found strong fish populations in the interior Columbia Basin were more frequently found in areas of low road density than high road density. Similarly, Al-Chokhachy *et al*. (2010) found reference watersheds generally provided higher quality physical stream habitat than managed watersheds with higher road densities. Following Lee *et al*. (1997), the USFWS (1999) considers watersheds with road densities <1 mile/square mile and no valley bottom roads as one measure of properly functioning watersheds for bull trout recovery. The USFWS considers road densities of 1-2.4 miles/square mile to be functioning at risk, and road densities greater the 2.4 miles/square mile to be not properly functioning.

OHV trails that are not designed or maintained properly, including the drainage system, can be sources of chronic and long-term sediment delivery to streams. Negative impacts of soil and watershed functions from OHV activities include soil compaction, reduced water infiltration capacity, increased erosion, and damage to vegetation. Extensive networks of OHV routes across a landscape, especially on steep slopes, can direct or alter the direction of surface flows forming gullies that channel sediment and contaminants into aquatic systems (Ouren *et al*. 2007).

The access system, can also be a vector for AIS. Boats coming from water bodies with AIS can introduce AIS infecting a previously unaffected system. Road construction and maintenance often requires water that is obtained by pumping out of nearby streams. A pump that has been previously used in waters with AIS can transmit the AIS into new uninfected waters. Pumping water from streams can also entrain juvenile fish, such as bull trout resulting in direct mortality. During road construction reconstruction and

maintenance both pumps and vehicles need to be refueled near the work site creating the potential for a fuel spill.

The effects of roads and trails on watershed function can be reduced by considering the location, design, and employing design or maintenance methods to disperse runoff (Furniss *et al.* 1991). Road removal or decommissioning creates a short-term disturbance which may temporally increase sediment but over the long-term, decommissioning can reduce chronic erosion and the threat of landslides.

The potential effects of managing the AS have resulted one desired condition and eight standards and guidelines designed to minimize effects that may result in bull trout mortality or the adverse modification or destruction of habitat. The desired condition *MA-DC-RMA-04 Roads* reflects the Forest's intent that roads are not a substantial risk to soil or hydrologic function; and do not disrupt riparian and aquatic function. The standards and guidelines designed to specifically reduce the potential for adverse effects due to the AS include:

- *FW-STD-WR-05 Construction of New Roads, Trails and Developed Recreation Sites*, directing new roads and trails be designed to minimize disruption of natural hydrologic processes at perennial and intermittent stream crossings, valley bottoms, valley approaches and other over land drainage features
- *FW-GDL-WR-05. Hydrologic Function of Roads, Trails, and Developed Recreation Sites* - Roads and trails should be maintained to minimize disruption of natural hydrologic processes at perennial and intermittent stream crossings, valley bottoms, valley approaches and other over-land drainage features.
- *MA-STD-RMA-06. Road Construction and Maintenance* prohibits sidecasting or placement of fill in riparian management areas and directs snowplowing activities to include measures to prevent runoff from roads in locations where it could deliver sediment to streams.
- *MA-STD-RMA-07. Road Construction at Stream Crossings* – requires that at a minimum, all new or replaced permanent stream crossings shall accommodate at least the 100-year flood and its bedload and debris. The 100-year flood estimates will reflect the best available science regarding potential effects of climate change.
- *MA-STD-RMA-08. Road Construction-Fish Passage* – All new construction or reconstruction of stream crossings shall provide and maintain passage for all life stages of all native and desired non-native aquatic species and for riparian-dependent organisms where connectivity has been identified as an issue. Crossing designs shall reflect the best available science regarding potential effects of climate change on peak flows and low flows.
- *MA-GDL-RMA-01. Fuel Storage* - Refueling shall occur with appropriate containment equipment and a spill response plan in place. Wherever possible, storage of petroleum products and refueling will occur outside of RMAs. If refueling or storage of petroleum products is necessary within RMAs, these operations will be conducted no closer than 100 feet from waterways**.**
- *MA-GDL-RMA-04. Road Construction* - Construction of permanent or temporary roads in riparian management areas should be avoided.

- *MA-GDL-RMA-05. Temporary Road Reconstruction* – Avoid temporary roads in RMAs, when avoidance is not possible, temporary roads in RMAs should be managed to protect and restore aquatic and riparian desired conditions.
- *MA-GDL-RMA-06. Road Construction – Wetlands and Unstable Areas* - Wetlands and unstable areas should be avoided when reconstructing existing roads or constructing new roads and landings. Impacts should be mitigated where avoidance is not possible.
- *MA-GDL-RMA-076. Road Management – Road Drainage* - Road drainage should be routed away from potentially unstable channels, fills, and hillslopes.
- *MA-GDL-RMA-21. Pump and Dipping Equipment Cleaning* - Fish habitat and water quality shall be protected when withdrawing water for administrative purposes. When drafting, pumps shall be screened at drafting sites to prevent entrainment of aquatic species, screen area shall be sized to prevent impingement on the screens, and shall have one-way valves to prevent back-flow into streams. Use appropriate screening criteria where listed fish or critical habitat are present.

The AEC assessment found in the Pend Oreille subbasin the attributes associated with roads were *functioning at risk* or *not properly functioning* for road densities (19 subwatersheds), riparian road densities (19 subwatersheds), and roads on sensitive soils (eight subwatersheds). While it is not possible to eliminate all the adverse effects of roads and to a lesser extent trails as long as the AS is in place, the Water Resource and RMA standards and guidelines, as well as the key watershed and Water Resource objectives to improve roads that are hydrologically connected to streams will help reduce the current effects of the AS. The RMA Standards and Guidelines reduce the potential for future adverse effects due to new road construction and reconstruction, as well as minimize the potential for fuel spills, introducing AIS, into waterbodies and entraining juvenile bull trout during construction, reconstruction and maintenance activities. Standards for constructing new and reconstructing existing road stream crossings will prevent creating future fish passage barriers. The key watershed and Water Resource objectives for improving passage will help connect currently disconnected habitat.

Livestock Grazing

The potential effects of livestock grazing on fish habitat have been well documented (*e.g*. Platts 1991, Spence *et al.* 1996). The potential adverse effects of grazing include soil erosion and sediment delivery to streams; soil compaction; alteration or removal of riparian vegetation that provides shade, cover, a terrestrial food source and stabilizes stream banks; altered channel morphology including channel widening, increased bank instability and loss of undercut banks. Al-Chokhachy *et al*. (2010) found the presence of cattle in watersheds sampled across the interior Columbia Basin and the Missouri River Basin often resulted in degraded physical aquatic habitat conditions, especially where grazing occurred in watersheds with high road densities.

The Plan does not include any changes to grazing allotments, but does include new desired conditions and standards and guidelines for managing the grazing program. There are currently 8 grazing allotments in the Pend Oreille subbasin.

Endangered Species Act section 7 consultation has recently been completed for the LeClerc Creek Allotment (USFWS 2016). As discussed in section 5.1.2 of this BA, the overall aquatic habitat index

scores within the sampled DMAs across the Forest are significantly lower than reference reaches as are the median substrate size, fines in pool tail-outs, and bank angle habitat attributes. There does appear to be significant positive trends in the bank stability and percent pool indices within the DMAs across the Forest, although the sample size is low. There are not enough samples within DMAs within the Pend Oreille subbasin to statistically determine overall index scores or trends. The monitoring program should provide such information in the future. Grazing can result in direct mortality to bull trout if livestock trample redds (Gregory and Gamett 2009).

The Livestock Grazing program desired conditions that when managed for should be beneficial to watershed process and aquatic habitat include managing grazing for native plant communities with few to no invasive plant species, have stable or improving ecological conditions, and are resilient to disturbance events (*FW-DC-LG-01. Plant Community Structure and Diversity*); and riparian and upland areas within allotments reflect ecological conditions supporting the desired conditions, including those described in the Wildlife, Aquatic and Riparian, Soil, and Vegetation Desired Conditions (*FW-DC-LG-02. Economic and Social Contributions*).

The Plan includes one desired condition, four standards and one guideline specifically developed to prevent or minimize the potential adverse effects grazing can have on riparian and aquatic habitat.

- *MA-DC-RMA-03. Livestock Grazing* - Livestock grazing of riparian vegetation retains sufficient plant cover, rooting depth and vegetative vigor to protect stream bank and floodplain integrity against accelerated erosional processes, and allows for appropriate deposition of overbank sediment.

- *MA-STD-RMA-09. Management of Livestock Grazing to Attain Desired Conditions* directs that grazing be managed to move toward aquatic and riparian desired conditions. Where livestock grazing is found to prevent or retard attainment of aquatic and riparian desired conditions, modify grazing management, including removal of livestock if adjusting grazing practices is not successful.

- *MA-STD-RMA-09. Recreational and Permitted Grazing Management-Livestock Handling, Management, and Water Facilities* directs that new and replaced livestock handling and/or management facilities and livestock trailing, salting, and bedding are prohibited in RMAs unless they do not prevent or retard attainment of aquatic and riparian desired conditions, inherently must be located in an RMA, or are needed for resource protection.

- *MA-STD-RMA-10. Permitted Grazing Management - Allotment Management Planning* directs that during allotment management planning, negative impacts to water quality and aquatic and riparian function from existing livestock handling or management facilities located within riparian management areas shall be minimized to allow conditions to move toward the desired condition.

- MA-GDL--RMA-12. Recreational and Permitted Grazing Management - Fish Redds Prohibits livestock trampling of Federally-listed Threatened or Endangered fish redds.

- *MA-GDL-RMA-10 - Permitted Grazing Management* establishes livestock use indicators for stubble height, utilization of deep-rooted herbaceous vegetation, streambank alteration, and utilization of woody browse as starting points for managing grazing depending upon the

ecological condition of riparian and aquatic habitat. In the digital files, document 2017.03.28.ColvilleFEIS_AppendixH-ColvilleARCS_DRAFT.docx and the Forest Plan provides the technical rational for this guideline.

The overall aquatic habitat index scores within the sampled DMAs across the Forest are significantly lower than reference reaches as are the median substrate size, fines in pool tail-outs, and bank angle habitat attributes. There does however appear to be significant positive trends in the bank stability and percent pool indices within the DMAs across the Forest. The Plan components that have been developed to reduce the potential impacts of grazing to bull trout and bull trout habitat are more complete than the current direction in INFISH and therefore the improvements being noted within DMAs are expected to continue at least at the current pace if not faster. MA-GDL-RMA-10 adds indicators (based on best available science) that will maintain conditions in functioning properly subwatersheds and improve conditions in functioning at risk subwatersheds.

Mining

Spence *et al.* (1996) reviewed the effects of mining on fish habitat. In general mining activities can increase sediment delivery, cause changes in the substrate and increase streambed and streambank stability. Mining activities may fundamentally alter the way water and sediment are transported through a river system, altering the erosional and depositional processes changing channel configuration. Increased turbidity can not only affect salmonids but also the macroinvertebrate community. Mining operations can damage streamside vegetation that shades streams and stabilizes streambanks. Toxic effects of materials used in mining or metals released into the stream environment can affect growth, reproduction behavior and migration of salmonids and degrade macroinvertebrate habitat.

There is currently one large mining operation near Metaline Falls, a slate rock mining operation on private lands in the Indian Creek drainage and suction dredging is common in Sullivan Creek. The recovery plan (USFWS 2015a) includes an action specific to mining:

- 1.2.1 Washington Department of Fish and Wildlife (WDFW) and partners will address mining impacts in Sullivan Creek. Minimize or eliminate impacts of dredging and sluicing within Sullivan Creek.

The Plan does not authorize any new mining operations on the Forest. The Plan does however address new mining operations with specific standards for mining and through the identification of suitable uses within RMAs in order to avoid or minimize the effects of mining operations on bull trout. There is one mining desired condition, *FW-DC-MIN-02. Reclamation and Extraction*, for operations to include interim and post-operation reclamation measures to ensure the long-term function and stability of resources including, but not limited to, soil; vegetation; water quality; aquatic, riparian and upland habitats. There are eight standards developed to minimize the potential impacts of mining operations:

- *MA-STD-RMA-16* – Requires that operations within RMAs include all practicable measures to maintain, protect, and rehabilitate water quality and habitat for fish and wildlife and other riparian-dependent resources affected by the operations and do not retard or prevent attainment of aquatic and riparian desired conditions.

- *MA-STD-RMA-17*. Instructs the Forest to work with operators to adjust their mineral operations to minimize adverse effects to aquatic and riparian-dependent resources in RMAs.
- *MA-STD-RMA-18*. Instructs the Forest to work with operators to locate structures, support facilities, and roads outside RMAs. When such facilities must be within an RMA locate and manage them to minimize effects upon aquatic and riparian desired conditions and restore or reclaim the sites when they are no longer needed.
- *MA-STD-RMA-19*. Mine waste with the potential to generate hazardous material (as defined by CERCLA) is not to be locates within RMAs and/or areas where groundwater contamination is possible except for temporary staging of waste during abandoned mine cleanup.
- *MA-STD-RMA-20*. For leasable oil, gas, and geothermal exploration and development activities, coordinate with the Bureau of Land Management and recommend the application of BMPs and mitigation as Conditions of Approval to support attainment and maintenance of aquatic and riparian desired conditions.
- *MA-STD-RMA-21*. Saleable mineral activities such as sand and gravel mining and extraction are prohibited within RMAs unless no alternatives exist and if the action(s) will not retard or prevent attainment of aquatic and riparian desired conditions.
- *MA-STD-RMA-22*. Requires inspections, monitoring, and annual reviews for mineral plans, leases, and permits. Mitigations are required where monitoring results show a need to eliminate impacts that retard or prevent attainment of aquatic and riparian desired conditions.
- *MA-STD-RMA-23*. Mineral activities on NFS lands shall avoid or minimize adverse effects to aquatic threatened or endangered species/populations and their designated critical habitat. The standard requires the district ranger to evaluate suction dredging operations to determine if "take" may occur and if so the operation is determined to "likely cause significant disturbance of surface resources". The standard also requires the district ranger to contact and inform the operator to seek voluntary compliance with 36 CFR 228 mining regulations and to cease operations until compliance if placer mining operations are causing or will likely cause significant disturbance to surface resources.

The mining standards are as stringent if not more so than the INFISH standards and guidelines when combined with Forest-wide Water resource plan components and are an improvement over current direction. Not all impacts of mining can be avoided but the standards will help minimize potential impacts. *MA-STD-RMA-23* directly applies to suction dredging. The plan provides additional protection to bull trout habitat in that saleable mineral development and surface occupancy for leasable mineral operations may not be authorized as identified in the suitable uses for riparian management areas.

Recreation

Recreation is a large program with the potential to effect bull trout and habitat. The desired conditions for the recreation program include providing a variety of high quality, nature-based outdoor recreational settings and opportunities varying from primitive to urban in both developed (e.g., campsites, vistas, parking areas) and dispersed (e.g., camping, backcountry skiing, boating, mushroom and berry picking, hunting, and fishing) recreation settings.

The potential effects to bull trout and habitat due to recreation include effects due to the access system maintained to support the recreation activities (discussed in section 6.2.2) and the human disturbance to the environment and potentially individual fish at dispersed and developed sites.

The potential effects of developed and dispersed camping are similar, the major difference being developed sites have been dedicated to the recreation. The concentrated human use of developed and dispersed sites can lead to soil compaction and trampled vegetation exposing soils to erosion accelerating sediment delivery to streams. Riparian and streamside vegetation may be damaged or destroyed removing shade and thus resulting in increased solar radiation reaching a stream and increasing water temperatures. Large wood that is important for providing complex aquatic habitat and instream cover for fish may be lost as hazard trees are felled in developed sites and by unauthorized firewood cutting in dispersed sites. Loss of streamside vegetation can result in destabilizing streambanks as the roots holding the banks together are damaged causing accelerated bank erosion contributing excess sediment to the stream system and channel widening. Wider streams with shallow flow are subject to greater amounts of warming plus loss of deep pools necessary for adult bull trout holding during spawning migrations and loss of overhead hiding cover for both juvenile and adult bull trout. Litter fall from streamside vegetation is an important food source for aquatic macroinvertebrates that provide food for juvenile bull trout and the vegetation provides habitat for terrestrial insects that are also an important food source.

Camping and other recreation uses may also encourage harassment of spawning fish, especially bull trout that spawn in the late summer and fall. Redds may be damaged resulting in egg and alevin mortality if disturbed by campers. Finally recreation activities, especially boating, can introduce AIS into previously uninfected waters. In general the effects of recreation activities, other than the transportation are confined to the site, however larger scale effects may result from cumulative impacts of multiple sites.

The potential effects to riparian habitat are recognized by the Recreation Program which includes *FW-GDL-REC-02. Dispersed Recreation* stating the priority for facilities or minor developments in dispersed sites includes protection of the environment and dispersed campsites should not be designated in areas with sensitive soils or within 50 feet of streams, wetlands, or riparian areas. However RMA Plan components provide more complete direction to minimize the potential effects of recreation.

RMA guidelines specific to recreation activities, other than those previously mentioned for the AS and Livestock grazing programs, that will help minimize the potential adverse effects of recreation to bull trout habitat include:

- *MA-GDL-RMA-02. Felling Trees* that states trees are felled for safety should generally be retained onsite (channels and adjacent floodplains) to maintain, protect, or enhance aquatic and riparian resources unless otherwise the trees pose a new risk to administrative or developed recreation sites.

- *MA-GDL-RMA-12. Recreation Management – New Facilities and Infrastructure* is designed to keep new facilities or infrastructure outside expected long-term channel migration zones. Those facilities that inherently occur in riparian management areas (e.g., road stream crossings, boat ramps, docks, interpretive trails) should be located to minimize impacts on riparian-dependent resource conditions (e.g., within geologically stable areas, avoiding major spawning sites).

- *MA-GDL-RMA-13. Recreation Management – Existing Facilities* states existing facilities that are not meeting desired conditions or are within an active floodplain should be considered for removal, relocation, or re-design.

The current impacts of recreation sites are to be reduced within bull trout critical habitat as key watershed objectives include restoring riparian vegetation on 75-450 acres in key watersheds some of which will be sites associated with dispersed recreation. RMA objective *MA-OBJ-RMA-01 Improve Riparian Function at Dispersed and Developed Recreation Sites* is to restore riparian processes at 75 sites through education, enforcement, and engineering where recreational use results in bank damage, reduction in water quality, and/ or a reduction in stream shade.

The treat of invasion by AIS species is addressed in *FW-OBJ-WR-01 Aquatic Invasive Species* where aquatic invasive species prevention measures are to be implemented at all developed recreation sites providing direct and/or indirect access to water bodies, such as boat ramps, campgrounds, and day use areas that provide portal zones for hand carried watercraft.

The recreation-specific guidelines combined with the overarching standards and guidelines for RMAs are provide the management direction to implement actions necessary to minimize the potential effects of the Recreation Program on riparian processes and bull trout. The direction is at least equal to the direction in INFISH. The objectives addressing recreation impacts provide specific direction to improve riparian and aquatic habitat where recreation impacts have occurred and prevent AIS invasion that is not included in INFISH.

Lands and Special Uses

The Forest "Lands" program includes real estate type activities (including land exchanges and acquisitions, granting or accepting of easements. The Lands program can be beneficial to bull trout in that one of the reasons for land acquisition is to maintain, restore, and enhance plant, wildlife, and riparian aquatic and riparian-dependent resources and habitat including aspects of connectivity, foraging and reproduction for threatened and endangered and species of conservation concern. The Lands program activities will continue and do not change as a result of the Plan.

Special uses include permitting activities other than those uses included in the regulations governing the disposal of timber, minerals, and the grazing of livestock. The Forest administers a variety of uses under special use permits, leases, or easements. A permit for a special use is governed by the management direction for the area the special use permit, lease, or easement is authorized. The effects of a special use will be determined at the time a request for a permit is received and there is no way to know what uses may be requested in the future. Current special use permits may need to be modified in order to meet the new direction provided by the Plan.

The potential effects of special uses within RMAs will be minimized as all special uses will not only need to meet the RMA standards and guides but will also be constrained by *MA-STD-RMA-14 Lands and Special Use Authorizations*. The standard states all new and existing special uses that result in adverse effects to habitat conditions and ecological processes essential to aquatic and riparian-dependent resources shall require mitigation that results in re-establishment, restoration, mitigation, or improvement of those conditions and processes. These authorizations include, but are not limited to, water diversion or transmission facilities (e.g, pipelines, ditches), energy transmission lines, roads, hydroelectric, and other surface water development proposals.

Hydropower special uses are further constrained by *MA-STD-RMA-15. Hydroelectric New Support Facilities* that requires new support facilities to be located outside of RMAs. Additional Hydroelectric constraints are included in the standards for key watersheds.

Management Areas

The MAs are lands where general management intent is similar. The purpose of MAs is to provide consistent guidance for similar portions of National Forest System lands when implementing or continuing management activities. Forest-wide plan components apply within management areas. The Plan components for the MAs provide an idea as to the amount and types of resource management programs that may be implemented within an MA and therefore the potential magnitude and extent of the potential resource effects described in the previous sections.

The MAs included within the Pend Oreille subbasin are displayed in Table 3, section 2.1.1. The MAs that were considered especially relevant to the effects of the different FEIS alternatives (see MacDonald *et al*. 2016) are the Focused Restoration, General Restoration, Back Country (BC), Back Country Motorized (BCM), Recommended Wilderness (RW), RMAs, and Congressionally Designated Wilderness (Wilderness) MAs. These MAs were emphasized to determine the potential effects due to the amount and types of management programs that may be expected to occur and they represent changes to the current Forest plan management areas. These MAs were also used to determine the *Forest Service Contribution to Viability* (section 6.4 below) of the FEIS alternatives. The Plan includes RW areas but there is no change in the Wilderness. The MA was included in the effects discussion and viability assessment because of the protective nature of Wilderness to aquatic species and habitat. The RMAs overlay all the MAs.

Focused and General Restoration

The 191,965 acre Focused Restoration MA comprises the most acreage (47%) of the CNF within the Pend Oreille River subbasin. The second largest MA is the General Restoration MA, 93,433 acres (23%). These two MAs are where all forest management programs, including all forms of recreation and vegetation management is expected to occur, and where roads have the biggest impact on the landscape. There are two major differences however. While both MAs allow active vegetation management, including timber sales, to achieve desired vegetation conditions and improve the resiliency of the Forest to disturbances such as wildfire, the Focused Restoration MA also emphasizes management for important wildlife and fish habitat. Of the two 'restoration' MAs, only the Focused Restoration MA is within key watersheds. The desired conditions for road densities are also different. The desired road densities are no more than one mile of NFS road per square mile within the focused restoration management area within each subwatershed. In the General Restoration MA the desired road densities are no more than two miles of NFS road per square mile within the general restoration management area within each subwatershed. Within both MAs, this road density calculation does not include roads under another jurisdiction, or roads that have been hydrologically stabilized and effectively closed to vehicular traffic, or decommissioned.

Back Country (BC) and Back Country Motorized (BCM)

The Plan identifies 34,805 acres (almost 9%) and 5,255 (about 1%) to the BC and BCM management areas respectively. The only difference between the two areas is the suitability for non-motorized and motorized recreation. Backcountry emphasizes non-motorized recreation opportunities and can include foot, horse, and mechanized (e.g., mountain bikes) modes of travel. Backcountry motorized emphasizes

summer and winter motorized recreation opportunities and can include off- highway vehicles, motorcycles, jeeps, and over-snow vehicles.

Recommended Wilderness (RW)

Approximately 36,792 (9% of CNF within the Pend Oreille subbasin). Current motorized and mechanized use is allowed pending a Congressional decision on wilderness designation.

Combined Effects of MAs

Timber harvest is allowed on about 70 percent of the Forest in the Pend Oreille subbasin within the Focused and General Restoration MAs. These areas are to be managed to provide the vegetation structure and composition, including late forest structure, for forest communities that are resilient to disturbances such as wildfire, drought and insect infestations. Many of the subwatersheds on the Forest are *functioning at risk* for the fire regime indicator in the AEC assessment, and a few are *not properly functioning*. Vegetation management to restore vegetation to conditions as may be expected under historic and anticipated disturbance regimes, may improve watershed condition especially in the Focused Restoration MAs if the desired road densities are attained. The risks to watershed processes and aquatic habitat associated with vegetation management is probably greater in the General Restoration MA, as the Focused Restoration MA includes more management emphasis for wildlife habitat and key watersheds.

Most subwatersheds on the Forest are *not properly functioning* or *functioning at risk* for the road and riparian road density attributes of the AEC. The desired road density of 1.0 mile/square mile in the Focused Restoration MA approaches the road density in subwatersheds generally conducive to supporting strong bull trout populations, while the 2.0 miles/square mile in the General Restoration MA is still within the *function at risk* level for road density. New roads cannot be constructed in RW, or Backcountry Motorized or Backcountry non-motorized MAs. The extent to which watershed conditions may improve will depend upon the amount of vegetation treatments that occur within a subwatershed and the ability of the Forest to achieve the road desired conditions within fiscal and social constraints.

Motorized recreation is allowed in the Restoration MAs and Backcountry Motorized MA, plus the current levels of motorized recreation are allowed in RW, bringing the total amount of land open to motorized recreation to 327,445 acres or about 81 percent of the CNF within the Pend Oreille River subbasin. No active vegetation management or roads are allowed in the BC, BCM or RW. These three MAs combined with the 31,416 acres of designated wilderness, and the 3,617 acres of RNA means that about 28 percent of the CNF land within the Pend Oreille River subbasin is within MAs that will not be affected by vegetation management activities or roads. Sediment may continue to be delivered to streams and aquatic habitat due to the use of the existing motorized trail system. The level of effect on aquatic habitat will likely depend upon the ability of the Forest to maintain the trails.

Forest Service Contribution to Viability

The Forest Service Contribution to Viability of the MIS/Focal species was assessed to meet the direction of the 1982 planning rule and the intent of the 2012 planning rule. The assessment was made by FEIS alternative for each MIS/Focal species, by subbasin. This is a relative risk assessment based upon the risk different management allocations may pose to the MIS/focal species, the current condition of the MIS/focal species populations and habitat, and the amount of habitat on National Forest lands. The

emphasis of this assessment is on management of CNF lands, in other words management that the CNF has control over. There are numerous actions and conditions of other lands that affect the MIS/focal species future viability; residential development, road systems; hydroelectric projects; etc. over which the CNF has more limited or no management authority. Hence this a relative assessment of how well CNF management as described for each alternative may be expected to contribute to the viability of the MIS/focal species. See Reiss *et al*. (2008) for a description of the Forest Service Contribution to Viability model and MacDonald *et al.* (2016) for a complete description how the model was implemented for the FEIS.

The contribution to viability assessment includes three attributes; protection, the percent of habitat occupied by a MIS/focal species on the Forest, and the AEC of the subbasin. The scores of the attributes are averaged resulting in a +1 (high support for the conclusion that that an alternative will contribute to MIS/focal species' ecological viability) to -1 (low support for the conclusion).

The MAs described in the alternatives are assessed for the level of protection the allocation is expected to provide for aquatic habitat and watershed condition. A basic premise is allocations with no or few roads are more protective than allocations with higher road densities. Lands where terrestrial vegetation will be managed with a restoration emphasis is more protective or less risky to aquatic habitat and watershed condition than lands with a timber production emphasis.

The MAs included in the assessment for the Pend Oreille subbasin are; RW, BCM, BC, Focused Restoration, General Restoration. The current designated wilderness was also included. Within each MA the management activities were assessed based on the level of protection (or inversely the level of risk to the aquatic habitat); non-motorized trails, motorized trails, timber harvest, and roads. At the beginning of the analysis each MA starts with a protection value of +1 and then points are subtracted based upon the potential intensity of an activity within the MA. If an activity is not allowed in an MA there is zero deduction. For example roads, motorized use and timber harvest are not allowed in wilderness so there are no deductions for those activities within the Wilderness MA.

If non-motorized trails are present -0.1 is deducted for the MA. The reason is that the presence of the trails do affect a watershed to a small degree and use of the trail does pose a risk to riparian habitat by trampling vegetation, may increase fishing pressure and possible introduction of AIS or a non-native fish. If motorized trail use is allowed the deduction is -0.2. Timber harvest deductions are based on the potential intensity of the activity. While the restoration MAs often emphasize terrestrial vegetation restoration which may help improve watershed condition, vegetation management activities do pose some risk to aquatic resources. It is assumed the intensity of vegetation management would be higher in General Restoration MAs than Focused Restoration MAs where there is more emphasis on aquatic resources and wildlife. Focused Restoration areas therefore received a -0.1 deduction; General Restoration a -0.2 deduction.

The road deductions were based upon whether roads are allowed or not, and if allowed, the desired road densities. If roads are allowed and the road density desired condition is up to 1.0 mile/square mile then -0.2 was deducted. Even low road densities affect hydrologic processes and can affect aquatic habitat. The 1.0 mile/square mile density is at the upper range of road densities that in general watersheds may be *properly functioning* and potentially support strong fish populations. If the road density desired condition is no greater than 2 miles/square mile there is a -0.3 deduction. The 2.0 miles/square mile road density is within the range where watersheds are generally considered

functioning at risk for road density as is the potential for the presence of strong fish populations. The total score for a MA is obtained by subtracting the deductions for a total protection value. Instead of assessing the protection value of Key Watersheds based on allowed activities in the Key Watersheds, it is assumed the Key Watersheds have an added protection value of their own as management within Key Watersheds emphasizes minimizing risk and maximizing restoration or retention of ecological health. Therefore the percent area of key watershed within a subbasin was added to the protection score.

The AEC of the subbasin is the area-weighted average of the habitat condition AEC scores of the National Forest lands within the subbasin. The final model attribute was the proportion of the occupied spawning and rearing habitat on the CNF in a subbasin.

The final 'contribution' score for an alternative by subbasin and MIS/focal species is the average of protection, percent of occupied habitat on National Forest lands, and the AEC. The viability assessment and the Forest Service Contribution scores represent an interpretation of the relative role of CNF lands to provide for the viability of a MIS/focal species in a subbasin by alternative. It should be noted that when the Forest Service contribution to ecological viability scores are low, this does not necessarily indicate that Forest Service management direction is insufficient, but rather that management is not addressing all factors that contribute to species ecological viability. Much of the other management not addressed may be off National Forest lands such as roads managed by other entities. A low Forest Service contribution may also be due to presence on non-native fish and isolation due to natural barriers and man-made barriers off the National Forest.

Again a +1 score indicates high support for the conclusion that that an alternative will contribute to MIS/focal species' ecological viability and a -1 indicates no support for the conclusion. The CNF contribution to bull trout viability of the Plan is -0.13. Although the protection attribute was ranked high, 0.89, due to the key watersheds, large amount of acres within the focused restoration MA (approximately 47% of the CNF within the Pend Oreille subbasin) and about 28% of the acres within BC, BCM, RW and wilderness; the final score was affected by the current poor distribution of bull trout on the Forest and low AEC scores due to the population status and most subwatersheds are currently *functioning at risk* or *not properly functioning* habitat attributes. Using the Watershed condition framework process of focusing on priority watersheds and addressing projects in a systematic way will move watersheds toward functioning and increasing AEC scores. Bull trout populations may increase due to stocking efforts by other entities. The population viability score may increase due to restoration and restocking of habitats.

5.1.2 Monitoring and Adaptive Management

The Plan includes an integrated watershed and aquatic habitat monitoring plan. The monitoring plan is designed to facilitate adaptive management by testing assumptions, tracking relevant conditions over time, measuring management effectiveness, and evaluating effects of management practices to determine if a change in plan components or other plan management guidance may be needed. The monitoring plan will determine whether progress towards the desired conditions is being achieved.

The Plan monitoring program includes specific monitoring questions tied to specific Plan components, with specific indicators to be assessed and reporting requirements. While much of this monitoring may be currently occurring, monitoring program provides a comprehensive, detailed description of how the

Forest will determine if the intended conservation value of the Plan for bull trout is being achieved and inform any needed management changes.

5.1.3 Climate Change

Desired conditions place emphasis on managing RMAs so they are resilient to climate change and other disturbances. *FW-DC-WR-13. Aquatic Threatened, Endangered, and Sensitive Species* and *FW-DC-WR-14 Resiliency to Climate Change*, as well as standard *FW-STD-WR-01 Properly Functioning Watersheds*, in combination with the other Forest-wide Plan components, show clear intent to provide habitat necessary for the recovery of bull trout that includes not degrading habitat which may make conditions more suitable for non-native competitors to the extent possible given both current conditions and those that may occur with climate change.

Old Forest Management and Timber Production is one of the primary Needs for change leading to the revised Plan. It was identified due to the recent history of uncharacteristic levels of disturbances resulting from fire and insect and disease activity that would likely continue into the future; the interaction between disturbances and climate change elevates the importance of restoring landscape resiliency; and uncertainty about the recovery and viability of old forest-dependent species given the increased risk of uncharacteristically severe disturbances that is likely to be exacerbated by climate change impacts. Land management objectives for forests with mixed-severity fire regimes are increasingly to restore successionally diverse landscapes that are resistant and resilient to current and future stressors, such as climate change (Hessberg et al. 2016). *MA-STD-RMA-07. Road Construction at Stream Crossings and MA-STD-RMA-08. Road Construction-Fish Passage* provide standards to reduce potential effect of climate change from the road systems. Providing for resilient RMA, Forest, and Road conditions is key for providing productive bull trout habitat over time.

5.1.4 Cumulative Effects, Consistency with the Recovery Plan

INFISH did not include key watersheds, however INFISH designated what are termed Priority Watersheds. Within Priority Watersheds, inland native fish, are to receive special attention and treatment (USDA Forest Service 1995). The CNF INFISH Priority Watersheds are only located in the Pend Oreille subbasin and include the bull trout critical habitat on the Forest. However the INFISH did not include specific desired conditions, standards and guidelines or restoration objectives for the priority watersheds. The key watershed plan components provide more explicit management direction for the key watersheds than is included in the INFISH direction.

The key watershed concept has been shown to result in improved watershed conditions within the Northwest Forest plan area; the same results may be expected for the key watersheds in the Plan. The protective aspect of the key watersheds will add to the conservation value for bull trout of the Plan by providing an extra level of protection to subwatersheds containing bull trout critical habitat. The threats to bull trout recovery that are pertinent to management of the Forest include forest management practices and forest roads and fish passage issues. The watershed condition scores are generally *not properly functioning* for CNF subwatersheds draining into the Pend Oreille subbasin with only the Headwaters South Salmo River subwatershed, North Fork Sullivan Creek-Sullivan Creek, and Slate Creek subwatersheds considered to be *properly functioning*. The watershed conditions are degraded to *functioning at risk* and *not properly functioning* ratings at risk or not properly functioning ratings for large woody debris (16 subwatersheds), channel shape and function (17 subwatersheds), riparian vegetation condition (18 subwatersheds), insects and disease (four subwatersheds), road densities (19

subwatersheds) riparian road densities (19 subwatersheds) and roads on sensitive soils (eight subwatersheds). All subwatersheds were rated *functioning at risk* for the fire regime attribute and barriers to upstream and downstream movements of bull trout are an important reason for the poor status of local bull trout populations.

The key watershed objectives were developed to address the specific threats to habitat due to past forest management, road construction and impeded fish passage within the watersheds. The Forest-wide watershed objectives will not only help protect and restore aquatic habitat in the key watersheds but should contribute to improved habitat conditions downstream of the Forest.

5.1.5 Summary of Effects

The Plan ARCS is based upon the Region 6 ARCS. The ARCS and subsequently the Forest's ARCS includes desired conditions, standards and guidelines, and a key watershed network designed to provide the ecological conditions conducive to maintaining, restoring, and enhancing habitat necessary to sustain aquatic and riparian-dependent species on National Forest System lands. Watershed, aquatic and riparian direction address both ecosystem and species diversity at watershed and landscape scales through desired conditions, objectives, and standards and guidelines for general water resources, key watersheds and RMAs. The ARCS is also consistent with the Interior Columbia Deputy Team direction for revising forest plans.

The Forest Service Contribution to bull trout viability of the Plan is due to the current habitat conditions and status of the bull trout local populations on the Forest. Bull trout populations are thought to be in only 2 watersheds on the forest, Salmo and LeClerc. While the viability score is low, this will be offset by restoration efforts that will better support the small populations and allow for future reintroductions/colonizations by bull trout into critical habitat and other Forest streams. The Plan however should aid bull trout recovery over time as most of the bull trout critical habitat on the CNF is included within the key watershed network. Management direction for key watersheds is intended to the highest relative level of protection and the lowest relative level of risk from activities threatening watershed and aquatic habitat integrity and resiliency. The key watershed designation has been shown to be effective at improving watershed conditions where it is being implemented within the Northwest Forest Plan area. Most subwatersheds on the Forest within the Pend Oreille subbasin are *functioning at risk* or *not properly functioning* due to the fire condition class of the vegetation, road densities and road location. The Focused Restoration MA, with an emphasis on restoring vegetation towards the desired ecological conditions and road densities of no greater than one mile/mi² will help restore the vegetation conditions and reduce the effects of roads. The degree to which the restoration will be effective will depend upon how much vegetation management is implemented within a subwatershed and the degree to which road densities can be reduced within fiscal and social constraints.

Forest management programs, especially vegetation management, the access system, livestock grazing, minerals, and lands and special uses all can adversely affect bull trout. The Water Resource and RMA desired conditions, standards and guidelines are expected to limit adverse effects of management activities to short-term effects that do not degrade watershed and riparian desired conditions or slow progress towards achieving the desired conditions. The Plan includes an integrated watershed and aquatic resource monitoring program designed to assess if management actions during Plan implementation are meeting or moving towards the desired conditions. The Water Resource and RMA Plan components are more comprehensive than the current INFISH direction, plus there are now specific

Plan components for key watersheds that INFISH does not include. The Plan includes specific objectives for improving watershed and aquatic habitat conditions, and population and habitat connectivity, particularly within the key watersheds. Aquatic habitat within the Pend Oreille subbasin (and the Forest as a whole) appears to be improving since the adoption of INFISH so implementing the Plan with the Water Resource, RMA, and key watershed desired conditions, standards and guidelines, and objectives is expected to continue the improving trends.

The Plan in general and particularly the Water Resource, RMA, and key watershed plan components is intended to restore ecological resiliency and protect watershed and stream channel processes. Restoring resiliency, protecting ecological processes and improving habitat and population connectivity are likely the best strategy for helping bull trout survive in changing climate conditions.

Therefore, the CNF, by adopting and implementing the Plan, is consistent with section 7(a)(1) of the ESA that requires Federal agencies to use their authorities to further the conservation of listed species, in this case bull trout. The Plan is also consistent with the recovery plan as standards and guidelines should limit the potential for exacerbating the threats to bull trout recovery due to forest management practices, forest roads and fish passage issues on the Forest. The key watershed objectives are also consistent with and will complement recovery actions identified in the recovery plan and restoration plans of other entities. Forest management activities may affect bull trout. The Plan does not authorize any specific management activities and future management activities will undergo project specific ESA section 7 (a)(2) consultation with the USFWS. The ARCS should prevent any long-term adverse effects so that management activities implemented under the plan direction **may affect, likely to adversely affect** bull trout.

5.2 Bull Trout Critical Habitat

This section addresses the effects on bull trout critical habitat related to the revision of the Forest Plan for the CNF. All designated bull trout critical habitat on the Forest is within the Pend Oreille River subbasin. There are 30 subwatersheds, 18 of which have streams with designated critical habitat. Of the 228 miles of critical habitat in the subwatersheds approximately 98 stream miles are within the CNF boundary.

Table 26 - Subwatersheds within the Pend Oreille River subbasin

HUC 12 Number	HUC 12 Associated With Pend Oreille HUC8	Total HUC 12 Acres (Within the US)	HUC 12 Acres Inside CNF	Miles of Stream Bull Trout Critical Habitat Total/CNF
170102160901	Big Muddy Creek	17,661	11,628	0/0
170102160104	Calispell Creek	27,377	1,109	7/0
170102161003	Cedar Creek	17,150	5,359	0/0
170102160204	Cee Cee Ah Creek	12,063	6,500	0/0
170102160207	Cusick Creek-Pend Oreille River	30,687	10,018	12/0
170102160203	Davis Creek – Pend Oreille River	32,667	0	0/0
170102160303	East Branch LeClerc Creek	26,663	11,145	21/10
170102160201	Exposure Creek-Pend Oreille River	41,224	14,463	16/2
170102160904	Flume Creek-Pend Oreille River	20,453	14,231	5/.2

HUC 12 Number	HUC 12 Associated With Pend Oreille HUC8	Total HUC 12 Acres (Within the US)	HUC 12 Acres Inside CNF	Miles of Stream Bull Trout Critical Habitat Total/CNF
170102160401	Harvey Creek	32,999	27,554	0/0
170102160702	Headwaters South Salmo River	15,849	15,849	0/0
170102160402	Headwaters Sullivan Creek	45,516	45,417	18/18
170102160306	Lost Creek	20,007	17,741	0/0
170102160307	Maitlen Creek-Pend Oreille River	33,608	18,070	10/0
170102160301	Middle Creek-Pend Oreille River	23,209	5,066	11/3
170102160101	North Fork Calispell Creek	35,963	23,848	0/0
170102160403	North Fork Sullivan Creek-Sullivan Creek	12,709	11,259	5/3
170102160704	Outlet South Salmo River	3,549	3,549	0/0
170102161004	Pend Oreille River	4,308	2,474	0/0
170102160905	Pewee Creek-Pend Oreille River	20,499	16,023	5/.3
170102160304	Ruby Creek	19,597	18,385	13/12
170102160202	Skookum Creek	31,811	14,192	0/0
170102160903	Slate Creek	19,922	19,922	1/.6
170102160103	Smalle Creek	17,754	11,058	11/3
170102160902	Sweet Creek-Pend Oreille River	41,832	28,890	21/6
170102160206	Tacoma Creek	39,519	27,182	38/25
170102160205	Trimble Creek	7,102	917	0/0
170102160302	West Branch LeClerc Creek	21,672	15,099	15/11
170102160102	Winchester Creek	10,482	5,628	10/4
170102160305	Yokum Lake-Pend Oreille River	15,044	5,323	9/0
	Grand Total	698,895	407,899	228/98

All bull trout critical habitat on the Forest, is located on tributaries to the Pend Oreille River. These tributaries lie within the Clark Fork River Basin CHU (31), Lower Clark Fork Geographic Region, Pend Oreille Core Area. The large Pend Oreille Core Area has been divided into three parts. The streams tributary to the Pend Oreille River flowing off the Forest are in LPO-C, which includes the Lower Pend Oreille basin downstream of Albeni Falls Dam to Boundary Dam (1 mile upstream from the Canadian border) and bisected by Box Canyon Dam; including portions of Idaho, eastern Washington, and the Kalispel Reservation (USFWS 2015a).

There are is no bull trout critical habitat within the Upper Columbia River-Lake Roosevelt, Sanpoil, Kettle and Colville subbasins, therefore the Plan will have No Effect to critical habitat in the four subbasins.

The Plan, through the designation of MAs, identifies what types of management activities will be emphasized on different portions of the Forest. The decision, or 'Federal action' to designate the MAs will have no direct effects bull trout critical habitat. The Plan components describe the management intent and sideboards placed on management activities either forest-wide or specific to a MA. The plan components include the ARCS that will replace the current direction provided by INFISH. This section assesses the MAs and plan components, in particular the plan components contained in the ARCS, for

their conservation value to bull trout and potential effects (indirect effects of the Plan) to bull trout critical habitat that may occur during future implementation of the Plan. Because the Plan is programmatic in nature and does not authorize any actions and any future land management activities that occur through implementing the plan will be subject to ESA section 7(a)(2) consultation; the Plan is considered a *framework programmatic action* (80 FR 26832).

5.2.1 Direct and Indirect Effects

Most management activities that will be implemented by the different management programs under the direction of the Plan have the potential to affect bull trout and their habitats, either directly or indirectly, in a beneficial or negative manner. Land management activities that disturb the soil surface and alter vegetation have the greatest potential for and risk of adverse effects. The management programs that have the greatest potential to affect bull trout critical habitat are Vegetation Management, the National Forest Access System, Livestock Grazing, Mining, Recreation, and Lands and Special Uses. As previously mentioned, the new Plan does not authorize any specific management actions. The Plan designates MAs, where, depending upon the intent and Plan components for the MA, management activities will be implemented to achieve desired conditions of the MA within the constraints provided by the plan components for the individual programs.

The potential threats to bull trout recovery due to forest management activities will be avoided or greatly reduced by the Forest-wide Water Resource and RMA plan components (desired conditions, standards and guidelines) that have been previously discussed. The Water Resources and RMA standards and guidelines for specific management activities further help either avoid or minimize the potential effects to bull trout critical habitat due to the specific activity. The following describes the potential effects of the above mentioned management programs and the ARCS plan components that will constrain or guide those activities to avoid or minimize effects to bull trout critical habitat.

Aquatic and Riparian Conservation Strategy (ARCS) Effects

The Plan ARCS was developed based upon the U.S. Forest Service ARCS and is consistent with the Interior Columbia Deputy Team's documents; *Interior Columbia Strategy*, *A Strategy For Applying The Knowledge Gained By The Interior Columbia Ecosystem Management Project To The Revision Of Forest and Resource Management Plans* and *A Framework for Incorporating the Aquatic and Riparian Component of the Interior Columbia Basin Strategy into BLM and Forest Service Plan Revisions*. The ARCS plan components including desired conditions, standards and guidelines, objectives, the designation of riparian management areas and key watersheds, the identification of suitable uses within RMAs and monitoring provide a comprehensive approach for conserving and recovering populations of the MIS/Focal species and meeting the Clean Water Act. Consistent with the ARCS, the Plan ARCS has been developed to maintain and restore healthy watersheds, riparian areas and stream channels that are resilient to natural disturbance. Natural disturbances such as wildfire, large storms and subsequent floods, hillslope failures, landslides, debris flows, and channel migration create a mosaic of habitat conditions over time and space that native fish populations have adapted to. The ARCS also was developed recognizing that streams and aquatic ecosystems are linked to the dynamics of both the riparian and upland communities, and the watershed and physical processes that shape them.

The ARCS will replace INFISH. The CNF forest plan was amended by INFISH in 1995. INFISH was to be an interim strategy lasting 18 months. While INFISH has been in place considerably longer than 18 months, the strategy appears to have been successful effective in improving aquatic habitat (Archer *et al*. 2009,

Meredith *et al*. 2012). Indeed the PIBO monitoring shows that although stream habitat on the CNF is generally in "degraded" conditions compared to reference streams, there are some improving trends. The ARCS, with more comprehensive set of desired conditions, standards and guidelines and objectives then included in INFISH is expected to be more effective at restoring ecologically healthy watersheds, riparian and aquatic habitats. Plan_component_comparison_3_21_17_draft.docx in the bull trout digital files provides a side-by-side comparison of INFISH and the ARCS.

Forest-wide ARCS Plan Components

The Water Resources section of the Plan includes desired conditions and standards and guidelines that are to be applied Forest-wide in all MAs. The Forest-wide Water Resources plan components are in addition to plan components that are specific to RMAs and key watersheds. The Forest-wide desired conditions, standards and guidelines are to work in concert with the plan components for key watersheds and RMAs to establish the general direction and sideboards for managing for healthy watersheds and contribute to the viability of native aquatic and riparian species during Plan implementation.

The 15 desired conditions provide a more comprehensive description of the intent of the Plan to provide for the ecological integrity of watersheds, riparian, and aquatic habitats than the eight goals included in INFISH. As discussed in section 2.1 of this BA, to be consistent with the desired conditions of the Plan, a project or activity, when assessed at the appropriate spatial scale described in the Plan (each desired condition specifies the scale to be assessed at; subwatershed, watershed, subbasin), must be designed to meet one or more of the following conditions:

- Maintain or make progress toward one or more of the desired conditions of a plan without adversely affecting progress toward, or maintenance of, other desired conditions; or
- Be neutral with regard to progress toward plan desired conditions; or
- Maintain or make progress toward one or more of the desired conditions over the long term, even if the project or activity would adversely affect progress toward or maintenance of one or more desired conditions in the short-term; or
- Maintain or make progress toward one or more of the desired conditions over the long term, even if the project or activity would adversely affect progress toward other desired conditions in a negligible way over the long-term.

Therefore, all management activities implemented during the life of the plan must be designed to meet the desired conditions.

The Plan desired conditions include ones that have no direct counterpart goal in INFISH and are a benefit to bull trout conservation. *FW-DC-WR-04. Physical Integrity of Aquatic and Riparian Habitat* states that CNF lands will provide aquatic habitats in which the distribution of stream channel conditions in watersheds across the Forest is similar to the distribution of conditions in similar, reference watersheds. *FW-DC-WR-05. Water Quality* states water quality is not only provided to a degree that provides for stable and productive riparian and aquatic ecosystems (INFISH Riparian Goal 1), but also to specifically benefit the survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities. There are currently approximately two miles of stream on the Forest within the Pend Oreille subbasin with an approved TMDL for temperature. An additional two miles, three miles, 11 miles and 20 miles are still on the 303(d) list for bacteria, temperature, pH and dissolved

oxygen respectively (see Table 19). This desired condition reiterates the CNF intent to meet the Clean Water Act and the bull trout water quality standards.

FW-DC-WR-09. Groundwater-Dependent Systems: Seeps, Springs, and Groundwater-fed Wetlands recognizes the important role of groundwater to healthy watershed conditions. There is no counterpart Riparian Goal in INFISH. *FW-DC-WR-10. Water Production for Downstream Uses* recognizes the importance of water flowing off the CNF downstream ecological communities, including human communities

FW-DC-WR-12. Aquatic Invasive and Non-Native Species – this desired condition brings management attention to the threat aquatic invasive species pose to native aquatic species. *FW-DC-WR-13. Aquatic Threatened, Endangered, and Sensitive Species* specifically identifies the Forest's intent to contribute to the recovery of bull trout and the other MIS/focal species (westslope cutthroat trout and interior redband trout).

The Plan includes five watershed standards that apply forest-wide. These five standards constrain management activities and will benefit the bull trout conservation. INFISH includes standards and guidelines for projects in riparian areas to achieve RMOs but no other forest-wide standards and guidelines.

The first standard; *FW-STD-WR-01. Properly Functioning Watersheds* – states that "when watershed function desired conditions are being achieved and watersheds are functioning properly projects shall maintain those conditions. When watershed function desired conditions are not yet achieved or watersheds have impaired function or are functioning-at-risk and to the degree that project activities would contribute to those conditions, projects shall restore or not retard attainment of desired conditions. Short-term adverse effects from project activities may be acceptable when they support long-term recovery of watershed function desired conditions. Exceptions to this standard include situations where Forest Service authorities are limited. In those cases, project effects towards attainment of desired conditions shall be minimized and not retard attainment of desired conditions to the extent possible within Forest Service authorities".

The assessment of Aquatic Ecological Condition found the condition of subwatersheds, on the CNF within the Pend Oreille subbasin are generally *not properly functioning* or *functioning at risk*. Only the Headwaters South Salmo River subwatershed, North Fork Sullivan Creek-Sullivan Creek, and Slate Creek subwatersheds are judged to be *properly functioning*. The *functioning at risk* and *not properly functioning* ratings are due to at risk or not properly functioning ratings for large woody debris (16 subwatersheds), channel shape and function (17 subwatersheds), riparian vegetation condition (18 subwatersheds), insects and disease (four subwatersheds), road densities (19 subwatersheds) riparian road densities (19 subwatersheds) and roads on sensitive soils (eight subwatersheds). Additionally all subwatersheds were rated *functioning at risk* for the fire regime attribute. Standard *FW-STD-WR-01* will require all management actions maintain properly functioning conditions where they exist, but importantly in most subwatersheds, projects will contribute to improved conditions by not retarding recovery towards the desired conditions or improving conditions to the extent possible given the project scope.

Standard *FW-STD-WR-02* will benefit bull trout conservation by requiring all projects to include National and Regional Best Management Practices which will reduce the risk of projects resulting in long-term adverse effects to bull trout critical habitat.

Forest wide standards FW-STD-WR-03 Aquatic Invasive Species In-Water Work and FW-STD-WR-05 Construction of New Roads, Trails and Developed Recreation Sites that are included in the Plan are also consistent with bull trout conservation. FW-STD-WR-03 Aquatic Invasive Species In-Water Work directs prevention measures be implemented for in-water projects to decrease the potential for aquatic invasive species transference into non-infested water bodies. INFISH does not include a similar standard or guideline. FW-STD-WR-04 Construction of New Roads, Trails and Developed Recreation Sites requires new road, trail, and recreation sites be designed to minimize disruption of natural hydrologic processes at perennial and intermittent stream crossings, valley bottoms, valley approaches and other over land drainage features. The standard should help reduce the risk of these specific management activities disrupting the processes controlling the flow of water and sediment into aquatic habitat.

There are four Forest-wide guidelines that are designed to reduce the risk of spreading AIS, a benefit to bull trout conservation. There are no similar guidelines in INFISH. *FW-GDL-WR-01 Aquatic Invasive Species Wildfire Suppression Equipment* – addresses the risk of cross contamination between streams and lakes from pumps, suction, and dipping devices during wildfire suppression by avoiding dumping water directly from one stream or lake into another and water storage and conveyance components of water tenders, engines, and aircraft should be disinfected prior to use on a new on-forest incident. *FW-GDL-WR-02. Aquatic Invasive Species - Aquatic Resource Sampling* reduces the risk of spreading AIS infestation by stating aquatic sampling equipment should be disinfected prior to use in new stream or lake locations. *FW-GDL-WR-03. Aquatic Invasive Species Early Detection and Rapid Response* – encourages using the principles and processes of early detection and rapid response (EDRR) to find, identify and quantify new aquatic invasive species occurrences; and coupling EDRR with other integrated activities to rapidly assess and respond with quick and immediate actions to eradicate, control, or contain aquatic invasive species.

Forest-wide guideline *FW-GDL-WR-04. Watershed Restoration* is similar to INFISH standard and guideline WR-1 by encouraging restoration methods be utilized that maximize the use of natural ecological processes for long-term sustainability and minimize the need for long-term maintenance.

The Forest-wide water resources direction is more comprehensive that INFISH and thus should provide more for bull trout conservation than INFISH.

Riparian Management Areas (RMAs)

The Plan RMAs are similar to the RHCAs of INFISH and are a MA that overlay all other MAs, therefore the RMA Plan components apply no matter what other MA the RMA is within. RMAs are used as the primary framework (coarse filter) to provide for riparian and aquatic ecosystem diversity by conserving ecological processes at the landscape and watershed scales. Management activities within RMAs are to be designed to maintain or enhance existing desired conditions or restore degraded conditions for aquatic and riparian dependent species. The ecological processes and conditions, and the important functions riparian areas provide to aquatic habitat that RMAs are designed to protect are described in section 2.2.1.

The Plan RMAs are similar to the INFISH RHCAs with two notable differences: 1) a RMA for lakes and natural ponds of at least 300 feet compared to INFISH riparian width of 150 feet; and 2) the RMA width of at least 100 feet for all seasonally flowing or intermittent streams, wetlands, seeps and springs less than one acre; compared to the existing direction of 100 feet in Priority Watersheds, and 50 feet in non-priority watersheds. The increase in RMAs, compared to the INFISH direction recognizes the importance of these areas for maintaining watershed function and protecting downstream aquatic habitat as well as associated riparian dependent species.

Management within RMAs is guided by four Desired Conditions, 23 Standards and 24 Guidelines. Management direction for INFISH includes eight riparian goals, similar to the Forest-wide water resources goals discussed above, 39 standards and guidelines (INFISH did not distinguish between standards and guidelines: see Plan_component_comparison_3_21_17_draft.docx in the bull trout digital files for a comparison to the Plan desired conditions, standards and guidelines with those of INFISH).

One difference between the INFISH and the Forest's ARCS is management activities within RHCAs as constrained by the standards and guidelines are to meet RMOs. The RMOs are specific, numeric descriptors for what was considered good fish habitat at the time (figure 2, in section 2.2.1). The RMOs were considered to be interim and a national forest could change the RMOs based on the results of a watershed analysis. The Forest has not changed the RMOs while implementing INFISH.

The Forest ARCS does not include RMOs. Streams and aquatic habitat conditions are expected to be dynamic, varying in time and space due to natural disturbance. The use of specific habitat standards or objectives does not recognize the dynamic processes that create and maintain ecologically complex and resilient watersheds (Reeves *et al*. 1995; Bisson *et al.* 1997, ISAB 2003, Al-Chokhachy *et al*. 2011). Management in RMAs is to maintain or restore desired conditions.

The Plan includes four desired conditions that are a benefit to bull trout conservation by accounting for maintaining natural processes and the functions of the RMAs:

MA-DC-RMA-01. Composition

Riparian management areas consist of native flora and fauna in a functional system and a distribution of physical, chemical, and biological conditions appropriate to natural disturbance regimes affecting the area.

MA-DC-RMA-02. Key Riparian Processes

Key riparian processes and conditions (including slope stability and associated vegetative root strength, capture and partitioning of water within the soil profile, wood delivery to streams and within the riparian management areas, input of leaf and organic matter to aquatic and terrestrial systems, solar shading, microclimate, and water quality) are operating consistently with local disturbance regimes.

MA-DC-RMA-03. Livestock Grazing

Livestock grazing of riparian vegetation retains sufficient plant cover, rooting depth and vegetative vigor to protect stream bank and floodplain integrity against accelerated erosional processes, and allows for appropriate deposition of overbank sediment.

Three of the 8 allotments in the Pend Oreille Valley have 43 miles of the total 213 miles of critical habitat.

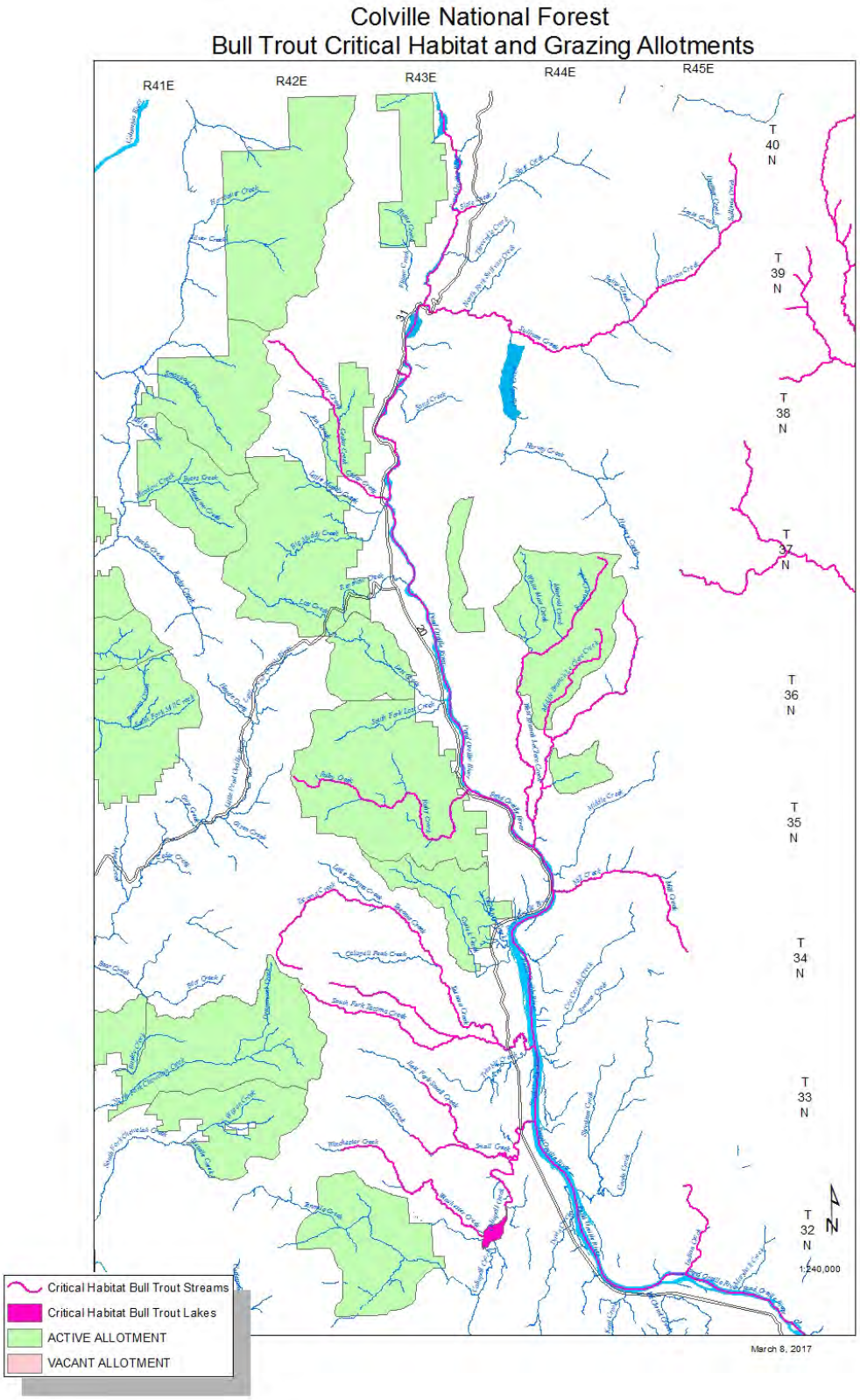

Figure 18 - Bull Trout Critical Habitat and Grazing Allotments

MA-DC-RMA-04. Roads

Roads located in or draining to riparian management areas do not present a substantial risk to soil or hydrologic function. Roads do not disrupt riparian and aquatic function.

The first two desired conditions need to be considered in all land management activities that occur within an RMA. *MA-DC-RMA-01* focuses on maintaining natural processes are occurring with to ensure native flora and fauna are present in a functional system and the distribution of physical, chemical and biological conditions are appropriate to the natural disturbance regime affecting the area. *MA-DC-RMA-02* addresses the riparian processes and functions that are key to providing healthy riparian and aquatic habitats.

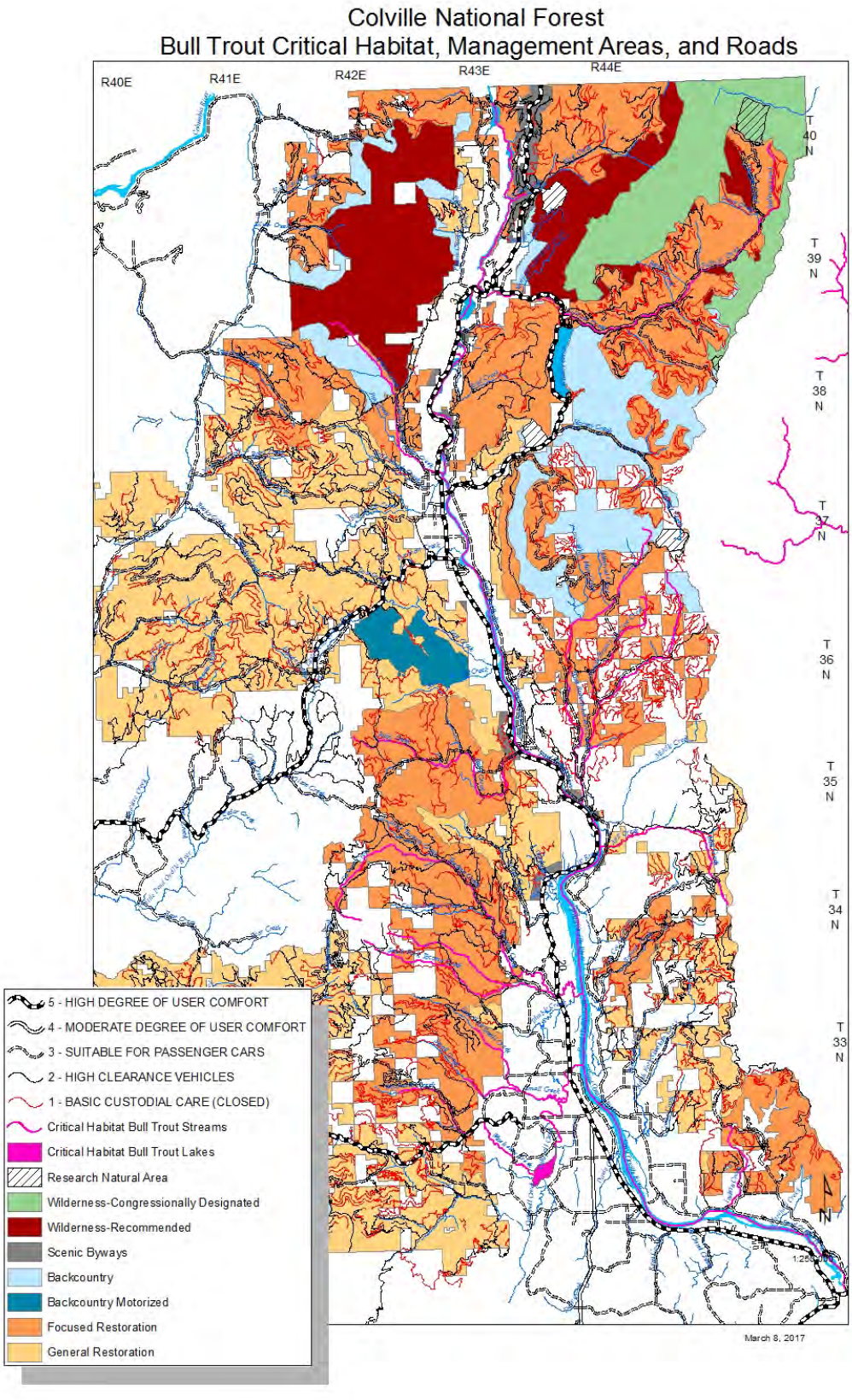

Figure 19 - Bull trout critical habitat, management areas, and roads

MA-DC-RMA-03 helps protect riparian areas during livestock grazing by maintaining riparian vegetation with sufficient plant cover, rooting depth and vigor thus protecting against accelerated erosion and allowing for the deposition of overbank sediment necessary to maintain stream banks. *MA-DC-RMA-04* will help conserve bull trout by requiring road maintenance activities account for reducing risk to soil, hydrologic function as well as riparian and aquatic function.

These two desired conditions aide in the conservation of bull trout critical habitat.

MA-DC-WR-04. Aquatic habitats in which the distribution of conditions (e.g., bank stability, substrate size, pool depths and frequencies, channel morphology, large woody debris size and frequency) in the population of watersheds on the Forest is similar to the distribution of conditions in the population of similar, reference condition watersheds. (Reference Conditions can be drawn from the Forest or Provincial scales. Conditions are assessed at the subbasin scale for Forest and project planning). This desired condition basically replaces the INFISH RMOS and may provide a more ecologically relevant way to assess stream channel conditions. Currently the Forest will use an index approach as was discussed in section 5.1.2 to determine progress towards the desired condition.

The ARCS standards and guidelines, as with INFISH, cover a variety of management activities including: general riparian and aquatic conditions; chemical application within RMAs; fuelwood cutting; logging activities; road construction and maintenance and road/stream crossings; grazing management; fire and fuels management; lands and special use authorizations; hydroelectric development; and minerals management. The RMA standards and guides specific to management activities associate with a program will be discussed in the effects discussion for the individual programs.

The following standard is important to the conservation of riparian and aquatic habitat and necessary to provide habitat conditions for bull trout recovery. *MA-STD-RMA-01*, makes it clear that: RMAs include portions of watersheds where aquatic and riparian-dependent resources receive primary management emphasis; that projects shall maintain RMA conditions where desired conditions are functioning properly; and that when riparian management area desired conditions are not yet achieved or RMAs have impaired function or are functioning-at-risk and to the degree that project activities would contribute to those conditions, projects or permitted activities shall restore or not retard attainment of desired conditions. Short-term adverse effects from project activities may be acceptable when they support long-term recovery of RMA desired conditions. Exceptions to this standard include situations where Forest Service authorities are limited. In those cases, project effects towards attainment of RMA desired conditions shall be minimized and not retard attainment of desired conditions to the extent possible within Forest Service authorities. The standard provides clear direction that riparian dependent resources are the management priority for all management activities within RMAs.

The CNF's RMA delineation follows the ARCS approach to riparian area management. Relatively large default RMAs are established to protect and restore water quality, provide for a wide range of aquatic and terrestrial habitats and species, and critical ecological processes. As stated in the ARCS, the scientific basis for the size of the RMAs was originally established in FEMAT (1993). Everest and Reeves (2007) later concluded that there was no scientific evidence that either the default prescriptions or the options for watershed analysis in the NWFP (USDA and USDI 1994) provide more protection than necessary to meet stated riparian management goals ARCS 2016.

It needs to be emphasized that RMAs are not "no-touch" buffers. It is fully expected that management activities, especially those designed to benefit aquatic and riparian-dependent resources and move the landscape towards desired conditions are allowed and encouraged within them**.** Activities that do not degrade desired conditions or prevent the desired conditions from being attained are also allowed. Instead, a wide range of management activities, involving highly-varied prescriptions, are expected to occur within them. In order to achieve RMA desired conditions *MA-DC-RMA-01. Composition, MA-DC-RMA-02*. *Key Riparian Processes, and FW-DC-WR-14. Resiliency to Climate Change* - RMAs are resilient to climate change may require some active management of vegetation within RMAs.

Reeves (*et al.*) 2016 provide a review of the current science surrounding riparian functions and processes. As they state, and described in USDA and USDI (1994), most of the key ecological processes needed to be maintained within RMAs occur within a distance equal to one site potential tree height from a stream or the floodplain (when present), including the beneficial effects of root strength for bank stability, litter fall, shading to moderate water temperature, and delivery of coarse wood to streams. Most of the moderating effects of sediment delivery to streams from overland erosion that may be produced by upland management activities generally occurs within a distance of one site potential tree. Similarly an extensive literature review by Sweeny and Newbold (2014) of stream side buffers and concluded, overall, buffers ≥30 m (98 feet) wide are needed to protect the physical, chemical, and biological integrity of small streams. Sweeny and Newbold (2014) also state their review found that sediment trapping was ~65 and ~85% for a 10- and 30-m buffer, respectively, concluding the increased sediment removal attained by wider buffers may be small fraction of the total sediments (by mass), but probably a large fraction of the finer silts and clays, which are typically released from narrow buffers in concentrations high enough to impair water quality.

As explained in Reeves *et al.* (2016) the extension of the riparian reserve boundary in the Northwest Forest Plan (as can likely be said for INFISH) from one site-potential tree-height to two on fish-bearing streams was to protect and enhance the microclimate of the riparian ecosystem within the first tree-height. Reeves *et al* (2016) conclude, in some cases, one-site potential tree buffer may be enough to ameliorate increases in microclimate due to management activities, especially timber harvest. There are also concerns for decreasing the extent of the riparian reserves and the effects on stream temperatures (Reeves *et al.* 2016).

Given the above, plus the uncertainties, and that at a minimum an approximately 100 foot distance is needed to filter most but not all sediment delivered to streams via overland flow, the RMAs in the Plan, with the associated desired conditions, standards and guidelines plus standards and guidelines for specific management activities and programs represent a precautionary approach for managing RMAs to protect fish habitat water quality and the PBFs of bull trout critical habitat. The RMAs will be equally as protective as the RHCAs of INFISH and allow for careful management within RMAs to achieve riparian, aquatic and landscape scale desired conditions while protecting the important ecological processes.

The Plan increases the RMAs along all non-fish bearing intermittent streams than currently designated by INFISH. All the ecological functions for which the RMAs are established for fish-bearing streams also apply to intermittent streams (Reeves *et al*. 2016). The RMA width of 100 feet or one site potential tree, plus protection of landslide prone areas should be protective of those ecological functions.

The Plan RMAs including the desired conditions, standards and guidelines are designed to protect and restore the important watershed and ecological processes necessary to provide naturally functioning aquatic habitat. As such the RMAs are expected directly support the bull trout critical habitat PBFs numbers 1, 2, 3, 4, 5, 6, and 8. The RMA plan components discussed above do not directly support PBF number 9, however *MA-DC-RMA-01. Composition*, *MA-DC-WR-14 - Resiliency to Climate Change*, in combination with the other desired conditions, standards and guidelines display a clear intent to manage riparian and aquatic habitat to provide the habitat conditions that will favor native species over non-native species to the extent possible. The RMA plan components should, by guiding forest management activities to maintain natural ecological process on Forest, contribute to providing high water quality to bull trout critical habitat downstream of the Forest boundary.

Population Strongholds/Restoration Priorities and Guidance – Key Watersheds/Aquatic Objectives.
The key watersheds and objectives will be discussed together as the two plan components are closely related. The key watersheds are areas that either provide, or are expected to provide, high quality habitat that will serve as source areas for threatened or endangered fish species, fish species of concern, and fish species of interest, and/or provide high quality water important to these populations downstream and/or their habitats. The key watersheds are also the priority for watershed, riparian and aquatic habitat restoration. Management direction for key watersheds is intended to provide the highest relative level of protection and accept the lowest relative level of risk from activities that may threaten watershed integrity and resiliency. The identification of key watersheds in the Plan gave high priority to supporting bull trout conservation in the Pend Oreille subbasin.

The Plan key watersheds are listed in Table 8, section 2.2.2 of this BA. The key watersheds include all subwatersheds with bull trout critical habitat and $\geq$ 25% of the subwatershed within the CNF. There is critical habitat within the Calispell Creek, Cusick Creek-Pend Oreille, Maitlen Creek Pend-Oreille River, and Yokum Lake-Pend Oreille River subwatersheds, but the critical habitat is not within the Forest boundary. There is also a very small amount (less than a mile) of critical habitat within the Forest in the Pewee Creek-Pend Oreille River subwatershed with greater than 25% CNF managed land. Although these above mentioned subwatersheds are not included in the key watershed network, Forest-wide and RMA plan components are expected to provide high quality water and protect the riparian and watershed ecological processes that can contribute to providing downstream habitat conditions for bull trout as discussed in sections 6.1.2 and 6.1.2.

The emphasis on protection and restoration in key watersheds has been found to be an effective strategy in the Northwest Forest Plan area as the watershed condition of key watersheds appears to be improving at a faster rate than non-key watersheds (Lanigan *et al*. 2012). The Plan's key watershed desired conditions, standards and guidelines, and objectives as are to be implemented in the Pend Oreille subbasin (and other key watersheds on the Forest) were developed in the ARCS (USDA Forest Service 2008; 2016) and are based upon lessons learned in implementation of the Northwest Forest Plan. *FW-DC-WR-14. Key Watershed Network* and *FW-DC-WR-16 Key Watershed Integrity* provide a clear description of the purpose of the Plan key watersheds and that in the case of the key watersheds in the Pend Oreille subbasin, the key watersheds are to contribute to short-term conservation and long-term recovery of bull trout. Key watershed desired condition *FW-DC-WR-15 Roads in Key Watersheds*, addresses the threat roads, a key threat specific to bull trout in the lake Pend Oreille core area, pose to watershed processes and aquatic habitat (the potential threats of roads will be discussed in section 6.2.2 in the Access program discussion).

Minimizing the threat of roads in key watersheds is further emphasized with standard *FW-STD-07 Road Construction and Hydrologic Risk Reduction in Key Watersheds*. In key watersheds with ESA listed fish critical habitat that are functioning properly with respect to roads, there will be no net increase is system roads that affect hydrologic function. In key watersheds with ESA critical habitat for aquatic species that are functioning-at-risk or have impaired function with respect to roads, there will be a net decrease (for every mile of road construction there would be greater than one mile of road-related risk reduction) in system roads that affect hydrologic function to move toward proper function. Treatment priority shall be given to roads that pose the greatest relative ecological risks to riparian and aquatic ecosystems. Road-related risk reduction will occur prior to new road construction unless logistical restrictions require post-construction risk reduction.

In addition to the standard regarding roads in key watersheds, the Forest-wide and RMA standards and guidelines there are two additional standards specific to key watersheds, *FW-STD-WR-08 Hydroelectric and Other Water Development Authorizations in Key Watersheds* and *FW-STD-WR-09 New Hydroelectric Facilities and Water Developments*, that provide extra protection to critical habitat from potential adverse effects of hydropower and other water developments.

In addition to the protection or passive restoration benefits, key watersheds are a priority for active restoration for the conservation of bull trout. Since the development of the ARS, (USDA Forest Service 2007), Region 6 watershed and aquatic habitat restoration has been implemented a whole watershed approach where active restoration is focused within a watershed or subwatershed to address all restoration needs that are politically, economically, and technically feasible within a watershed before moving on to other watersheds or subwatersheds. Such a whole watershed approach is consistent with the findings of Roni *et al.* (2010) who found considerable restoration is needed to produce measurable changes in coho salmon (*O.kisutch*) and steelhead abundance (and presumably bull trout) at a watershed scale.

The key watershed objectives that have been identified for key watersheds with bull trout critical habitat include 57 miles of road improvements, improving fish and other aquatic organism passage at 22 road/stream crossings, 70 acres of range infrastructure improvement, improving riparian vegetation structure on between 75-450 acres, and restoring 52 miles of stream habitat. These objectives are identified by specific key watershed (Table 9, section 2.2.2).

In addition to the key watersheds there are what are called Priority watersheds and Focused subwatersheds that are also expected to have restoration actions implemented. These priority and focused watersheds were identified prior to development of the revised Plan through implementation of the Region Six ARS. The current CNF Focus Watersheds are the LeClerc-Pend Oreille River (HUC 171021602), The Upper Sanpoil River (HUC 1702000401) and Chewelah Creek-Colville River (HUC 1702000301). The LeClerc Creek-Pend Oreille River watershed includes bull trout critical habitat and the Forest along with partners has developed a watershed action plan.

The Forest has also identified Priority watersheds through the implementation of the Watershed Condition Framework (Potyondy and Geier 2010). The West Branch and East Branches LeClerc Creek are priority watersheds that are also key watersheds. While the key watersheds are the priority for restoration, the focus and priority watersheds that are not in the Key Watershed network are used to target implementation of short-term, opportunistic restoration work such as in subwatersheds that are

a restoration priority for partners but not necessarily a priority to benefit the aquatic MIS/Focal species like bull trout.

Restoration objectives that apply to all watersheds including key watersheds that may directly contribute to bull trout conservation both on the Forest and to downstream critical habitat where implemented within the Pend Oreille River subbasin include; *FW-OBJ-WR-01 Aquatic Invasive Species*, *FW-OBJ-WR-02. Aquatic Invasive and Non-Native Species*, FW-*OBJ-WR-03, General Watershed Function and Restoration* and *MA-OBJ-RMA-01. Improve Riparian Function at Dispersed and Developed Recreation Sites*. Objectives for restoration outside key watersheds may indirectly contribute to improving downstream critical habitat where implemented within the Pend Oreille River subbasin include; *MA-OBJ-RMA-02. Restoration of Riparian Habitat and Process on Roads* and *MA-OBJ-RMA-03. Restoration of Late Forest Structure*.

Consistency of Restoration Objectives with Other Agency Restoration Programs or Plans

The USFWS released the final bull trout recovery plan in September 2015 (USFWS 2015a). Bull trout and bull trout critical habitat on the Forest fall within the Columbia Headwaters Recovery. Actions identified in the recovery plan to reduce habitat threats that are especially pertinent to the Forest include (USFWS 2015a):

- 1.1.2 Seattle City Light, Pend Oreille Public Utility District (POPUD), Forest Service and partners will improve habitat within streams through restoration actions and fencing to improve riparian habitat and sedimentation within streams identified as potential local populations (Including LeClerc Creek and Sullivan Creek).
- 1.2.2 Seattle City Light, POPUD, Forest Service, and partners will improve instream conditions restoration actions including but not limited to channel improvement floodplain connectivity, and floodplain restoration. Implement measures defined in the updated Forest Plan and FERC licenses to improve instream habitat.
- 2.1.1 Pend Oreille Public Utility District (PUD) and partners will remove Mill Pond Dam. The PUD, in partnership with Seattle City Light will remove Mill Pond Dam and the associated log crib dam, manage sediment, restore the Sullivan Creek stream channel, implement site restoration measures for the affected area, and conduct long-term monitoring and maintenance. This dam removal and restoration has already been required by FERC under the Pend Oreille PUD's surrender of its license to operate the Sullivan Project.
- 2.1.2 USFS and partners will remove historic water diversions and log crib dams on LeClerc Creek and the upper West Branch LeClerc Creek.
- 2.1.6 Maintain and enhance connectivity of cold water patches. Downstream of Albeni Falls and Box Canyon Dams cold water habitat is limited, but some patches persist in tributaries (e.g., LeClerc Creek (Box Canyon pool), Sullivan Creek (Boundary Pool), and others) which may, over time and with habitat improvement, support migratory bull trout. Maximizing the scope, resiliency, and connectivity of these patches is important in maintaining the migratory life history (downstream of Albeni Falls Dam).

Boundary Project - The USFWS issued a biological opinion for re-licensing the Seattle City Light's (SCL) Boundary Dam (Boundary Project) and decommissioning of Pend Oreille's Public Utility District's (PUD) Sullivan Creek Project (USFWS 2012). Mitigation measures expressed as terms and conditions included

in the re-licensing for the Boundary Hydroelectric Project that will or may be implemented on the Forest (USFWS 2012) but at any rate the restoration objectives will complement include:

- Removing Mill Pond Dam on Sullivan Creek and installing a cold water pipe in Sullivan Lake.
- Providing upstream fish passage at Boundary Dam
- Eradicating non-native fish and supplementing the native WSCT and bull trout populations.
- Habitat improvement projects both on and off the Forest

Vegetation Management

While implementation of the Plan is intended to produce commercial timber (*FW-DC-RFP-01 Commercial Products* and *FW-OBJ-RFP-01Planned Sale Quantity*), the intent of the Vegetation Management program is to create forest and non-forest vegetation structure that contributes to the species diversity, species composition, and structural diversity of native plant communities (*FW-DC-VEG-01*). The desired vegetation structure classes, identified by plant community type (Table 14) are to be resilient and compatible with maintaining characteristic disturbance processes such as wildland fire, insects and diseases (*FW-DC-VEG-04*). It is also the intent of the Plan that active management, such as wood product removal, wildland fire use, vegetation treatments will be used to meet desired conditions, move toward desired conditions, or not impair desired conditions (*FW-DC-VEG-03 Human Disturbances*).

Old Forest Management and Timber Production is one of the primary Needs for change leading to the revised Plan. It was identified due to the recent history of uncharacteristic levels of disturbances resulting from fire and insect and disease activity that would likely continue into the future; the interaction between disturbances and climate change elevates the importance of restoring landscape resiliency; and uncertainty about the recovery and viability of old forest-dependent species given the increased risk of uncharacteristically severe disturbances that is likely to be exacerbated by climate change impacts.

Most of the CNF is within what is termed a moderate- or mixed-severity fire regime. Mixed-severity fires are ones where 20–70% of the dominant tree basal area or canopy cover of a given patch of forest is killed by any single instance of fire. Mixed-severity fires commonly had fire severity patches between 100 and 103 ha (about 250 acres) with larger patches were also possible but historically rarer in number than those in this more common range of sizes. Mixed-severity fires greater than 250 acres did not burn with complete tree mortality, rather, individual trees and clumps of various sizes would have survived, creating an overall patchiness of a large landscape over space and time due to variation in disturbance severity. Mixed-severity fire regime forests were structurally diverse. Mixed-severity fire regime forests could have patches ranging from areas with relatively high tree survival after primarily surface fires, with only modest amounts of individual tree and group torching (i.e., 20–50% of the dominant tree basal area or canopy cover is killed), to mixed surface and crown fires, where more trees are killed than survive (i.e., 51–70% of the dominant tree basal area or canopy cover is killed) (see Hessberg *et al.* 2016).

The current conditions in many mixed severity fire regime forests have been broadly simplified by the combined effects of a century of fire suppression, fire exclusion, livestock grazing and road building, selection cutting in dry forests, and clearcut logging in more productive moist forests. Shade-tolerant Douglas-fir, grand fir (*Abies. grandis*), white fir (*A. concolor*), and subalpine fir (*A.lasiocarpa*) now dominate in many areas formerly occupied by fire-tolerant and shade-intolerant ponderosa pine, Jeffrey pine (*P. jeffreyi*) , western white pine (*P. monticola*), sugar pine (*P. lambertiana*), and western larch

(*Larix occidentalis*). This has simplified species diversity at patch and larger scales. Large, old trees that are naturally fire-tolerant today are often threatened by dense understory that create fuel ladders increasing the susceptibility of large trees to large, severe fires. Land management objectives for forests with mixed-severity fire regimes are increasingly to restore successionally diverse landscapes that are resistant and resilient to current and future stressors, such as climate change (Hessberg *et al*. 2016).

Large fires can result in accelerated erosion due to surface erosion or debris slides increasing the sediment supply to streams and changing channel structure (Wondzell and King 2003, Benda *et al.* 2003). However, disturbances such as fires and the resulting erosion processes also help create diverse fish habitat through the introduction of large woody debris and coarse substrates that maintain productive fish habitat (Reeves *et al.* 1995). Fires can cause direct mortality to fish resulting in local extirpations. However, fish populations, especially salmonids, have been observed to rapidly recover after an episodic disturbance such as a wildfire; as long as the population and habitat are connected to adjoining populations, (Sestrich *et al.* 2011, Rieman *et al.* 2003, Rieman *et al*. 1995). As was discussed in the Affected Environment section, a number of the local populations for the MIS/focal species are isolated above barriers or in streams with little connectivity to adjacent populations and are therefore more susceptible to extirpation by a large disturbance. The concern therefore is not so much over the effects of "natural" fires but larger, possibly more severe fires than generally occurred historically, especially if the fires occur in subwatersheds with isolated populations.

There is also a desire to manage vegetation for natural watershed and riparian function as illustrated in forest-wide Water Resource and RMA desired conditions and objectives including; *FW-DC-WR-01, FW-DC-WR-11, MA-DC-RMA-01*; RMA objective, *MA-OBJ-RMA-03. Restoration of Late Forest Structure*; Key watershed objectives *FW-DC-WR-16. Key Watershed Integrity - FW-OBJ-WR-08. Upland Vegetation Structure in Riparian Management Areas in Key Watersheds and MA-OBJ-RMA-03. Restoration of Late Forest Structure – outside key watersheds.*

Vegetation management through timber sales for timber production or as a fuel treatment (e.g. thinning, prescribed fire) and managing wildfires to reduce the potential for uncharacteristically severe wildfires can adversely affect watershed processes, aquatic and riparian habitat (see Spence *et al.* 1996, Mehan 1991; and Day 2015). Vegetation management can adversely affect PBFs 2, 3, 4, 5, 6, 7, and 8. Removal of large trees through timber harvest or prescribed fire within the RMA reduces large wood input to stream channels that is necessary to create complex aquatic habitat. Removal of trees shading streams can result in increased summer stream temperatures. Accelerated erosion from ground disturbing activities associated with vegetation management such as skid roads and the transportation system, result in accelerated erosion and sediment delivery to stream channels. Pumps and other equipment used to deliver water for to manage prescribed fire or wildfire can also transmit AIS from infected waters to unaffected waters.

The potential for adverse effects is greatest on lands specifically allocated for timber production due to the emphasis on commodity production; potentially resulting in intense vegetation manipulation and more ground disturbance due to logging and roads than is expected where vegetation management emphasizes the restoration of forest vegetation. The RMA standards and guidelines that specifically constrain vegetation management activities to prevent or minimize adverse effects of vegetation management activities include:

- *MA-STD-RMA-02. Chemical Application*. Apply herbicides, insecticides, piscicides, and other toxicants, other chemicals, and biological agents only to maintain, protect, or enhance aquatic and riparian resources and/or native plant communities
- *MA-STD-RMA-03. Personal Fuelwood Cutting* that does not authorize personal fuelwood cutting within RMAs or source areas for large woody debris.
- *MA-STD-RMA-04 Timber harvest and Thinning* - directing that Timber harvest and other silvicultural practices can occur in riparian management areas only as necessary to attain desired conditions for aquatic and riparian resources and RMAs are not subject to scheduled timber harvest.
- *MA-STD-RMA-05. Yarding Activities* – requiring full suspension over wet and dry stream channels during yarding activities.
- *MA-STD-RMA-12. Wildland Fire and Fuels Management -Minimum Impact Suppression Tactics* directs that minimum impact suppression tactics (MIST) be used during wildland fire suppression activities in riparian management areas.
- *MA-STD-RMA-13. Wildland Fire and Fuels Management - Portable Pumps* directs portable pump set-ups shall include containment provisions for fuel spills, and fuel containers shall have appropriate containment provisions. Park vehicles in locations that do not allow entry of spilled fuel into streams.
- *MA-GDL-RMA-03. Landings, Skid Trails, Decking, and Temporary Roads* states landings, designated skid trails, staging or decking should not occur in riparian management areas, unless there are no other reasonable alternatives and provides conditions to be considered if such facilities must be located within an RMA:
- *MA-GDL-RMA-22. Direct Ignition* – discouraging direct ignition in RMAs unless effects analysis demonstrates that it would not retard attainment of aquatic and riparian desired conditions
- *FW-GDL-WR-01. Aquatic Invasive Species Wildfire Suppression Equipment* – avoid cross contamination between streams and lakes from pumps, suction, and dipping devices during wildfire suppression including dumping water directly from one stream or lake into another. Water storage and conveyance components of water tenders, engines, and aircraft should be disinfected prior to use on a new on-forest incident.

Additional protection to bull trout critical habitat is provided as RMAs are not suitable for scheduled timber harvest.

Vegetation management activities are likely to adversely affect bull trout critical habitat, however the Water Resource and RMA desired conditions, standards and guidelines will greatly reduce the potential for long-term adverse effects that may result in the destruction or adverse modification of bull trout critical habitat. The AEC results show that a number of subwatersheds are *functioning at risk* or *not properly functioning* for the Fire Regime and Insects and Disease attributes. Vegetation management to create a vegetation composition and structure that is more characteristic of the natural fire regime and to promote late forest structure appropriate to the biophysical environment is a component of

managing for natural watershed function and may result in terrestrial and aquatic ecosystems that are more resilient to disturbance from fires or insects and disease.

National Forest Access System (AS)

The desired conditions for the AS include: providing a safe, affordable and environmentally sound road and trail system and docks road and trail system that supports forest management objectives, provides for both administrative and public needs. The PBFs potentially most affected by the AS are numbers 1, 2, 6, 7, 8, and 9.

Roads can have numerous adverse effects to fish habitat including the interruption or alteration of geomorphic and hydrologic processes. Geomorphic impacts of roads include chronic and long-term sediment delivery to aquatic habitat, accelerated mass failures of cuts and fills depositing large quantities of sediment, and altered channel morphology if the roads confine streams and prevent access to the floodplain. Roads constructed in riparian areas damage or remove vegetation thus reducing stream shade and large woody debris input. Roads constructed in the floodplain may inhibit natural stream channel migration processes (Gucinski *et al* 2001). Meredith *et al.* (2014) found that in the interior Columbia Basin, the presence of near-stream roads resulted in reduced amounts of large woody debris in streams.

The effects of roads on hydrologic processes include the interception of rainfall directly on the road surface and road cutbanks affecting subsurface water moving down the hillslope; concentrating flow on the surface or in an adjacent ditch or channel; and diverting or rerouting water from normal flow paths were the roads not present. Trombulak, and Frissell (2000) in their review of the ecological effects of roads cite research on how roads directly change the hydrology of slopes and stream channels. Roads intercept shallow groundwater flow paths, diverting the water along the roadway and routing it efficiently to surface-water systems at stream crossings. This can cause or contribute to changes in the timing and routing of runoff, the effects of which may be more evident in smaller streams than in larger rivers. Hydrologic effects are likely to persist for as long as the road remains a physical feature altering flow routing.

OHV trails that are not designed or maintained properly, including the drainage system, can be sources of chronic and long-term sediment delivery to streams. Negative impacts of soil and watershed functions from OHV activities include soil compaction, reduced water infiltration capacity, increased erosion, and damage to vegetation. Extensive networks of OHV routes across a landscape, especially on steep slopes, can direct or alter the direction of surface flows forming gullies that channel sediment and contaminants into aquatic systems (Ouren *et al*. 2007).

The access system, can also be a vector for AIS. Boats coming from water bodies with AIS can introduce AIS infecting a previously unaffected system. Road construction and maintenance often requires water that is obtained by pumping out of nearby streams. A pump that has been previously used in waters with AIS can transmit the AIS into new uninfected waters. Pumping water from streams can also entrain juvenile fish, such as bull trout resulting in direct mortality. During road construction reconstruction and maintenance both pumps and vehicles need to be refueled near the work site creating the potential for a fuel spill.

The effects of roads and trails on watershed function can be reduced by considering the location, design, and employing design or maintenance methods to disperse runoff (Furniss *et al.* 1991). Road removal or

decommissioning creates a short-term disturbance which may temporally increase sediment but over the long-term, decommissioning can reduce chronic erosion and the threat of landslides.

The potential effects of managing the AS have resulted one desired condition and eight standards and guidelines designed to minimize effects that may result in bull trout mortality or the adverse modification or destruction of critical habitat. The desired condition *MA-DC-RMA-04 Roads* reflects the Forest's intent that roads are not a substantial risk to soil or hydrologic function; and do not disrupt riparian and aquatic function. The standards and guidelines designed to specifically reduce the potential for adverse effects due to the AS include:

- *FW-STD-WR-05 Construction of New Roads, Trails and Developed Recreation Sites*, directing new roads and trails be designed to minimize disruption of natural hydrologic processes at perennial and intermittent stream crossings, valley bottoms, valley approaches and other over land drainage features
- *FW-GDL-WR-05. Hydrologic Function of Roads, Trails, and Developed Recreation Sites* - Roads and trails should be maintained to minimize disruption of natural hydrologic processes at perennial and intermittent stream crossings, valley bottoms, valley approaches and other over-land drainage features.
- *MA-STD-RMA-06. Road Construction and Maintenance* prohibits sidecasting or placement of fill in riparian management areas and directs snowplowing activities to include measures to prevent runoff from roads in locations where it could deliver sediment to streams.
- *MA-STD-RMA-07. Road Construction at Stream Crossings* – requires that at a minimum, all new or replaced permanent stream crossings shall accommodate at least the 100-year flood and its bedload and debris. The 100-year flood estimates will reflect the best available science regarding potential effects of climate change.
- *MA-STD-RMA-08. Road Construction-Fish Passage* – All new construction or reconstruction of stream crossings shall provide and maintain passage for all life stages of all native and desired non-native aquatic species and for riparian-dependent organisms where connectivity has been identified as an issue. Crossing designs shall reflect the best available science regarding potential effects of climate change on peak flows and low flows.
- *MA-GDL-RMA-01. Fuel Storage* - Refueling shall occur with appropriate containment equipment and a spill response plan in place. Wherever possible, storage of petroleum products and refueling will occur outside of RMAs. If refueling or storage of petroleum products is necessary within RMAs, these operations will be conducted no closer than 100 feet from waterways**.**
- *MA-GDL-RMA-04. Road Construction* - Construction of permanent or temporary roads in riparian management areas should be avoided.
- *MA-GDL-RMA-05. Temporary Road Reconstruction* – Avoid temporary roads in RMAs, when avoidance is not possible, temporary roads in RMAs should be managed to protect and restore aquatic and riparian desired conditions.

- *MA-GDL-RMA-06. Road Construction – Wetlands and Unstable Areas* - Wetlands and unstable areas should be avoided when reconstructing existing roads or constructing new roads and landings. Impacts should be mitigated where avoidance is not possible.
- *MA-GDL-RMA-076. Road Management – Road Drainage* - Road drainage should be routed away from potentially unstable channels, fills, and hillslopes.
- *MA-GDL-RMA-21. Pump and Dipping Equipment Cleaning* - Fish habitat and water quality shall be protected when withdrawing water for administrative purposes. When drafting, pumps shall be screened at drafting sites to prevent entrainment of aquatic species, screen area shall be sized to prevent impingement on the screens, and shall have one-way valves to prevent back-flow into streams. Use appropriate screening criteria where listed fish or critical habitat are present.

The AEC assessment found in the Pend Oreille subbasin the attributes associated with roads were *functioning at risk* or *not properly functioning* for road densities (19 subwatersheds), riparian road densities (19 subwatersheds), and roads on sensitive soils (eight subwatersheds). While it is not possible to eliminate all the adverse effects of roads and to a lesser extent trails as long as the AS is in place, the Water Resource and RMA standards and guidelines, as well as the key watershed and Water Resource objectives to improve roads that are hydrologically connected to streams will help reduce the current effects of the AS. The RMA Standards and Guidelines reduce the potential for future adverse effects due to new road construction and reconstruction, as well as minimize the potential for fuel spills, introducing AIS, into waterbodies, reconstruction and maintenance activities. Standards for constructing new and reconstructing existing road stream crossings will prevent creating future fish passage barriers. The key watershed and Water Resource objectives for improving passage will help connect currently disconnected habitat.

Livestock Grazing

The potential effects of livestock grazing on fish habitat have been well documented (*e.g*. Platts 1991, Spence *et al.* 1996). The potential adverse effects of grazing include soil erosion and sediment delivery to streams; soil compaction; alteration or removal of riparian vegetation that provides shade, cover, a terrestrial food source and stabilizes stream banks; altered channel morphology including channel widening, increased bank instability and loss of undercut banks. Thus livestock grazing can impact PBFs 3, 4, 5, 6, and 8. Al-Chokhachy *et al*. (2010) found the presence of cattle in watersheds sampled across the interior Columbia Basin and the Missouri River Basin often resulted in degraded physical aquatic habitat conditions, especially where grazing occurred in watersheds with high road densities.

The Plan does not include any changes to grazing allotments, but does include new desired conditions and standards and guidelines for managing the grazing program. There are currently 3 grazing allotments in the Pend Oreille subbasin with critical habitat. As discussed in section 5.1.2 of this BA, the overall aquatic habitat index scores within the sampled DMAs across the Forest are significantly lower than reference reaches as are the median substrate size, fines in pool tail-outs, and bank angle habitat attributes. There does appear to be significant positive trends in the bank stability and percent pool indices within the DMAs across the Forest, although the sample size is low. There are not enough samples within DMAs within the Pend Oreille subbasin to statistically determine overall index scores or trends. The monitoring program should provide such information in the future.

The Livestock Grazing program desired conditions that when managed for should be beneficial to watershed process and aquatic habitat include managing grazing for native plant communities with few to no invasive plant species, have stable or improving ecological conditions, and are resilient to disturbance events (*FW-DC-LG-01. Plant Community Structure and Diversity*); and riparian and upland areas within allotments reflect ecological conditions supporting the desired conditions, including those described in the Wildlife, Aquatic and Riparian, Soil, and Vegetation Desired Conditions (*FW-DC-LG-02. Economic and Social Contributions*).

The Plan includes one desired condition, four standards and one guideline specifically developed to prevent or minimize the potential adverse effects grazing can have on riparian and aquatic habitat.

- *MA-DC-RMA-03. Livestock Grazing* - Livestock grazing of riparian vegetation retains sufficient plant cover, rooting depth and vegetative vigor to protect stream bank and floodplain integrity against accelerated erosional processes, and allows for appropriate deposition of overbank sediment.

- *MA-STD-RMA-09. Management of Livestock Grazing to Attain Desired Conditions* directs that grazing be managed to move toward aquatic and riparian desired conditions. Where livestock grazing is found to prevent or retard attainment of aquatic and riparian desired conditions, modify grazing management, including removal of livestock if adjusting grazing practices is not successful.

- *MA-STD-RMA-10. Recreational and Permitted Grazing Management-Livestock Handling, Management, and Water Facilities* directs that new and replaced livestock handling and/or management facilities and livestock trailing, salting, and bedding are prohibited in RMAs unless they do not prevent or retard attainment of aquatic and riparian desired conditions, inherently must be located in an RMA, or are needed for resource protection.

- *MA-STD-RMA-11. Permitted Grazing Management - Allotment Management Planning* directs that during allotment management planning, negative impacts to water quality and aquatic and riparian function from existing livestock handling or management facilities located within riparian management areas shall be minimized to allow conditions to move toward the desired condition.

- *MA-GDL-RMA-10 - Permitted Grazing Management* establishes livestock use indicators for stubble height, utilization of deep-rooted herbaceous vegetation, streambank alteration, and utilization of woody browse as starting points for managing grazing depending upon the ecological condition of riparian and aquatic habitat. In the digital files, document 2017.03.28.ColvilleFEIS_AppendixH-ColvilleARCS_DRAFT.docx and the Forest Plan provides the technical rational for this guideline.

The overall aquatic habitat index scores within the sampled DMAs across the Forest are significantly lower than reference reaches as are the median substrate size, fines in pool tail-outs, and bank angle habitat attributes. There does however appear to be significant positive trends in the bank stability and percent pool indices within the DMAs across the Forest. The Plan components that have been developed to reduce the potential impacts of grazing to bull trout critical habitat are more complete than the current direction in INFISH and therefore the improvements being noted within DMAs are

expected to continue at least at the current pace if not faster. MA-GDL-RMA-10 adds indicators that a literature review of best available science showed will maintain conditions in functioning properly subwatersheds and improve conditions in functioning at risk subwatersheds.

Mining

Spence *et al.* (1996) reviewed the effects of mining on fish habitat. In general mining activities can increase sediment delivery, cause changes in the substrate and increase streambed and streambank stability. Mining activities may fundamentally alter the way water and sediment are transported through a river system, altering the erosional and depositional processes changing channel configuration. Increased turbidity can not only affect salmonids but also the macroinvertebrate community. Mining operations can damage streamside vegetation that shades streams and stabilizes streambanks. Toxic effects of materials used in mining or metals released into the stream environment can affect growth, reproduction behavior and migration of salmonids and degrade macroinvertebrate habitat. Mining activities depending on the type and scope of the activity can affect PBFs 1, 2, 3, 4, 5, 6, and 8.

There is currently one large mining operation near Metaline Falls, a slate rock mining operation on private lands in the Indian Creek drainage and suction dredging is common in Sullivan Creek. The recovery plan (USFWS 2015a) includes an action specific to mining:

- 1.2.1 Washington Department of Fish and Wildlife (WDFW) and partners will address mining impacts in Sullivan Creek. Minimize or eliminate impacts of dredging and sluicing within Sullivan Creek.

The Plan does not authorize any new mining operations on the Forest. The Plan does however address new mining operations with specific standards for mining and through the identification of suitable uses within RMAs in order to avoid or minimize the effects of mining operations on bull trout critical habitat. There is one mining desired condition, *FW-DC-MIN-02. Reclamation and Extraction*, for operations to include interim and post-operation reclamation measures to ensure the long-term function and stability of resources including, but not limited to, soil; vegetation; water quality; aquatic, riparian and upland habitats. There are eight standards developed to minimize the potential impacts of mining operations:

- *MA-STD-RMA-16* – Requires that operations within RMAs include all practicable measures to maintain, protect, and rehabilitate water quality and habitat for fish and wildlife and other riparian-dependent resources affected by the operations and do not retard or prevent attainment of aquatic and riparian desired conditions.
- *MA-STD-RMA-17*. Instructs the Forest to work with operators to adjust their mineral operations to minimize adverse effects to aquatic and riparian-dependent resources in RMAs.
- *MA-STD-RMA-18*. Instructs the Forest to work with operators to locate structures, support facilities, and roads outside RMAs. When such facilities must be within an RMA locate and manage them to minimize effects upon aquatic and riparian desired conditions and restore or reclaim the sites when they are no longer needed.
- *MA-STD-RMA-19*. Mine waste with the potential to generate hazardous material (as defined by CERCLA) is not to be locates within RMAs and/or areas where groundwater contamination is possible except for temporary staging of waste during abandoned mine cleanup.

- *MA-STD-RMA-20*. For leasable oil, gas, and geothermal exploration and development activities, coordinate with the Bureau of Land Management and recommend the application of BMPs and mitigation as Conditions of Approval to support attainment and maintenance of aquatic and riparian desired conditions.
- *MA-STD-RMA-21*. Saleable mineral activities such as sand and gravel mining and extraction are prohibited within RMAs unless no alternatives exist and if the action(s) will not retard or prevent attainment of aquatic and riparian desired conditions.
- *MA-STD-RMA-22*. Requires inspections, monitoring, and annual reviews for mineral plans, leases, and permits. Mitigations are required where monitoring results show a need to eliminate impacts that retard or prevent attainment of aquatic and riparian desired conditions.
- *MA-STD-RMA-23*. Mineral activities on NFS lands shall avoid or minimize adverse effects to aquatic threatened or endangered species/populations and their designated critical habitat. The standard requires the district ranger to evaluate suction dredging operations to determine if "take" may occur and if so the operation is determined to "likely cause significant disturbance of surface resources". The standard also requires the district ranger to contact and inform the operator to seek voluntary compliance with 36 CFR 228 mining regulations and to cease operations until compliance if placer mining operations are causing or will likely cause significant disturbance to surface resources.

The mining standards are as stringent if not more so than the INFISH standards and guidelines when combined with Forest-wide Water resource plan components and are an improvement over current direction. Not all impacts of mining can be avoided but the standards will help minimize potential impacts. *MA-STD-RMA-23* directly applies to suction dredging. The plan provides additional protection for bull trout critical habitat in that saleable mineral development and surface occupancy for leasable mineral operations may not be authorized as identified in the suitable uses for riparian management areas.

Recreation

Recreation is a large program with the potential to effect critical habitat. The desired conditions for the recreation program include providing a variety of high quality, nature-based outdoor recreational settings and opportunities varying from primitive to urban in both developed (e.g., campsites, vistas, parking areas) and dispersed (e.g., camping, backcountry skiing, boating, mushroom and berry picking, hunting, and fishing) recreation settings.

The potential effects to bull trout critical habitat due to recreation include effects due to the access system maintained to support the recreation activities and the human disturbance to the environment.

Camping and other recreation uses may also encourage harassment of spawning fish, especially bull trout that spawn in the late summer and fall. Redds may be damaged resulting in egg and alevin mortality if disturbed by campers. Finally recreation activities, especially boating, can introduce AIS into previously uninfected waters. Recreation activities therefore have the potential to affect all the processes for which RMAs are designated and affect PBFs 1, 2, 3, 4, 5, 6, and 8. In general the effects of recreation activities, other than the transportation are confined to the site, however larger scale effects may result from cumulative impacts of multiple sites.

The potential effects to riparian habitat are recognized by the Recreation Program which includes *FW-GDL-REC-02. Dispersed Recreation* stating the priority for facilities or minor developments in dispersed sites includes protection of the environment and dispersed campsites should not be designated in areas with sensitive soils or within 50 feet of streams, wetlands, or riparian areas. However RMA Plan components provide more complete direction to minimize the potential effects of recreation.

RMA guidelines specific to recreation activities, other than those previously mentioned for the AS and Livestock grazing programs, that will help minimize the potential adverse effects of recreation to bull trout critical habitat include:

- *MA-GDL-RMA-02. Felling Trees* that states trees are felled for safety should generally be retained onsite (channels and adjacent floodplains) to maintain, protect, or enhance aquatic and riparian resources unless otherwise the trees pose a new risk to administrative or developed recreation sites.
- *MA-GDL-RMA-12. Recreation Management – New Facilities and Infrastructure* is designed to keep new facilities or infrastructure outside expected long-term channel migration zones. Those facilities that inherently occur in riparian management areas (e.g., road stream crossings, boat ramps, docks, interpretive trails) should be located to minimize impacts on riparian-dependent resource conditions (e.g., within geologically stable areas, avoiding major spawning sites).
- *MA-GDL-RMA-13. Recreation Management – Existing Facilities* states existing facilities that are not meeting desired conditions or are within an active floodplain should be considered for removal, relocation, or re-design.

The current impacts of recreation sites are to be reduced within bull trout critical habitat as key watershed objectives include restoring riparian vegetation on 75-450 acres in key watersheds (Table 10) some of which will be sites associated with dispersed recreation. RMA objective *MA-OBJ-RMA-01 Improve Riparian Function at Dispersed and Developed Recreation Sites* is to restore riparian processes at 75 sites through education, enforcement, and engineering where recreational use results in bank damage, reduction in water quality, and/ or a reduction in stream shade.

The treat of invasion by AIS species is addressed in *FW-OBJ-WR-01Aquatic Invasive Species* where aquatic invasive species prevention measures are to be implemented at all developed recreation sites providing direct and/or indirect access to water bodies, such as boat ramps, campgrounds, and day use areas that provide portal zones for hand carried watercraft.

The recreation-specific guidelines combined with the overarching standards and guidelines for RMAs are provide the management direction to implement actions necessary to minimize the potential effects of the Recreation Program on riparian processes, the PBFs of bull trout critical habitat and bull trout. The direction is at least equal to the direction in INFISH. The objectives addressing recreation impacts provide specific direction to improve riparian and aquatic habitat where recreation impacts have occurred and prevent AIS invasion that is not included in INFISH.

Lands and Special Uses

The Forest “Lands” program includes real estate type activities (including land exchanges and acquisitions, granting or accepting of easements. The Lands program can be beneficial to bull trout in that one of the reasons for land acquisition is to maintain, restore, and enhance plant, wildlife, and

riparian aquatic and riparian-dependent resources and habitat including aspects of connectivity, foraging and reproduction for threatened and endangered and species of conservation concern. The Lands program activities will continue and do not change as a result of the Plan.

Special uses include permitting activities other than those uses included in the regulations governing the disposal of timber, minerals, and the grazing of livestock. The Forest administers a variety of uses under special use permits, leases, or easements. A permit for a special use is governed by the management direction for the area the special use permit, lease, or easement is authorized. The effects of a special use will be determined at the time a request for a permit is received and there is no way to know what uses may be requested in the future. Current special use permits may need to be modified in order to meet the new direction provided by the Plan.

The potential effects of special uses within RMAs will be minimized as all special uses will not only need to meet the RMA standards and guides but will also be constrained by *MA-STD-RMA-14 Lands and Special Use Authorizations*. The standard states all new and existing special uses that result in adverse effects to habitat conditions and ecological processes essential to aquatic and riparian-dependent resources shall require mitigation that results in re-establishment, restoration, mitigation, or improvement of those conditions and processes. These authorizations include, but are not limited to, water diversion or transmission facilities (e.g, pipelines, ditches), energy transmission lines, roads, hydroelectric, and other surface water development proposals.

Hydropower special uses are further constrained by *MA-STD-RMA-15. Hydroelectric New Support Facilities* that requires new support facilities to be located outside of RMAs. Additional Hydroelectric constraints are included in the standards for key watersheds.

Monitoring and Adaptive Management

The Plan includes an integrated watershed and aquatic habitat monitoring plan. The monitoring plan is designed to facilitate adaptive management by testing assumptions, tracking relevant conditions over time, measuring management effectiveness, and evaluating effects of management practices to determine if a change in plan components or other plan management guidance may be needed. The monitoring plan will determine whether progress towards the desired conditions is being achieved.

The Plan monitoring program includes specific monitoring questions tied to specific Plan components, with specific indicators to be assessed and reporting requirements. While much of this monitoring may be currently occurring, monitoring program provides a comprehensive, detailed description of how the Forest will determine if the intended conservation value of the Plan for bull trout is being achieved and inform any needed management changes.

5.2.2 Climate Change

Desired conditions place emphasis on managing RMAs so they are resilient to climate change and other disturbances. *FW-DC-WR-13. Aquatic Threatened, Endangered, and Sensitive Species* and *FW-DC-WR-14 Resiliency to Climate Change*, as well as standard *FW-STD-WR-01 Properly Functioning Watersheds*, in combination with the other Forest-wide Plan components, show clear intent to provide habitat necessary for the recovery of bull trout that includes not degrading habitat which may make conditions more suitable for non-native competitors to the extent possible given both current conditions and those that may occur with climate change.

Old Forest Management and Timber Production is one of the primary Needs for change leading to the revised Plan. It was identified due to the recent history of uncharacteristic levels of disturbances resulting from fire and insect and disease activity that would likely continue into the future; the interaction between disturbances and climate change elevates the importance of restoring landscape resiliency; and uncertainty about the recovery and viability of old forest-dependent species given the increased risk of uncharacteristically severe disturbances that is likely to be exacerbated by climate change impacts. Land management objectives for forests with mixed-severity fire regimes are increasingly to restore successionally diverse landscapes that are resistant and resilient to current and future stressors, such as climate change (Hessberg et al. 2016). *MA-STD-RMA-07. Road Construction at Stream Crossings and MA-STD-RMA-08. Road Construction-Fish Passage* provide standards to reduce potential effect of climate change from the road systems.

5.2.3 Cumulative Effects, Consistency with the Recovery Plan

INFISH did not include key watersheds, however INFISH designated what are termed Priority Watersheds. Within Priority Watersheds, inland native fish, are to receive special attention and treatment (USDA Forest Service 1995). The CNF INFISH Priority Watersheds are only located in the Pend Oreille subbasin and include the bull trout critical habitat on the Forest. However INFISH did not include specific desired conditions, standards and guidelines or restoration objectives for the priority watersheds. The key watershed plan components provide more explicit management direction for the key watersheds than is included in the INFISH direction.

The key watershed concept has been shown to result in improved watershed conditions within the Northwest Forest plan area; the same results may be expected for the key watersheds in the Plan. The protective aspect of the key watersheds will add to the conservation value for bull trout of the Plan by providing an extra level of protection to subwatersheds containing bull trout critical habitat. The threats to bull trout recovery that are pertinent to management of the Forest include forest management practices and forest roads and fish passage issues. The watershed condition scores are generally *not properly functioning* for CNF subwatersheds draining into the Pend Oreille subbasin with only the Headwaters South Salmo River subwatershed, North Fork Sullivan Creek-Sullivan Creek, and Slate Creek subwatersheds considered to be *properly functioning*. The watershed conditions are degraded to *functioning at risk* and *not properly functioning* ratings at risk or not properly functioning ratings for large woody debris (16 subwatersheds), channel shape and function (17 subwatersheds), riparian vegetation condition (18 subwatersheds), insects and disease (four subwatersheds), road densities (19 subwatersheds) riparian road densities (19 subwatersheds) and roads on sensitive soils (eight subwatersheds). All subwatersheds were rated *functioning at risk* for the fire regime attribute and barriers to upstream and downstream movements of bull trout are an important reason for the poor status of local bull trout populations.

The key watershed objectives were developed to address the specific threats to habitat due to past forest management, road construction and impeded fish passage within the watersheds. The Forest-wide watershed objectives will not only help protect and restore aquatic habitat in the key watersheds but should contribute to improved habitat conditions downstream of the Forest.

5.2.4 Summary of Effects

The Plan ARCS is based upon the Region 6 ARCS. The ARCS and subsequently the Forest's ARCS includes desired conditions, standards and guidelines, and a key watershed network designed to provide the

ecological conditions conducive to maintaining, restoring, and enhancing habitat necessary to sustain aquatic and riparian-dependent species on National Forest System lands. Watershed, aquatic and riparian direction address both ecosystem and species diversity at watershed and landscape scales through desired conditions, objectives, and standards and guidelines for general water resources, key watersheds and RMAs. The ARCS is also consistent with the Interior Columbia Deputy Team direction for revising forest plans.

Forest management programs, especially vegetation management, the access system, livestock grazing, minerals, and lands and special uses all can adversely affect the PBFs of critical habitat. The Water Resource and RMA desired conditions, standards and guidelines are expected to limit adverse effects of management activities to short-term effects that do not degrade watershed and riparian desired conditions or slow progress towards achieving the desired conditions. The Plan includes an integrated watershed and aquatic resource monitoring program designed to assess if management actions during Plan implementation are meeting or moving towards the desired conditions. The Water Resource and RMA Plan components are more comprehensive than the current INFISH direction, plus there are now specific Plan components for key watersheds that INFISH does not include. The Plan includes specific objectives for improving watershed and aquatic habitat conditions, and population and habitat connectivity, particularly within the key watersheds. Aquatic habitat within the Pend Oreille subbasin (and the Forest as a whole) appears to be improving since the adoption of INFISH, so implementing the Plan with the Water Resource, RMA, and key watershed desired conditions, standards and guidelines, and objectives is expected to continue the improving trends.

The Forest-wide plan components will help support maintaining or restoring the watershed processes necessary to provide for all the PBFs of bull trout critical habitat. The Plan components do not directly support PBF number 9, non-native predatory species, but the standards and guidelines provide more emphasis on preventing invasion by AIS than the current Forest Plan direction. The Forest-wide plan components should, by guiding forest management activities, to maintain natural ecological process on Forest, contribute to providing high water quality to bull trout critical habitat downstream of the Forest boundary.

The plan components for watershed resources, riparian management areas, and key watersheds, starting with standards WM-1 and RMA-1 are designed to maintain and improve watershed conditions and riparian and aquatic habitat. The plan components are to be used collectively to maintain or restore the processes and functions, including those of riparian areas as discussed in section 2.2 and 2.2.1 necessary to maintain and improve all of the freshwater PBFs. The Colville ARCS builds upon the lessons learned from implementing INFISH. However the Colville ARCS is more comprehensive than the current INFISH direction which has been shown to be slowly moving toward improved habitat conditions. The current rate of improving aquatic habitat conditions is expected to accelerate with the more comprehensive Colville ARCS. The rate of improving aquatic habitat conditions, and therefore the condition of the freshwater PBFs on the Forest is expected to be further enhanced with specific restoration objectives especially for key watersheds.

Therefore, the CNF, by adopting and implementing the Plan, is consistent with section 7(a)(1) of the ESA that requires Federal agencies to use their authorities to further the conservation of listed species, in this case bull trout. The Plan is consistent with recovery plans and the critical habitat justification document by not precluding the goal for critical habitat in and near the action area to reestablish local

populations that are broadly distributed throughout the Critical Habitat Unit. The standards and guidelines should limit the potential for exacerbating the threats to bull trout recovery due to forest management practices, forest roads and fish passage issues on the Forest. The key watershed objectives are also consistent with and will complement recovery actions identified in the recovery plan and restoration plans of other entities. The Plan does not authorize any specific management activities and future management activities will undergo project specific ESA section 7 (a)(2) consultation with the USFWS. The ARCS should prevent any long-term adverse effects so that management activities implemented under the plan direction **may affect, likely to adversely affect**, but should not adversely modify or destroy critical habitat on the Forest.

5.3 Woodland Caribou

The forest management activities that can influence the recovery and viability of woodland caribou based on the woodland caribou recovery plan and critical habitat (see below) include: 1) Vegetation management and natural disturbances affect the amount and connectivity of old forests of Engelmann spruce/subalpine fir and western redcedar/western hemlock. 2) Human access that can increase the potential for poaching and cause disturbance to caribou during the critical winter period. These effects were used to evaluate the potential contribution of the Forest plan to the recovery of woodland caribou.

5.3.1 Direct and Indirect Effects

The plan components for woodland caribou are in section 2.1.2.1 on page 34. Additional plan components are also found in the general wildlife section 2.1.2 page 34 and in the management area direction for focused and general restoration.

The Plan would implement new science, recommendations from the Biological Opinion issued in 2001 (USFWS 2001) on the 1988 Forest Plan (USFS 1988), and address the critical habitat designation (USFWS 2012). Vegetation management would be focused on restoring late successional and old forest habitats based the historic range of variability. This would provide the amount, spatial arrangement, and connectivity of caribou habitat to mimic natural patterns and processes.

A term and condition of the 2001 Biological Opinion was that the Forest develop a winter recreation strategy that protects important winter habitats for caribou while providing some level of winter recreation access. This strategy was developed (USFS 2003) and is fully integrated into the Plan (see Map, Fig. X). This strategy includes information and education about the effects of winter recreation on wildlife, monitoring and enforcement of areas closed to over-the-snow activities, and limitations on permitted over-the-snow activities. Collectively, these actions have reduced the impacts of winter recreation to caribou habitat such as displacement from snowmobile use in high quality habitat, while providing recreation opportunities in areas and at the time of the winter season when effects to caribou are minimal. In addition to winter recreation, the Plan emphasizes substantially reducing the negative effects of forest roads on wildlife habitat. The Caribou habitat occurs in Key Watersheds. Minimizing the threat of roads in key watersheds is emphasized with standard *FW-STD-07 Road Construction and Hydrologic Risk Reduction in Key Watersheds*. In key watersheds that are functioning properly with respect to roads, there will be no net increase is system roads that affect hydrologic function. In key watersheds that are functioning-at-risk or have impaired function with respect to roads, there will be a net decrease (for every mile of road construction there would be greater than one mile of road-related risk reduction) in system roads that affect hydrologic function to move toward proper function. By

managing for a no net increase or net decrease, there will be a decrease in caribou displacement from roads.

5.3.2 Climate Change

Climate change would likely alter the distribution and abundance of suitable caribou habitat, and would also change snow depths and persistence, which affect seasonal movements of mountain caribou (WDFW 2012). The potential effects of climate change depend on the interaction, not only of seasonal temperatures and snowfall patterns, but also occurrence of wildfires, outbreaks of forest insects, and diseases (Mountain Caribou Science Team 2005). Management adaptations to address the effects of climate change include a focus on forest restoration and reducing non-climatic factors that affect wildlife populations (e.g., restoring habitat effectiveness). The Plan would implement these adaptations.

5.3.3 Cumulative Effects

Fuels reduction projects are possible on all land ownerships, in particular where they are near residences. These can be done in such a way that they restore wildlife habitat that has been affected by fire exclusion.

Recreation is likely to increase on all land ownerships due to increasing demands from the public. This would increase the effects of human disturbance on caribou and result in NFS lands that have relatively low human disturbance becoming more important to wildlife such as caribou.

Big game hunting continues on both sides of the U.S./Canada border. Encounters with hunters may result in caribou mortality as a result of mistaken identification. Legal harvest of caribou by Treaty Indians does occur, but with few statistics on the number of animals taken it is difficult to evaluate the influence of this on the caribou population. Fatal collisions with vehicles occur on open roads in caribou habitat and are likely to continue. Predation by mountain lions, wolves and other predators would continue, with the effect on the caribou population dependent on big game populations, predator populations and a variety of other factors.

One important factor is how the Canadian officials decide to manage this herd. In the British Columbia portion of the recovery area, human activities that would continue to impact caribou habitat include gas, powerline, and international border corridors, recreation activities, timber harvest, and highways.

5.3.4 Summary of Effects

Implementation of the Plan would have a **May Affect, Likely to Adversely Affect**, determination for woodland caribou and their habitat. It would make a relatively high contribution to the recovery of woodland caribou. The reasons for this determination are:

1) The Plan would address new science and risk factors identified in the recovery plan and critical habitat.

2) The Plan would formally adopt the winter recreation strategy for caribou habitat that was a Term and Condition of the 2001 Biological Opinion.

3) The Plan emphasizes the protection and restoration of caribou habitat, better addressing expected climate change effects and enhancing resiliency.

5.4 Woodland Caribou Critical Habitat

Based on the current understanding of the PBFs and habitat characteristics required to sustain the southern Selkirk Mountains population of woodland caribou's life-history processes, the primary constituent elements specific to the southern Selkirk Mountains population of woodland caribou are:

- Mature to old-growth western hemlock (*Tsuga heterophylla*)/western red cedar (*Thuja plicata*) climate forest and subalpine fir (*Abies lasiocarpa*)/Engelmann spruce (*Picea engelmanni*) climax forest at least 5,000 feet in elevation; these habitats typically have 26-50% or greater canopy closure.
- Ridge tops and high-elevation basins that are generally 6,000 feet in elevation or higher, associated with mature to old stands of subalpine fir/Engelmann spruce climate forest with relatively open (approximately 50%) canopy.
- Presence of arboreal hair lichens.
- High-elevation benches and shallow slopes, secondary stream bottoms, riparian areas, and seeps, and subalpine meadows with succulent forbs and grasses, flowering plants, horsetails, willow, huckleberry, dwarf birch, sedges and lichens. These are used by woodland caribou, including pregnant females, for feeding during the summer seasons.
- Corridors/transition zones that connect the habitats described above. If human activities occur, they are such that they do not impair the ability of caribou to use these areas.

The forest management activities that can influence the PCE's of woodland caribou critical habitat based on the caribou recovery plan and critical habitat include: 1) Vegetation management and natural disturbances affect the amount and connectivity of old forests of Engelmann spruce/subalpine fir and western redcedar/western hemlock. 2) Human access that can increase the potential for poaching and cause disturbance to caribou during the critical winter period. These effects were used to evaluate the potential contribution of the Plan to the recovery of woodland caribou.

5.4.1 Direct and Indirect Effects

There are plan components (Desired Conditions, Objectives, Standards and Guidelines) in the revised Forest Plan that addresses the physical and biological features (PBFs) and primary constituent elements (PCEs)(See Plan components for Woodland Caribou in section 2.1.2.1 on page 34). These plan components provide management direction that addresses the habitat conditions (mature and old growth forests, lichens) and needs for security from disturbance associated with winter recreational activities during the critical winter period, and from management activities during the critical calving period.

5.4.2 Climate Change

Climate change would likely alter the distribution and abundance of some of the PCE's (e.g., mature forest, lichens) of caribou habitat, and would also change snow depths and persistence, which affect seasonal movements of mountain caribou (WDFW 2012). The potential effects of climate change depend on the interaction, not only of seasonal temperatures and snowfall patterns, but also occurrence of wildfires, outbreaks of forest insects, and diseases (Mountain Caribou Science Team 2005). Management adaptations to address the effects of climate change include a focus on forest

restoration and reducing non-climatic factors that affect wildlife populations (e.g., restoring habitat effectiveness). The Plan would implement these adaptations.

5.4.3 Cumulative Effects

Fuels reduction projects are possible on all land ownerships, in particular where they are near residences. These can be done in such a way that they restore wildlife habitat that has been affected by fire exclusion.

Recreation is likely to increase on all land ownerships due to increasing demands. This would increase human disturbance and result in NFS lands that have relatively low human disturbance to become more important to wildlife such as caribou.

Big game hunting continues on both sides of the U.S./Canada border. Encounters with hunters may result in caribou mortality as a result of mistaken identification. Legal harvest of caribou by Treaty Indians does occur, but with few statistics on the number of animals taken it is difficult to evaluate the influence of this on the caribou population. Fatal collisions with vehicles occur on open roads in caribou habitat and are likely to continue. Predation by mountain lions, wolves and other predators would continue, with the effect on the caribou population dependent on big game populations, predator populations and a variety of other factors.

One important factor is how the Canadian officials decide to manage this herd. In the British Columbia portion of the recovery area, human activities that would continue to impact caribou habitat include gas, powerline, and international border corridors.

5.4.4 Summary of Effects

The management guidance for woodland caribou and vegetation management in the Plan, would contribute to the maintenance and restoration of the primary constituent elements of designated Critical Habitat for the woodland caribou. This would allow the Critical Habitat to support the life-history needs of the southern Selkirk Mountains population of woodland caribou and provide for the conservation of the species. The standards and guidelines in the Plan should prevent any long-term adverse effects so that management activities implemented under the plan direction **may affect, likely to adversely affect**, but should not adversely modify or destroy critical habitat on the Forest.

5.5 Grizzly Bear

Forest activities that influence the recovery of the grizzly bear based on the grizzly bear recovery plan and the access management guidance (IGBC 1998) include: human access that can displace bears from important seasonal habitats or increase the risk of bear-human interactions, disposal of livestock carcasses within range allotments to avoid attracting bears to a potential food source, placement of apiaries under special use permits, and the storage of food and garbage at recreation sites to reduce the potential for bears to associate humans with food sources.

5.5.1 Direct and Indirect Effects

The plan components for grizzly bear are in section 2.1.2.2 on pages 35-37. Additional plan components are also found in the general wildlife section 2.1.2 page 34 and in the management area direction for focused and general restoration.

The Plan provides standards for human access, disposal of livestock carcasses, and food and garbage storage within the Selkirk Grizzly Bear Recovery Area (IGBC 1998, USFS 1988, USFWS 1993, USFWS

2001). The Plan standards have largely been met and would continue to be followed. The Plan includes guidance that would limit the placement of apiaries within the grizzly bear recovery zone.

Outside the recovery zone, plan components to manage vegetation using the historic range of variability as a reference condition and to reduce the impacts of roads of aquatic and terrestrial habitats would enhance habitat conditions for grizzly bears.

5.5.2 Climate Change

Grizzly bears have been identified as having a low sensitivity to climate change because they are opportunistic, eat a diverse array of food resources, and are highly adaptable (Servheen and Cross 2010, CCSD 2013). Anticipated impacts may include changes in the timing of denning due to longer snow-free periods and reduced snowpack (Lawler et al. 2014) and changes in the availability of food sources (Servheen and Cross 2010). These changes may put bears at risk of negative human interactions for a longer period of time each year (Servheen and Cross 2010). This would make education, proper food and garbage storage, carcass disposal measures, and human access management that much more important.

5.5.3 Cumulative Effects

The primary reason for the low population of grizzly bears in the recovery zone is past persecution and human-caused mortality of bears. Legal protections are now in place to protect grizzly bears. Information/education programs, sanitation measures, and access management have and would continue to be used to aid in the recovery of grizzly bears in the Selkirk Recovery Area.

Past, present and reasonable foreseeable non-federal future actions that could affect grizzly bears include timber harvest and associated road construction, recreational activities that can cause disturbance to bears and create potential for human-bear conflicts, and human development that fragment grizzly bear habitat. Cumulative effects are evaluated across the Recovery Area by tracking activities within Grizzly Bear Management Units (GBMUs). Other land managers have adopted and are following similar management direction (USFS 2015) and overall recovery is coordinated by the Selkirk Grizzly Bear Management Subcommittee. GBMUs that occur on the Colville National Forest include the LeClerc, Salmo-Priest, and Sullivan-Hughes. The contribution made on federal lands to grizzly bear recovery would help to mitigate potential cumulative effects from off-forest activities. The Plan would reduce the negative impacts of roads on wildlife habitats, which helps to mitigate cumulative effects.

Border Patrol activities on the Forest have the potential to cause disturbance through use of roads or trails that are normally closed to motorized use. The exact extent or amount of the impact over the life of the plan is difficult to predict because many factors could influence Border Patrol activities.

Fuels reduction projects are possible on all land ownerships, in particular where they are near residences. These can be done in such a way that they restore wildlife habitat affected by fire exclusion.

Recreation is likely to increase on all land ownerships due to increasing demands by the public. This would increase the effects of human disturbance on grizzly bears and result in NFS lands that have relatively low human disturbance (e.g., core areas) becoming more important to wildlife such as grizzly bears.

Black bear hunting on both sides of the international border within the Selkirk Recovery Area has the potential to add cumulatively to the mortality of grizzly bears. Hunters that encounter grizzly bears may

mistakenly identify the bear, kill the bear in self-defense, or opportunistically poach the bear. Human access management within the recovery area is key to reducing the risk of mortality to grizzly bears from black bear hunting.

On private lands, the presence of garbage, pet food, fruit trees, or other attractants may lure bears into conflict situations. Bears that become habituated or a nuisance may lead to the bear being killed.

5.5.4 Summary of Effects

The Plan would make a relatively high contribution to the recovery of grizzly bears in the Selkirk Recovery Area and would result in a **May Affect, Likely to Adversely Affect** determination. This is based on the management direction that addresses:

1. Human access management,
2. Disposal of carcasses in range allotments that occur in the recovery area,
3. Consideration of grizzly bears in the permitting of apiaries, and
4. Proper storage of food, garbage and other attractants that may lead to human-bear interactions.

5.6 Canada Lynx

The Lynx Conservation Assessment and Strategy (ILBT 2013) was used to identify forest management activities that influence the recovery and conservation of Canada lynx include: vegetation management that affect lynx habitat components, winter recreation that influences habitat connectivity and lynx habitat use, forest roads that can become sources of lynx mortality at high traffic volumes and speeds, and grazing effects to riparian areas that provide habitat for snowshoe hares, a primary food resource for lynx (ILBT 2013). The Interagency Lynx Biology Team (ILBT 2013) developed conservation measures for core and secondary areas (USFWS 2005) to address each of these forest management activities, and for planners to consult when revising forest plans. These were used to evaluate the potential contribution of forest management alternatives to the recovery of Canada lynx.

5.6.1 Direct and Indirect Effects

The plan components for Canada lynx are in section 2.1.2.3 on pages 37-39. Additional plan components are also found in the general wildlife section 2.1.2 page 34 and in the management area direction for focused and general restoration.

Vegetation management activities (e.g., timber harvest, prescribed fire) affect the distribution of lynx habitat components, can fragment habitats, and create sources of disturbance (ILBT 2013). As a result, the ILBT (2013) identified risk factors associated with vegetation management and developed conservation measures to address the risk factors. The conservation measures for vegetation management apply to lynx core areas and include using the historic range of variability to mimic the pattern and scale of natural disturbances and connectivity across the landscape, while considering the future range climate change (ILBT 2013). A conservation measure focused on the restoration of disturbance regimes in dry forests that occur in close proximity to lynx habitat to reduce the risk of uncharacteristically severe and frequent fires reaching lynx habitat. Finally, conservation measures were recommended that limit the amount of vegetation management and the rate of habitat change (e.g.,

acres treated/decade) within lynx analysis units. The implementation of the Plan includes management direction to manage habitat for Canada lynx toward desired conditions that are based on the historic range of variability (HRV). This means that habitats would be managed so that the amount of habitat, patch sizes, and spatial arrangement would mimic conditions under which Canada lynx evolved (Agee 2000). These plan components would provide foraging, denning, and travel habitat components for lynx, while reducing the potential of habitat loss and fragmentation from uncharacteristically severe wildfires, a key threat to lynx habitat (Lewis 2016).

Winter recreation can influence how lynx use habitats (ILBT 2013). To minimize the potential of negative effects from winter recreation, the ILBT (2013) developed conservation measures to reduce effects. Conservation measures for winter recreation in lynx core areas included reducing effects on habitat connectivity and discouraging expansion of over-the-snow routes that may influence lynx habitat use (ILBT 2013). There is management direction in the Plan that limits over-the-snow winter recreational activities in lynx habitat.

The conservation measures for forest roads in lynx core areas include avoiding road reconstruction or upgrades that occur in lynx habitat that would result in increased traffic speeds or volumes (ILBT 2013). These measures would reduce the potential for vehicular traffic to result in a source of mortality to lynx. The Plan includes management direction to limit road reconstruction and upgrades in lynx habitat that would increase traffic volume or speed. This would reduce the potential for lynx mortality associated with vehicle-collisions.

The conservation measures for grazing in lynx core areas include management of riparian areas to assure adequate habitat for snowshoe hares, the primary prey species for Canada lynx (ILBT 2013). The Plan includes management direction for grazing in riparian management areas specific to providing habitat for snowshoe hares.

The Plan would provide management direction to address the direct and indirect effects of forest management activities on the recovery of Canada lynx. The direct and indirect effects that the plan direction addresses include desired conditions for vegetation management to provide lynx habitat components (foraging, denning, travel), plan components to limit the effects of winter recreation on Canada lynx habitat connectivity and habitat use, plan direction that limits speed on forest roads to reduce the risk of mortality to lynx from vehicle collisions, and standards and guidelines to improve conditions in riparian areas that provide habitat for snowshoe hares, a primary food resource for lynx. The Plan would provide more protections for Canada lynx than any of the other alternatives, and would make a substantial contribution to the recovery of Canada lynx.

5.6.2 Climate Change

The potential effects of climate change on Canada lynx identified by the Interagency Lynx Biology Team (2013) included: 1) an upward shift in elevation or latitudinal distribution of lynx and prey, 2) a decrease in the amount of habitat and population size from reduced snow persistence and increased disturbance events (e.g., fires), 3) changes in demographic rates, such as survival and reproduction, and 4) changes in predator-prey relationships.

Climate change adaptations to address these effects include restoration of landscape-scale disturbance regimes to better mimic natural patterns and processes (Spies et al. 2010, Gaines et al. 2012), and maintaining or restoring habitat connectivity to allow Canada lynx to adjust their ranges to changing

conditions (Heller and Zavaleta 2009, ILBT 2013, Squires et al. 2013). There is management direction in the Plan to implement these climate change adaptations through the emphasis on dynamic-landscape restoration, and the restoration of conditions that would enhance connectivity of habitats.

5.6.3 Cumulative Effects

Past, present, and reasonably foreseeable future non-federal actions that affect lynx habitat include timber harvest and fuels reduction, recreation, human development, and grazing on private and state lands. In addition, legal trapping of lynx, timber harvest, oil and gas development, mining and human access in British Columbia have and would continue to affect Canada lynx and their habitat.

Border Patrol activities on the Forest have the potential to cause disturbance through use of roads or trails that are normally closed to motorized use. The exact extent or amount of the impact over the life of the plan is difficult to predict because many factors could influence Border Patrol activities.

Grazing has occurred and would continue to take place on off-forest lands potentially impacting deciduous or riparian habitats for lynx prey species.

Fuels reduction projects are possible on all land ownerships, in particular where they are near residences. These can be done in such a way that they restore wildlife habitat that has been affected by fire exclusion.

Recreation is likely to increase on all land ownerships due to increasing demands from the public. This would increase human disturbance and result in areas with relatively low human disturbance on NFS lands becoming more important to lynx and other wildlife.

In Canada, timber harvesting, oil and gas development, coal mining, and the proliferation of human access associated with these industries, have and would continue to affect lynx habitat. Legal trapping occurs north of the Forest in Canada and could reduce the potential for lynx to disperse into the lynx habitat on the Forest. Trapping is not legal in Idaho, Montana, or Washington.

5.6.4 Summary of Effects

The proposed revised Forest Plan would make a relatively high contribution to the recovery of the Canada lynx in both the short (≤20 years) and long (≤50 years) term, and result in a **May Effect, Likely to Adversely Affect** determination. This is because of the following:

1) The Plan incorporates the best available science and conservation measures identified in the recent version of the Lynx Conservation Assessment and Strategy (ILBT 2013), and the USFWS Recovery Outline (USFWS 2005);

2) The Plan would implement recommended climate change adaptations by focusing on the restoration of forest disturbance regimes and resiliency, and reducing the impacts of roads on habitat connectivity, and

3) The Plan addresses previous findings that existing management plans provided inadequate regulatory mechanisms to prevent the listing of lynx as a federally Threatened species (USFWS 2003).

5.7 Yellow-billed Cuckoo

Forest activities that directly influence the quality and availability of habitat for riparian dependent species such as the yellow-billed cuckoo include management of roads, recreation sites, and vegetation treatments that occur within riparian habitats.

5.7.1 Direct and Indirect Effects

The plan components for Yellow-billed cuckoo are in section 2.1.2.4 on page 39. Additional plan components are also found in the general wildlife section 2.1.2 page 34 and in the management area direction for focused and general restoration.

In the Plan, management direction for watersheds and riparian habitats is consolidated into one consistent set of plan components that applies to the entire Colville National Forest, and is consistent with other national forests in Region 6. Standards and Guidelines would limit management activities that are allowed to occur within riparian habitats. The Plan includes greater riparian management area widths along intermittent streams, lakes, and ponds than in the areas previously covered by the INFISH forest plan amendment (USFS 1998).

The implementation of the Plan would reduce the effects of roads on riparian habitat within 10 watersheds in the short-term (<20 years based on Objectives). In the longer-term (<50 years based on Desired Conditions) the Plan would result in road densities of equal to or less than 1 miles/square mile on 23 percent of the Forest, and equal to or less than 2 miles/square mile on 48 percent of the Forest.

5.7.2 Climate Change

Riparian habitats are considered vulnerable to the anticipated effects of climate change (Lawler et al. 2014). The primary effect that is anticipated from climate change is the loss of habitat and reduced connectivity of riparian habitats due to altered hydrologic and disturbance (fire) regimes (Lawler et al. 2014). The dynamic-landscape restoration approach that is emphasized in the Plan would result in landscapes, including disturbance regimes, that are more resilient to climate change through the application of strategically located restoration treatments in priority locations. In addition, emphasis of the Plan in reducing the negative effects of roads on riparian habitats would help to make them more resilient to disturbances.

5.7.3 Cumulative Effects

On private lands, Washington State Forestry Practices Act provides some limited protections for riparian habitats. Management of priority watersheds emphasizes using an “all lands” approach to enhance coordination across landowners and may enhance conditions for riparian associated wildlife species. However, habitat protections for riparian habitats on federal lands would help to mitigate for the limited protections and cumulative effects that occur on private lands.

5.7.4 Summary of Effects

The implementation of the Plan would results in a **May Effect, Likely to Adversely Affect** determination and make a relatively high contribution to the recovery of the yellow-billed cuckoo. This determination is based on the following:

1) The Plan would make substantial reductions in the negative effects that road have on riparian habitats.

2) The Plan would consolidate and make more consistent management direction for riparian habitats using standards and guidelines and providing larger management zones that existing direction.

3) The Plan would emphasize landscape restoration that would reduce the potential effects of uncharacteristically severe fires on riparian habitats.

5.8 Wolverine

Gaines et al. (2017) completed a viability assessment for a wide-range of focal species in northeastern Washington, including wolverine, to establish baseline conditions and inform forest plan revision. Their viability assessment considered the current condition of vegetation, potential denning, road and winter recreation routes on their habitat. They found that the current viability outcome scores were considerably lower than those estimated for historical conditions (pre-settlement), largely due to the prevalence of roads. They made the following recommendations that were incorporated into the plan components of the revised Colville Forest Plan:

- Reduce road densities to increase the amount of source habitats for wolverine (Raphael et al. 2001, Wisdom et al. 2000) in the planning area.
- Limit recreational activities in potential and known denning habitat during the periods when dens are occupied (Banci 1994, Raphael et al. 2001).

Motorized recreation and the use of forest roads may influence the habitat use and populations of wolverines. These potential effects include displacement from key habitats, disturbance during critical periods, and an increased risk of mortality (see Wisdom et al. 2000 and Gaines et al. 2003 for a complete list of road and trail associated factors that influence wolverine). The effects of motorized recreation and roads can occur during the non-winter period or during the winter period when snowmobiling or ski-trail grooming occurs.

5.8.1 Direct and Indirect Effects

The implementation of the Plan would reduce the negative effects of roads on wolverine habitat in 10 watersheds in the short-term (<20 years based on Objectives). In the longer-term (<50 years based on Desired Conditions) the Plan would result in road densities of equal to or less than 1 miles/square mile on 23 percent of the Forest, and equal to or less than 2 miles/square mile on 48 percent of the Forest. The remainder of the Forest would remain unroaded. Habitat effectiveness (as affected by roads) for wolverines would be improved from a current low to moderate level of habitat effectiveness in 26 watersheds to a moderate level of habitat effectiveness in 17 watersheds and a high level of habitat effectiveness in 9 watersheds as Desired Conditions for road access are achieved.

Overall, the Plan would provide greater habitat effectiveness for wolverines than the current plan. The Plan would improve habitat conditions for wolverines, whose habitats are influenced by roads and motorized trails.

5.8.2 Climate Change

The sensitivity of wolverine to the effects of climate change were considered to be high (CCSD 2013). An important climate change adaptation that has been recommended for wolverine is to reduce the negative effects of non-climate related stressors such as the effects of roads (and trails) on habitat (Gaines et al. 2012, Lawler et al. 2014). By reducing the negative effects of roads, habitats can become more resilient to the effects of climate change, and habitat connectivity can be restored allowing

wolverines to adjust their ranges as conditions change. The implementation of the Plan includes management direction to make substantial improvement to habitat effectiveness for wolverines by reducing road impacts and densities.

5.8.3 Cumulative Effects

Past, present, and reasonably foreseeable future non-federal actions that affect wolverine habitat include timber harvest and fuels reduction, recreation, human development, and grazing on private and state lands.

Border Patrol activities on the Forest have the potential to cause disturbance through use of roads or trails that are normally closed to motorized use. The exact extent or amount of the impact over the life of the plan is difficult to predict because many factors could influence Border Patrol activities.

Grazing has occurred and would continue to take place on off-forest lands potentially impacting deciduous or riparian habitats for wolverine prey species.

Fuels reduction projects are possible on all land ownerships, in particular where they are near residences. These can be done in such a way that they restore wildlife habitat that has been affected by fire exclusion.

Recreation is likely to increase on all land ownerships due to increasing demands from the public. This would increase human disturbance and result in areas with relatively low human disturbance on NFS lands becoming more important to wolverine and other wildlife.

5.8.4 Summary of Effects

The implementation of the Plan would make a relatively high contribution to the maintenance and restoration of habitat for wolverines and result in a **May Effect, Likely to Adversely Affect** determination. This would occur because:

1) The Plan includes management direction to substantially reduce the impact of roads on habitat effectiveness for wolverines, and

2) The Plan does not alter the current impacts that summer and winter motorized trails have on habitat effectiveness for wolverines.

5.9 White Bark Pine

5.9.1 Direct and Indirect Effects

Alpine and subalpine meadows, fellfields, and parklands habitats are generally a high vulnerability group with exposure to environmental change from climatic and fire regime factors (Miller-Struttmann et al. 2015, Munson and Sher 2015). Whitebark pine is exposed to threats from insect and disease, as well as environmental changes (Devine et al. 2012). Additionally, this group of species has exposure to livestock grazing, recreational activity, hydrologic regime alteration, and plant collecting. Together this creates high to medium levels of risk for desired conservation outcomes.

The plan components that are relevant to the recovery and conservation of whitebark pine on the Colville National Forest are in section 2.1.3. The Plan promotes landscape scale restoration of sustainable vegetation types within historic and future ranges of variation, it would continue to provide capable habitat as a corollary to protection of the source populations. This includes restoration of disturbances, such as fire, that are responsible for landscape character. The proposed conservation

desired future conditions to maintain or enhance existing populations are mediated by application of plan components. These include protective standards and guidelines as well as implementation of plant monitoring that targets population and habitat conditions and trends.

The areas occupied by whitebark pine are either in wilderness, proposed wilderness, or backcountry. There will be very few other management activities in these management areas. The vulnerability rating is low for Whitebark pine. In Table 27, Ratings are high (H), medium (M), and low (L). Site reflects the number of sites and individuals on the Colville NF, Area reflects the total occupied area on the Colville NF, and Plant reflects the State NatureServe ranks. Table 28 shows the highest ranked threats are natural events and not management activities. The Forest will implement the R6 Whitebark Pine Restoration Strategy to maintain and enhance whitebark pine. A large part is to collect seed to maintain a genetic seed bank of the whitebark pine. These efforts are to reduce the cumulative effects from the threats listed below.

Table 27 - Vulnerability

Scientific Name	Site	Area	Plant	Vulnerability Rating
Pinus albicaulis	L	L	L	L

Table 28 illustrates the interplay between vulnerability (Table 27), threats, the resultant risk, and the management actions that are necessary to ensure viability of each taxon and habitat group.

Table 28 - Vulnerability, Threats, Risks, and Management Actions

Scientific Name		Pinus albicaulis
Habitat Group		Alpine, subalpine meadows, fellfields, parklands
Threats (associated risks rated High (H), Medium (M), and Low (L)		
Vulnerability	Low	Vulnerability ratings are based on plant distribution, number of sites (majority of weight), area occupied, number of individual plants, state rank.
Alternation of hydrologic regimes	Low	Wetland/riparian species rated as % of habitat; data lacking for wetland species still rated as high because of wetland habitat; low or medium for other habitat.
Diseases and Insects	High	
Environmental Change	High	Environmental change related to fire, climate, conifer encroachment, riverbank erosion.
Gopher Disturbances	Low	
Invasives	Low	Invasives rating comes from risk analyses for direct effect and threat in 2008 analyses of priority watersheds. Percent of area under these categories was rated as High, Medium, or Low. If threat was identified somewhere else (e.g., literature) w/out data then threat was rated as Low.
Livestock grazing and trampling	Medium	
Plant Collecting	Low	
Windthrow	Low	This threat is associated with sites in conifer or hardwood-dominated riparian stands.
Recreational use	Low	Occupied habitat is in wilderness, proposed wilderness, or backcountry. Recreational use involves trail use.
Road building, maintenance	Low	Occupied habitat is in wilderness, proposed wilderness, or backcountry. No roads are allowed in these management areas.
Timber Harvest	Low	Occupied habitat is in wilderness, proposed wilderness, or backcountry. No harvest is allowed in these management areas.
Risks		Disturbance regime, regional endemic in NE WA, MAs, allotments
Management Action		Implement R6 Whitebark Pine Restoration Strategy

Insect and Disease

Assessments describe the existing threats for the *Pinus albicaulis* ecosystem from both western white pine blister rust and mountain pine beetle (USDI FWS 2011, Spies et al. 2010). Across the range of *Pinus albicaulis*, these agents have contributed significantly to recent tree mortality. This species is a candidate for federal listing with a "warranted but precluded" finding issued in 2011. Continued implementation of the Pacific Northwest whitebark pine restoration strategy would be a critical management action to accomplish conservation goals. In the Pacific Northwest, whitebark pine is highly vulnerable to insects and diseases (Devine et al. 2012).

5.9.2 Climate Change

The sensitivity of white bark pine to the effects of climate change are considered to be high.

5.9.3 Cumulative Effects

Past, present, and reasonably foreseeable future non-federal actions that affect whitebark pine habitat include timber harvest, fuels reduction, and grazing on private and state lands. These activities may reduce fuel loadings which would reduce the risk of large wildfires. Actions such as thinning to reduce bark beetle outbreaks will also beneficially affect nearby populations of whitebark pine.

5.9.4 Summary of Effects

The conservation outcome of implementation of the Plan **May Effect, Likely to Adversely Affect** determination. This is because of the following:

1) The Forest will implement the R6 Whitebark Pine Restoration Strategy to maintain and enhance whitebark pine.
2) The proposed conservation desired future conditions to maintain or enhance existing populations are mediated by application of plan components.

6.0 References

Agee, J.K. 2000. Disturbance ecology of North American boreal forests and associated northern mixed/subalpine forests. Pages 39-82 in Ruggerio, L.F.; Aubry, K.B.; Buskirk, S.W.; Koehler, G.M.; Krebs, C.J.; McKelvey, K.S.; Squires, J.R. Ecology and Conservation of Lynx in the United States. University Press of Colorado, Denver, CO.

Al-Chokhachy, R., B. B Roper, E.K. Archer, and S. Miller 2011. Quantifying the Extent of and Factors Associated with the Temporal Variability of Physical Stream Habitat in Headwater Streams in the Interior Columbia River Basin', Transactions of the American Fisheries Society, 140: 2, 399 – 414.

Al-Chokhachy, R., B. B. Roper, and E. Archer. 2010. Evaluating the status and trends of physical stream habitat in headwater streams within the interior Columbia River and upper Missouri River basins using an index approach. Transactions of the American Fisheries Society 139:1041–1059.

Almack, J.A. 1998. Mountain caribou recovery in the southern Selkirk Mountains of Washington, Idaho, and British Columbia. Progress report, October 1995-September 1998. Washington Department of Fish and Wildlife, Olympia, WA. 45 pp.

Archer, E., J.V. Ojala and A.Van Wagenan. 2016. Stream habitat condition for sites in the Colville National Forest. PacFish/InFish Biological Opinion Monitoring Program. USDA Forest Service, Logan, Utah. July 28, 2016. 92 pp. Available at Colville National Forest Headquarters, Colville, WA.

Archer, E., R. Al-Chokhachy, J. Heitke, P. Ebertowski, R. Leary, T. Romano and B. B. Roper. 2009. PACFISH INFISH biological opinion effectiveness monitoring program for streams and riparian areas 2009 Annual Summary Report. Logan, Utah, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fish and Aquatic Ecology Unit: 48 p.

Aubry, K.B., K.S. McKelvey, and J.P. Copeland. 2007. Distribution and broad-scale habitat relations of the wolverine in the contiguous United States. Journal of Wildlife Management 71: 2147-2159.

Banci, V. 1994. Wolverine.

Benda, L., D. Miller, P. Bigelow and K. Andras. 2003. Effects of post-wildfire on channel environments, Boise River, Idaho. Forest Ecology and Management 178: 105-119

Bisson, P. A., G. H. Reeves, R. E. Bilby, and R. J. Naiman. 1997. Watershed management and Pacific salmon: desired future conditions. Pages 447-474 in D. J. Stouder, P. A. Bisson, and R. J. Naiman, editors. Pacific salmon and their ecosystems: status and future options. Chapman and Hall, New York.

Bjornn, T.C., and D.W. Reiser. 1991. Habitat requirements of salmonids in streams. Pages 83-138 In W.R. Meehan, ed. Influences of forest and rangeland management on salmonid fishes and their habitats, American Fisheries Society Special Publication 19

Booth, E.S. 1947. Systematic review of the land mammals of Washington. Ph.D. Thesis, State College of Washington, Pullman, Wa.

Carim, K., Young, M. McKelvey, K., Schwartz, M. 2016. Project: Environmental DNA Sampling for Detection of Salmonid Fish by the United States Forest Service February 29, 2016. Colville National Forest, Colville WA. 15 pp.

Carroll, C., R.F. Noss, and P.C. Paquet. 2001. Carnivores as focal species for conservation planning in the Rocky Mountain region. Ecological Applications 11: 961-980.

Climate Change Sensitivity Database (CCSD). 2013. Climate change sensitivity database. University of Washington.

Copeland, J.P. 1996. Biology of the wolverine in central Idaho. M.S. Thesis, University of Idaho, Moscow, ID.

Copeland, J.P., J.M. Peek, C.R. Groves, W.E. Melquist, K.S. McKelvey, G.W. McDaniel, C.D. Long, and C.E. Harris. 2007. Seasonal habitat associations of the wolverine in central Idaho. Journal of Wildlife Management 71: 2201-2212.

Copeland, J.P., K.S. McKelvey, K.B. Aubry, L. Landa, J. Persson, R.M. Inman, J. Krebs, E. Lofroth, H. Golden, J.R. Squires, A. Magoun, M.K. Schwartz, J. Wilmot, C.L. Copelan, R.E. Yates, I. Kojola, and R. May. 2010. The bioclimatic envelope of the wolverine (Gulo gulo): do climatic constraints limit its geographic distribution? Canadian Journal of Zoology 88: 233-246.

Dalquest, W.W. 1948. Mammals of Washington. University of Kansas Publications, Museum of Natural History 2: 1-444.

Davis, C., Karrer, M., Kovalchik, B., Lillybridge, T., and C. Narsico, 2004. Landtype associations of north central Washington: Wenatchee, Okanogan, and Colville National Forests. USDA Forest Service, Wenatchee, WA. 118pp

Day, K. 2016. Watershed function, water quality, and water uses. Report prepared for the Colville National Forest forest plan revision March 2, 2015.

Everest, F. and G. E. Reeves. 2007. Riparian and aquatic habitats of the Pacific Northwest and southeast Alaska: ecology, management history, and potential management strategies. Gen. Tech. Rep. PNW-GTR-692. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 130 p.

FEMAT (Forest Ecosystem Management Assessment Team). 1993. Forest ecosystem management: an ecological, economic, and social assessment. Report of the Forest Ecosystem Management Assessment Team. U.S. Government Printing Office 1993-793-071. U.S. Government Printing Office for the U.S. Department of Agriculture, Forest Service; U.S. Department of the Interior, Fish and Wildlife Service, Bureau of Land Management, and National Park Service; U.S. Department of Commerce, National Oceanic and Atmospheric Administration and National Marine Fisheries Service; and the U.S. Environmental Protection Agency.

Flinn, P. 1956. Caribou of Idaho. Idaho Fish and Game Department, Boise, Idaho.

Freddy, D.J. 1974. Status and management of the Selkirk caribou head, 1973. M.S. Thesis, University of Idaho, Moscow, Idaho.

Furniss, M. J., T. D. Roelofs and C. S. Yee. 1991. Road construction and maintenance. In: Influence of Forest and Rangeland management on Salmonid Fishes and Their Habitats. W. R. Meehan, ed. Bethesda, Maryland. American Fisheries Society. Special Publication 19: 297-323.

Gaines, D., and S.A. Laymon. 1984. Decline, status, and preservation of the yellow-billed cuckoo in California. Western Birds 15: 49-80.

Gaines, W.L.; Peterson, D.W.; Thomas, C.A.; Harrod, R.J. 2012. Adaptations to climate change: Colville and Okanogan-Wenatchee National Forests. U.S. Department of Agriculture, Forest Service, Gen. Tech. Rep. PNW-GTR-862.

Gaines, W.L.; Singleton, P.H.; Ross, R.C. 2003. Assessing the cumulative effects of linear recreation routes on wildlife habitats on the Okanogan and Wenatchee National Forests. U.S. Department of Agriculture, Forest Service, Gen. Tech. Rep. PNW-GTR-586.

Gaines, W.L.; Wales, B.C.; Suring, L.H.; Begley, J.S.; Mellen-McLean, K.; Mohoric, S. 2017. Terrestrial species viability assessments for the National Forests in northeastern Washington. U.S. Department of Agriculture, Forest Service, Gen. Tech. Rep. PNW-GTR-907.

Gregory, J.S., and B.L.Gamet. 2009. Cattle trampling of simulated bull trout redds. North American Journal of Fisheries Management 29:361-366.

Gregory, S.V. F.T. Swanson, W.A. McKee, K.W. Cummins. 1991. An ecosystem perspective of riparian zones. Bioscience 41:540-551

Gucinski, Hermann; Furniss, Michael J.; Ziemer, Robert R.; Brookes, Martha H. 2001. Forest roads: a synthesis of scientific information. Gen. Tech. Rep. PNWGTR-509. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 103 p.

Haak, A.L. and J.E. Williams. 2012. Spreading the risk; native trout management in a warmer and less-certain future. North American Journal of Fisheries Management 32:387-401.

Heller, N.E.; Zavaleta, E.S. 2009. Biodiversity management in the face of climate change: a review of 22 years of recommendations. Biological Conservation 142: 14-32.

Hessburg, P.F., T. A. Spies, D. A. Perry, C. N. Skinner, A. H. Taylor, P. M. Brown, S. L. Stephens, A. J. Larson, D. J. Churchill, N. A. Povak, P. H. Singleton, B. McComb, W. J. Zielinski, B. M. Collins, R. B. Salter, J. J. Keanem, J. F. Franklin, G. Riegel. 2016. Tamm Review: Management of mixed-severity fire regime forests in Oregon, Washington, and Northern California. Forest Ecology and Management 366: 221–250.

Inman, R.M., M.L. Packila, K.H. Inman, A.J. McCue, G.C. White, J. Persson, B.C. Aber, M.L. Orme, K.L. Alt, S.L. Cain, J.A. Fredrick, B.J. Oakleaf, and S.S. Sartorious. 2012. Spatial ecology of wolverines at the southern periphery of distribution. Journal of Wildlife Management 76: 778-792.

Interagency Grizzly Bear Committee (IGBC). 1998. Interagency Grizzly Bear Committee access management task force report. Interagency Grizzly Bear Committee, Denver, CO. 6 pp.

Interagency Lynx Biology Team (ILBT). 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.

Isaak, D. J., M. K. Young, C, H. Luce, S. W. Hostetler, S. J. Wengerd, E. E. Peterson, J, M. Ver Hoeff, M. C. Groce, D. L. Horan, and D. E. Nagel. 2016. Slow climate velocities of mountain streams portend

their role as refugia for cold-water biodiversity. Proceedings of the National Academy of Sciences. April 2016. 6pp

Isaak, D.J., C.H. Luce, B.E. Rieman, D.E. Nagel, E.E. Peterson, D.L. Horan, S. Parkes, and G. Chandler. 2010. Effects of climate change and wildfire on stream temperatures and salmonid thermal habitat in a mountain river network. Ecological Applications 20:1350-1371.

ISAB (Independent Scientific Advisory Board). 2003. A review of strategies for recovering tributary habitat. ISAB 2003-2. Report for the Northwest Power and Conservation Council. Portland, Oregon March 31, 2003. 56 pp.

ISAB (Independent Scientific Advisory Board). 2007. Climate change impacts on Columbia Basin fish and wildlife. ISAB Climate Change Report ISAB 2007-2 to for the Northwest Power and Conservation Council. Portland, Oregon May 11, 2007. Accessed at: http://www.nwcouncil.org/media/31247/isab2007_2.pdf. March 6, 2014.

Iten, C., T.A. O'Neil, K.A. Bettinger, and D.H. Johnson. 2001. Extirpated species of Oregon and Washington. Pages 452-473 in D.H. Johnson and T.A. O'Neil, eds. Wildlife-Habitat Relationships in Oregon and Washington. Oregon State University Press, Corvallis, Oregon.

Kasworm, W. 2016. Cabinet-Yaak and Selkirk Mountains Grizzly Bear Ecosystems Update 10/3/2016. U.S. Fish and Wildlife Service, Libby, MT.

Kasworm, W.F., H. Carriles, T.B. Radandt, J.E. Teisberg, M. Proctor, and C. Servheen. 2012. Cabinet-Yaak grizzly bear recovery area 2011 research and monitoring progress report. U.S. Fish and Wildlife Service, Missoula, MT. 90 pp.

Kershner, J.L., E.K. Archer, M. Coles-Ritchie, E.R. Cowley, R.C. Henderson, K. Kratz, C.M. Quimby, D.L. Turner, L.C. Ulmer and M.R. Vinson. 2004. Guide to effectiveness monitoring of aquatic and riparian resources. Gen, Tech. Rep. RMRS-GTR-121. Fort Collins, CO: U.S. Department of Agriculture, Rocky Mountain Research Station. 57 p.

Koehler, G.M.; Maletzke, B.T.; von Kienast, J.A.; Aubry, K.B.; Wielgus, R.B.; Naney, R.H. 2008. Habitat fragmentation and persistence of lynx populations in Washington State. Journal of Wildlife Management. 72: 1518-1524.

Krebs, J.A., E.C. Lofroth, and I. Parfitt. 2007. Multiscale habitat use by wolverines in British Columbia, Canada. Journal of Wildlife Management 71: 2180-2192.

Lanigan, Steven H.; Gordon, Sean N.; Eldred, Peter; Isley, Mark; Wilcox, Steve; Moyer, Chris; Andersen, Heidi. 2012. Northwest Forest Plan—the first 15 years (1994–2008): watershed condition status and trend. Gen. Tech. Rep. PNW-GTR-856. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 155 p.

Lawler, J.J.; Raymond, C.L.; Ryan, M.E.; Case, M.J.; Rochefort, R.M. 2014. Climate change, wildlife, and wildlife habitat in the North Cascade Range. Pages 191-260 in Raymond, C.L.; Peterson, D.L.; Rochefort, R.M. eds. Climate change vulnerability and adaptation in the North Cascades Region, Washington. U.S. Department of Agriculture, Forest Service, Gen. Tech. Rep. PNW-GTR-892.

Laymon, S.A., and M.D. Halterman. 1987. Can the western subspecies of the yellow-billed cuckoo be saved from extinction? Western Birds 18: 19-25.

Layser, E.F. 1974. A review of the mountain caribou of northeastern Washington and adjacent northern Idaho. Journal of the Idaho Academy of Science, Special Research Issue 3:1-63.

Lee, D. C., J. R. Sedell, B. E. Rieman, R. F. Thurow, J. E. Williams, and others. 1997. Broadscale Assessment of Aquatic Species and Habitats. Pages 1057-1496 in S. J. Arbelbide, editor. An Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins: Vol. III. USDA Forest Service General Technical Report PNW-GTR-405

Leopold, L. 1994. A view of the river. Harvard University Press, Cambridge, MA: 298pp.

Lewis, J.C. 2016. Periodic status review for the lynx in Washington. Washington Department of Fish ad Wildlife, Olympia, Wa. 17 pp.

Lofroth, E.C., and J. Krebs. 2007. The abundance and distribution of wolverines in British Columbia, Canada. Journal of Wildlife Management 71: 2159-2169.

Lyons, A.L., P.H. Singleton, W.L. Gaines, J.C. Lewis, and B. Maletzke. In prep. Canada lynx carrying capacity in Washington. Draft report for the Washington Department of Fish and Wildlife, Contract No. 16-06588.

MacDonald, K., K. Day and K. Honeycutt. 2016. Fisheries report. Colville National Forest plan revision final environmental impact statement. Colville National Forest, Colville, WA. December 12, 2016.

Mantua, N., I. Tohver, and A. Hamlet. 2010. Climate change impacts on streamflow extremes and summertime stream temperature and their possible consequences for freshwater salmon habitat in Washington State. Climate Change 102:187-223.

McKelvey, K.S.; Ortega, Y.K.; Koehler, G.M.[and others]. 2000. Canada lynx habitat and topographic use patterns in north central Washington: a reanalysis. USDA Forest Service, Rocky Mountain Research Station, RMRS-GTR-30WWW.

McMahon, T.E., A.V. Zale, F.T. Barrows, J.H. Selong and R.J. Daney. 2007. Temperature and competition between bull trout and brook trout: a test of the elevation refuge hypothesis. Transactions of the American Fisheries Society 136: 1313-1326.

Mehan, W.R. 1991. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19.

Meredith, C., B, Roper and E. Archer, 2014. Reductions in instream wood in streams near roads in the Interior Columbia River Basin. North American Journal of Fisheries Management, 34:493-506

Meredith, C., E.K. Archer, R. Scully, A. Van Wagenen, J.V. Ojala, R. Lokteff and B. Roper. 2012. PIBO effectiveness monitoring program for streams and riparian areas. USDA Forest Service 2012 Annual Summary report (available at: http://www.fs.fed.us/biology/resources/pubs/feu/pibo/2012_PIBOEM_AnnualReport9_12_2013update.pdf (March 20, 2014)

Mitchell, S.; Hamilton, D. 2007. Snowmobiling and Mountain caribou: a literature review of stewardship practices. Version 4.0. Nanuq Consulting Ltd. Nelson, BC.

Montgomery, D.R. and J.M. Buffington. 1998. Channel processes, classification and response. Pages 13-42 in R.J. Naiman & R.E. Bilby (eds.) River Ecology and Management: Lessons from the Pacific Coastal Ecoregion. Springer. New York, New York

Mountain Caribou Science Team. 2005. Mountain caribou in British Columbia: a situation analysis. 19 May 2005.

Naiman, R. J., T. J. Beechie, L. E. Benda, D. R. Berg, P. A. Bisson, L. H. MacDonald, M. D. O'Connor, P. L. Olson and E. A. Steel. 1992. Fundamental elements of ecologically healthy watersheds in the Pacific Northwest coastal ecoregion. In: Watershed Management, Balancing Sustainability and Environmental Change. R. Naiman, ed. New York. McGraw-Hill: 127-188.

National Park Service. 2012. North Cascades National Park and Recreation Area Management Plan. USDI National Park Service, Sedro Woolley, Wa.

Ouren, D.S., C. Hass, C.P. Melcher, S.C. Stewart, P.D. Ponds, N.R. Sexton, L. Burris, T. Fancher, and Z.H. Bowen. 2007. Environmental effects of off-highway vehicles on Bureau of Land Management lands: A literature synthesis, annotated bibliographies, extensive bibliographies, and internet resources: U.S. Geological Survey Open-File Report 2007-1353.

Platts, W. S. 1991. Livestock grazing. pp. 389-424 in Meehan, ed., Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. American Fisheries Soc., Bethesda, Maryland. 751 p.

Post, E., J. Brodie, M. Hebblewhite, A.D. Anders, J.A.K. Maier, and C.C. Wilmers. 2009. Global population dynamics and hot spots of response to climate change. BioScience 59: 489-497.

Potyondy, J.P, and T.W. Geier 2010. Forest Service watershed condition classification technical guide. Available at : http://www.fs.fed.us/biology/resources/pubs/watershed/maps/watershed_classification_guide2011FS978.pdf. Accessed October 4, 2016

Proctor, M.F., C. Servheen, W. Kasworm, and T. Radandt. 2007. Trans-border Purcell and Selkirk Mt. grizzly bear project: annual report 2007. Birchdale Ecological Ltd., Kaslo, British Columbia, Canada.

Proctor, M.F., D. Paetkau, B. McLellen, G. Stenhouse, K. Kendall, R. Mace, W. Kasworm, C. Servheen, C. Lausen, M. Boyce, and C. Strobeck. 2012. Population fragmentation and inter-ecosystem movements of grizzly bears in western Canada and the northern USA. Wildlife Monograph.

Proctor, M.F., S.E. Nielson, W.F. Kasworm, C. Servheen, T.G. Radandt, A.G. MacHutchon, and M.S. Boyce. 2015. Grizzly bear connectivity mapping in the Canada-United States trans-border region. Journal of Wildlife Management.

Quigley, T.M., and S.J. Arbelbide, tech. eds. 1997. An assessment of ecosystem components in the Interior Columbia Basin and Portions of the Klamath and great basins: volume III. Gen.Tech.Rep. PNW-GTR-405. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 4 vol.

Raphael, M.G.; Wisdom, M.J.; Rowland, M.M. [and others]. 2001. Status and trends of habitats of terrestrial vertebrates in relation to land management in the interior Columbia River basin. Forest Ecology and Management. 153: 63-87.

Reeves, G. H.; B. R. Pickard, K.N. Johnson. 2016. An initial evaluation of potential options for managing riparian reserves of the Aquatic Conservation Strategy of the Northwest Forest Plan. Gen. Tech. Rep. PNW-GTR-937. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 97 p.

Reeves, G.H., L.E. Benda, K.M. Burnett, P.A. Bisson, and J. Sedell. 1995. A disturbance-based ecosystem approach to maintaining and restoring freshwater habitats of evolutionary significant units of anadromous salmonids in the Pacific Northwest. American Fisheries Society Symposium 17:334-349.

Reiss, K. Yuki, K. Gallo, P. Dawson, D. Konnoff, and L. Croft. 2008. Process for evaluating the contribution of national forest system lands to aquatic ecological sustainability. A regional pilot process conducted on the Okanogan-Wenatchee and Colville National Forests. USDA Forest Service, Pacific Northwest Region, Region 6. Portland, Oregon. June 5, 2008.

Rieman, B. E., J. T. Peterson, and D. L. Myers. 2006. Have brook trout (Salvelinus fontinalis) displaced bull trout (Salvelinus confluentus) along longitudinal gradients in central Idaho streams? Canadian Journal of Fisheries and Aquatic Sciences 63:63–78.

Rieman, B., D. Lee, D. Burns, R. Gresswell, M. Young, R. Stowell, J. Rinne, and P. Howell. 2003. Status of native fishes in the western United States and issues for fire and fuels management. Forest Ecology and Management 178: 197-211.

Rieman, B., D. Lee, G. Chandler and D. Myers. 1995. Does wildfire threaten extinction for salmonids? Responses of redband trout and bull trout following recent large fires on the Boise National Forest. Proceedings-Fire Effects on Rare and Endangered Species and Habitat Conference. Coeur d' Alene, Idaho. November 13-16, 1995.

Rieman, B.E. and J.D. McIntyre. 1993. Demographic and habitat requirements for conservation of bull trout. General technical Report INT-302. Ogden, UT. U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 38 p.

Rieman, B.E., D. Isaak, S. Adams, D. Horan, D. Nagel, C. Luce, D. Myers. 2007. Anticipated climate warming effects on bull trout habitats and populations across the interior Columbia basin Transactions of the American Fisheries Society 136:1552-1565.

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

Rominger, E.M. 1995. Late winter foraging ecology of woodland caribou. Ph.D. Dissertation, Washington State University, Pullman, Wa. 68 pp.

Rominger, E.M.; Oldemeyer, J.L. 1998. Early-winter habitat of woodland caribou, Selkirk Mountians, British Columbi. Journal of Wildlife Management 53: 238-243.

Rominger, E.M.; Robins, C.T.; Evans, M.A. 1996. Winter foraging ecology of woodland caribou in northeastern Washington. Journal of Wildlife Management 60: 719-728.

Roni, P. G. Pess, T. Beechie, and S. Morley. 2010. Estimating changes in coho salmon and steelhead abundance from watershed restoration: how much restoration is needed to measurably increase smolt production? North American Journal of Fisheries Management 30:1469–1484.

Rosgen, D.L. 1996. Applied River Morphology. Wildland Hydrology. Pagosa Springs, Co. 390 p.

Rowland, M.M., M.J. Wisdom, D.H. Johnson, B.C. Wales, J.P. Copeland, and F.B. Edelmann. 2003. Evaluation of landscape models for wolverines in the interior Northwest, USA. Journal of Mammalogy 8: 92-105.

Ruediger, B.; Claar, J.; Gniadek, S. [and others]. 2000 Canada lynx Conservation Assessment and Strategy. U.S. Department of Agriculture, Forest Service, Forest Service Publication, R1-00-53. Missoula, MT. 142 p.

Scott, M.D., and G. Servheen. 1985. Caribou ecology, July 1, 1982 to June 30, 1985. Job completion report, Pittman-Robertson Project No. W-160-R-12. Idaho Department of Fish and Game, Boise, Idaho.

Servheen , C., and M. Cross. 2010. Climate change impacts on grizzly bears and wolverines in the Northern U.S. and Transboundary Rockies: Strategies for conservation. Report on a workshop held Sept. 13-15, 2010 in Fernie, British Columbia. 23 pp.

Sestrich, C.M., T.E. McMahon and M.K. Young. 2011. Influence of fire on native and nonnative salmonid populations and habitat in a Western Montana basin. Transactions of the American Fisheries Society 140: 136-146.

Seton, E.T. 1927. Lives of game animals. Volume 3. Doubleday, Page and Company, Garden City, New York.

Simpson, K.; Terry, E. 2000. Impacts of backcountry recreation activities on mountain caribou. Management Concerns, Interim Management Guidelines and Research Needs. Wildlife Working Report No. WR-99. British Columbia Ministry of Environment, Lands, and Parks, Wildlife Branch. Victoria, BC. 11 pp.

Snover, A.K, G.S. Mauger, L.C. Whitely Binder, M. Krosby, and I. Tohver. 2013. Climate Change Impacts and Adaptation in Washington State: Technical Summaries for Decision Makers. State of Knowledge Report prepared for the Washington State Department of Ecology. Climate Impacts Group, University of Washington, Seattle.

Spence, B.C., G.A. Lomnicky, R.M. Hughes, and R.P. Novitzki. 1996. An ecosystem approach to salmonid conservation. ManTech Environmental Research Services, Inc., Corvallis, Oregon, to National Marine Fisheries Service, Habitat Conservation Division, Portland, Oregon (Project TR-4501-96-6057).

Spies, T.A.; Giesen, T.W.; Swanson, F.J.; Franklin, J.F.; Lach, D.; Johnson, K.N. 2010. Climate change adaptation strategies for federal forests of the Pacific Northwest, USA: ecological, policy, and socio-economic perspectives. Landscape Ecology.

Squires, J.R., N.J. DeCesare, J.A. Kolbe, and L.F. Ruggiero. 2010. Seasonal resource selection of Canada lynx in managed forests of the Northern Rocky Mountains. Journal of Wildlife Management 74: 1648-1660.

Squires, J.R.; DeCesare, N.J.; Olson, L.E.; Kolbe, J.A.; Hebblewhite, M.; Parks, S.A. 2013. Combining resource selection and movement behavior to predict corridors for Canada lynx at their southern range periphery. Biological Conservation. 157: 187-195.

Staab, B., M. Safeeq, G. Grant, D. Isaak, C. Luce, M. Kramer, D. Konnoff, J. Chatel, and J. Capurso. 2014. Climate change vulnerability assessment Resources for national forests and grasslands in the Pacific Northwest- Water Resources and Aquatic Ecosystems. USDA Forest Service, Pacific Northwest Region Portland, Oregon

Stinson, D.W. 2001. Washington state recovery plan for the lynx. Washington State Department of Fish and Wildlife, Olympia, WA. 78 pp.

Sweeney, B. W. and J. D. Newbold, 2014. Streamside forest buffer width needed to protect stream water quality, habitat, and organisms: A Literature Review. Journal of the American Water Resources Association (JAWRA) 50(3): 560-584. DOI: 10.1111/jawr.12203

Taylor, W.P. and W.T. Shaw. 1929. Provisional list of land mammals of the state of Washington. Occasional Papers of the Charles R. Conner Museum 2: 1-32.

Trombulak, S.C. and C.A. Frissell. 2000. Review of the ecological effects of roads on terrestrial and aquatic communities. Conservation Biology 14: 18-30.

U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) 1998. Endangered species consultation handbook. Procedures for conducting consultation and conference activities under section 7 of the Endangered Species Act. March 1998 Final (Place of publication unknown). 315 pp.

U.S. Fish and Wildlife Service (USFWS). 1993. Grizzly Bear Recovery Plan. Missoula, MT.

U.S. Fish and Wildlife Service (USFWS). 1994. Recovery plan for woodland caribou in the Selkirk Mountains. Portland, Or. 71 pp.

U.S. Fish and Wildlife Service (USFWS). 1999. A framework to assist in making Endangered Species Act determinations of effect for individual or grouped actions at the bull trout subpopulation watershed scale. Prepared by the U.S. Fish and Wildlife Service (adapted from the National Marine Fisheries Service). February 1998; Revised 6/11/99. (Place of publication unknown). 45 pp.

U.S. Fish and Wildlife Service (USFWS). 2000-Pend Oreille National Wildlife Refuge

U.S. Fish and Wildlife Service (USFWS). 2001. Amended Biological Opinion for continued implementation of the Colville National Forest Land and Resource Management Plan: FWS Reference 1-9-00-F-4. 68 pp.

U.S. Fish and Wildlife Service (USFWS). 2005. Recovery outline for the Canada lynx. U.S. Department of Interior, Fish and Wildlife Service, Missoula, Montana.

U.S. Fish and Wildlife Service (USFWS). 2008. Bull trout (Salvelinus confluentus) 5 year review: summary and evaluation. U.S. Fish and Wildlife Service. Portland, Oregon. 55 p. Accesses May 3, 2008 at: http://www.fws.gov/pacific/bulltrout/pdf/Bull%20Trout%205YR%20final%20signed%20042508.pdf.

U.S. Fish and Wildlife Service (USFWS). 2009. Revised final rule designating Critical Habitat for Canada lynx. Fed. Reg. 74(36): 8616-8702.

U.S. Fish and Wildlife Service (USFWS). 2011. Grizzly Bear 5-year Review: Summary and evaluation. U.S. Fish and Wildlife Service, Grizzly Bear Recovery Office, Missoula, MT.

U.S. Fish and Wildlife Service (USFWS). 2011. Biological Opinion on the Forest Plan amendments for Motorized Access Management within the Selkirk and Cabinet-Yaak Grizzly Bear Recovery Zones on the Kootenai, Idaho Panhandle, and Lolo National Forests. USFWS Montana Field Office, Kalispell, MT, and Northern Idaho Field Office, Spokane, WA. 227 pp.

U.S. Fish and Wildlife Service (USFWS). 2012 Endangered Species Act – section 7 consultation. Biological opinion. Consultation for Boundary Hydroelectric Project Commission No. 225-013) Pend Oreille County, Washington. U.S. Fish and Wildlife Service Reference number: 13410-2011-F-0199. U.S. Fish and Wildlife Service, Eastern Washington Field Office. Spokane, WA

U.S. Fish and Wildlife Service (USFWS). 2012. Designation of critical habitat for the southern Selkirk Mountains population of woodland caribou: final rule. Federal Register: 77(229): 71042-71082.

U.S. Fish and Wildlife Service (USFWS). 2013. Endangered and threatened wildlife and plants: proposed threatened status for the western distinct population segment of the Yellow-billed Cuckoo. Federal Register 78(192): 61622-61666.

U.S. Fish and Wildlife Service (USFWS). 2015a. Recovery plan for the coterminous United States population of bull trout (Salvelinus confluentus). Portland, Oregon. xii + 179 pages. Available at: https://www.fws.gov/pacific/ecoservices/endangered/recovery/plans.html

U.S. Fish and Wildlife Service (USFWS). 2015b. U.S. Fish and Wildlife Service Informal consultation re: Colville Confederated Tribes' Sanpoil River fish habitat restoration project, Ferry County, Washington. U.S. Fish and Wildlife Service Reference 01EWFW00-2015-I-0964. Eastern Washington Field Office. Spokane, Washington. 4pp.

U.S. Fish and Wildlife Service (USFWS). 2015c. Biological opinion for the Box Canyon Dam Upstream Passage Facility, FERC #P-2042, NWS-2014-754, Pend Oreille County, Washington. U.S. Fish and Wildlife Service Reference number:01EWFW00-2014-0798. U.S. Fish and Wildlife Service, Eastern Washington Field Office. Spokane, WA. 86 pp.

U.S. Fish and Wildlife Service (USFWS). 2016. Endangered Species Act - section 7 consultation. Biological opinion LeClerc Creek cattle grazing allotment project Pend Oreille County, Washington. U.S. Fish and Wildlife Service Reference 01EWFW00-2015-F-0285. U.S. Fish and Wildlife Service, Washington Fish and Wildlife Office. Spokane, Washington. 38 pp.

USDA Forest Service (USFS) and USDI Bureau of Land Management. 1994. Record of decision for amendments to Forest Service and Bureau of Land Management planning documents in the range of the northern spotted owl and standards and guidelines for management of habitat for

late-successional and old growth forest related species. (Place of publication unknown). 74 p. (plus Attachment A: standards and guides)

USDA Forest Service (USFS). 1988. Colville National Forest Land and Resource Management Plan. Colville, WA.

USDA Forest Service (USFS). 1998. East-side screens. USDA Forest Service, Portland, Or.

USDA Forest Service (USFS). 2003. Winter recreation strategy for the Sullivan Lake Ranger District. On file with USFS, Sullivan Lake Ranger District, Colville, Wa.

USDA Forest Service (USFS). 2008. Aquatic and riparian conservation strategy (ARCS). USDA Forest Service, Region 6. Portland, Oregon. August 13, 2008.

USDA Forest Service (USFS). 2016. Draft Aquatic and riparian conservation strategy version 2016.1. USDA Forest Service, Pacific Northwest and Pacific Southwest Regions. USDA Forest Service Pacific Northwest Region, Portland, Oregon. 125 pp. August 10, 2016.

USDA Forest Service and USDI Bureau of Land Management. 1995. Decision notice/decision record, FONSI, environmental assessment, and appendices for the implementation of interim strategies for managing anadromous fish-producing watersheds in eastern Oregon and Washington, Idaho, and portions of California (PACFISH). (Place of publication unknown). 305 p.

USDA Forest Service. 1995. Inland native fish strategy environmental assessment decision notice and finding of no significant impact: interim strategies for managing fish-producing watersheds in eastern Oregon and Washington, Idaho, western Montana, and portions of Nevada (INFISH). (Place of publication unknown): Intermountain, Northern, and Pacific Northwest Regions. 39 p.

USDA Forest Service. 2007, Aquatic restoration strategy. March 2005, revised November 2007. USDA Forest Service, Pacific Northwest Region. Portland, Oregon. 28 pp.

Wakkinen, W.L. and W.F. Kasworm. 2004. Demographics and population trends of grizzly bears in the Cabinet-Yaak and Selkirk Ecosystems of British Columbia, Idaho, Montana, and Washington. Ursus 15: 65-75.

Wakkinen, W.L., B.K. Johnson, and J.B. Slone. 2009. Selkirk Ecosystem project: January 2008 – December 2008. Idaho Department of Fish and Game, Boise, ID.

Warren, C.D., J.M. Peek, G.L. Servheen, and P. Zager. 1996. Habitat use and movements of two ecotypes of translocated caribou in Idaho and British Columbia. Conservation Biology 10: 547-553.

Washington Department of Fish and Wildlife (WDFW) and U.S. Forest Service (USFS). 2011. Surveys for Canada lynx on the Colville National Forest. Report on file, Colville National Forest, Colville, WA.

Washington Department of Fish and Wildlife (WDFW). 2012. Annual Report: Woodland Caribou. Washington Department of Fish and Wildlife, Olympia, WA. Pages 44-47.

Washington Department of Fish and Wildlife (WDFW). 2012. Annual Report: Yellow-billed Cuckoo. Washington Department of Fish and Wildlife, Olympia, WA. Pages 200-202.

Washington Department of Fish and Wildlife (WDFW); US Forest Service (USFS). 2001. Surveys for Canada lynx in the Kettle Mountains. Report on file with USFS, Colville National Forest, Colville, Wa.

Washington Department of Natural Resources (WDNR). 1996. Canada Lynx Conservation and Management Plan for the Loomis State Forest. Washington Department of Natural Resources, Olympia, WA.

WDFW 2013

Wenger, S.J., D. J. Isaak, J.B. Dunham, K.D. Fausch, C.H. Luce, H.M. Neville, B.E. Rieman, M.K. Young, D.E. Nagel, D.L. Horan and G.L. Chandler. 2011. Role of climate and invasive species in structuring trout distributions in the interior Columbia River Basin, USA. Canadian Journal of Fisheries and Aquatic Sciences 68: 988-1008.

Wiles, G.J. 2017. Periodic status review for the woodland caribou in Washington. Washington Department of Fish and Wildlife, Olympia, Wa. 24 pp.

Wiles, G.J., and K.S. Kalas. 2017. Draft status report for the Yellow-billed Cuckoo in Washington. Washington Department of Fish and Wildlife, Olympia, WA. 32 pp.

Winward, Alma H. 2000. Monitoring the vegetation resources in riparian areas. General Technical Report RMRS GTR-47. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 49 p.

Wisdom, M.J.; Holthausen, R.S.; Wales, B.C. [and others]. 2000. Source habitat for terrestrial vertebrates of focus in the interior Columbia basin: broad-scale trends and management implications. U.S. Department of Agriculture, Forest Service, Gen. Tech. Rep. PNW-GTR-485. Portland, OR.

Wondzell, S. M. and J. G. King. 2003 Postfire erosional processes in the Pacific Northwest and Rocky Mountain regions. Forest Ecology and Management 178: 75-87.

Glossary

TERM	DEFINITION
Active channel	The portion of a stream channel commonly wetted during and above base flows, identified by a break in rooted vegetation or moss growth on rocks along stream margins (Taylor and Love 2003). The active channel is somewhat lower than bankfull and is sometimes called the ordinary high water mark.
Active floodplain	The area bordering a stream that is inundated by flows at a surface elevation defined by two times the maximum bankfull depth measured at the thalweg. (Thalweg is a line drawn to join the lowest points along the entire length of a streambed in its downward slope, defining the deepest channel, thus making the natural direction or profile of a watercourse. The thalweg is almost always the line of fasted flow in any river).
Active restoration	Deliberate activities to influence the processes needed to improve conditions. Investment of human actions of the ecosystem processes and functions. As an example, this might include seeding native grasses and planting native shrubs and trees, or thinning trees to restore fire regimes.
Activity	A measure, course of action, or treatment that is undertaken to directly or indirectly produce, enhance, or maintain a desired condition or objective on a Forest, Grassland, Prairie, or other comparable administrative unit.
Animal unit month (AUM)	The amount of oven-dry forage required by 1 animal unit for a period of 30 days. An animal unit is considered to be 1 mature cow, either dry or with calf up to 6 months in age. (Society for Range Management. 1998. (Society for Range Management 1998)
Aquatic ecological condition	The AEC is a model to evaluate the status of local populations of focal species and their habitat at the HUC12 or sub-watershed scale. The results are then aggregated to produce an ecological sustainability or viability outcome for each focal species at the subbasin (HUC 8) scale. It is described in the Process for Evaluating the Contribution of National Forest System Lands to Aquatic Ecological Sustainability (Reiss et al. 2008).
Aquatic ecosystem	Any body of water and its associated riparian area, and all organisms and non-living components within it functioning as a natural system.
Assessment	An analysis and interpretation of the social, economic, or ecological characteristics of an area using scientific principles to describe existing conditions as they affect sustainability.
Grizzly Bear management unit	Areas established for use in grizzly bear analysis. GBMUs generally a) approximate female home range size; and b) include representations of all seasonal habitat components.
Biological legacy	Organisms, organic matter and biologically created patterns that persist from the pre-disturbance ecosystem and influence recovery processes in the post-disturbance ecosystem.
Canopy closure	The proportion of the sky hemisphere obscured by vegetation when viewed from a single point (Korhonen et al. 2006).
Canopy cover	The proportion of the forest floor covered by the vertical projection of tree crowns (Korhonen et al. 2006).
Capability	The potential of an area of land to produce resources, supply goods and services, and allow resource uses under an assumed set of management practices and at a given level of management intensity. Capability depends upon current conditions and site conditions such as climate, slope, landform, soils, and geology, as well as the application of management practices, such as silviculture or protection from fire, insects, and disease.
Characteristic fire	When a fire occurs within the time, space, and severity parameters of the natural fire regime of the vegetation group (Hardy, 2005). Also, see uncharacteristic fire.
Class I and II areas (air quality)	Class I areas defined under the Clean Air Act Amendments of 1977 are afforded the highest level of protection from air pollutants in the nation. All other lands in the nation are designated as Class II areas.
Coarse filter/coarse filter management	Land management that addresses the needs of all associated species, communities, environments and ecological processes in a land area (see fine filter management). Coarse filter conservation focuses on assuring adequate representation of ecosystem diversity, and is generally accomplished by comparing the current condition of landscape

TERM	DEFINITION
	structure and composition to a set of reference conditions. Management direction then addresses the landscape components that have departed from reference conditions to assure adequate representation across the plan area. A fine-filter approach may be needed if the coarse-filter does not adequately provide ecosystem conditions needed to maintain populations (Samson 2002) (see fine-filter).
Coarse woody debris	Coarse woody debris consists of any woody material greater than three inches in diameter and is derived from tree limbs, boles, roots, and large (greater than 12 inches in diameter) wood fragments and fallen trees in various stages of decay. Provides living spaces for a host of organisms and serves as long-term storage sites for moisture, nutrients, and energy.
Code of Federal Regulations (CFR)	The listing of various regulations pertaining to management and administration of the National Forest.
Community (ecological)	A group of organisms living together; any group of interacting organisms.
Connectivity	See *habitat connectivity*.
Core area/ core habitat	A core area represents the closest approximation of a biologically functioning unit consisting of habitat that could supply all the necessary elements for every life stage (*e.g.* spawning, rearing, migratory and adult) and include one or more groups of bull trout (USFWS 2014)
Corridor (utility)	See *Transportation and utility corridors*.
Corridor (wildlife)	Avenues along which wide ranging animals can travel, plants can propagate, genetic interchange can occur, populations can move in response to environmental changes and natural disasters, and threatened species can be replenished from other areas.
Cover	Vegetation used by wildlife for protection from predators, ~~or~~ to ameliorate conditions of weather, or in which to reproduce. **Hiding cover** – vegetation consisting primarily of trees, capable of hiding 90 percent of a standing adult animal from the view of a human at a distance of 200 feet or less. **Thermal cover** – cover used by animals to ameliorate chilling effects of weather, for elk, a stand of coniferous trees 40 feet or taller with an average crown closure of 70 percent or more.
Critical (key) habitat	Specific areas • within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to conservation, and those features may require special management considerations or protection; and • outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation http://www.nmfs.noaa.gov/pr/species/criticalhabitat.htm
Crossing (structure)	That point in a linear feature (i.e., trail, road, stream) where the feature intersects and continues past another feature (i.e. a road crosses over or through a stream). Crossing structures are man-made structures that facilitate the ability of an animal to travel across a road and reduce the likelihood of a collision with a vehicle.
Cultural resources	Such resources as archeological, historical, or architectural sites, structures, places, objects, ideas, and traditions that are identified by field inventory, historical documentation, or other evidence and that are important to specified social or heritage groups or scientific and management endeavors.
Cumulative effects	The combined effects of two or more management activities. The effects may be related to the number of individual activities, or to the number of repeated activities on the same piece of ground. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.
Decommission (roads)	Activities that result in restoration of unneeded roads to a more natural state through reestablishment of vegetation and restoration of ecological processes interrupted or adversely affected by the unneeded road (FSM 7734).

TERM	DEFINITION
Designated Monitoring Area (DMA)	A representative Designated Monitoring Area is a monitoring site in a riparian complex that is representative of a larger area. The DMA should be placed in the most sensitive complex responsive to management influences. (MIM Technical Reference 1737-23, 2011)
Designated route	A National Forest System (NFS) road or an NFS trail on NFS lands that is designated for motor vehicle use pursuant to 36 CFR 212.1 on a motor vehicle use map.
Desired conditions	The social, economic, and ecological attributes toward which management of the land and resources of the plan area are to be directed. Desired conditions are aspirations and are not commitments or final decisions approving projects and activities, and may be achievable only over a long period (36 CFR 219.7).
Desired landscape character	Appearance of the landscape to be retained or created over time, recognizing that a landscape is a dynamic and constantly changing community of plants and animals. Combination of landscape design attributes and opportunities, as well as biological opportunities and constraints. (Landscape Aesthetics-A Handbook for Scenery Management, Agriculture Handbook Number 701, December 1995, USDA Forest Service)
Developed recreation site	Distinctly defined area where facilities are provided for concentrated public use; e.g. campgrounds, picnic areas, boating sites, and ski areas.
Diameter at breast height (d.b.h.)	The diameter of a standing tree at a point 4 feet, 6 inches from ground level.
Dispersed recreation	Outdoor recreation that takes place outside developed recreation sites.
District Population Segment (DPS)	The term "DPS" is used by the U.S. Fish and Wildlife Service (USFWS) to refer to regional subgroups of bull trout and is the term used in the Endangered Species Act to describe subunits of species that are eligible for listing, or to describe subgroups of species that could be delisted separately by meeting specific recovery objectives identified in a Species Recovery Plan.
Disturbance	A discrete event that changes existing plant and wildlife community composition or structure, and interrupts, changes, or resets the ongoing successional sequence.
Disturbance processes	Stresses and agents that influence ecosystem dynamics and processes operating within known resilience parameters. Stresses and agents can include invasive species, fire, changes in climate, weather events (wind, ice), pollution, and timber harvest.
Disturbance regime	Any recurrent disturbance that tends to occur in a forested area. It is often defined in terms of timing, frequency, predictability, and severity. (Puettmann et al. 2009)
Diversity	The distribution and abundance of different plant and animal communities and species within an area.
Ecological conditions	Components of the biological and physical environment that can affect diversity of plant and animal communities and the productive capacity of ecological systems. These components could include the abundance and distribution of aquatic and terrestrial habitats, roads and other structural developments, human uses, and invasive, exotic species. (36 CFR 219.16)
Ecological health (ecosystem health)	The state of and ecosystem in which processes and functions are adequate to maintain diversity of biotic communities commensurate with those initially found there.
Ecological restoration	The process of assisting the recovery of resilience and adaptive capacity of ecosystems that have been degraded, damaged, or destroyed. Restoration focuses on establishing the composition, structure, pattern, and ecological processes necessary to make terrestrial and aquatic ecosystems sustainable, resilient, and healthy under current and future conditions. (FSM 2000 Chapter 2020).
Ecosystem	An interacting system of organisms considered together with their environment; for example, marsh, watershed, and lake ecosystems.
Ecosystem diversity	The variety and relative extent of ecosystem types, including their composition, structure, and processes, within all or a part of an area of analysis. (36 CFR 219.16)
Ecosystem health (ecological health)	A condition where the parts and functions of an ecosystem are sustained over time and where the system's capacity for self-repair is maintained, such that goals for uses, values, and services of the ecosystem are met. (www.icbemp.gov)

TERM	DEFINITION
Ecosystem services	Ecosystem services are the benefits people obtain from ecosystems. For example, healthy ecosystems provide: • The stuff of life – food, fresh water, timber, and fiber for clothing. • Protection from extreme weather, floods, fire, and disease. • Regulation of the Earth's climate. • Filtration of wastes and pollutants. • Regeneration of clean air, water, and soil. • Inspiration, recreation and spiritual sustenance, and support for a way of life." (Island Press 2007)
Edaphic	Relating to, or determined by, conditions of the soil, especially as it relates to biological systems; soil characteristics, such as water content, pH, texture, and nutrient availability that influence the type and quantity of vegetation in an area.
Effect (impact), economic	The change, positive or negative, in economic conditions, including the distribution and stability of employment and income in affected local, regional, and national economies that directly or indirectly results from an activity, project, or program.
Effect (impact), physical, biological	The change, positive or negative, in the physical or biological conditions that directly or indirectly results from an activity, project, or program.
Effect (impact), social	The change, positive or negative, in social and cultural conditions that directly or indirectly results from an activity, project, or program.
Endangered species	Any species of animal or plant that is in danger of extinction throughout all or a significant portion of its range. An endangered species must be designated by the Secretary of Interior as endangered in accordance with the Endangered Species Act of 1973.
Evaluation	An appraisal and study of social, economic, and ecological conditions and trends relevant to a unit. The analysis of monitoring data that produces information needed to answer specific monitoring questions. Evaluation may include comparing monitoring results with a predetermined guideline or expected norm that may lead to recommendations for changes in management, a land management plan, or monitoring plan. Evaluations provide an updated compilation of information for use in environmental analysis of future project and activity decisions.
Even-aged management	The application of a combination of actions that results in the creation of stands in which trees of essentially the same age grow together. Managed even-aged forests are characterized by a distribution of stands of varying ages (and, therefore, tree sizes) throughout the forest area. An even-aged stand of trees is one in which there are only small differences in age among the individual trees. Regeneration in a particular stand is obtained during a short period at or near the time that a stand has reached the desired age or size for regeneration and is harvested. Clearcut, shelterwood, or seed tree cutting methods produce even-aged stands.
Fine filter management	Management that focuses on the welfare of a single or only a few species rather than the broader habitat or ecosystem (see coarse filter management). Coarse and fine-filter management approaches are generally complimentary to provide ecological conditions that support ecosystem and species diversity.
Fire intensity	A general term relating to the heat energy released by a fire.
Fire management	Activities required for the protection of burnable wildland values from fire and the use of prescribed fire to meet land management objectives.
Fire regime	Description of the patterns of fire occurrences, frequency, size, severity, and sometimes vegetation and fire effects as well, in a given area or ecosystem. A fire regime is a generalization based on fire histories at individual sites. Fire regimes can often be described as cycles because some parts of the histories usually get repeated, and the repetitions can be counted and measured, such as fire return interval. (NWCG. 2008)
Fire severity	The degree to which a site has been altered or disrupted by fire. A product of fire intensity, fuel consumption, and residence time.

TERM	DEFINITION
Floodplain	Lowland and relatively flat area adjacent to rivers and streams, formed from river sediments that are subject to recurring flooding.
Focal species	Those species whose abundance, distribution, health and trend over time and space are indicative of the functioning of the larger ecological system (Committee of Scientists. 1999. USDA Forest Service). Focal species serve an umbrella function in terms of encompassing habitats needed for other species, are sensitive to the changes likely to occur in the area, or otherwise serve as an indicator of ecological sustainability. The long-term sustainability of the focal species is assumed to be representative of a group of species with similar ecological requirements and this group is assumed to respond in a similar manner to environmental change.
Forage	All browse and non-woody plants available to livestock or wildlife for grazing or harvestable for feed.
Forb	Any herb other than grass.
Forest health	The perceived condition of a forest derived from concerns about such factors as its age, structure, composition, function, vigor, presence of unusual levels of insects and disease, and resilience to disturbance. Perception and interpretation of forest health are influenced by individual and cultural viewpoints, land management objectives, spatial and temporal scales, the relative health in stands that comprise the forest, and the appearance of the forest at a point in time.
Forest land	Land at least 10 percent occupied by forest trees of any size or formerly having had such tree cover and not currently developed for non-forest use. Lands developed for non-forest use include areas for crops, improved pasture, residential or administrative areas, improved roads of any width and adjoining road clearing, and power line clearings of any width. (36 CFR 219.16)
Forest products, commercial use (non-timber harvest)	The sale of special forest products to commercial entities.
Forest products, firewood, commercial use	The sale of firewood, a type of special forest product, to commercial entities.
Forest products, firewood, permitted personal use	The collection of firewood, a type of special forest product, for personal, non-commercial use.
Forest road or trail	A road or trail wholly or partly within or adjacent to and serving the National Forest System that the Forest Service determines is necessary for the protection, administration, and utilization. (Title 36, Code of Federal Regulations, Part 212—Administration of the Forest Transportation System, section 212.1.)
Fuels	Any material that will carry and sustain a forest fire, primarily natural materials, both live and dead.
Goods and services	The various outputs, including on-site uses, produced from forest and rangeland resources.
Grazing allotment	Area designated for the use of a certain number and kind of livestock for a prescribed period of time.
Grizzly bear core habitat	An area of secure habitat within a bear management unit that contains no motorized travel routes or high use non-motorized trails during the non-denning season and is more than 0.3 miles (500 meters) from a drivable road. Core areas do not include any gated roads but may contain roads that are impassible due to vegetation or constructed barriers. Core areas strive to contain the full range of seasonal habitats that are available in the bear management unit.
Grizzly bear management unit (BMU)	A subunit of the Selkirk Grizzly Bear Recovery Area. Each BMU is intended to approximate the size of a female grizzly bear home range, include some portion of all seasonal habitats, and not cross political boundaries of land management agencies. Boundary lines follow natural features such as rivers, streams, and watershed boundaries; and man-made features such as roads, ownership and Public Land Survey System (PLSS) section lines. A project analysis unit upon which direct, indirect and cumulative effects analyses are performed.

<table>
<tr><th>TERM</th><th>DEFINITION</th></tr>
<tr><td>Groundwater-dependent system (ecosystem)</td><td>An area that requires access to groundwater to maintain its community of plants, animals, and processes. Examples include springs, seeps, fens, and wetlands.</td></tr>
<tr><td>Guidelines</td><td>Information and guidance for project and activity decision making to help achieve desired conditions and objectives in the plan area.</td></tr>
<tr><td>Habitat capability</td><td>The estimated ability of an area, given existing or predicted habitat conditions, to support a wildlife, fish, or plant population. It is measured in terms of potential population numbers.</td></tr>
<tr><td>Habitat connectivity</td><td>A measure of the ability of organisms to move among separated patches of suitable habitat (Hilty et al. 2006), and is important for providing the long-term viability of populations (Hanski 2002), and for allowing species to respond to changing climate (Heller and Zavleta 2009). Landscape features influence how of if a species can move. These may include natural features such as topography or land cover, or human created features such as highways or roads.</td></tr>
<tr><td>Habitat effectiveness</td><td>A measurement of the effect of human access on wildlife and wildlife habitat. In this proposal habitat effectiveness is analyzed as an index of the amount of habitat that is impacted by human access for a given species. Generally, two types of indices (measures) are used to assess the impacts of roads and trails on wildlife habitats: 1) the density of travel routes (e.g., miles of route/square miles of habitat) or 2) the zone of influence. The zone of influence refers to the distance on each side of a road or trail within which habitat use by a species of interest is affected by the human use that occurs on the road or trail. Both density and zone of influence are determined by species-species research (see Gaines et al. 2003 for a review).</td></tr>
<tr><td>Heritage resources</td><td>Archaeological and historic sites, structures, buildings, artifacts, sacred sites, and traditional cultural properties identified through research, field inventory, and historic documentation that are important to the American public and American Indian Tribes.</td></tr>
<tr><td>High quality habitat</td><td>Habitat that completely satisfies a species life history (e.g., food, shelter, security) requirements.</td></tr>
<tr><td>Historical Range of variability</td><td>Refers to the dynamic behavior and functioning of ecosystems before dramatic changes occurred with European settlement, generally considered to be the mid-1800s for this area (Aplet and Keeton 1999). The historical range of variability provides a framework to determine changes to ecosystem attributes that have occurred between historical and current conditions and recognizes that ecosystems experience a range of conditions across which processes are resilient and self-sustaining</td></tr>
<tr><td>Horizontal cover</td><td>That portion of a tree or shrub that grows horizontally (parallel to the ground) out from the main trunk/stem of the plant (i.e., a tree bough) and provides cover up to approximately 5 – 7 feet above the ground. Horizontal cover refers to the stems/boughs that are used by snowshoe hares and are subsequently considered foraging habitat for lynx.</td></tr>
<tr><td>Hydrologic unit (HU) system</td><td>A nested-hierarchical classification of hydrologic units (watersheds) delineated national by the United States Geological Survey with six levels of classification of successively smaller hydrologic units. Individual hydrologic units are denoted numerically by a unique hydrologic unit code, with the number of digits within the code based on the level of classification, and both a general hydrologic unit name, and a specific name. The table below shows the classification, names, # of digits in the code, level of classification, average size, and an example of name and number of at each level of classification from the hydrologic hierarchy of the Ninemile subwatershed.
<table>
<tr><th>Hydrologic Unit (HU) name</th><th># of digits in HUC</th><th>HU Level</th><th>Average Size (sq. miles)</th><th>Example Name</th><th>Example Number</th></tr>
<tr><td>Region</td><td>2</td><td>1st</td><td>180,000</td><td>Pacific Northwest Region</td><td>17</td></tr>
<tr><td>Subregion</td><td>4</td><td>2nd</td><td>17,000</td><td>Upper Columbia Subregion</td><td>1702</td></tr>
</table>
</td></tr>
</table>

TERM	DEFINITION
	<table><tr><td>Basin</td><td>6</td><td>3rd</td><td>10,000</td><td>Upper Columbia Basin</td><td>170200</td></tr><tr><td>Subbasin</td><td>8</td><td>4th</td><td>700</td><td>Sanpoil Subbasin</td><td>17020004</td></tr><tr><td>Watershed</td><td>10</td><td>5th</td><td>227 (40,000-250,000 acres)</td><td>Upper Sanpoil Watershed</td><td>1702000401</td></tr><tr><td>Subwater-shed (SWS)</td><td>12</td><td>6th</td><td>40 (10,000-40,000 acres)</td><td>Ninemile Subwatershed</td><td>170200040107</td></tr></table>
Hydrologically connected road	A segment of road that is connected to the natural stream channel network via surface flow (Flanagan et al. 1998). Roads that are hydrologically connected deliver water, sediment, and chemicals generated on the road surface directly to the stream channel network.
Indicator	A measure or measurement of an aspect of a sustainability criterion. A quantitative or qualitative variable that can be measured or described and, when observed periodically, shows trends. Indicators are quantifiable performance measures of outcomes or objectives for attaining criteria designed to assess progress toward desired conditions.
Inner gorge	
Instream flow	Water flowing in a stream channel. Instream flow is used to designate a specific stream flow measured in cubic feet per second (cfs) at a particular location for a defined time for protection and preservation of fish, wildlife, recreation, and other non-consumptive water uses in a waterway.
Interdisciplinary team (ID Team)	A group of people that collectively represent several disciplines and whose duty is to coordinate and integrate the planning activities.
Invasive species	Non-native species whose introduction does or is likely to cause economic or environmental harm or harm to human health. Non-native species are any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem (with respect to a particular ecosystem). (EO13112)
Inventoried Roadless Area	Areas identified in a set of inventoried roadless area maps, contained in the Forest Service Roadless Area Conservation, Final Environmental Impact Statement, Volume 2, dated November 2000, and any subsequent update or revision of those maps through the land management planning process. (36 CFR 294.11)
Issue	Issues may be considered as: 1) A potential factor for determining need for change for a plan; 2) Specific resource concerns about a proposed action under NEPA (FSM 1950); 3) Points of contention or disagreement; or 4) A subject or question of widespread public interest about management of the National Forest System.
Key habitat (grizzly bear)	Vegetation components that are crucial for grizzly bear survival, such as Whitebark pine, riparian habitats, berry-producing shrub fields, natural meadows, and forest cover.
Key watershed	Key watersheds are a network of watersheds designated at the subwatershed scale (6th field, HUC12), to serve as strongholds for important aquatic resources or having the potential to do so. They are areas crucial to threatened or endangered fish and aquatic species of concern and/or interest, and/or areas that provide high quality water important for maintenance of downstream populations. Management emphasizes minimizing risk and maximizing restoration or retention of ecological health.
Landscape	A heterogeneous land area composed of interacting ecosystems evaluated at a broad scale to facilitate understanding of process, composition, structure, and pattern. In most cases this will be at a scale of a 5th field HUC, at10's of thousands of acres, to provide an understanding of coarse filter broad scale interplay and dynamics of soils, climate, fire, insects, hydrology, genetics, large home range wildlife, and vegetation.
Landscape character	Particular attributes, qualities, and traits of a landscape that give it an image and make it identifiable and unique. (Agricultural Handbook Number 701)

TERM	DEFINITION
Large woody debris	Large pieces of relatively stable woody material located within the bankfull channel and appearing to influence bankfull flows.
Life history requirements	Habitat and other environmental conditions need to support the series of living phenomena exhibited by an organism in the course of its development from inception to death. This includes seasonal behaviors and daily routines of juvenile and adults of the species.
Lynx analysis unit (LAU)	An area of at least the size used by an individual lynx, from about 25 to 50 square miles. A project analysis unit upon which direct, indirect and cumulative effects analyses are performed.
Listed species (TE)	Listed species (TE) are those listed by the U.S. Department of the Interior, U.S. Fish and Wildlife Service or the National Oceanic and Atmospheric Administration, National Marine Fisheries Service as threatened or endangered under the ESA (FSH 1909.12, 43.22a).
Maintenance level (roads)	Maintenance levels define the level of service provided by, and maintenance required for, a specific road. Maintenance levels must be consistent with road management objectives and maintenance criteria. The objective maintenance level is the maintenance level to be assigned at a future date considering future road management objectives, traffic needs, budget constraints, and environmental concerns. The objective maintenance level may be the same as, or higher or lower than, the operational maintenance level. (FSH 7709.59)
Management area	A specifically identified area on National Forest system lands to which specific plan components (desired conditions, objectives, identification of suitable and unsuitable land uses, or special designations) are applied.
Management direction	A statement of multiple-use and other goals and objectives, the associated management prescriptions, and standards and guidelines for attaining them.
Management indicator species (MIS)	A species selected because its welfare is presumed to be an indicator of the welfare of other species using the same habitat. A species whose condition can be used to assess the impacts of management actions on a particular area.
Management practice	A specific activity, measure, course of action, or treatment.
Management prescription	Management practices and intensity selected and scheduled for application on a specific area to attain multiple-use and other goals and objectives.
Mechanized	Wheeled forms of transportation (including non-motorized carts, wheelbarrows, bicycles and any other non-motorized, wheeled vehicle).
Mechanical transport	Any contrivance for moving people or material in and over land, water, or air, having moving parts that provides a mechanical advantage to the user and that is powered by a living or non-living power source. This includes, but is not limited to, sailboats, hang gliders, parachutes, bicycles, game carriers, carts, and wagons. It does not include wheelchairs when used as necessary medical appliances. It also does not include skis, snowshoes, rafts, canoes, sleds, travois, or similar primitive devices without moving parts. (FSM 2320.3)
Minerals – leasable	Coal, oil, gas, phosphate, sodium, potassium, oil shale, Sulphur, and geothermal resources.
Minerals - locatable	Those hardrock minerals that are mined and processed for the recovery of metals. They also may include certain nonmetallic minerals and uncommon varieties of mineral materials, such as valuable and distinctive deposits of limestone or silica.
Minimum Impact Suppression Tactics (MIST)	The concept of Minimum Impact Suppression Tactics is to use the minimum amount of forces necessary to effectively achieve fire management protection objectives. It implies a greater sensitivity to the impacts of suppression tactics and their long-term effects, when determining how to implement an appropriate suppression response. Fire managers and firefighters select tactics that have minimal impact to values at risk. These values are identified in approved Land or Resource Management Plans. Standards and guidelines are then tied to implementation practices which result from approved Fire Management Plans. Minimum Impact Suppression Tactics is not intended to represent a separate or distinct classification of firefighting tactics but rather a mindset of how to suppress a wildfire while minimizing the long-term effects of the suppression action on other resources. The principle of fighting fire aggressively but providing for safety first will not be compromised in the

TERM	DEFINITION
	process and when selecting an appropriate suppression response, firefighter safety must remain the highest concern.
Mitigation measures	Modifications of actions taken to: a) avoid impacts by not taking a certain action or parts of an action; b) minimize impacts by limiting the degree or magnitude of the action and its implementation; c) rectify impacts by repairing, rehabilitating, or restoring the affected environment; d) reduce or eliminate impacts over time by preservation and maintenance operations during the life of the action; or, e) compensate for impacts by replacing or providing substitute resources or environments.
Monitoring	A systematic process of collecting information to evaluate changes in actions, conditions, and relationships over time and space or progress toward meeting desired conditions or plan objectives.
Motor Vehicle Use Map	A map reflecting designated roads, trails, and areas on an administrative unit or a ranger district of the National Forest System (36 CFR 212.1).
National Forest System (NFS)	All national forest lands reserved or withdrawn from the public domain of the United States; all national forest lands acquired through purchase, exchange, donation, or other means; the National Grasslands and land utilization projects administered under Title III of the Bankhead-Jones Farm Tenant Act (50 Stat. 525, 7 U.S.C. 1010-1012), the Midewin Tallgrass Prairie, and other lands, waters, or interests therein which are administered by the Forest Service or are designated for administration through the Forest Service as a part of the system. (16 U.S.C. 1608)
National visitor use monitoring program (NVUM)	To gain a better understanding of the recreation use, importance of, and satisfaction associated with National Forest recreation opportunities, the Forest Service embarked on the national visitor use monitoring project (NVUM) in the late 1990s. Each survey is conducted over the course of one year (October 1 – September 30) and includes questions regarding visitor use (activities), expenditures on recreation activities, and user satisfaction associated with the activities, settings, and infrastructure used while visiting the Forest.
Objectives	Concise projections of measurable, time-specific intended outcomes. The objectives for a plan are the means of measuring progress toward achieving or maintaining desired conditions. Like desired conditions, objectives are aspirations and are not commitments or final decisions approving projects and activities. (36 CFR 219.7)
Occupied habitat	An area that is currently being used by a species for one or more parts of its life history (such as nesting, foraging, roosting, denning). This area will receive repeat use and the animal is not simply travelling through to somewhere else.
Off-highway vehicle (OHV)	Any motor vehicle designed for or capable of cross-country travel on or immediately over land, water, sand, snow, ice, marsh, swampland, or other natural terrain. (36 CFR 212.1)
Open motorized trail	Trails that are passable by motorcycles or all-terrain vehicles and are not legally restricted.
Overstory	That portion of the trees in a forest of more than one story, forming the upper or uppermost canopy layer.
Outstandingly remarkable value (wild and scenic rivers)	A river-related value that is a rare, unique, or exemplary feature that is significant at a comparative regional or national scale.
Patch (patch size)	A patch is a relatively uniform area of vegetation that differs from its surroundings (NCSSF 2005). Patch size is influenced by disturbance history, vegetation dynamics, topographic position, and soils. For fisheries, a patch or patch size is the connected length of stream available to the focal species. Habitat patches within the subbasin are delineated by aggregating all connected stream kilometers of occupied habitat.
Plan area	The National Forest System lands covered by a plan. (36 CFR 219.16)

TERM	DEFINITION
Plan components	Broad guidance in a plan that identifies desired conditions, objectives, standards, guidelines, suitability of areas, and special areas.
Plan set of documents	The complete set of documentation supporting the land management plan. It may include, but is not limited to, evaluation reports, documentation of public involvement, the plan including applicable maps, applicable plan improvement documents, applicable NEPA documents, and the monitoring program for the plan area.
Planned fire (planned ignition)	An intentionally ignited fire with the intent to achieve specific objectives. A planned fire is generally covered under a NEPA decision document specifying a specific location, burning conditions, operational and management objectives, and monitoring measures. Includes all prescribed fire including ~~pile~~ burning slash piles. Also, see *unplanned fire*.
Planning period	The time interval within the planning horizon that is used to show incremental changes in yields, costs, effects, and benefits (generally 15 to 20 years).
Population (ecological)	Organisms of the same species that occur in a particular place at a given time.
Population Viability	The likelihood of continued existence of a well-distributed population or species for a specific period. For most scientific analyses, the period is 100 years. For example, high viability is a high likelihood of continued existence of well-distributed populations for a century or longer.
Potential wilderness area	Inventoried lands within National Forest System lands that satisfy the definition of wilderness found in section 2(c) of the 1964 Wilderness Act. (FSH 1909.12, chapter 70, 01/31/2007)
Primitive recreation	Those recreation activities which are non-motorized and do not involve mechanical transport. Examples include hiking, horseback riding, hunting, canoeing, and cross-country skiing.
Project	An organized effort to achieve an objective identified by location, activities, outputs, effects, times, and responsibilities for execution.
Project design	The process of developing specific information necessary to describe the location, timing, activities, outputs, effects, accountability, and control of a project.
Properly functioning condition	
Public access	Usually refers to a road or trail route over which a public agency claims a right-of-way for public use.
Public involvement (public participation)	A Forest Service process designed to broaden the information base upon which agency approvals and decisions are made by: (a) informing the public about Forest Service activities, plans, and decisions, and (b) encouraging public understanding about and participation in the planning processes that lead to final decision making.
Public issue	A subject or question of widespread public interest relating to management of the National Forest System.
Public participation	See *public involvement*.
Range allotment	A designated area containing land suitable and available for livestock grazing use upon which a specified number and kind of livestock are grazed under an approved allotment management plan. It is the basic management unit of the range resource on National Forest System lands administered by the Forest Service.
Rangeland	Land on which the indigenous vegetation (climax or natural potential) is predominately grasses, grass-like plants, forbs, or shrubs and is managed as a natural ecosystem. If plants are introduced, they are managed similarly. Rangeland includes natural grasslands, savannas, shrub lands, many deserts, tundras, alpine communities, marshes, and meadows.
Reach	A relatively homogenous section of stream having a repetitious sequence of habitat types and relatively uniform physical attributes such as channel slope, habitat width, habitat depth, streambed substrate and degree of interaction with its floodplain. (PNW Region 6 Stream Inventory Handbook [2010 version 2.1])

TERM	DEFINITION
Record of decision (ROD)	A document separate from but associated with an Environmental Impact Statement which states the decision, identifies all alternatives, specifying which were environmentally preferable, and states whether all practicable means to avoid environmental harm from the alternative have been adopted, and if not, why not. (40 CFR 1505.2)
Recovery unit (bull trout)	Bull trout recovery units are the major units for managing recovery efforts; each recovery unit is described in a separate chapter in the recovery plan. Most recovery units consist of one or more major river basins. Several factors were considered in identifying recovery units, for example, biological and genetic factors, political boundaries, and ongoing conservation efforts. In some instances, recovery unit boundaries were modified to maximize efficiency of established watershed groups, encompass areas of common threats, or accommodate other logistic concerns. Recovery units may include portions of mainstem rivers (e.g., Columbia and Snake rivers) when biological evidence warrants inclusion. Biologically, bull trout recovery units are considered groupings of bull trout for which gene flow was historically or is currently possible. (USFWS 2013).
Recreation opportunity	An opportunity for a user to participate in a preferred activity within a preferred setting, in order to realize those satisfying experiences which are desired.
Recreation opportunity spectrum	A framework of land delineations that identifies a variety of recreation experience opportunities categorized into classes on a continuum. The spectrum's continuum has been divided into six major classes for Forest Service use: Urban (U), Rural (R), Roaded Natural (RN), Semi-Primitive Non-Motorized (SPNM), Semi-primitive Motorized (SPM), and Primitive (P). (FSM 2311)
Recreation residence	A privately owned dwelling within an established recreation residence tract or group on National Forest System land, authorized for maintenance and use under a special use permit. A vacation structure authorized for the purpose of facilitating the use and enjoyment of related National Forest land and recreation resources by holders, their families, and guests. A recreation residence is not intended for use as the primary or permanent residence of the owner. (FSM 2340.5)
Recreation sites	Specific places in the Forest other than roads and trails that are used for recreational activities. These sites include a wide range of recreational activities and associated development. These sites include highly developed facilities like ski areas, resorts, and campgrounds. It also includes dispersed recreation sites that have few or no improvements but show the effects of repeated recreation use.
Reforestation	The natural or artificial restocking of an area with forest trees; most commonly used in reference to artificial restocking.
Refugia	Locations and habitats that support populations of organisms that are limited to small fragments of their previous geographic range (i.e., endemic populations). (FEMAT)
Regional Forester	The official responsible for administering a single Forest Service region.
Regulated timber production	The act of controlling forest stocking, harvest, growth, and yield to annually meet a sustained production of timber in perpetuity.
Rehabilitation	A short-term management alternative used to return existing visual impacts in the natural landscape to a desired visual quality.
Resilience	The capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks. (FSM 2000, Chapter 2020)
Responsible official	The official with the authority and responsibility to oversee the planning process and to approve plans, plan amendments, and plan revisions. (36 CFR 219.16)
Restoration	The process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed. It is an intentional activity that initiates or accelerates the recovery of an ecosystem with respect to its health, integrity, and sustainability.
Reviewing officer	The supervisor of the Responsible Official. The Reviewing Officer responds to objections made to a plan, plan amendment, or plan revision prior to approval. (36 CFR 219.16)

TERM	DEFINITION
Riparian area	Areas adjacent to rivers, streams, seeps, springs, and wetlands that are shaped and maintained by water table height, flooding, scour, and soil deposition. Riparian areas provide habitat for aquatic and upland plants and animals, and provide shade, bank stability, and runoff filtration
Riparian-dependent resources	Resources that owe their existence to the riparian area
Riparian ecosystem	An ecosystem whose components are directly or indirectly attributed to the influence of surface and groundwater (www.icbemp.gov), located adjacent to rivers, streams, and other hydrologic features. Riparian ecosystems encompass both the river and adjacent floodplain, and provide the transition between the aquatic and terrestrial ecosystem.
Riparian Habitat Conservation Area / Riparian management area	Lands along permanently flowing streams, ponds, lakes, wetlands, seeps, springs, intermittent streams, and unstable sites that may influence these areas where management activities are designed to maintain, restore or enhance the ecological health of aquatic and riparian ecosystems and dependent resources.
Road	A motor vehicle route over 50 inches wide, unless identified and managed as a trail.
Road construction	FSM 7705 defines road construction or reconstruction together as the supervising, inspecting, actual building, and incurrence of all costs incidental to the construction or reconstruction of a road (36 CFR 212.1).
Road decommissioning	Activities that result in restoration of unneeded roads to a more natural state *see decommissioning.* (FSM 7734)
Road maintenance	Ongoing upkeep of a road necessary to maintain or restore the road in accordance with its road management objectives. (FSM 7714)
Roadless area	*See inventoried roadless area*
Scenic Integrity Objective	The Scenic Integrity Objectives (SIOs) serve as the desired conditions for the scenic resources and represent the degree of intactness of positive landscape attributes. SIOs are categorized into 5 levels. The highest scenic integrity ratings are given to those landscapes where valued landscape attributes will appear complete with little or no visible deviations evident. Lowers SIOs are given to those landscapes where modifications to the landscape will be more evident.
Self-sustaining population	Populations that are sufficiently abundant, interacting, and well distributed in the plan area, within the bounds of their life history and distribution of the species and the capability of the landscape, to provide for their long-term persistence, resilience and adaptability over multiple generations.
Sensitive species	Those species of plants or animals that have appeared in the Federal Register as proposed for classification and are under consideration for official listing as endangered or threatened species, that are on an official state list, or that are recognized by the Regional Forester as needing special management to prevent their being placed on federal or state lists.
Seral stage	A biotic community that is a developmental, transitory stage in an ecological succession.
Sidecast	Placement of unconsolidated excavated material from road construction and maintenance over the downhill side of the road.
Silvicultural practices	Activities that control the establishment, composition, structure, and function of forested ecosystems.
Slope distance	
Snag	A standing dead tree usually greater than five feet in height and six inches in diameter at breast height (DBH).
Source water protection area Habitat	Source water is untreated water from streams, rivers, lakes or underground aquifers that provides public drinking water. A source water protection area is the land area contributing to a public water system where potential contamination could affect drinking water supply. Those characteristics of macrovegetation that contribute to stationary or positive population growth. Distinguished from habitats associated with species occurrence: such habitats may or may not contribute to long-term population persistence (Wisdom et al. 2000).

TERM	DEFINITION
Special areas	Areas in the National Forest System designated for their unique or special characteristics. (36 CFR 219.7)
Special forest products	Products collected from National Forest System lands that include, but are not limited to, bark, berries, boughs, bryophytes, bulbs, burls, Christmas trees, cones, ferns, firewood, forbs, fungi (including mushrooms), grasses, mosses, nuts, pine straw, roots, sedges, seeds, transplants, tree sap, wildflowers, fence material, mine props, posts and poles, shingle and shake bolts, and rails. Special forest products do not include sawtimber, pulpwood, non-sawlog material removed in log form, cull logs, small roundwood, house logs, telephone poles, derrick poles, minerals, animals, animal parts, insects, worms, rocks, water, and soil (36 CFR part 223 Subpart G).
Special use authorization	A permit, term permit, lease, or easement that allows occupancy, use, rights, or privileges of National Forest System land.
Species-at-risk	All ESA listed TES , SOC and SOI form a suite of species recognized as potentially sensitive to management actions from which focal species are chosen to serve as surrogates for assessing current conditions and potential effects of alternatives to other aquatic vertebrate and invertebrate species, and other species-at-risk. The criteria, established in FSH 1909.12 Chapter 43.22, determine how species–at-risk are sorted.
Species of concern (SOC)	Species-of-concern (SOC) are species for which the responsible official determines if management actions may be necessary to prevent listing under the ESA. Identified species-of-concern may include entities such as distinct population segments or evolutionarily significant units that may be listed under the ESA.
Species of interest (SOI)	Species-of-interest (SOI) are species for which the responsible official determines that management actions may be necessary or desirable to achieve ecological or other multiple-use objectives (FSH 1909.12, 43.22c).
Species viability	A viable population is one for which the number and distribution of reproductive individuals would "insure its continued existence". (1982 Planning rule)
Standards	Constraints upon project and activity decision-making explicitly identified in a plan as 'standards'. Standards are established to help achieve the desired conditions and objectives of a plan and to comply with applicable laws, regulations, Executive orders, and agency directives (36 CFR 219.7(a)(3). A standard differs from a guideline in that a standard is a strict design criteria, allowing no variation, whereas a guideline allows variation if the result would be equally effective. (FSH 1909.12)
Stewardship	Natural resource management emphasizing careful and conscientious use and conservation of resources and ecosystems in a sustainable manner.
Structural Stage	Tree structure is classified into five general groups based on diameter and canopy cover. The diameter is based on the quadratic mean diameter in inches of trees whose heights are in the top 25% of all tree heights in the stand. This generally means that the diameters of the larger co-dominant trees in a stand are used to define the structure class.
Structural Stage – Early	Trees less than 10" dbh[35] or canopy cover < 10%
Structural Stage – Mid Open	Trees 10-20" dbh, canopy cover ≥ 10% and < 40%
Structural Stage – Mid Closed	Trees 10-20" dbh, canopy cover ≥ 40%
Structural Stage – Late Open	Trees ≥ 20" dbh, canopy cover ≥ 10% and < 40%
Structural Stage – Late Closed	Trees ≥ 20" dbh, canopy cover ≥ 40%
Subbasin	A watershed with a drainage area of approximately 800,000 to 1,000,000 acres, equivalent to a 4th-field hydrologic unit code (HUC8). Hierarchically, subwatersheds are contained

[35] dbh = diameter at breast height.

TERM	DEFINITION
	within a 5th field watershed, which are contained within subbasins. (ICBEMP) See *Hydrologic Unit System*
Subwatershed	A watershed with a drainage area of 10,000 to 40,000 acres, equivalent to a 6th-field Hydrologic Unit Code (HUC12). Hierarchically, subwatersheds are contained within 5th field watersheds, which are contained within subbasins. (ICBEMP)) See *Hydrologic Unit System*
Succession	The sequential replacement over time of one plant community by another, in the absence of major disturbance. The different stages of succession are often referred to as seral stages. Developmental stages are as follows: **Early seral:** Communities that occur early in the successional path and generally have less complex structural developmental than other successional communities. Seedling and sapling size classes are an example of early seral forests. **Mid-seral:** Communities that occur in the middle of the successional path. For forests, this usually corresponds to the pole or medium saw timber-size growth stages. **Late-seral:** Communities that occur in the later stage of the successional path with mature, generally larger individuals, such as mature forests.
Suitable habitat	Habitat that currently has both the fixed and variable attributes for a given species habitat requirements. Variable attributes change over time and may include seral stage, cover type and overstory canopy cover.
Suitability	The appropriateness of a particular area of land for applying certain resource management practices, as determined by an analysis of the existing resource condition and the social, economic, and environmental consequences and the alternative uses foregone. A unit of land may be suitable for a variety of individual or combined management practices.
Surrogate Species	
Sustainability	Meeting needs of the present generation without compromising the ability of future generations to meet their needs. Sustainability is composed of desirable social, economic, and ecological conditions or trends interacting at varying spatial and temporal scales embodying the principles of multiple-use and sustained-yield.
Thermal cover	Cover used by animals to lessen the effects of weather; for elk, a stand of coniferous trees 12 meters (40 feet) or more tall with an average crown closure of 70 percent or more; for deer, cover may include saplings, shrubs, or trees at least 1.5 meters (5 feet) tall~~)~~ with 75 percent crown closure.
Threatened species	Any species of animal or plant which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range and which has been designated in the Federal Register by the Secretary of Interior as a threatened species.
Timber harvest	The removal of trees for wood-fiber use and other multiple-use purposes.
Timber harvest as a tool	Areas where timber harvest is allowed to be used to reach multiple use objectives, but regulated timber production is not a suitable use.
Timber harvest, scheduled production	Lands where regulated timber production is suitable.
Timber production	The purposeful growing, tending, harvesting, and regeneration of regulated crops of trees to be cut into logs, bolts, or other round sections for industrial or consumer use (36 CFR 219.16). In addition, managing land to provide commercial timber products on a regulated basis with planned, scheduled entries.
Transportation and utility corridor	A parcel of land, without fixed limits or boundaries, which is used as the location for one or more transportation or utility right-of-ways. (36 CPR 219.3)
Transportation system	The system of National Forest System roads, national forest trails and airfields on National Forest System lands. (36 CFR 212.1)

TERM	DEFINITION
Travel management	Travel management decisions include adding a route to or removing a route from the forest transportation system, constructing a~~n~~ National Forest System road or National Forest System trail, acquiring an National Forest System route through a land purchase or exchange, decommissioning a route, approving an area for motor vehicle use, or changing allowed motor vehicle classes or time of year for motor vehicle use. (FSM 7715)
Unauthorized roads or trails	A road or trail that is not a forest road or trail or a temporary road or trail and that is not included in a forest transportation atlas. (36 CFR 212.1)
Uncharacteristic fire	Any fire that occurs outside the time, space, and severity parameters of the natural fire regime for the vegetation group. RCW 76.06.020(16), "ecologically atypical for a forest or vegetation type or plant association and refers to fire, insect or disease events that are not within a natural range of variability." WDNR. 2012. Staff Report: Forest Health Technical Advisory Committee. Washington State Department of Natural Resources.
Understory reinitiation	Establishment of tree regeneration as older trees occupy less than full growing space.
Uneven-aged management	The application of a combination of actions that results in the creation or maintenance of stands with several different ages of trees. Managed uneven-aged forests are characterized by a distribution of tree ages throughout the forest area. An uneven-aged stand of trees is one in which there are differences in age among the individual trees. Group selection, variable density thinning, and shelterwood with reserves are methods that produce uneven-aged stands (Helms 1998)
Unplanned fire	Any unplanned non-structural fire. Any unplanned fire may be concurrently managed for one or more objectives and those objectives can change as the fire spreads across the landscape, encountering new fuels, weather, social conditions, and governmental jurisdictions. Current policy requires that all arson fires be suppressed.
Unroaded	Unroaded areas are large and contiguous areas, usually over 5,000 acres, with no Forest Service System roads. They provide a recreational setting without Forest Service System roads.
Utility and transportation corridors	See *Transportation and utility corridors*.
Variable Density Thinning	A type of variable retention harvest system that retains structural elements and biological legacies (snags, logs, trees) from the harvested stand for incorporation into the new stand to achieve various ecological objectives (Helms 1998)
Vegetation management	Activities designed primarily to promote the health of forest vegetation in order to achieve desired results. When vegetation is actively managed, it means that it is manipulated or changed on purpose by humans to produce desired results. Where active management of vegetation is required, techniques are based on the latest scientific research and mimic natural processes as closely as possible. Vegetation management is the practice of manipulating the species mix, age, fuel load, and/or distribution of wildland plant communities within a prescribed or designated management area in order to achieve desired results. It includes prescribed burning, grazing, chemical applications, biomass harvesting, and any other economically feasible methods of enhancing, retarding, modifying, transplanting, or removing the aboveground parts of plants.
Watershed	The area of land where all contributing water drains to a single defined outlet point. (FEMAT, IX-39). Watersheds occur and are categorized at various scales, described in the Hydrologic Unit system definition. A watershed is also the 5th field hydrologic unit within the Hydrologic Unit system. 5th field watersheds classified by the Hydrologic Unit system are approximately 250,000 acres. Hierarchically, 5th field watersheds, are contained within subbasins, and contain subwatersheds.

TERM	DEFINITION
Watershed condition class	Watershed condition is the state of physical and biological characteristics and processes within a watershed that affect the hydrologic and soil functions supporting aquatic ecosystems (Potyondy and Geier 2010). Three classes are used to describe watershed condition (FSM 2521.1): • Class 1: Functioning properly--watersheds exhibit high geomorphic, hydrologic, and biotic integrity relative to their natural potential condition; • Class 2: Functioning at risk--watersheds exhibit moderate geomorphic, hydrologic, and biotic integrity relative to their natural potential condition; • Class 3: Impaired function--watersheds exhibit low geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. Change in watershed condition class through focused restoration activities is the nationally consistent measure to demonstrate improvement in watershed condition on NFS lands.
Wetlands	Areas that are inundated by surface or ground water with a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.
Wild and scenic rivers	Those rivers or sections of rivers designated as such by congressional action under the 1968 Wild and Scenic Rivers Act, as supplemented and amended, or those sections of rivers designated as wild, scenic, or recreational by an act of the Legislature of the State or States through which they flow. Wild and scenic rivers may be classified and administered under one or more of the following categories: 1. Wild River Areas-- Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America. 2. Scenic River Areas-- Those rivers or sections of rivers that are free of impoundments, with watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads. 3. Recreational River Areas-- Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.
Wilderness	An area of National Forest system land designated by Congress and ~~wilderness is~~ defined in sec. 2(c) of the Wilderness Act (16 U.S.C. 1131-1136). The term wilderness is applied to all National Forest System lands included in the National Wilderness Preservation System. (FSM 2320.5)
Wilderness resource spectrum (WRS)	A spectrum of wilderness conditions including finer gradations of naturalness and solitude mapped as pristine, primitive, semi-primitive, and transition. WRS is a kind of zoning where different management prescriptions apply.
Wildland urban interface (WUI)	Wildland-urban interface (WUI) is defined as “the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels” (NWCC 2012). In applying Title I of Healthy Forests Restoration Act (HFRA) (P.L. 108-148), this term means: • An area within or adjacent to an at-risk community identified in recommendations to the Secretary in a Community Wildfire Protection Plan (CWPP), or, in the case of any area for which a CWPP is not in effect: • An area extending ½ mile from the boundary of an at-risk community; an area within 1 ½ miles of the boundary of an at-risk community including any land that has a sustained steep slope that creates the potential for wildland fire behavior endangering the at-risk community, has a geographic feature that aids in creating an effective firebreak, such as a road or ridgetop, or is in Condition Class 3, as documented by the Secretary in the project-specific environmental analysis; and an area that is adjacent to an evacuation route for an at-risk that the Secretary determines (in cooperation with the at-risk community) requires hazardous fuel reduction to provide safer evacuation.

TERM	DEFINITION
	When not using Title I of the HFRA, use the definition of wildland-urban interface community from the Federal Register, January 4, 2001, pages 752 to 753.
Winter Range	The area available to and used by wildlife (big game) during the winter season (Dec 1 to April 30). Generally, lands below 4,000 feet in elevation, on south and west aspects, that provides forage and cover.

Acronyms

ACS	Aquatic Conservation Strategy
AEC	Aquatic Ecological Condition
AIS	Aquatic Invasive Species
AMS	Analysis of the Management Situation
ARCS	Aquatic and Riparian Conservation Strategy
ARS	Aquatic Restoration Strategy
ASQ	Allowable Sale Quantity
ATV	All-terrain Vehicle
AUM	Animal Unit Month
BC	Backcountry Non-Motorized
BCM	Backcountry Motorized
BLM	Bureau of Land Management
BMP	Best Management Practice
BMU	Bear Management Unit
CCF	Hundred Cubic Feet
CEQ	Council on Environmental Quality
CER	Comprehensive Evaluation Report
CFR	Code of Federal Regulations
CNF	Colville National Forest
CWA	Clean Water Act
CWPP	Community Wildfire Protection Plan
DEIS	Draft Environmental Impact Statement

DSM	Decision Support Model
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
FR	Federal Register
FRCC	Fire Regime Condition Class
FSH	Forest Service Handbook
FSM	Forest Service Manual
GDE	Groundwater-dependent Ecosystems
GIS	Geographic Information System
HRV	Historic Range of Variability
HUC	Hydrologic Unit Code
ICBEMP	Interior Columbia Basin Ecosystem Management Project
IDT	Interdisciplinary Team
IGBC	Interagency Grizzly Bear Committee
INFISH	Inland Native Fish Strategy
IRA	Inventoried Roadless Area
KCRA	Kettle Crest Recreation Area
LCAS	Lynx Conservation Assessment and Strategy
LMP	Land Management Plan
LRMP	Land and Resource Management Plan
LSOF	Late Structure Old Forest

LTA	Landtype Association
LTSYC	Long-term Sustained Yield Capacity
MA	Management Area
MIS	Management Indicator Species
MMBF	Million Board Feet
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MUSYA	Multiple Use Sustained Yield Act
MVUM	Motor Vehicle Use Map
NAAQ	National Ambient Air Quality Standard
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NFS	National Forest System
NHD	National Hydrography Dataset
NHPA	National Historic Preservation Act
NOA	Notice of Availability
NVUM	National Visitor Use Monitoring
OHV	Off-highway Vehicle
PIBO	PACFISH/INFISH Biological Opinion
PILT	Payment in Lieu of Taxes
PTSQ	Projected Timber Sale Quantity
PUD	Public Utility District
PWA	Potential Wilderness Area

PWSQ	Projected Wood Sale Quantity
RHCA	Riparian Habitat Conservation Area
RMA	Riparian Management Area
RMO	Riparian Management Objective
RNA	Research Natural Area
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
RW	Recommended Wilderness
SIA	Special Interest Area
SMS	Scenery Management System
SOC	Species of Concern
SOI	Species of Interest
SPM	Semi-primitive Motorized
SPNM	Semi-primitive Non-Motorized
TE	Threatened or Endangered (species)
TES	Threatened, Endangered & Sensitive (species)
TMDL	Total Maximum Daily Load
U.S.C.	United States Code
USDA	United States Department of Agriculture
USDI	United States Department of Interior
USFS	United States Forest Service
USFWS	United States Fish & Wildlife Service
USGS	United States Geologic Survey

WAC	Washington Administrative Code
WAP	Watershed Action Plan
WCF	Watershed Condition Framework
WDFW	Washington Department of Fish & Wildlife
WDoE	Washington Department of Ecology
WQIP	Water Quality Implementation Plan
WRIA	Water Resources Inventory Areas
WSR	Wild and Scenic River
WUI	Wildland Urban Interface