

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

NAVAL SURFACE WARFARE CENTER ACOUSTIC RESEARCH DETACHMENT BAYVIEW, IDAHO

September 2010



Naval Facilities Engineering Command Northwest
Silverdale, WA

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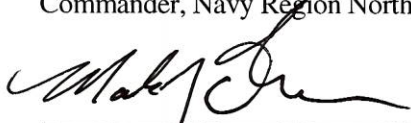
This Integrated Natural Resources Management Plan is a long term planning document to guide the Detachment Bayview management of natural resources to support its military mission while protecting and enhancing natural resources for multiple uses, sustainable yield and biological integrity. The primary purpose of the plan is to ensure that natural resources conservation and military operations are integrated and consistent with legal and stewardship requirements. This plan and the use of the natural resources comply with legal mandates.

Reviewed and Approved by:



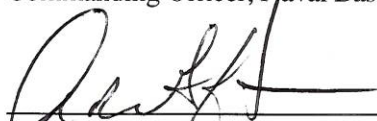
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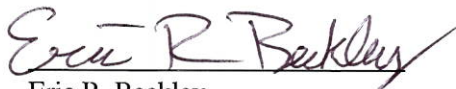
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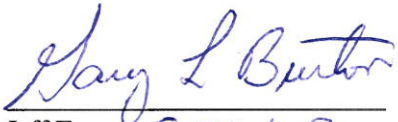
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Reviewed and Approved by:


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Reviewed and Approved by:



Charles Corsi
Regional Supervisor
Idaho Fish and Game

4/23/10

Date

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This Integrated Natural Resources Management Plan covers a 5-year period. The plan is required to be reviewed annually and updated as needed on a 5-year basis. Reviews and updates are a necessary part of maintaining a proactive management plan. The section below should be used to document reviews and changes to the plan that will improve natural resources management. It is not intended to replace the 5-year review process. Annual reviews will provide information to be incorporated into the 5-year update.

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ACRONYM LIST

ACOE	U.S Army Corps of Engineers
BMP	Best Management Practices
CH	Critical Habitat
CNIC	Commander, Navy Installations Command
CNO	Chief of Naval Operations
CWCS	Idaho Comprehensive Wildlife Conservation Strategy
dbh/DBH	Diameter Breast Height
DOD	Department of Defense
DODINST	Department of Defense Instruction
DON	Department of the Navy
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
EPR	Environmental Program Review
ESA	Endangered Species Act
FICMNEW	Federal Interagency Committee for the Management of Noxious and Exotic Weeds
FONSI	Finding of No Significant Impact
FR	Federal Register
HM&E	Hull, Mechanical, and Electrical
HUC	Hydrologic Unit Code
IDFG	Idaho Department of Fish and Game
INRMP	Integrated Natural Resources Management Plan
JAG	Judge Advocate General
MBTA	Migratory Bird Treaty Act
mya	million years ago
NAVFAC NW	Naval Facilities Engineering Command Northwest
NBK	Naval Base Kitsap
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRM	Natural Resources Manager
NSWCCD	Naval Surface Warfare Center
OCH	Occupied Critical Habitat
OGC	Office of the General Counsel
OHWM	Ordinary High Water Mark
PAO	Public Affairs Officer
RDT&E	Research, Development, Testing and Evaluation
SAIA	Sikes Act Improvement Amendment
TES	Threatened, Endangered, and Sensitive
TSI	Timber Stand Improvement
U&A	Usual and Accustomed
USC	United States Code
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service

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1.0 Overview of Integrated Natural Resources Management Plan

1.1 Purpose

This Integrated Natural Resources Management Plan (INRMP) is a planning document to guide Detachment Bayview's management of natural resources in support of the Navy's military mission, while protecting and enhancing natural resources for multiple uses, sustainable yield and biological integrity. The primary purpose of the plan is to ensure that natural resources conservation measures and military operations on the installation are integrated and compliant with stewardship and legal requirements.

This plan emphasizes ecosystem management, a process that considers the environment as a complex system functioning as a whole, not as a collection of parts. It recognizes the needs of people and the military mission as parts of the whole. Ecosystem management encourages partnerships among private, tribal, and local, state, and federal government interests.

1.2 Scope

This plan covers the federally-owned lands and waters of the Naval Surface Warfare Center (NSWCCD) Acoustic Research Detachment Bayview.

1.3 Goals and Objectives

The installation's successfully implemented natural resources program will meet two basic goals, which are closely related and not mutually exclusive:

- 1) Ensure the sustainability of all ecosystems encompassed by an installation; and
- 2) Ensure no net loss of the capability of installation lands to support the Department of Defense (DOD) mission.

Detachment Bayview's natural resources program objectives are to accomplish the following:

- a) Assign professionally trained personnel to this program and provide natural resource personnel the opportunity to participate in job-training activities and professional meetings.
- b) Protect, conserve and manage the watersheds, wetlands, soils, uplands, fish and wildlife and other natural resources as vital elements of a natural resources program.
- c) Protect threatened, endangered, and sensitive (TES) species and critical habitats regulated by the Endangered Species Act (ESA).
- d) Use and care for natural resources in the combination best serving the present and future needs of the U.S. and its people.
- e) Provide for the optimum use of land and water areas and access thereto while maintaining safety, security and ecological integrity.
- f)

1.4 Responsibilities

Responsibility for implementation of this program flows through the following chain of command:

1.4.1 Chief of Naval Operations, Environmental Readiness Division

The Chief of Naval Operations (CNO) shall serve as the principal leader and overall Navy program manager for the development, revision, and implementation of Integrated Natural Resources Management Plans (INRMPs) and shall:

- a) Provide policy, guidance, and resources for the development, revision, and implementation of INRMPs and associated National Environmental Policy Act (NEPA) documents.
- b) Represent the Navy on issues regarding development and implementation of INRMPs and delegate responsibility in writing.
- c) Resolve high-level conflicts associated with development and implementation of INRMPs.
- d) Approve all INRMP projects before INRMPs are submitted to regulatory agencies for signature.

1.4.2 Commander, Navy Installations Command

The Commander, Navy Installations Command (CNIC) shall:

- a) Ensure that installations under its command develop, revise and implement INRMPs, if required, and :
 - 1) Reevaluate the need for an INRMP at all installations that currently do not have an INRMP.
 - 2) Following the initial evaluation, reevaluate all remaining installations that do not have an INRMP every five years.
- b) Ensure that installations comply with DOD, Department of the Navy (DON) and CNO policy on INRMPs and associated NEPA document preparation, revision and implementation.
- c) Ensure the programming of resources necessary to maintain and implement INRMPs, which involves:
 - 1) The review of and endorsement of projects recommended for INRMP implementation prior to submittal for signature. These projects are identified in Appendix A.
 - 2) The evaluation and validation of Environmental Program Review (EPR)-web project proposals.
- d) Participate in the development and revision of INRMPs, which involves the maintenance of a close liaison with N45, NAVFAC and other budget submitting offices.
- e) Provide overall program management oversight for all natural resources program elements.

1.4.3 Regional Commander

The Regional Commander shall:

- a) Ensure that installations comply with DOD, Department of the Navy (DON) and Director Environmental Readiness Division (CNO) policy on INRMPs and associated NEPA document preparation, revision and implementation.
- b) Ensure that installations under their control undergo annual informal reviews as well as formal five-year evaluations.
- c) Ensure the programming of resources necessary to maintain and implement INRMPs, which involves:
 - 1) The evaluation and validation of EPR-web project proposals.
 - 2) The funding of installation natural resources management staff.
- d) Participate in the development and revision of INRMPs, which involves:

- 1) Maintenance of a close liaison with the local/regional United States Fish and Wildlife Service (USFWS) and appropriate state fish and wildlife agency and other INRMP stakeholders.
- 2) Endorsement of the INRMP by Regional Commander signature.

1.4.4 Commanding Officer

The Commanding Officer, Naval Base Kitsap (NBK), in coordination with the Director, ARD Bayview, shall ensure the preparation, completion and implementation of the INRMP and associated NEPA documentation for this installation and should systematically apply the conservation practices set forth in the Plans. Their roles are to:

- a) Act as stewards of natural resources under their jurisdiction and integrate natural resources requirements into the day-to-day decision-making process.
- b) Ensure that natural resources management and the INRMP comply with all natural resources-related legislation, Executive Orders and Executive Memoranda, as well as DOD, SECNAV, DON and CNO directives, instructions and policies.
- c) Involve appropriate tenant, operational, training or R&D commands in the INRMP review process to ensure no net loss of military mission.
- d) Designate a Natural Resources Manager (NRM) responsible for the management efforts related to the preparation, revision, implementation, and funding for the INRMP.
- e) Involve appropriate Navy Judge Advocate General (JAG) or Office of the General Counsel (OGC) Legal Counsel to provide advice and counsel with respect to legal matters related to natural resources management and INRMPs.
- f) Endorse the INRMP via Commanding Officer NBK and Director ARD signatures.

The Commanding Officer NBK and Director ARD hold the highest-ranking positions at the installation and ultimately are responsible for all aspects of the installation and its many functions. This includes ensuring that the INRMP is developed, implemented and fully supported. They can facilitate the implementation of the INRMP by encouraging support down the chain of command; ensure that a process is established for early coordination between the Natural Resources Manager and key installation staff; and ensure that natural resources management is integrated with other installation management functions, military operations, security, and RDT&E activities.

1.4.5 Natural Resources Manager

A member of the Naval Base Kitsap Environmental staff is designated as the NRM, as specified in Appendix B. The NRM is primarily responsible for implementing this INRMP and coordinating with personnel on the installation. Some of the implementation responsibilities include identifying personnel, internal or external to the installation, with expertise to perform the work identified; identifying the appropriate funding source to accomplish the projects; and ensuring installation personnel are familiar with the contents of this INRMP. The NRM facilitates and coordinates the issuance of INRMP related NEPA documentation. The NRM is also responsible for ensuring this plan is reviewed in coordination with the USFWS and the Idaho Department of Fish and Game (IDFG).

1.4.6 Naval Facilities Engineering Command Northwest

Naval Facilities Engineering Command Northwest (NAVFAC NW) provides oversight and support for the development, maintenance and implementation of Navy Region Northwest's installation INRMPs and the natural resources program. NAVFAC NW's role in natural resources management is to:

- a) Provide technical and contractual support to ARD Bayview for the preparation, development and implementation of the INRMP and associated NEPA documents.
- b) Facilitate and coordinate the issuance of INRMP related NEPA documentation.
- c) Evaluate and disseminate information concerning new technology, methods, policies and procedures for use in the development and implementation of INRMPs.
- d) Assist with the development of the INRMP Project Implementation Table, EPR and Legacy project proposals.
- e) Provide technical and administrative guidance for the development and execution of contracts and cooperative agreements to develop and implement INRMPs.
- f) Facilitate the acquisition of INRMP "mutual agreement" between the Navy, USFWS and state fish and wildlife agencies.
- g) Facilitate resolution of conflicts between the Navy, USFWS and state fish and wildlife agencies and other stakeholders if necessary.
- h) Provide technical oversight and resources for forest management and agricultural outlease projects.
- i) Provide technical oversight and budget approval of installation fish and wildlife/hunting and fishing fee and permit projects.
- j) Compile, track and maintain INRMP metrics on the Natural Resources Data Call Station.
- k) Review and sign INRMPs to ensure technical sufficiency.

In addition to the installation NRM, NAVFAC NW has professionally qualified Senior Natural Resources Specialists in Forestry and Fish and Wildlife Management to support and assist the installation's Natural Resources Manager.

1.4.7 Other Federal Agencies

The Sikes Act (16 U.S.C. 670a et seq., as amended) directs DOD to cooperate with the USFWS in the management of natural resources on DOD installations. The USFWS, along with the Navy and the appropriate state fish and wildlife agency, has signature approval authority over the INRMP and USFWS biologists may be called upon to provide assistance and support to the Natural Resources Manager, if necessary.

1.4.8 State Agencies

The Sikes Act also directs DOD to cooperate with the appropriate state fish and wildlife office in the management of natural resources on DOD installations. The appropriate state fish and wildlife office, along with the Navy and the USFWS, has signature approval authority over INRMPs and state biologists may be called upon to provide assistance and support to the NRM, if necessary.

1.4.9 Native American Tribes

The Navy must consult with federally recognized Indian tribes whose interests may be affected by the implementation of this INRMP, as natural resource management can affect traditional subsistence and medicinal resources as well as the character of sacred and religious sites. However, there are no local area Native American Tribes with Usual and Accustomed (U&A) treaty harvest rights within or adjacent to the installation. The Coeur d'Alene, Kalispell, and Kootenai tribes have some presence in northern Idaho, but they are not present on Lake Pend Oreille and do not have management jurisdiction for this area. Therefore, no Native American tribes will be consulted for comments or recommendations on this INRMP.

1.5 Authority

INRMPs are authorized under the Conservation Programs on Military Installations (Sikes Act), as amended; Public Law 86-797, 16 United States Code (USC) § 670(a) et seq., which requires military installations to prepare and implement INRMPs to provide for:

- a) Fish and wildlife management, land management, forest management and fish and wildlife-oriented recreation.
- b) Fish and wildlife habitat enhancement or modifications.
- c) Wetlands protection, enhancement, and restoration, where necessary for support of fish, wildlife or plants.
- d) Integration of and consistency among the various activities conducted under the plan.
- e) Establishment of specific natural resources management goals and objectives and timeframes for proposed actions.
- f) Sustainable use by the public of natural resources to the extent that the use is not inconsistent with security, safety and the needs of the fish and wildlife resources.
- g) Public access to the military installation that is necessary and appropriate for natural resource uses, subject to requirements necessary to ensure safety and military security.
- h) Enforcement of applicable natural resources laws and regulations.
- i) No net loss in the capability of military installation lands to support the military mission of the installation.
- j) Such other activities as the Secretary of the Navy determines appropriate.

The Sikes Act also sets guidelines for the collection of fees for the use of natural resources such as hunting and fishing.

Various guidance documents have been issued regarding interpretation of the Sikes Act Improvement Amendment (SAIA) and INRMP preparation. Below are listed key DOD and DON documents relevant to natural resource management.

- *Memorandum on Implementation of Ecosystem Management in DOD.* This Memorandum, issued by the Deputy Under Secretary of Defense on 8 August 1994, was the first formal statement of an ecosystem management approach to land management in the DOD. Ecosystem management is to be achieved through developing and implementing INRMPs. This Memorandum contains DOD's 10 principles of ecosystem management as an attachment, which were later included as an enclosure in DODINST 4715.3.

- *DODINST 4715.3, Environmental Conservation Program (3 May 1996)* - This Department of Defense Instruction (DODINST) pertains to both natural and cultural resources management on DOD lands. It includes budgeting classifications for funding priorities and detailed information on the intent of INRMPs. Exhibit 1–1 lists the specific contents required in an INRMP document.
- *Memorandum on Implementation of Sikes Act Improvement Amendment: Updated Guidance* -- This Memorandum of the Under Secretary of Defense, issued on 10 October 2002, provides guidance for implementing the requirements of the Sikes Act in a consistent manner throughout DOD and replaces the 21 September 1998 guidance Implementation of the Sikes Act Improvement Amendments. The October 2002 memorandum and its supplement issued in November 2004 emphasize implementing and improving the overall INRMP coordination process and focus on coordinating with stakeholders, reporting requirements and metrics, budgeting for INRMP projects, using the INRMP as a substitute for critical habitat designation, supporting military training and testing needs, and the INRMP review process.
- *The Implementation of Sikes Act Improvement Amendment - Supplemental Guidance Concerning Leased Lands*, 17 May 2005. This document provides supplemental guidance for implementing SAIA requirements consistently throughout the Department of Defense. The guidance covers lands occupied by tenants or lessees or being used by others pursuant to a permit, license, right of way or any other form of permission. INRMPs must address the resource management of all lands for which the subject installation has real property accountability, including leased lands. Installation Commanding Officers may require tenants to accept responsibility for performing appropriate natural resource management actions as a condition of their occupancy or use, but this does not preclude the requirement to address the natural resource management needs of these lands in the installation INRMP.
- *OPNAVINST 5090.1C, Environmental and Natural Resources Management Manual – (SAIA 1997)* - Establishes broad policy and assigns responsibilities for the Navy Natural Resources Program. Naval Facilities Engineering Command is assigned overall program management responsibility with authority to establish, coordinate and promulgate the program; to issue appropriate instructions to the Navy installations for implementation of the various natural resources programs; and to provide professional natural resources services and technical assistance, through NAVFAC offices, to Navy and Marine Corps Installations. It also directs major claimants and intermediate commands to ensure that subordinate commands support natural resources programs on installations under their control. Installation Commanding Officers are tasked with:
 - 1) Requesting and using technical assistance from the appropriate NAVFAC office in developing and maintaining an effective natural resources program.
 - 2) Providing funding to ensure adequate support of the natural resources program.
 - 3) Applying practices set forth in approved natural resources management plans.
 - 4) Assigning specific responsibilities, centralized supervision and qualified personnel to the natural resources program.
- *NAVFAC Real Estate Operations and Natural Resources Management Procedure Manual, P-73, Volume I, May 1987* - Establishes the governing format under which the INRMP is structured. This document addresses all CNO natural resources program requirements, guidelines and standards.

- *Guidelines for Preparing Integrated Natural Resources Management Plans for Navy Installations*, September 1998. This guidance provides natural resources managers at Navy installations with an interpretation of what processes are needed to prepare INRMPs. This document is divided into three sections. The first section suggests a process to develop an INRMP. The second section addresses traditional technical areas to be included in the INRMP. The third section includes a discussion on implementing the INRMP. The Navy is developing updated INRMP guidance, including an INRMP template. This guidance may be issued in 2010.



1.6 Sustainability and Compliance

As a steward of military lands, the Navy recognizes that the installations in Navy Region Northwest are part of diverse and functioning ecosystems. Sustainability ensures the integrity of natural ecosystems over time while meeting the needs of the military mission. Sustainability goes beyond the definition of regulatory compliance, which is simply meeting the minimum requirements of laws and regulations that pertain to the environment. Detachment Bayview's personnel will take an active approach to managing the natural resources of the installation and integrate all plans and operations into the concepts of biodiversity and sustainability of these resources.

1.7 Review and Revision Process

The effectiveness of the installation's INRMP will be evaluated annually. The evaluation will utilize the seven areas in the Navy's web-based Metrics Builder tool on the Natural Resources Data Call Station website (<https://clients.emainc.com/dcs/navfac/index.htm>). These seven areas are:

- 1) INRMP Implementation;
- 2) Partnerships/Cooperation and Effectiveness;
- 3) Team Adequacy;
- 4) INRMP Impact on the Installation Mission;
- 5) Status of Federally Listed Species and Critical Habitat (CH);
- 6) Ecosystem Integrity;
- 7) Fish and Wildlife Management and Public Use.

Use of the Metrics Builder to accomplish the INRMP Annual Reviews will also generate Navy conservation program metrics to measure effects of the conservation program on the installation's mission and the status of the installation's relationship with USFWS and IDFG.

The annual evaluation must be completed in cooperation with the appropriate field-level offices of the USFWS and IDFG. The cooperating partners will work together to measure both the successes and issues resulting from INRMP implementation. During these reviews, it may be determined that the installation's current INRMP is effective and is not in need of revision. With agreement from USFWS and IDFG, thorough written documentation of the annual informal evaluations may be used to substitute for the five-year formal review, thereby reducing the demands on the installation. In addition, minor changes can be made to the INRMP following annual reviews that will prevent the need for a more costly and time-consuming revision following the five-year review. Therefore, it is in the installation's best interest that it document annual reviews and work

with USFWS and IDFG to utilize the annual review process to meet the five-year formal review requirement whenever possible.

1.8 Commitment of the Partner Agencies

No element of the SAIA is intended to either enlarge or diminish the existing responsibility and authority of the USFWS or IDFG concerning fish and wildlife responsibilities on military lands. The Sikes Act requires the INRMPs to be prepared in cooperation with the USFWS and appropriate state fish and wildlife agency (IDFG). An INRMP reflects mutual agreement of the parties concerning the conservation, protection and management of fish and wildlife resources. In addition, USFWS and the state fish and wildlife agency will review the INRMP as to the operation and effectiveness at least once every five years. However, it is preferred that this take place annually.

1.9 Management Strategy

Ecosystem management is a goal-driven approach to environmental management that is at a scale compatible with natural processes; is cognizant of nature's time frames; recognizes social and economic viability within functioning ecosystems; and is realized through effective partnerships among private, local, state, tribal and federal interests. Ecosystem management is a process that considers the environment as a complex system functioning as a whole, not as a collection of parts, and recognizes that people and their social and economic needs are a part of the whole. The ecosystem management approach has the overarching goal of protecting the properties and functions of natural ecosystems. Over the long term, this approach will maintain and improve the sustainability and biological diversity of terrestrial and aquatic ecosystems while supporting sustainable economies and communities. Maintenance of healthy ecosystems supports realistic military training and testing, which in turn promotes mission readiness.

The Commander, Navy Region Northwest, considers this approach to be responsible stewardship. The Natural Resources Management Program is based on the premise that responsible stewardship and ecosystem management are synonymous and are compatible with integrated natural resources management.

1.9.1 Natural Resources Management Strategy

The natural resources management strategy for Detachment Bayview begins with three words: “What, Where, When”:

- **What:** what natural resources, habitats, vegetation, wildlife and water resources are on the installation?
- **Where:** where are these resources located?
- **When:** when are they present on the installation

The NRM will use the best available data that helps answer the “What, Where, When” questions for management decisions for the installation.

1.9.2 Early Review and Risk Assessment

Early review of proposed actions and the assessment of environmental risk is achieved at the installation. Installation review process requires all new projects, programs and operations, or changes to existing projects, programs, and operations, be reviewed by the Environmental Division

staff for potential impacts to natural resources. Detachment Bayview with the support of the NRM review planned actions, assess the risks to natural resources, and provide comments and/or alternatives to the action proponents that will minimize or eliminate the risks, if possible. The early review process also allows the installation an opportunity to identify the appropriate NEPA documents that will be generated based on the proposed action and the alternatives.

1.10 Restoration and Enhancement of Resources

The NRM will keep abreast of installation military requirements and identify areas heavily impacted by the operations and thus not appropriate for restoration activities. A ranking system must be developed in order to make efficient use of budgets and to focus restoration and monitoring activities. Mission, biological, seasonal or budgetary constraints may dictate when restoration projects can be implemented. Restoration planning must be detailed enough to allow for successful completion of the project. Monitoring for success or failure should also be a key component of any restoration or enhancement planning.

1.11 Current Conditions and Use

1.11.1 General Description

The installation currently comprises about 38 acres mostly within the town of Bayview, Idaho. Located in Kootenai County at the southern end of Lake Pend Oreille, the installation owns approximately 22 developed acres on the shore of Lake Pend Oreille and manages approximately 16 acres of lake bottom (Figure 1.1, Table 1.1). This acreage includes two operational areas which are located on U.S. Forest Service property and operated under a Special Use Permit. The two operational areas are located north of Bayview on the western shore of Lake Pend Oreille. These outlying parcels (named Outpost and Wigwam) are located in Bonner County. They house cable structures that are integral to the research, development, testing and evaluation (RDT&E) activities of Detachment Bayview. Additionally, Detachment Bayview maintains several floating facilities anchored in Lake Pend Oreille and uses public waters to conduct routine testing (Figure 1.2). Descriptions of the various habitats (forested, landscaped, and developed areas) are presented in Section 2, Existing Conditions.

Operational Areas	Acreage
Developed Installation	8
Remote Storage Area	13
Outlying Parcels	<1
(Wigwam and Outpost)	
Submerged Lake Bottom	16
Submerged Test Areas, Floating Facilities, and Tow Path	N/A
<i>Total Acres</i>	<i>~38</i>

Table 1.1. Detachment Bayview Operational Areas

1.11.2 Installation History

Detachment Bayview is a small, 38-acre remnant of an extensive naval training camp developed in the 1940's. The 7 December 1941 attack on Pearl Harbor emphasized the vulnerability of the

U.S. Navy's coastal training facilities. A mere four months following the attack, the desire for a more secure facility led the Navy to select Bayview, Idaho as the location of a new inland training facility. The site was rapidly developed and the first training camp was activated in August of 1942 as Farragut Naval Training Station, covering 4,050 acres.

Farragut Naval Training Station was deactivated in September 1946, shortly following the end of World War II. During its active life span of less than 4 years, nearly 300,000 troops were trained at the facility. The vast majority of the original property is now Idaho's largest state park. Farragut State Park is managed by Idaho Department of Parks and Recreation and they maintain a useful and interesting collection of photographs and memorabilia from the Park's days as a naval training facility.



Figure 1.1. Location of Detachment Bayview in Idaho

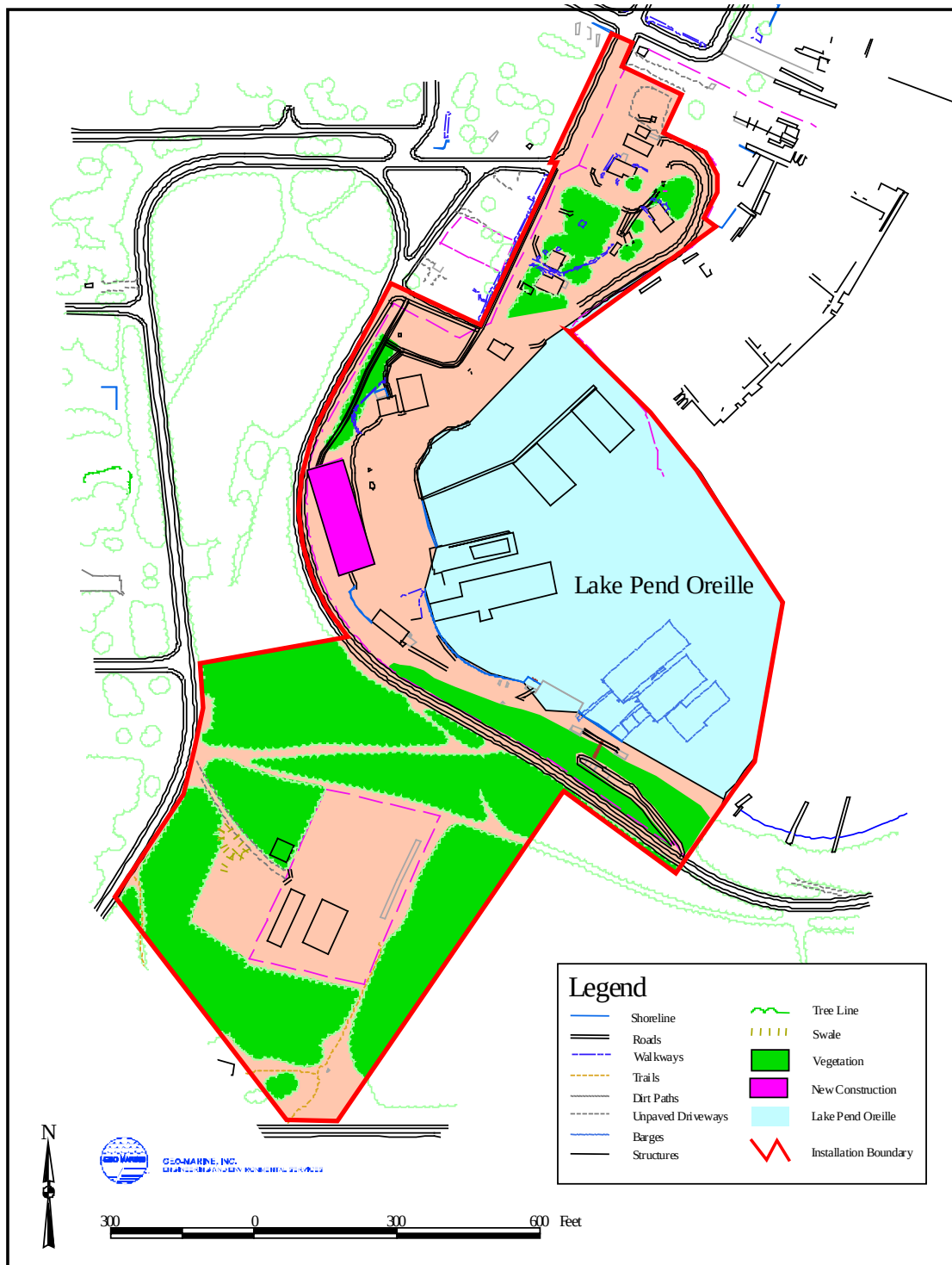


Figure 1.2. Detachment Bayview Installation Map.

1.11.3 Military Mission

Detachment Bayview is a component of Naval Surface Warfare Center. The Operational Areas are shown in Figure 1.3. The current mission of Detachment Bayview is to provide:

- RDT&E, fleet support and in-service engineering for surface and undersea vehicle, hull, mechanical, and electrical (HM&E) systems and propulsors;
- Logistics research and development; and
- Support to the maritime administration and maritime industry.

1.11.4 Operations and Constraints

Existing land use and the possibility of future development in support of the military mission are the primary constraints to implementation of this INRMP. Detachment Bayview and outlying parcels are shown in Figure 1.4. Presently, there are only small amounts of forest, some of which act as buffer zones and provide critical benefits such as slope stabilization. The forested areas and various other natural habitats would be compromised in productivity and resilience by a reduction in size. Proposed development should provide opportunities to improve the natural resources base, such as offsetting the loss of natural resources by demolition of obsolete structures or paved areas and restoration of these areas to native vegetation. Also, the development or enhancement of habitat can reduce the potential for establishment of invasive species. This INRMP recommends management actions for mitigation in which the natural environment and its various resources benefit in exchange for necessary development of buildings or facilities.

1.11.5 Overview of the Natural Resources Management Program

Administratively, the program implementation is the responsibility of the designated NRM at Naval Base Kitsap, with Detachment Bayview Environmental, Safety and Health office providing on-site support. Typical program duties include program documentation for actions required under the NEPA, forest and land management, fish and wildlife management, and cultural resources protection. Conservation of biodiversity and ecosystem management has been directed by DOD as the management approach for protection and enhancement of natural resources. The NRM supports the military mission by implementing this INRMP, maintaining compliance with applicable laws, regulations and instructions, and preparing NEPA documentation for military projects.

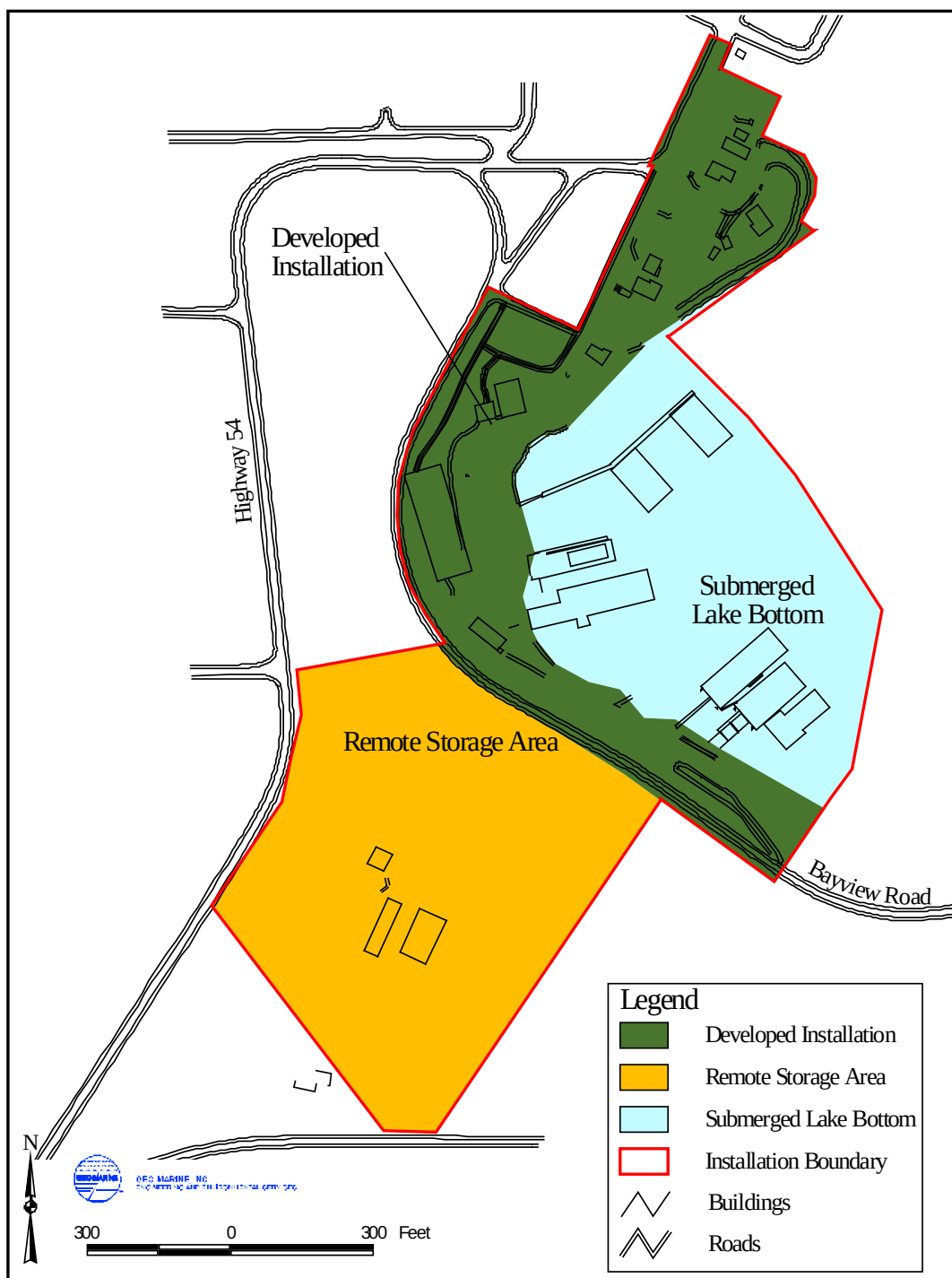


Figure 1.3 Detachment Bayview Operational Areas

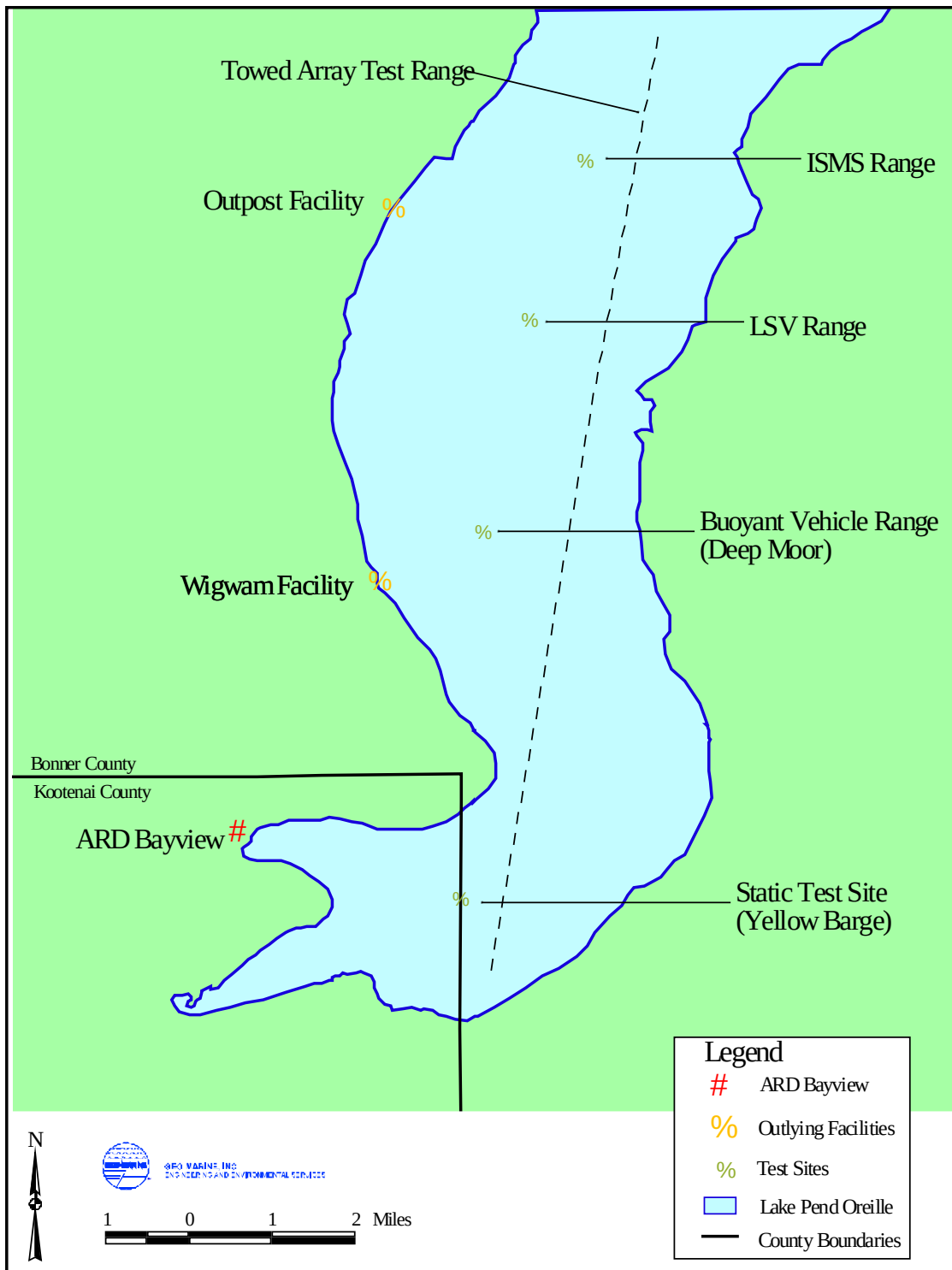


Figure 1.4. Detachment Bayview Outlying Parcels.

2.0 Physical Environment

2.1 Regional Setting and Climate

Detachment Bayview is located in northern Idaho, approximately 75 miles south of Canada, bordered on the southwest by Farragut State Park and to the east and northeast by Lake Pend Oreille. Surrounding the lake to the east and north is the Kaniksku National Forest, one of three forests that make up the Idaho Panhandle National Forests.

The regional climate is influenced by predominantly west winds, which deliver moist air masses from the Pacific Ocean (University of Idaho 2001). The local climate is also influenced by Lake Pend Oreille. The large, deep lake has much capacity for moderating local temperatures. In fact, despite its northern latitude, the deep lake remains ice-free throughout the winter. Temperatures in the region are typically warmer in the winter and cooler in the summer than found in areas east of the Rockies. Communities in the Lake Pend Oreille region regularly advertise this moderate climate to attract visitors.

The average annual monthly temperature at Detachment Bayview is 45.3 °F based on data collected by the National Climatic Data Center from 1971-2000 (Western Regional Climate Center, no date). The average minimum temperature is lowest in December (22.7 °F) and in January (21.8 °F), while the average maximum temperature is reached in July and August (80.5 °F and 80.1 °F, respectively).

The average annual precipitation is 25.3 inches of water. This average includes rain, snow, hail and other forms of precipitation. The monthly precipitation averages are highest in November (3.13 inches) and December (3.29 inches). The lowest monthly average precipitation occurs in July through September, ranging from 1.19-1.25 inches.

The average annual snowfall at Detachment Bayview is 40.9 inches based on data collected from 1948-2000 (Western Regional Climate Center, 2002). Snowfall occurs in October through April, with the most snowfall occurring in the months of December (12.7 inches) and January (15.7 inches). The average snow depth is highest in January and February, 5 and 4 inches, respectively. Because of the influence of the surrounding Bitterroot Mountains, Coeur d'Alene Mountains and Selkirk Mountains, precipitation patterns vary dramatically over small spatial scales. Some nearby locations experience more than 80 inches of snowfall.

2.1.1 Geology

The northern part of the Idaho is a mere 45 miles wide with elevations ranging from 700 to 9,000 feet. Forested mountains and high plains characterize this region. Elevations at Detachment Bayview range from 2,051 feet, along the shoreline of Lake Pend Oreille, to approximately 2,290 feet at the remote storage yard (Figure 2.1). A unique combination of events formed this northern Idaho setting, where Detachment Bayview is located. The northern Rocky Mountains formed from compression and volcanism, in contrast to the spreading forces that formed the basin and range topography represented in southern Idaho.

The Laramide Orogeny, which occurred 70 to 40 million years ago (mya), was the last of three major mountain building events that formed the Rocky Mountains. This event formed great mountains that subsequent events would erode to leave the landscape we see today.

Perhaps equally important to the shape of the modern-day landscape was the last glacial advance occurring 10,000 to 12,000 years ago. Near the end of the last ice age, the southern extent of the continental ice sheet reached into the states of Washington, Idaho, and Montana. Glaciers

carved steep sided valleys and left steep mountain spires, or cirques, where several glaciers originated around a mountain peak. During the glacial advance, a large portion of the ice sheet advanced into northern Idaho. This “finger” of ice formed a dam near the present-day Lake Pend Oreille, blocking waters draining westward from Montana via the Clark Fork River. The ice dam

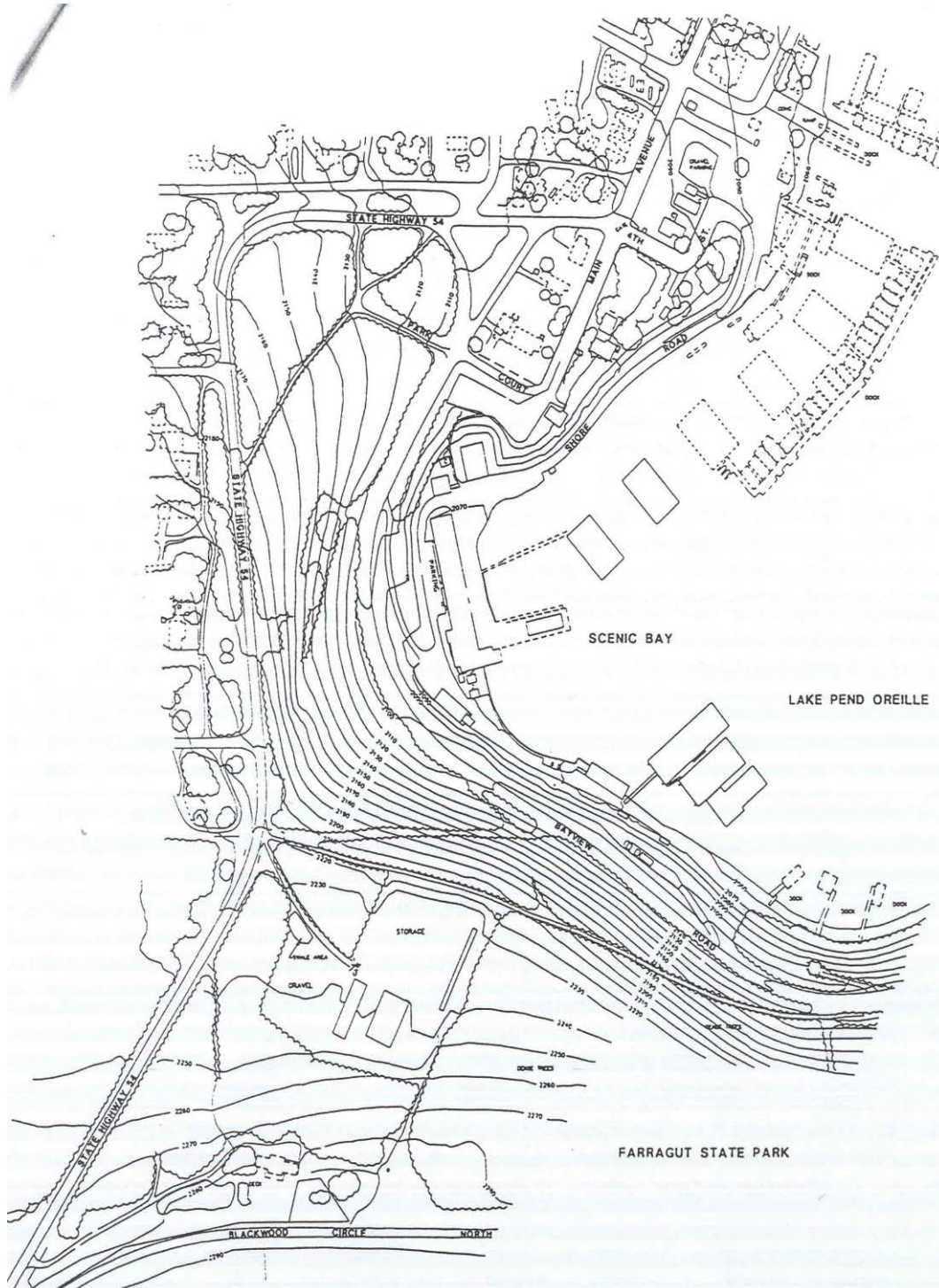


Figure 2.1. Detachment Bayview Topography.

created a lake more than 2,000 feet deep, impounding water hundreds of miles to the east into what is now Montana. At its greatest, this Lake Missoula contained more water than combined volumes of Lake Erie and Lake Ontario (Idaho Geologic Survey n.d.). Perhaps even more dramatic than the formation of Lake Missoula, was the catastrophic collapse of the ice dam. The rapid outflow of water approached speeds of 65 miles per hour and scoured soils down to the underlying bedrock (Idaho Geologic Survey n.d.). In some places, the erosive force of the water stripped away more than 200 feet of soil. This event is believed to have occurred not once, but many times.

2.1.2 Topography

Topography of the Detachment lands varies from nearly level to moderately steep slopes. Erosion hazard from disturbed or denuded soils ranges from slight to severe. In order to maintain slope stability and prevent erosion, vegetation will be maintained on undeveloped portions of the Detachment. The topography is shown in Figure 2.1.

2.1.3 Soils

The soils at Detachment Bayview are described in the Soil Survey of Kootenai County Area, Idaho (Soil Conservation Service, 1981) and are shown in Figure 2.2. Three soils have been identified at Detachment Bayview and one additional soil type represents the outlying parcels, Wigwam and Outpost. Much of the soil resource found at Detachment Bayview includes altered or disturbed materials. Sources of disturbance include building site preparation and road-building activities.

The three soils identified at Detachment Bayview are Bonner silt loam, Bonner gravelly silt loam and Kootenai gravelly silt loam. The Bonner and Kootenai soils are mapped in the soil survey (Soil Conservation Service, 1981); Dystrochreptic Arents are also included based on the intensive development at the site. Dystrochreptic Arents represent human disturbance over Bonner soils. Descriptions of the soils and mapping units found at the Detachment Bayview follow:

Bonner silt loam, 0 to 8 percent slopes – This Bonner soil is a very deep, well drained soil that formed in glacial outwash mantled with volcanic ash and loess on glacial outwash plains and terraces. The soils have moderately rapid permeability, slight to moderate erosion hazard, a rooting depth to 60 inches and a low available water capacity. Other characteristics include a gravelly subsoil and a dusty soil surface when dry.

Bonner gravelly silt loam, 0 to 8 percent slopes – This Bonner soil is a very deep, well drained gravelly soil that formed in glacial outwash mantled with volcanic ash and loess on glacial outwash plains and terraces. The soils have moderately rapid permeability, slight to moderate erosion hazard, a rooting depth to 60 inches and a low available water capacity. Other characteristics include small stones throughout the profile and a dusty soil surface when dry.

Kootenai gravelly silt loam, 20 to 45 percent slopes – This Kootenai soil is very deep, well drained soil that formed in slightly weathered glacial till that is modified by water and mantled by loess and volcanic ash on glacial outwash terraces and escarpments. Permeability is moderate and the steep slope contributes to a very high erosion hazard.



Dystrochreptic Arents, 0 to 20 percent slopes – Dystrochreptic Arents are human-disturbed soils on glacial outwash terraces. Soils are variable and well drained. They are made up of Bonner soils where the surface has been stripped and soils have been mixed.

In addition to the soil types at Detachment Bayview, one additional soil type was identified at the outlying properties. The soil is described in the soil survey of Bonner County (Soil Conservation Service 1982), but this area is not included in the survey. The attribution of the Ardtoo soil to the Wigwam and Outpost sites is based on the 1997 INRMP (U.S. Department of the Navy 1997).

Ardtoo gravelly sandy loam, 35 to 65 percent slopes – Ardtoo soils are formed from granite, gneiss, and schist and are found on south-facing mountainsides. Permeability is moderately rapid, but the erosion hazard is very high.

2.1.4 Water Resources

2.1.4.1 Watersheds

The term watershed refers to the catchment area or drainage basin of a particular waterway. Detachment Bayview is located within the Lake Pend Oreille watershed [Hydrologic Unit Code (HUC) 17010214] (Figure 2.3). Lake Pend Oreille is fed by the Clark Fork River, which originates near Butte, Montana, and accounts for more than 90 percent of the lake's inflow. The Clark Fork comprises its drainage from much of northwestern Montana.

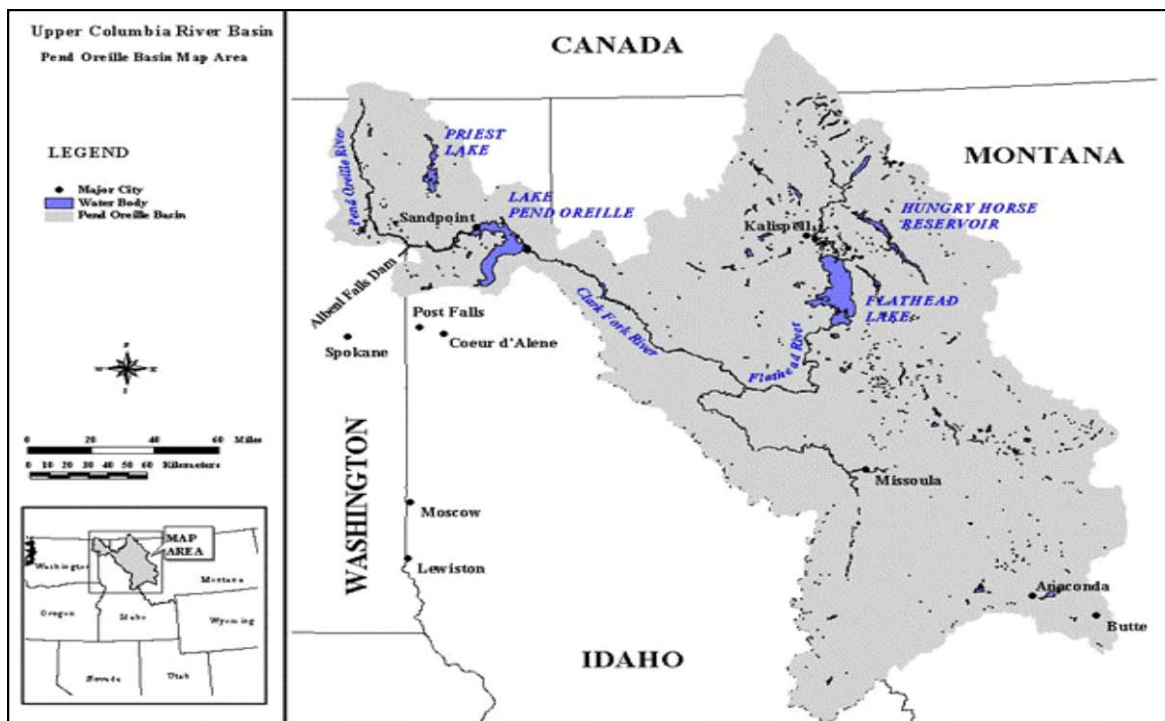


Figure 2.3. Lake Pend Oreille Watershed

2.1.4.2 Surface Water

There are no surface water drainages or impoundments on Detachment Bayview. The only surface water present is Lake Pend Oreille. The area of surface water covered by Naval facilities is approximately 3.5 acres. The Albeni Falls Dam was constructed in 1952 to regulate the water level in Lake Pend Oreille for power production and flood control. The U. S. Army Corps of Engineers (ACOE) controls the lake levels. Target levels for Lake Pend Oreille surface elevation are 2,051 feet in winter and 2,062 feet in summer. The low winter level provides water storage capacity to absorb snowmelt and runoff from spring rainfall (Figure 2.4). Efforts to enhance kokanee (*Oncorhynchus nerka*) spawning success suggest increasing the lake level during winter drawdown (reference). The proposed level (2,055.0 ft) is still within the ACOE defined operating limits of the lake.

Lake Pend Oreille is the largest and deepest lake in Idaho and the fifth deepest lake in the U.S., encompassing 148 square miles (94,500 acres) and reaching to a depth of 1,152 feet. The lake is generally oriented in a north-south direction. It is approximately 43 miles long and over 6 miles wide. It receives widespread use for recreation purposes, including fishing, boating, sailing and sightseeing.

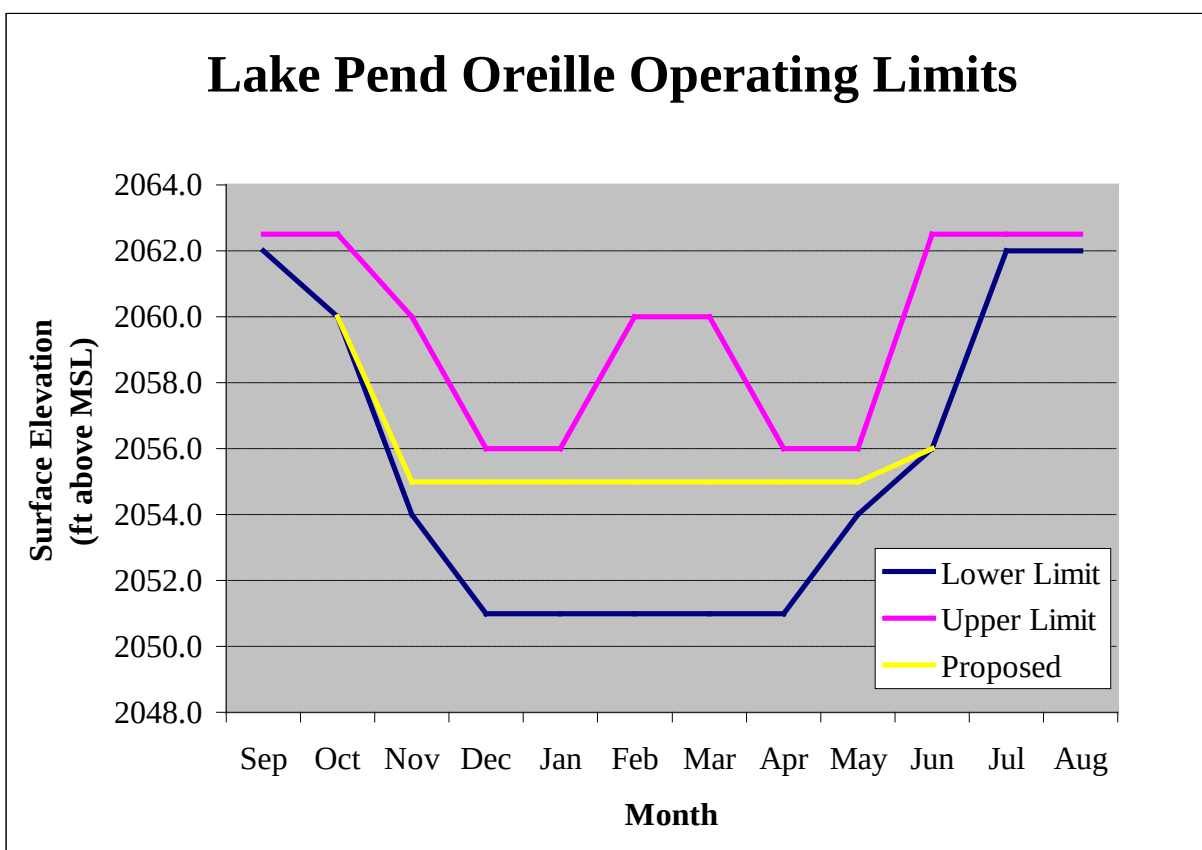


Figure 2.4. Lake Pend Oreille Water Level Operating Range.

2.1.4.3 Wetlands

Wetland resources at Detachment Bayview were delineated in 1993 (U.S. Navy 1994) and no signs of wetland hydrology were found. A search of the National Wetlands Inventory (USFWS

1989) did not identify any wetlands on the subject property. Since Detachment Bayview lacks jurisdictional wetlands, Section 404 permitting for wetland impacts associated with potential development opportunities is not applicable. However, other permit requirements under CWA Section 404 for activities within the ordinary high water mark (OHWM) of Lake Pend Oreille may be required.

2.1.4.4 Groundwater

The sole groundwater supply to northern Idaho and eastern Washington is the Spokane Valley-Rathdrum Prairie Aquifer, which covers 325 square miles of northern Idaho and eastern Washington. The aquifer formed during the last ice age from coarse gravelly deposits of glacial outwash (sands, gravels, and cobbles). The coarse nature of these sediments contributes to the aquifer's extreme permeability and high groundwater velocities. These characteristics also forewarn of the great risks associated with the potentially rapid spread of contamination. Aquifer recharge originates from Coeur d'Alene Lake and the Spokane River (approximately one-third); the watersheds of Hayden, Spirit, Twin, Hauser and Pend Oreille Lakes provide one-third; and precipitation supplies the remaining one-third.

2.2 General Biotic Environment

2.2.1 Flora

2.2.1.1 Terrestrial Vegetation

Detachment Bayview is a heavily developed installation. Most of the area is comprised of buildings and other impervious surfaces (roads, parking, and sidewalks). Three areas still support native forest cover. The first area located near the main gate supports a mature forest canopy including ponderosa pine and Douglas-fir. While the canopy is mature forest, the understory and shrub layer have been cleared. This site is used as a picnic area.

The second forested area is located in the southeastern area of the installation. Native forest is present on the slope between Bayview Road and the developed installation. This slope provides a noise and visual buffer as well as slope stabilization. Lastly, the largest forested area surrounds the Remote Storage Area on the southern part of the installation and will be maintained as a mature forest to provide wildlife habitat and a buffer for the Remote Storage Area. This is the largest contiguous patch of forest at Detachment Bayview (approximately 7 acres). This forest also functions as a buffer to Highway 54 and Bayview Road. Tree species occurring in the forested areas include Douglas-fir (*Pseudotsuga menziesii*), ponderosa pine (*Pinus ponderosa*), western larch (*Larix occidentalis*). Understory species include false Solomon's seal (*Smilacina spp.*), creeping Oregon grape (*Mahonia repens*), and oceanspray (*Holodiscus spp.*) (U.S. Department of the Navy 1997).

The remaining vegetation at Detachment Bayview is typical of disturbed sites and includes a mix of native and non-native invasive species. Common plants include common tansy (*Tanacetum vulgare*), spotted knapweed (*Centaurea maculosa*), and Canada thistle (*Cirsium arvense*).

2.2.1.2 Invasive Plant Species

No program is currently in place at Detachment Bayview to identify, locate, and remove invasive plant species. Preliminary investigations have identified several invasive species at Detachment Bayview. Common invasive plants include common tansy (*Tanacetum vulgare*),

spotted knapweed (*Centaurea maculosa*), orange hawkweed (*Hieracium aurantiacum*), Canada thistle (*Cirsium arvense*), and Klamath weed (*Hypericum perforatum*) (U.S. Department of the Navy 1997). To limit the spread of invasive species, either to or from Detachment Bayview, all earth-moving equipment should be thoroughly cleaned before entering and leaving the site. This effort will limit the introduction of new invasive species to Detachment Bayview, while limiting the spread of existing species to additional sites.

Invasive aquatic weeds are also present. Eurasian water milfoil (*Myriophyllum spicatum*) was discovered above Albeni Falls Dam in 1997. It was discovered in Lake Pend Oreille during the winter of 2002. Eurasian water milfoil grows at depths from one to ten meters. This plant spreads very rapidly, primarily by rhizomes and by dispersal of plant fragments. Eurasian water milfoil is Idaho's only aquatic noxious weed. It forms very dense mats of vegetation on the water's surface. This interferes with water-based recreation such as fishing, boating, water skiing, and swimming. The mats increase the pH of the water and reduce the amount of dissolved oxygen, killing fish and other life. At this time, the Navy has not surveyed its waters nor identified steps to reduce and/or eliminate this recently discovered species from Lake Pend Oreille. However, since 2006, the state of Idaho has had a program in place targeting complete eradication of Eurasian water milfoil. (source – <http://www.agri.state.id.us/Categories/PlantsInsects/NoxiousWeeds/milfoil.php>)

2.3.1 Fauna

2.3.2.1 Terrestrial Mammals

Detachment Bayview is within the range of several of our nations large mammals including elk (*Cervus elaphus*), moose (*Alces alces*), black bear (*Ursus americanus*), and white-tailed deer (*Odocoileus virginianus*). Because of the small size and extensive development of the installation, the white-tailed deer is the most frequent large mammal currently inhabiting the property. However, discussions with neighboring landowners confirmed the occasional presence of black bear. Smaller mammals that utilize the grounds include the raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), river otter (*Lutra canadensis*), mink (*Mustela vison*) and chipmunk (*Eutamias spp.*).

2.3.2.2 Fish

Additionally, numerous fish species are present in Lake Pend Oreille. These include kokanee (*Oncorhynchus nerka*), kamloops (rainbow) trout (*Oncorhynchus mykiss*), bull trout (*Salvelinus confluentus*), brown trout (*Salmo trutta*), lake trout (*Salvelinus namaycush*), westslope cutthroat trout (*Oncorhynchus clarki lewisi*), lake whitefish (*Coregonus clupeaformis*), mountain whitefish (*Prosopium williamsoni*), northern pike (*Esox lucius*), northern pikeminnow (*Ptychocheilus oregonensis*), smallmouth bass (*Micropterus dolomieu*), largemouth bass (*Micropterus salmoides*), and various catostomids, sculpins, chubs, dace, and warmwater panfish.

Of the species listed above, two receive Federal and/or State protection. The bull trout is listed as threatened by the USFWS and the westslope cutthroat trout is an Idaho species of special concern. The Lake Pend Oreille Bull Trout Conservation Plan is provided in Appendix D.

2.3.2.3 Birds

The mix of habitats at ARD Bayview has great potential to attract a diverse bird population. Its proximity to Farragut State Park, with a mix of forest and meadow habitats, provides opportunities to view birds that require larger forest acreage than are present within the installation boundary. In

addition to bird species that breed on the installation grounds, many species temporarily utilize the grounds during spring and fall migrations. A list of potential bird species by habitat type is presented in the Farragut State Park Natural Resource Plan (University of Idaho 2001).

Maintaining baseline survey data on bird populations, as well as other wildlife and plants, is a requirement of natural resources programs as specified in the SAIA. Currently, knowledge of flora and fauna has been gathered by chance encounters at ARD Bayview and from regional information. To obtain site-specific knowledge of resources present, surveys will be conducted to establish baseline information. Baseline surveys (Project FW-1) will consist of flora and fauna, including plants, birds, mammals, reptiles and amphibians. Periodic monitoring will provide critical information about population changes that can be used to set conservation and management priorities.

2.3.2.4 Threatened and Endangered (T&E) Species and Species of Concern

Bull Trout

The bull trout is a member of the char family. It was considered a member of the Dolly Varden (*Salvelinus malma*) species until being recognized as a distinct species in 1980. Most of the Lake Pend Oreille bull trout population is adfluvial, meaning that juvenile fish rear from one to four years in tributary streams before migrating to the lake. Adults reside in the lake throughout much of the year, but move into tributary streams to spawn in late summer to early fall.

The bull trout was formally listed by the USFWS as threatened in 1998. The USFWS proposed to designate critical habitat for the Klamath River and Columbia River distinct population segments of bull trout in the Federal Register on February 11, 2003 (Volume 68, Number 28). The proposed critical habitat designation includes approximately 29,720 kilometers (18,471 miles) of streams and 215,585 hectares (532,721 acres) of lakes, reservoirs, and marshes in Oregon, Washington, Idaho, and Montana. Designation would apply only to the waterways, not the adjacent lands. Bull trout populations in the Upper Columbia River Basin declined dramatically in the 1950's following construction of the Albeni Falls dam, which regulates outflow from Lake Pend Oreille, and the Cabinet Gorge Dam, which limits movement up the Clark Fork from the lake. Both dams were constructed without fish passageways, thereby isolating populations above and below the dams. Following the listing action three key documents were prepared that address the Lake Pend Oreille bull trout population: (1) Lake Pend Oreille Bull Trout Conservation Plan (Appendix D) (Lake Pend Oreille Bull Trout Watershed Advisory Group [WAG] 1999); (2) Biological Opinion: Effects to Listed Species from Operation of the Federal Columbia River Power System (USFWS 2000); and (3) Bull Trout (*Salvelinus confluentus*) Draft Recovery Plan (USFWS 2002).

Kokanee are the primary food source for bull trout (Maiolie et al. 2003), however, the kokanee population has also declined greatly since the 1950's. The Biological Opinion presented the risk that bull trout populations may decline if kokanee populations continue to decline. To address the decline in kokanee populations, two kokanee management options were discussed in the Biological Opinion. First, kokanee harvests should be closed in Lake Pend Oreille. Second, seasonal water levels in Lake Pend Oreille could be manipulated to improve spawning conditions and increase kokanee egg and fry survival. Option one has been implemented by IDF&G. A study was begun in 1996 to test the effectiveness of the second option. The final report from the study was completed in 2003 (Maiolie et al. 2003).

Westslope Cutthroat Trout

The westslope cutthroat trout was previously the most common trout in Lake Pend Oreille (USFWS 1999, citing others). The habitat requirements of westslope cutthroat trout are similar to the bull trout. Both live in lakes and rivers, but migrate to cold, clear headwaters to spawn. Cold spring-fed streams, such as Gold Creek on the southeast side of Lake Pend Oreille, provide prime spawning habitat for both trout. Similarly, declines in the westslope cutthroat trout have been attributed to migration barriers, multiple man-made dams, degradation of habitat in tributaries used for spawning and rearing, and competition and hybridization from introduced species.

Westslope cutthroat trout compete with several introduced species in Lake Pend Oreille, including rainbow trout, kokanee, brown trout, lake trout, and largemouth bass (USFWS 1999). Additionally, brook trout compete in tributary streams with adfluvial westslope cutthroat trout. The westslope cutthroat trout status review found the highest concentrations in only six locations; all six of these sites lacked rainbow trout and brook trout. The study also determined that westslope cutthroat trout were “most abundant in headwater areas when rainbow trout were absent” (USFWS 1999). Hybridization of westslope cutthroat trout with rainbow trout has also been documented, but the extent is not known.

The westslope cutthroat trout currently lacks federal protection. The USFWS was petitioned by multiple organizations in 1997 to list the westslope cutthroat trout as threatened. Following a review of the status of the westslope cutthroat trout, the determination was made that listing was ‘not warranted’ (2000). The petitioners sued and, on 31 March 2002, the U.S. District Court remanded the action to the USFWS and urged, “that it reconsider its ‘not warranted’ finding for westslope cutthroat trout”. The westslope cutthroat trout was under review by the USFWS to determine if federal protection is warranted; a final decision was issued on 8 August 2003 and concluded that the westslope cutthroat trout should not be listed as a threatened species.

2.3.2.5 Reptiles and Amphibians

Reptiles and amphibians are not diverse in northwestern Idaho, but species which may occur in the area of Detachment Bayview include western painted turtle (*Chrysemys picta belli*), common garter snake (*Thamnophis sirtalis*), wandering garter snake (*Thamnophis elegans vagrans*), western toad (*Bufo boreas*), Pacific chorus frog (*Pseudacris regilla*), Columbia spotted frog (*Rana luteiventris*), northern leopard frog (*R. pipiens*), bullfrog (*R. catesbeiana*), long-toed salamander (*Ambystoma macrodactylum*), rubber boa (*Charina bottae*), northern alligator lizard (*Elgaria coerulea*), and western skink (*Eumeces skiltonianus*). This species list is found at: <https://fishandgame.idaho.gov/sites/Wildlife/IDMasterNaturalist/HenrysFork/Wildlife%20Articles/amphib.pdf>.

The northern leopard frog (*Lithobates [=Rana] pipiens*) may potentially occur in the vicinity of Detachment Bayview. A study to determine presence will be conducted so that habitat protection measures can be included in this INRMP.

2.3.2.6 Pest Management

The Detachment Bayview Integrated Pest Management Program is overseen by the installation Environmental, Health, and Safety Manager, who maintains records of activity. Pests at Detachment Bayview include undesirable or nuisance plants and animals. Nuisance species include non-native species that have the potential to impact native species or their habitats, and native species that, lacking natural controls, may expand to population levels that may adversely impact

ecosystem balance or employee safety. Additionally, native species such as raccoons and skunks may occasionally become a nuisance. While these animals normally pose no threats, the potential exists for them to carry a range of diseases that may affect humans and/or domestic animals. Through proper education installation personnel will be advised against feeding or any close contact with wild animals.

2.3.2.7 Outdoor Recreation

Outdoor recreation is not permitted at Detachment Bayview due to safety and security restrictions.

3.0 Environmental Management Strategy and Mission Sustainability

3.1 Supporting Sustainability of the Military Mission and the Natural Environment

The fundamental components of Detachment Bayview's natural resources management are personnel and funding. OPNAVINST 5090.1C requires each installation to have designated in writing, a Natural Resources Manager (NRM). This individual is to be a professional, knowledgeable and trained in the particular resource issues for that installation. For Detachment Bayview, the NRM is a member of the Naval Base Kitsap environmental staff who coordinates/communicates with the installation Environmental, Health, and Safety Manager, a permanent, funded position. This position reports to the Officer in Charge of the installation. The NRM can call upon other environmental professionals within the Navy Region Northwest and Naval Facilities Engineering Command Northwest, to assist in the management of natural resources. The NRM will integrate environmental protection, conservation and enhancement/restoration within the constraints of the installation's military mission. At the same time, the NRM will work with the installation Environmental, Health, and Safety office to identify risks to the environment that may result from military activities and report these potential risks to the NBK Commanding Officer so that alternatives may be developed that reduce or eliminate the potential impacts.

3.2 Natural Resources Consultation Requirements

3.2.1 Threatened and Endangered Species Consultation

The Endangered Species Act (ESA) requires federal agencies to manage federally listed threatened and endangered (T&E) species and their habitats in a manner that promotes conservation of T&E species and is consistent with recovery plans for such species. Section 7 of the ESA requires all federal agencies to enter into consultation with the USFWS and NOAA Fisheries (also known as National Marine Fisheries Service, or NMFS) whenever proposed actions may affect listed T&E species of plants and animals. At each installation, proposed projects, operations or other actions are scrutinized for potential impacts to T&E species through a formal review process. Section 7 consultations will be initiated if warranted. Otherwise, written documentation that there are no effects to T&E species will be generated by the NRM, or the assigned NAVFAC Northwest natural resources professional, and kept with the project files. The NRM will use the installation's INRMP as a tool to identify at an early stage the potential impacts of planned Navy actions on endangered or threatened species and to provide a basis for altering the action to prevent or minimize those impacts. USFWS or NMFS, or both, may require changes or mitigation that could result in project delays and additional costs. Because of this, it is imperative that the Command at each installation initiate early environmental/natural resources review of proposed actions in order to assess risks, develop alternatives and correctly identify mitigation costs both in terms of time and dollars.

3.2.2 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act, as amended in October 1996, requires that federal agencies consult with the U.S. Secretary of Commerce, through NMFS, on any action proposed to be undertaken that may adversely affect essential fish habitat (EFH).

There is no EFH within the Detachment Bayview area, therefore no further discussion on EFH will be provided in this INRMP. There are no species with NMFS jurisdiction on or adjacent to the Detachment Bayview installation.

3.3 Planning for National Environmental Policy Act (NEPA) Compliance

The National Environmental Policy Act (NEPA) of 1969 (42 USC § 4321 et seq.) requires federal agencies to evaluate the impacts of their proposed actions on the quality of the human environment. The Navy's policies regarding NEPA, OPNAVINST 5090.1C, dated 30 October 2007, Chapter 2, Procedures for Implementing the National Environmental Policy Act (NEPA), SECNAVINST 5090.6A (SECNAV Instruction 5090.6A, Environmental Planning for Department of the Navy Actions, dated April 26, 2004), and Navy's Supplemental Environmental Planning Policy, dated 23 September 2004, echo NEPA and emphasize environmental planning at the earliest stages of projects. An Environmental Assessment and Finding of No Significant Impact (FONSI), for this INRMP can be found in Appendix C.

The Navy recognizes that the NEPA process includes the systematic examination of the likely environmental consequences of implementing a proposed action. To be an effective decision-making tool, the Navy integrates the process with project planning at the earliest possible time. This ensures that planning and decision-making reflect environmental values, avoid delays and avoid potential conflicts. The Navy is able to achieve its mission at home, at sea and abroad more efficiently when environmental planning is properly integrated into Navy decision-making for those Navy actions that have the potential for adverse environmental consequences.

NEPA and Navy policy require early review and coordination for environmental considerations. This is achieved by the installation's environmental review process, which requires all new projects, programs, and operations, or changes to existing projects, programs, and operations be reviewed by installation Environmental, Health, and Safety office for potential impacts to the environment, including potential impacts to natural resources. When alerted to potential environmental impact by the installation Environmental, Health, and Safety office, the NRM will review planned actions, identify the risks to natural resources, and provide comments and/or alternatives to the action proponents that will minimize or eliminate the risks, if possible. The early review process also allows the NRM an opportunity to identify the appropriate NEPA documents that will be generated based on the proposed action and the alternatives.

Detachment Bayview projects and operations are not exempt from the review process, nor from the requirements of NEPA. Agricultural or shellfish harvesting leases, research projects, and vegetation management, just to name a few possible natural resource actions, must all be reviewed for environmental risks and impacts, the same as if the proposed action were a construction project or a new training operation. Alternatives to proposed actions must be identified and investigated for projects that require an environmental assessment (EA) or an environmental impact statement (EIS). Because of the time and funding involved, it is imperative that the installation initiate early environmental/natural resources review of proposed actions, in order to assess risks, develop alternatives and correctly identify mitigation costs.

3.4 Public Access and Outreach

Persons authorized to use recreation areas on Detachment Bayview are current Detachment Bayview employees and guests only. Sponsors must accompany guests. General public use of the installation is not permitted at this time.

Public outreach regarding natural resources is typically accomplished through efforts of the installation's Public Affairs Office. Outreach activities may include such things as participation in local Arbor Day or Earth Day events and invitations to local officials and media reporters to view restoration or protection measures.

3.5 State Comprehensive Wildlife Plans

As a stakeholder in the management of natural resources on the installation, IDFG works closely with the Navy on various fish and wildlife conservation issues, ranging from on-site habitat protection to invasive species control, and also cooperates with the installation on developing and conducting wildlife and habitat research and surveys. The Idaho Comprehensive Wildlife Conservation Strategy (CWCS) is described at:

<http://fishandgame.idaho.gov/cms/tech/CDC/cwcs.cfm>

4.0 Management of Natural Resources Program Elements

4.1 Threatened and Endangered Species Management

The Endangered Species Act (ESA) requires federal agencies to manage federally listed threatened and endangered (T&E) species and their habitats in a manner that promotes conservation of T&E species and is consistent with recovery plans for such species. Section 7 of the ESA requires all federal agencies to enter into consultation with the USFWS and NMFS whenever actions are proposed that may affect listed and proposed T&E species of plants and animals.

This INRMP is meant to be used as a tool to identify at an early stage the potential impacts of planned Navy actions on endangered or threatened species and to provide a basis for altering the action to prevent or minimize those impacts.

Special Management and Protection of T&E Species

Special management and protection is a term that originates in the definition of Occupied Critical Habitat (OCH) in Section 3 of the Endangered Species Act. For Occupied Critical Habitat, one determines whether the area contains the physical and biological features essential to the conservation of the species and if the area has or needs additional special management or protection. Additional special management is not required if adequate management or protection is already in place.

Adequate special management or protection is provided by a legally operative plan. The DOD uses the term “Integrated Natural Resources Management Plan”, or INRMP. The INRMP is required by the Sikes Act. It addresses the maintenance and improvement of the primary constituent elements important to the species and manages for the long-term conservation of the species. The Navy uses the following three criteria to determine if a plan provides adequate special management or protection:

Criteria 1. Conservation Benefit

The plan provides a conservation benefit to the species. The cumulative benefits of INRMP management activities for the duration of the plan, must maintain or provide for an increase in a specie’s population, or the enhancement or restoration of its habitat within the area covered by the plan, i.e., those areas deemed essential to the conservation of the species. A conservation benefit may result from reducing fragmentation of habitat, maintaining or increasing populations, insuring against catastrophic events, enhancing and restoring habitats, buffering protected areas or testing and implementing new conservation strategies.

Criteria 2. Implementation of the Plan

The plan provides assurances that the management plan will be implemented. Persons charged with plan implementation are capable of accomplishing the objectives of the management plan and have adequate funding for the management plan. They have the authority to implement the plan and have obtained all the necessary authorizations or approvals. The plan provides a conservation effort implementation schedule, including completion dates.

Criteria 3. Management Effectiveness

The plan provides assurances that the conservation effort will be effective. The following criteria will be considered when determining the effectiveness of the conservation effort: The plan includes (1) biological goals (broad guiding principles for the program) and objectives (measurable targets for achieving the goals); (2) quantifiable, scientifically valid parameters that will demonstrate achievement of objectives, and standards for these parameters by which progress will be measured; (3) provisions for monitoring and, where appropriate, adaptive management; (4) provisions for reporting progress on implementation based on compliance with the implementation schedule, and effectiveness based on evaluation of quantifiable parameters of the conservation effort. This goal will be accomplished at the annual INRMP review and update in coordination with the appropriate federal and state agencies; and (5) a duration sufficient to implement the plan and achieve the benefits of its goals and objectives. The INRMPs are five-year plans but may be extended further than five years if installation mission or natural resources do not change or changes are minimal. At the end of the five-year period the INRMP will be reviewed and updated or rewritten, as necessary, to continue protection and enhancement for T&E species and habitats.

4.1.1 Threatened and Endangered Species

The bull trout (*Salvelinus confluentus*) is the only species listed under the ESA that occurs at Detachment Bayview. This species occurs within Lake Pend Oreille. Portions of the lake outside of the area owned by the federal government for Detachment Bayview are within bull trout critical habitat. The Detachment Bayview property is excluded from the critical habitat designation because the Navy maintains this approved Integrated Natural Resources Management Plan.

4.1.1.1 Bull Trout

In 1998, the bull trout was federally listed as threatened by USFWS under the ESA (63 FR 31647). Lake Pend Oreille is within the Clark Fork River Basin critical habitat unit for the bull trout. However, Detachment Bayview has an approved INRMP, and thus the 16 acres of in-water habitat at the facility are excluded from the critical habitat area designation (USFWS 2005). Most bull trout that occur within Lake Pend Oreille are adfluvial, meaning that juvenile fish rear from 1 to 3 years in tributary streams before migrating to the lake. Adult bull trout reside in Lake Pend Oreille throughout much of the year, but move into tributary streams to spawn. Bull trout spawning typically occurs in late August and continues through December, peaking in September and October (at periods of lowest water temperature). Thirteen basin-wide redd counts were conducted between 1983 and 2000, which documented an average of 657 redds in 18 streams (USFWS 2002). Grouse, Gold, Granite, Trestle, and Lightning Creeks consistently supported over 25 redds, with Gold and Trestle Creeks normally exceeding 100 redds each (USFWS 2002). Bull trout incubate their eggs for approximately 220 days before emerging. Their egg incubation times are temperature dependent, with optimal egg incubation temperatures at 39°F and below (Wydoski and Whitney 2003).

Despite local population declines in some tributary spawning stocks, the Pend Oreille bull trout population is generally considered to be one of the strongest remaining populations in the United States (Stovall and Kalispell Tribe of Indian 2001). Bull trout populations in the Upper Columbia River Basin declined dramatically in the 1950s following construction of dams that prevented fish passage.

Juvenile bull trout feed primarily on invertebrates, notably larval and adult aquatic insects and crustaceans. The main diet of adult bull trout in Lake Pend Oreille is kokanee, which are found along the Detachment Bayview shorelines. A decline in kokanee populations is believed to be a factor in the decline in bull trout populations (Navy 2004). Loss or degradation of spawning habitat and fragmentation and disconnection of migratory corridors have contributed to the decline of bull trout (Epifanio et al. 2003).

Critical Habitat

On September 26, 2005, USFWS designated Critical Habitat for bull trout but excluded designation on Navy installations in the northwest that have INRMPs (FR 70[185]: 56212-56311) (effective date October 26, 2005).

Bull Trout Special Management and Protection Requirements

Criteria 1. Conservation Benefit

Detachment Bayview will ensure that all proposed in-water routine construction and repair activities be restricted to the approved in-water work time for bull trout (July 1 – November 1) to minimize effects on bull trout and Kokanee that would otherwise be exposed to construction activities, including underwater noise produced during pile driving. To avoid or minimize impacts to spawning Kokanee, an important food source for bull trout, the Service may change this work window as applicable to Scenic Bay.

The installation command will ensure that all proposed actions that may potentially affect this protected species will comply with Section 7 of the Endangered Species Act. This Act requires, at a minimum, informal consultation with USFWS.

The NRM will identify operations and infrastructure that could affect water quality and coordinate with the command and installation's Detachments to minimize or eliminate releases to the lake waters. The NRM will provide assistance to the development of spill prevention, control and countermeasures for the facility and for operations. The NRM or designated staff will regularly inspect any in-water structures and keep the structures free of debris or other materials that could hinder bull trout movement along the shoreline.

Criteria 2. Implementation of the Plan

The NRM is responsible for implementation of the INRMP. The NRM may call upon environmental planners and specialists within NAVFAC NW to assist in conservation and environmental compliance requirements. The NRM has the authority to implement maintenance and protection plans and obtain all the necessary authorizations or approvals for proposed management actions.

The NRM annually develops projects and seeks funding for natural resources management issues, including habitat enhancement projects and special projects to assist in the recovery of T&E species, as circumstances require. The NRM or designated staff will regularly meet with the installation's command and Detachments to ensure that proposed new or changed operations and missions consider bull trout protection measures.

Criteria 3. Management Effectiveness

The NRM or designated staff will do the following as needed: coordinate with the appropriate state and federal fish and wildlife agencies to conduct surveys along the Lake Pend Oreille shoreline for bull trout presence; conduct a minimum of two surveys over five years to determine change over time, which will assist managers in assessing the effectiveness of the plan; consult with the regulatory partners during the annual INRMP review to identify necessary changes that would benefit bull trout.

4.2 Wetlands Management

According to Executive Order (EO) 11990 (1977), the term "wetlands" means those areas that are inundated by surface or ground water with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats and natural ponds. A review of the National Wetland Inventory was conducted and no wetlands were identified therein for ARD Bayview.

EO 11990 requires Federal agencies to minimize the loss or degradation of wetlands and to enhance their natural values. Section 404 of the Clean Water Act prohibits discharges of dredged or filled material into waters of the U.S., including wetlands, without first obtaining a permit from the U.S. Army Corps of Engineers. According to OPNAVINST 5090.1 (OCT 2007), the Navy will comply with the national goal of no net loss of wetlands, and will avoid loss of size, function and value of wetlands.

4.3 Fish and Wildlife Management

4.3.1 Habitat

Habitat loss has a direct correlation to a decline or loss of fish and wildlife populations. This INRMP will be used in operations, training, and construction planning to minimize or prevent loss of habitat, thereby preserving species diversity and populations. The following management criteria will ensure that the installation provides wise stewardship ethics in managing the fish and wildlife resources:

Program and Project Review

The installation NRM or designated staff is a part of all planning teams and reviews proposed projects, operations and training plans for possible impacts to habitat and fish and wildlife. If impacts to habitat or fish and wildlife are identified, the NRM will provide recommendations to the program/project managers so that changes or mitigation can be considered early in the planning process. The recommendations may include, but are not limited to, construction best management practices (BMPs) for erosion control, changing the aspect or placement of a new building to protect trees, identifying wetlands and wetland buffers that must be protected or other recommendations that will help an installation preserve its fish and wildlife habitats. The NRM is also available to help decide on the best mitigation designs if habitat loss is unavoidable.

Habitat Inspections

The NRM or designated staff drives and walks throughout the installation, inspecting various habitats for unauthorized encroachment or impacts and stays familiar with fish and wildlife use of

these areas. The NRM has the ability to elevate concerns about habitat impacts to the Director, ARD Bayview.

Habitat Enhancement and Restoration

Hunting, fishing, and trapping fees for the privilege of access onto military lands may be collected under the authority of the Sikes Act. These fees may be used to recover expenses of implementing these programs and shall be used only to defray costs of the fish and wildlife management program at the installation collecting the fees. Collected fees shall be accounted for and reported under a special fund entitled “Wildlife Conservation”. Funds in these accounts have been used in the past to enhance habitat, which has a direct benefit to fish and wildlife.

Forests Habitat Management

Forest management is discussed in Section 4.4.

Shorelines Habitat Management

Fish and many other wildlife species use shoreline areas. The NRM will do the following items to protect these shoreline habitats:

- **Inspect the shorelines for man-made debris and remove such debris.** Man-made trash may wash up on the shore of Lake Pend Oreille. This trash is not only unsightly, but some items may be perceived as a food source by wildlife and cause harm. Accumulations of trash or man-made objects may interfere with fish spawning or bird use.
- **Stormwater runoff.** The NRM or designated staff will review proposed projects and programs for stormwater or other discharges, and ensure that these discharges do not degrade the water or sediment quality of the waters surrounding an installation.
- **Military training.** The Navy and other services may conduct annual training operations at Detachment Bayview. These operations often require that equipment and personnel utilize shoreline areas for landings and encampments. The NRM will be familiar as to the seasonal use of shorelines by birds and fish spawning and recommend shoreline areas or seasonal timing that will result in minimal or no impact to these species or their habitats. Any operations that involve personnel and equipment that utilize the shoreline for landings and encampments should avoid the Kokanee spawning and incubation period (November 1 – June 30) and plan activities outside of this time.

Developed Areas Habitat Management

The following items may enhance wildlife habitat:

- **Where feasible, reduce mowed areas.** Reducing areas that are mowed will save money, allow native vegetation to grow and enhance wildlife habitat.
- **Use native vegetation for landscaping around buildings.** Native vegetation is well-suited to the conditions of the Pacific Northwest and will require less maintenance. Native vegetation provides better wildlife habitat than exotic, non-native plants and trees.

- **Reduce pesticide/herbicide/fertilizer use.** Reducing the use of chemicals will help protect surface and groundwater quality at the installation, as well as the quality of the surrounding marine waters.

4.3.2 Hunting Program

Hunting is not allowed at Detachment Bayview due to security and safety considerations.

4.3.3 Fishing Program

Recreational fishing is not allowed on Detachment Bayview due to security and safety considerations.

4.3.4 Birds

4.3.4.1 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) implements various treaties and conventions between the U.S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Under the Act, taking, killing or possessing migratory birds is unlawful. Appendix E provides a list of bird species known to occur in the vicinity of Detachment Bayview.

Prohibited Acts: Unless permitted by regulations, the Act provides that it is unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or receive any migratory bird, part, nest, egg or product, manufactured or not.

On March 15, 2005, the U.S. Fish and Wildlife Service published in the Federal Register (FR 70(49):12710-12716) a final list of the bird species to which the MBTA does not apply because they are not native to the United States and have been introduced by humans everywhere they occur in the nation. The list is required by the Migratory Bird Treaty Reform Act of 2004. The actual list of migratory birds protected by the MBTA is published in the Code of Federal Regulations (Title 50, Part 10.13). When it became law in 2004, the Reform Act excluded any species from protection not specifically included on the Title 50, Part 10 list.

Nuisance birds using Navy Northwest installations include the glaucous-winged gull, Canada goose, rock dove, Eurasian starling and house sparrow. Gulls and geese are a nuisance because of the large amount of feces they produce. The Navy has contracted with U.S. Detachment of Agriculture Wildlife Services (USDA WS) to control these problem birds on some installations. USDA WS has the expertise and necessary permits to deal with all problem wildlife, not just birds.

4.3.4.2 Partners in Flight

In 1990, the National Fish and Wildlife Foundation initiated the Neotropical Migratory Bird Conservation Program, known as "Partners in Flight - Aves de Las Americas." The purpose of the program is to bring together the diverse array of groups and individuals involved in the conservation and management of birds and their habitats. The initial focus was on neotropical migrants, but has now spread to include most birds requiring terrestrial habitats. The PIF strategy for effective conservation relies on setting realistic biological priorities, using an appropriate geographic scale and applying an ecosystem management approach. The primary goals and objectives of the DOD Partners in Flight program are to:

- Apply information collected from this partnership program to support DOD mission requirements;
- Take proactive management actions to prevent bird species from reaching threatened or endangered status;
- Facilitate cooperative partnership efforts consistent with the military mission;
- Determine the status of migratory and resident bird populations on DOD lands and the causes of population fluctuations;
- Reduce bird aircraft strike hazard risks through implementation of mobile radar;
- Maintain and restore priority habitats on DOD lands for migratory and resident bird populations;
- Reduce or eliminate pesticide use in sensitive habitats, especially in and around wetlands and riparian areas;
- Reduce the spread and impact to birds and their habitats of invasive and nuisance species on military lands, including feral and free-roaming cats.

For further information on the DOD Partners in Flight program go to <http://www.DODpif.org>.

4.3.5 Non-game Wildlife Species

More than 80 percent of Idaho's wild creatures are classified as "non-game" wildlife (419 species in all), including songbirds, waterfowl, raptors, small mammals, reptiles and amphibians, and threatened and endangered wildlife. Non-game wildlife are animals that are not usually hunted, fished or trapped. (Idaho Fish & Game Web site).

4.3.6 Amphibians and Reptiles

As mentioned above, managing habitat for diversity, protection and enhancement will have the greatest benefit for wildlife, including reptiles and amphibians, on Detachment Bayview. Protection of wetlands and retention of some downed logs will have the greatest benefit to these species.

4.3.7 Noise in Water and Air

There is increasing concern regarding the effect of human-generated (anthropogenic) noise on aquatic organisms. While most concern is focused on marine mammals, many of the lower frequency (under 1,000 Hz) sounds are also likely to affect fish (Hastings & Popper 2005).

At Detachment Bayview, the NRM or designated staff will review operations and projects for potential noise impacts to fish and wildlife. The NRM will recognize that some project actions (such as pile driving) may result in noise and may negatively affect nearby species. The NRM will work with project and program managers to reduce the effects of anthropogenic noise on fish and wildlife. The NRM will use his or her expertise to advise the command and program and project managers in the use of Best Management Practices to reduce or eliminate the effects of noise on fish and wildlife.

4.4 Forest Management

4.4.1 Introduction

Detachment Bayview forest lands extend over about 10 acres of established forest and approximately 1.5 acres of urban forest around buildings and facilities. The recent history of forest

management on the installation can be surmised from the existing timber stands as shown in Figure 4.1. The majority of existing trees are 50 to 120 years old. This indicates that most of the installation's forest was harvested in the late 19th or early to mid 20th centuries. The subsequent reforestation on areas harvested resulted from natural seeding coinciding with favorable environmental conditions for the establishment of new stands of timber. Since ponderosa pine and Douglas-fir dominated the acreage adjacent to harvested areas, they were the primary coniferous species available to provide seed. The existing stands have essentially developed naturally.

Since the Navy acquired the property, there has been little active forest management due to the combination of second growth and the desire to maintain visual and aesthetic buffers between installation facilities and abutting state park lands, public roads and privately-owned properties.

In accordance with DOD and DON requirements, the Navy Forest Management Program is centrally funded and executed through the Naval Facilities Engineering Command. The Forester, Naval Facilities Engineering Command Northwest (NAVFAC NW), will provide professional forestry services to manage and develop the forest resources for the economical production of forest products and the conservation of related resources. The Forester will prepare, and review with the Detachment Bayview, the forestry Annual Increments for the Detachment Bayview.

4.4.2 Authority and Requirement

The authority and requirement to have a Forest Management Plan is contained in an array of laws and DOD, DoN and NAVFACENGCOM instructions and directives cited elsewhere in this INRMP. For example, 32 CFR 190 "prescribes policies and procedures for an integrated program for multiple-use management of natural resources on property under DOD control." Title 10 U.S. Code, Section 2665 authorizes the sale of forest products as well as reimbursement for the costs of managing forest resources for timber production. This is administered in accordance with DODINST 7310.5 Accounting for Production and Sale of Forest Products. The NAVCOMPT Manual, Volume 3, paragraphs 07150 and 035475-79 provide guidance on funding, accounting, and fiscal reporting procedures. The Timber Conservation and Shortage Relief Act of 1990 prohibits export of unprocessed timber originating from federal lands west of the 100th meridian. OPNAVINST 5090.1C Environmental and Natural Resources Program Manual discusses requirements, responsibilities and policy for natural resources management for Navy ships and shore activities.

Annual Navy Forestry Program expenditures will normally not exceed annual income from the sale of forest products. In the case of the forest on the Detachment Bayview, restoration and enhancement efforts in any one given year might exceed income from the property in that same year. This is not to be a cause of alarm, since deposits from other forested Naval activities will generate sufficient funds to cover approved expenses, and planning and budgeting constraints will enforce economic investment of available funds for production and sale of forest products. Detachment Bayview may also provide appropriated funds for forestry projects if it so desires.

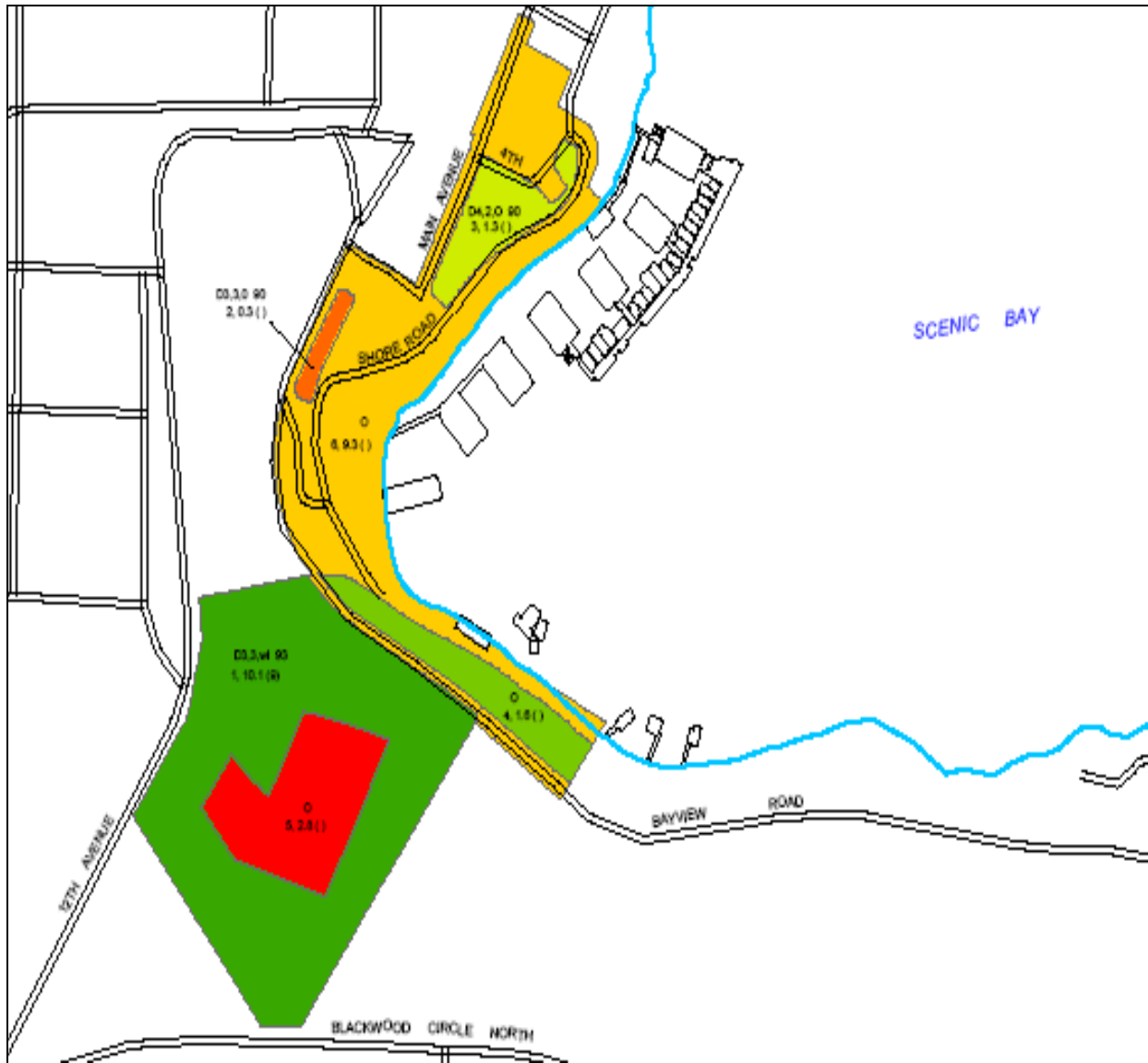


Figure 4.1 Forest Stand Map

4.4.3 Purpose and Objectives

The purpose of this forestry plan is to provide programmatic and silvicultural policy for management of forest resources at Detachment Bayview. It outlines procedures, projects and silvicultural prescriptions to restore, enhance, conserve and protect the health, vigor, productivity and associated resources of the forested areas. Forest stands are shown in Figure 4.1.

This plan's policies address existing forest stands as well as opportunities for planting additional trees. While base facilities and functions may constrain the location and size of forest stands, this plan will improve and enhance existing and nascent forests. The silvicultural and programmatic policies herein are consistent with DOD policy that forest lands suitable for timber production shall be intensively managed for restoration and improvement of forest resources and economical production of commercial forest products, based on soil-site capabilities and integrated with the

total natural resources program, and in consonance with military uses. Given the relatively small size of the forest stands on Detachment Bayview, commercial harvest will be infrequent except for construction clearing and removal of diseased or dead trees.

Detachment Bayview forests will be managed on a multi-disciplinary, multi-use watershed basis. This means that other natural resources programs and uses, such as military training, wildlife management, endangered species protection, wetlands protection, etc will be incorporated on a reciprocal basis to assure that all natural resources programs and the military mission are truly integrated. This approach will facilitate the greatest good for the greatest array of uses over the longest period of time without diminishment of future productivity and land use options. Specific management strategies and prescriptions are presented below in the appropriate management sections.

The forest management objectives at Detachment Bayview are: (1) continue to maintain the existing forest stands in a healthy, productive condition through selective thinning that will increase tree and stand vigor and health and enhance structural diversity; (2) support the military mission by maintaining land availability, use options and slope stability; (3) prevent Navy land management activities from impacting water resources; (4) generate forest products and income through timber sales contracts if and when compatible with other mission requirements; (5) integrate forest management with other natural resources disciplines and programs to protect natural resource attributes associated with the forested acreage on the Detachment

Navy forest management programmatic and silvicultural policies protect the real estate investment, conserve and enhance both consumptive and non-consumptive natural resources, maintain high soil and water quality and provide financial returns to the Government, as well as contributing forest products to the local economy. Management of Navy forests will be coordinated in an integrated, balanced natural resources program to furnish soil and watershed protection, enhance wildlife habitat, promote natural beauty and other natural resource values while providing operating, training and buffer areas for the military mission. These policies and plan will guide the preparation of annual increments and the selection of silvicultural techniques and projects used on Navy forests. Annual increments will be reviewed with the installation prior to implementation to assure compatibility with mission requirements. When implemented, the projects and prescriptions of this plan will improve the condition of the forested acreage, and enhance the horizontal and vertical structural diversity of forest stands to create habitat structure and opportunities for biological diversity.

4.4.4 Schedule for Review

This plan will be reviewed annually. The greatest needs in forestry on Detachment Bayview lie in the reforestation of open areas; commercial thinning of dense second growth stands to encourage development of understory vegetation and to enhance forest health and structural diversity; precommercial timber stand improvement (TSI) cuts to reduce competing vegetation; and interplanting of existing stands to encourage restoration of coniferous cover. This plan will provide stand by stand prescriptions tailored to achieve these goals. Thus, the plan will need review when: (1) the prescriptions have been fully implemented and regulated forest stands are achieved; (2) when sufficient time has passed and, in the absence of plan implementation, natural processes have so changed forest conditions that the plan no longer reflects existing conditions; or (3) when

sufficient land use changes have occurred as a result of mission requirements that the plan is outdated. Given recent types and intensities of mission uses, it is anticipated that a 5 year review schedule is appropriate.

4.4.5 Policies

The Navy Forest Management Program will be administered in consonance with applicable law and regulation. Planning, budgeting, fiscal management, reporting and implementation will be in accordance with DOD program requirements, including forest management initiatives, mission support, positive community relations and public affairs, ecosystem forest management on a watershed basis and environmental protection.

The Navy is committed to conserving and managing soil, water, forests, fish and resources. Our primary purposes in managing these natural resources are to support our national defense mission, maximize multiple land use benefits and fulfill land stewardship responsibilities required by applicable Laws, Executive Orders, administration initiatives and DOD directives. In order to achieve these purposes, this forestry plan will: provide for sustainable yield production, conservation and management of quality forests and wood fiber; fish and wildlife habitat; endangered species conservation and recovery; watershed and wetlands protection; and development and maintenance of desirable structural diversity and biological balance in the forest consistent with proven scientific practices.

Stand prescriptions are interdisciplinary and ecosystem oriented in approach, and considerate of watershed conditions. This means, for example:

- ~ forest management will be holistic to include a wide array of natural resource uses, values and functions
- ~ that wildlife and fisheries issues are incorporated into forest management planning, project criteria and operations
- ~ that wildlife trees, snag retention and wetlands protection are integral parts of forest management and timber sales;
- ~ that thinning prescriptions will achieve vertical and horizontal structural diversity to foster greater opportunities for biological diversity;
- ~ stand prescriptions will contribute positively to enhancement of wildlife habitat and corridors, and endangered species protection, conservation and recovery
- ~ that wetlands will be protected not only within jurisdictional boundaries, but including hyporrheic zones.
- ~ adjacent land conditions will be considered in prescriptions and implementation schedules

4.4.6 Implementation

The Navy Forest Management Program is centrally funded and executed through the Naval Facilities Engineering Command. The Forester, Naval Facilities Engineering Command Northwest (NAVFAC NW) will provide professional forestry services to manage and develop the forest resources for the economical production of forest products and the conservation of related resources. The Forester will prepare, and review with Detachment Bayview, the forestry annual work increments and budget requests. Annual increments are Forest Plan addenda which describe all forest management work to be completed during a fiscal year. Planned work and expenditures

are itemized by cost account codes. Upon approval of the annual increment and receipt of funding, the year's forestry work will be implemented.

Reimbursement for the cost of managing forest resources for timber production is authorized by 10 USC 2665 from the sale of forest products. Forest products sale income and reimbursement of forestry expenses are planned, budgeted and administered by the Forester at NAVFAC NW.

Forest product sales are a disposal of government real property, accomplished in accordance with NAVFAC P-73 Real Estate Procedures Manual, Volume II. Service contracts used to acquire forestry services are processed per FAR. Sales of forest products and forestry services are not combined under one contract. The Forester will provide technical specifications, funding and contract administration for all forestry contracts. The installation may provide its own funds to NAVFAC NW for forestry projects and services.

4.4.7 Forest Description and Inventory

Vegetation Characteristics

Detachment Bayview forest lands extend over approximately 10.1 acres owned by the Navy. The recent history of forest management on the installation can be surmised from the existing timber stands. The majority of existing trees are 70 to 120 years old. This indicates that most of the acreage was harvested by homesteading pioneers prior to Navy acquisition of the property. Over the last few years, silvicultural treatments have focused on removal of hazard trees. Some land has also been cleared of all timber for military construction projects.

Reforestation of areas harvested in the 1870s and subsequent decades resulted from natural seeding coinciding with favorable environmental conditions for the establishment of new stands of timber. Since ponderosa pine, Douglas-fir, larch and true fir dominated the area, they were the primary species available to provide seed. The existing stands have essentially developed naturally.

Forest Soils

Soil characteristics can be used to predict the probable impact of various forest management practices on individual soil map units. Probable impacts can be predicted for: woodland suitability, soil compaction, slope stability, competing vegetation and tree windthrow. Refer to Section 2.4 and the USDA Soil Conservation Service (sic) "Soil Survey of Kootenai County Area, Idaho (April 1981)" for specific soils mapping units, profile descriptions and pertinent land use information. Most of the soils on Detachment Bayview have adequate nutrients, available water holding capacity and internal drainage for tree production. The exceptions are soils that have been severely compacted by construction.

Inventory

A detailed forest inventory for Detachment Bayview is given in Appendix F. It includes:

Table 1: Stand Data reports volume data by stand number

Table 2: Stand Data by Decade of Origin reports volume data by decade of origin,

Table 3: Habitat Data by Cruised Stand provides the percentage of ground cover by primary species,

Table 4: Type Group Summary reports volume data by type group,

A variable sub plot was taken at each inventory plot point to measure snags. A fixed length transect was taken at each measure point to measure down woody material to a 4-inch diameter.

On the forest stand map, the stands are identified by stand number, species, size class, stocking and decade of origin. A summary of the type symbols used follows:

Species

D	Douglas fir
H	Western hemlock
RC	Western red cedar
WP	Western white pine
LP	Lodgepole pine (shore pine)
PP	Ponderosa pine
WL	Western larch
TF	True fir (Grand fir, Silver fir)
SS	Sitka spruce
RA	Red alder (includes aspen, cherry)
BLM	Bigleaf maple
BC	Black Cottonwood
Md	Madrone
Q	Aspen
Hd	Mixed hardwoods

Lower case letter species designations indicate a secondary species which comprises 20% or more of the stand volume as estimated from the aerial photographs or cruisers judgment. The secondary call is useful to indicate that individual stands are somewhat different from the type group in which it is included.

Non-Forest Types

A	Agriculture
Br	Brush
G	Grass
O	Open (developed)

Size Class

4	21" dbh and larger
3	11-21" dbh
2	5-11" dbh
1	0-5" dbh

Occasionally a size class is difficult to determine because of the broad range of diameters present. In this case, the diameter class may be shown as 4/3 indicating a mixture of size class 4 and 3 trees.

Stocking

Stocking is represented by percent of crown closure, based on aerial photo examination.

- 3 70-100 percent
- 2 40-69 percent
- 1 10-39 percent

Decade of Origin

Decade of origin is shown as a two-digit number following the type call. For instance, 92 indicates that the stand began in the decade of the 1920s, between 1921 and 1930.

For volume compilation purposes, cruise data from individual stands is combined with other similar stands into type groups. The groups contain stands with minor species variances that are unique to that stand, however the volume sample is too small to report individual stand volumes. Occasionally, an individual stand may not receive plots or may be too small to be reported separately. In that case, a judgment is made as to the most appropriate type group. When type groups are indicated with an “a”, this means that the cruiser chose a different basal area factor for that stand, though the group is the same as other stands.

Type Groups

- 0 non-timber stands
- 1 D3,3,wl
- 2 D3,3,O
- 3 D4,2,O

Site Index

Site quality is a term used to describe the relative productivity of a land area for a particular tree species. It is usually defined in terms of capacity to produce wood fiber. The most common expression of site quality is site index. Site index is based on tree growth patterns and refers to the height of dominant or dominant and co-dominant trees in even-aged stands at some index age, usually 100 years. The height growth of such trees is considered to be independent of stand density over a wide range of soil/site types.

Due to prior land management practices, including base construction that significantly disturbed the soils, many stands on Detachment Bayview have not been actively managed to maximize tree growth. Thus, the use of site indices may not always reflect actual site productivity potential. One goal of this plan is to achieve well stocked, regulated stands in order to take advantage of site productivity and to restore the coniferous forest cover previously found on these lands. Thus, site indices based on existing stand characteristics may increase with management and time. Site Indices are given in Table 1 for the dominant tree species in each stand.

4.4.8 Forest Management System

A forest management system of area control will be used to foster desirable forest age classes, stand structure, species composition and to enhance wildlife habitats. This will assure sustainable production of the most desirable timber and other forest products, functions and values while

protecting water quality, structural and biological diversity and aesthetics. Due to small forest size, it is inappropriate to fragment the forest into a number of stands equal to a rotation age. Rather, existing stand delineations will be the planning base for future age classes.

Tree planting and plantation maintenance, interplanting existing stands, and commercially thinning some areas will be the major forest management considerations for the next two decades. Most of the forest land is poorly to medium-well stocked second growth. The typical planting prescription will be 10 to 12 feet on center for plantations and when interplanting existing stands.

The typical thinning prescription will specify that 100 of the best commercial species “Leave Trees” will be left uncut and undamaged on each acre, spaced consistently and uniformly throughout the thinning area. In addition to the specified Leave Trees, all thinnings will leave intact all small non-commercial sized trees. The purposes of this approach include:

- ~ sustainable forest management without diminution of future diversity and productivity
- ~ minimizing stand disturbance while opening up the canopy sufficiently to allow more sunlight to hit the forest floor and establish understory vegetation
- ~ preserving and enhancing both horizontal and vertical structural diversity through retention of shade tolerant understory trees and development of grasses, forbs and woody brush species
- ~ providing a population of understory and suppressed trees that are recruitment for snags in future decades
- ~ providing botanical and structural diversity that will enhance forest stands for wildlife species.

Snags, Hollow Logs and Wildlife Trees

Snags and hollow logs play a very important role in forest ecology. Forest management will protect snags and downed large organic debris. In addition, trees deemed unique or of special interest for wildlife, such as advanced second growth specimens, isolated relict old growth, trees with large limbs or cavities, or less prevalent species will also be protected.

Snags and downed hollow logs, important to cavity-nesting birds and other animals, will be left uncut except when determined by the NAVFAC NW Forester, in consultation with the installation, to present a safety hazard and no alternatives are available for working around the snag. All naturally downed logs will be left on the forest floor, unless inadvertently moved as part of the logging process, to provide habitat for wildlife including small mammals, salamanders, insects and other arthropods. Slash left from cutting the tops and branches off of harvested trees will be left on the forest floor to allow it to decompose naturally and contribute to nutrient cycling.

Species to be Grown

Bigcone Douglas-fir, lodgepole pine, larch and ponderosa pine are the main species of this area. Superior to other local species in strength, growth and disease resistance, they are the most useful and therefore the most valuable species adapted to Detachment Bayview. For biological diversity, reforestation will use a mix of native species, tailored to site specifics. Natural regeneration of other native tree species is expected to diversify stands thinned or replanted, resulting in a species mix that will be more resistant to insect and disease attack through the synergistic effects of species and wildlife habitat diversities.

Reforestation

Reforestation will use a mixture of site-adapted native coniferous species. Plantings will be conducted the first planting season after harvest to achieve full stocking, which is defined as 302 live stems of commercial species per acre. This equates to a 12 foot on center spacing. Hand planting conifer seedlings will be the method used to reforest areas cleared for base construction, forest disease or to fully stock deficient stands. Hand planting is more expensive than seeding, but affords more rapid and dependable stand establishment and can provide positive influence on stand species composition. Hand planting will be funded by either the installation or the NAVFAC NW Forest Management Program and accomplished by service contract. Some planting areas may be cleared and scarified mechanically prior to planting. In areas of heavy grass and/or brush competition, spot application of herbicides may be used as part of the pre-planting site treatment. These plantings will continue until all available areas are fully stocked with live coniferous trees.

Rotation and Cutting Cycle

It is not appropriate to set a rotation and cutting cycle at this time for Detachment Bayview. Thus, this Plan will focus on intermediate silvicultural treatments that will promote structural diversity and protect endangered species habitats and water quality. However, it is anticipated that precommercial and commercial thinnings will be followed by a final harvest at a rotation age significantly in excess of 100 years. It is anticipated that rotations will be at ages 150 to 300 years. Some species such as western red cedar may have longer rotation ages. This will allow for development of high quality forest products and forest stands, which will provide superior structural and biological diversity supporting a mixture of consumptive and non-consumptive products, values and functions over multiple centuries.

Allowable Annual Harvest

The annual growth on Detachment Bayview will improve as the stands are stocked and treated. Allowable annual cut will not be determined for this plan since the remedial and developmental treatments are considered intermediate. When the Plan is revised subsequent to full stocking of all forest lands and completion of all intermediate thinnings, the stands may be in a condition favorable to determination of cutting cycle, rotation age and allowable annual cut. It is not anticipated that an allowable final cut would involve harvests every year.

Silvicultural Treatments

(1) Methods of Cutting Small patch cutting or thinning will be the preferred harvest method. Except in cases of timber salvage, it is anticipated that clearcutting will not be used under this Plan.

Selective cutting will be the system used in both precommercial and commercial thinnings for the foreseeable future. Intermediate selective cutting will be used to thin stands for the concentration of growth, development of horizontal and vertical structural diversity, increase in value of the residual trees and to salvage mortality losses. Thinning will improve stands by removing diseased trees, inferior species and damaged trees.

In riparian areas, special care and restrictions will be used, such as machinery exclusion, to maintain understory integrity, assure development of a healthy and vigorous stand of trees that will provide ample opportunity for wildlife uses while shading riparian areas to maintain slope and bank

and preferred water temperature regimes. Raptor perch or nest trees discovered in field surveys will be protected by buffer zones and off-season timing of silvicultural treatments.

(2) Insect and Disease Control Insect and disease problems have not reached epidemic proportions on Detachment Bayview in recent years. A variety of indigenous forest pests, both fungal and insectivorous, are common to the area. Detachment Bayview forest stands will be monitored for presence of fungal and insect pests. Detection may result in silvicultural treatment to control the outbreak if the extent so warrants. Silvicultural treatments may include patch cutting to remove diseased or infected trees plus an appropriate buffer, planting of an alternate native conifer species less susceptible to attack, tipping over stumps, etc.

(3) Wildlife Damage Control Deer browsing the growing tips of young conifers cause reduced height growth and in extreme cases may stop height growth completely. Individual trees or plantations may be treated with repellants to dissuade deer from browsing the seedlings. Small mammals such as mice, moles, squirrels, rabbits and mountain beavers also inhibit reforestation by eating seed and seedlings. Seeding is not anticipated as a means of regeneration. Raptor predation helps keep small mammal populations under control. Snags and perch trees will be retained as roosts and hunting perches. Further small mammal discouragement is not anticipated beyond that which can be achieved by using surficial repellants.

(4) Fire Suppression There have been no forest fires at Detachment Bayview. Forest fire detection would be by base personnel or from adjacent lands. Suppression of wildfire would probably be accomplished by local fire departments. Timber sale contracts require spark arrestors, fire tools, fire watchman during fire season, as well as suppression and reporting of any fire on the sale area. During periods of high fire danger, additional equipment such as a water buffalo or tank truck with pump, hose and nozzle is also required. Service contracts for silvicultural treatments also contain fire prevention and suppression requirements, although this is not the same threat because of the lack of machinery in most cases.

(5) Slash Treatment Logging slash will be treated after thinnings or clearcut harvest by lopping and scattering. Slash will decay over a period of years while slowly releasing organic nutrients back to the soils. Concentrations of slash will be removed to a minimum of 25 feet from roads and structures.

Firewood Cutting Program

A noncommercial firewood cutting program may be established at the base. This is an opportunistic program, with the suitable material and areas available and dependent upon logging slash, removal of hazard trees and natural occurrences such as storm damage and windthrow in accessible areas. This is not a year-round program. It may be implemented only in areas with suitable material and access. Many avian species are protected under the Migratory Bird Treaty Act. To avoid injury or mortality to nesting migratory birds, removal of vegetation should *not* occur during avian nesting season, typically April 1 through August 1 each year.

In accordance with law and regulation, timber is government property that may be disposed of through prescribed, legally sufficient and compliant methods. For the firewood cutting program, this means that a cutting permit/bill of sale must be issued. Fees are collected for woodcutting at the

rate of \$15/pickup truck load of 64 cubic feet (= ½ cord). These fees are collected via a special permit provided by the NAVFAC NW Forest Management Program, serially numbered and tracked for deposits to the U. S. Treasury. The funds received for firewood are deposited to the Navy Timber Sales Receipts Account pursuant to "Detachment of Defense Instruction 7310.5: Accounting for production and sale of forest products" (U.S. Navy 1988). The NAVFAC NW Forester will cooperate with Detachment Bayview to identify suitable and available material.

4.4.9 Natural Resources Protection Considerations in Forest Management

In accordance with The Sikes Act requirements, this Forest Management plan will be implemented upon approval. The NRM or designated staff will implement forest management in a coordinated manner to achieve prescriptions and goals. While Detachment Bayview has overall responsibility for the INRMP, NAVFAC NW administers the Navy's centrally-managed Forest Management Program. As such, NAVFAC NW is responsible for planning, budgeting and executing forest management activities in coordination with the installation. The NAVFAC NW Forest Management Program is staffed, funded and equipped to carry out any and all forestry consultations, operations and projects in furtherance of this INRMP's objectives.

4.4.10 Control of Non-point Sources of Water Pollution

(1) Pesticides Currently, the only anticipated use of herbicides would be possible spot applications for planting trees in areas of heavy grass sod, or the control of exotic vegetation. Historically, however, mechanical grubbing has been used instead when planting in wildland areas. If the installation desires to reduce grounds maintenance costs in developed areas, additional tree plantings may be undertaken to convert mowed grass areas to nascent forest. Because of the fierce competition the grass poses to the seedlings, herbicides will be used in these situations. If and when pesticides are used, they will be applied by trained and certified personnel in accordance with DOD, EPA and installation rules and regulations.

(2) Erosion Control Erosion in forest areas has not been a problem on Detachment Bayview because of the minimal disturbance to soils, the good vegetative cover and infrequency of silvicultural treatments. Natural development of the forest, timing of silvicultural treatments, choices of low-impact technologies and improving understory vegetation will protect the soils. Skid trails on slopes steeper than 10% will be water-barred to prevent gullyng. Wind erosion has not been a problem due to consistent vegetative cover. The risk of erosion during the exposed period of logging and early regeneration is greatly reduced by limiting the size of cuts, careful planning of cutting unit boundaries, the use of uncut buffer strips, early planting or seeding and the use of water bars on roads and skid trails steeper than 10%. Erosion from temporary forest access roads or skid trails will be absolutely minimal to nonexistent since existing graded roads will be used to the maximum extent possible. Under most circumstances, yarding will be between leave trees, with no clearing of temporary skid trails. No new permanent roads are anticipated to be constructed for forestry operations. Erosion control requirements are included in timber sale contracts, so additional funds and projects should not be required.

(3) Logging Debris Logging slash will be treated as described above or in special cases will be treated or disposed of in a manner to reduce, trap or repair historic erosion. In general, slash will be lopped to lie below 24 inches above grade.

(4) Riparian Zones The restoration and enhancement of coniferous forest cover along riparian or shore areas will be a direct benefit to wildlife, most importantly fish. It is anticipated that this zone will contain permanent trees managed for wildlife and buffer purposes. Selective thinning may be used to enhance the health, vigor, ultimate size, distribution, species composition, etc of trees in riparian zones.

(5) Horses Due to their very low impact on the forest floor, certain logging or other silvicultural treatments might be accomplished using draught horses instead of machinery such as skidders. This is dependent on the availability of horse and mule loggers in the area.

(6) Wetlands Protection Wetlands will be protected in accordance with applicable law and regulation. The erosion control and buffer strip requirements included in this section and in timber sale and forestry services contracts will protect wetlands from damage by forestry operations.

(7) Endangered Species Protection There are no known federally listed threatened or endangered plant species on Detachment Bayview.

(8) Cultural and Historic Site Protection Prior to silvicultural treatments, the project area will be examined for surficial cultural and historic artifacts. Any items or sites discovered will be evaluated and protected in accordance with law and regulation. There are no known historic or archeological sites on the Detachment. If sites or artifacts are discovered during presale investigations or other field inspections, they will be evaluated and protected from logging activity through restriction of treatments, machinery and skidding in such areas. The activities under this plan will comply with pertinent law and regulation.

(9) Aesthetics As with any question involving beauty, the question of forest aesthetics may be viewed from several perspectives. The common public view of the Navy property at Detachment Bayview is from adjacent public roads and parks, Lake Pend Oreille or private lands. For base employees and visitors, the view is from the immediate foreground. From a distance, this affords a vista of evergreen and deciduous trees interspersed with base facilities. Overall, it presents a semi-pastoral scene that cannot, however, be construed as “natural”. It is not "natural" since it is the result of considerable land disturbance and a conversion of forest to an industrial facility. However, it does create a relatively open space for adjacent residents and passers-by.

In forest areas thinned pursuant to this Plan, it is not so much what is done to encourage structural and biological diversity, as the rate at which it is done that might upset some viewers. Up close, reforestation efforts may appear somewhat harsher than from a distance. Trees cut or pushed over will appear less attractive as they turn brown and lose their leaves than they did when green and upright. Lopped, piled or windrowed slash will look better from afar than up close. This can be kept in mind when writing a prescription for silvicultural treatments.

Aesthetic considerations in forest management are intended to reduce visual impacts of silvicultural treatments, tree removal and site preparation. They include clean logging, placement and layout of cutting areas, and buffer strips to create visual barriers, when possible, between work sites and adjacent off-station areas.

(10) Wildlife Habitat The silvicultural methods used for reforestation, timber stand improvement and harvest will be supportive of wildlife. Dense timber stands shade out the understory plants that provide food and cover for wildlife. Thinnings and reforestation will provide young forest stands with a wide diversity of grass, forbs, woody shrubs and trees for food and cover. This will encourage a diversity of animal species. Treatments to improve the stands will help open up the forest canopy to allow sunlight to reach the forest floor so that the understory will be stimulated, developed and perpetuated as foraging, nesting and thermal cover for all wildlife species. Timber harvest might temporarily displace wildlife from the operation area to adjacent undisturbed forest while operations are underway. Quite frequently, browsing and avian species will visit thinning areas during nonworking hours to take advantage of the foliage and insects available.

Following patch sanitation salvage clearcuts, as the area seeds or sprouts to brush, weeds and young trees, the rapidly growing young forest and decaying logging residues will provide increased forage for deer, granivores and insectivores. Consequently, predators will benefit. Some species preferring closed canopy habitat will be displaced until the young trees reestablish a closed canopy. All wildlife management is subject to habitat manipulation and management for security requirements.

(11) Multiple Use Within the constraints of mission and safety requirements, the forests are managed for multiple use to produce sustained yields of wildlife, timber and other forest products, clean water, military training and recreational opportunity.

(12) Road Construction The roads developed for historic logging, construction and operation of Detachment Bayview are sufficient for forestry activities. To implement silvicultural treatments, it may be necessary to place crushed rock on existing roads, or to develop temporary haul spurs. Haul spurs will be developed using old grades where possible. Where these do not exist or present unacceptable risks, new spurs will be created by meandering between Leave Trees. Road construction will be minimized in order to retain as much land as possible in production and to minimize land disturbance and costs. Reforestation will be up to within 6 to 10 feet of road edges to reduce occluding ruderal vegetation and to fully stock the site. Full stocking will eventually function as a protector of the road corridor. Within cutting areas, road construction will be limited to temporary spurs as narrow as possible. These temporary spurs will be waterbarred or otherwise treated (seeding, cross ditching, etc) to prevent erosion.

4.4.11 Work Objectives and Thinning Criteria

The long term Detachment Bayview forest management goal is to achieve fully stocked, healthy, productive, mixed conifer stands of timber for sustainable yield of quality forest products and other compatible forest uses and benefits; and to provide land use opportunities for military training, installation security and natural resources education. In order to avoid injury and mortality to nesting birds protected under the MBTA, forest thinning and tree removal should occur outside the avian nesting season (April 1 through August 1).

Over the span of this plan, this will involve thinnings, plantings, selective cuts and, in the case of natural disaster or pest infestation, small patch clearcuts. The actual stands and projects will be

spelled out in the annual increment addenda to this plan, which is reviewed and approved by the installation. Since the bulk of the prescriptions are remedial silvicultural treatments to improve the health, vigor and structural diversity of the stands and forest as a whole, it is desirable that some work be accomplished each year under this plan. Specific recommendations on a stand-by-stand basis are given below.

Sales Procedures

The NAVFAC NW Forester provides professional forestry services to the installation to manage and develop the forest resources within the facility for the economical production of forest products and the conservation of all forest resources. In cooperation with the installation, the Forester: chooses the areas to be treated based on overall goals, silvicultural needs, resource protection considerations and stand inventory data below; analyzes the potential for environmental impacts of proposed silvicultural treatments; completes the field work, including volume and value estimates, project or sale boundary establishment, snag and wildlife tree marking, and access spur layout and design; and prepares and administers the contract. Projected sales are outlined for the fiscal year in the annual increment addenda to this Plan. All logging activities shall be carried out under contract issued by Naval Facilities Engineering Command Northwest (NAVFAC NW). The Forester will prepare timber sale contracts and administer them from advertisement and award through operations and completion. The installation will be kept advised of the schedule and progress of all forestry operations. Following award, the Forester will inspect timber sales to assure contract compliance and protection of the forest environment. Forestry services contracts will follow similar procedures.

Forestry Consultations and Support

The Forester will mark project boundaries, wetlands and riparian buffers prepare and administer contracts, and coordinate forestry projects for commercial and precommercial thinnings, plantings and other forestry work as needed. This includes forestry consultations in support of base operations, maintenance, repair and construction projects.

Public Relations

The Navy's natural resources management has generated significant interest over the years. As requested by the installation, the Forester will provide docent tours, consultations and support for natural resources education events, tours with VIPs, school groups, governmental agencies, conservation organizations, media and freelance writers. All such events will be coordinated through the installation Public Affairs Officer (PAO).

Thinning Criteria

A forest thinning will leave at least 100 stems/acre of merchantable trees. Additionally, less frequent species, wildlife trees, snags and unique specimens will be marked or identified in the contract for retention in furtherance of our goal of improving biological and structural diversity. The following are typical but not exclusive contract provisions governing selection of Leave Trees. These criteria apply to all thinnings and will be adjusted as needed in light of specific stand conditions.

***“LEAVE TREE SELECTION AND CUTTING.** On the coniferous thinning areas, one hundred (100) of the best live Douglas-fir or other conifer species shall be left uncut and undamaged as Leave Trees on each acre of the sale area. This equates to a spacing of approximately 20 feet on*

center between Leave Trees, which are to be uniformly and consistently spaced over the entire sale area. Trees marked with yellow or blue paint and/or signs are designated as wildlife and structural diversity trees, and are to be left uncut and undamaged. Live trees greater than 8 inches DBH so marked may be included in the 100 trees per acre. Dead wildlife trees may not be included in the 100 trees per acre count.

Leave trees shall be Purchaser selected on the following basis and criteria:

- (1) Preferred coniferous species in the following order: Douglas-fir, lodgepole pine, ponderosa pine, larch
- (2) Deciduous trees may not be selected as Leave Trees.
- (3) No cedar, black cottonwood or aspen trees may be cut.
- (4) All holly or other invasive species trees will be cut.
- (5) Coniferous trees free of defects, disease or damage.
- (6) Fastest growth as evidenced by larger relative diameter breast high (DBH), greatest height, and light colored bark with active, buff colored crevices.
- (7) Good form and straightness of the bole, and lack of forked tops.
- (8) Spacing as near as possible to 20 feet by 20 feet, on centers, for a uniform and consistent distribution of 100 Leave Trees per acre.
- (9) Dead trees, non merchantable culls, and understory trees less than 6 inches diameter on the stump are not to be selected as Leave Trees, but are to be left uncut when possible.
- (10) Pitch bleeding western white pine and dwarf mistletoe infected trees shall not be selected as Leave Trees. Live wildlife and structural diversity trees marked with yellow signs and/or paint may be selected as Leave Trees.
- (11) Less abundant and disease-free tree species such as madrona, dogwood, wild cherry, willow, bigleaf maple, western yew and holly may not be counted as Leave Trees and are to be left uncut and undamaged in the residual stand. Such trees do not have to comply with spacing requirements.

Trees to be cut and removed shall be Purchaser selected and cut so as to avoid damage to all Leave Trees. Trees smaller than 6 inches stump diameter and not selected as Leave Trees shall be left uncut when possible. Dead trees and non-merchantable culls shall be left uncut. Trees cut along sale area boundaries shall be felled into the sale area so as to contain slash and debris on the site. Stumps shall be cut as low as practicable and shall not exceed 12 inches or one DBH in height, whichever is greater. Limbs and tops are to be cut from merchantable stems and left in the woods. The Purchaser shall exercise care and use directional felling to minimize damage to residual trees. All felled trees shall be utilized to 6" DIB at the small end by 24 feet in length. Bucking to reduce length or diameter is not allowed. If the Purchaser bucks felled trees to reduce diameter or length, the spoiled merchantable portion will be scaled as though it were whole and the Purchaser will pay for such material at the unit prices bid."

Preferred yarding technology will be, in order of preference: draft horses or mules, skidders or excavators. No cable logging is anticipated. When compared to the other methods, the use of draft horses minimizes soil disturbance, compaction and churning, and impacts to forest floor organic matter, large organic debris and vegetation.

The only clearcutting permitted will be small cuts for construction projects or salvage due to fire, insect infestation, disease, blowdown or other natural causes. Such clearcutting is not expected

every year. No tree-planting will be necessary in thinning cuts, because regeneration is by natural seeding from the remaining trees and by the seeds remaining in the soil.

4.4.12 Silvicultural Prescriptions

Because of the small forest acreage, no stand silvicultural prescriptions will be given under this plan. Rather, an iterative and adaptive approach will be taken to create projects and prescriptions as the needs arise. Management will be adjusted in light of any unforeseen circumstances that pose new situations for forest and land management. Changing or evolving mission requirements and natural disasters may require some adjustment of the location, sequence and timing of silvicultural treatments. However, the silvicultural policies described elsewhere in this plan are considered ecologically sound and will be adhered to in the absence of urgent and compelling alternative land use requirements documented and adopted through established programmatic and project planning processes.

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APPENDIX A

DETACHMENT BAYVIEW NATURAL RESOURCES PROJECTS

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APPENDIX A.
NATURAL RESOURCES PROJECTS FOR DETACHMENT BAYVIEW

Project Recommendations	ERL Environmental Readiness Level	Estimated Cost	Implementation Year
Vegetation Management			
V-1: Monitor and control invasive, non-native plants. If significant populations of non-native plant species are found, these undesirable species should be removed and controlled. Primary efforts at control should consist of manual and/or mechanical removal and replacing with native plants.	2	\$15,000 (\$5,000 each survey year)	FY 2010, 2012, 2014
Fish and Wildlife			
FW-1: Baseline survey of biological resources. Information is currently known only about the potential presence of bull trout at Detachment Bayview. Surveys will be conducted to plant and wildlife species present, including birds, mammals, reptiles and amphibians..	3		
FW-2: Kokanee spawning surveys	3		
FW-3: Kokanee spawning gravel enhancement . This is accomplished through mechanical vacuuming of sediments. This project could potentially be funded through Detachment Bayview's P-207 MILCON. The implementation year is dependent upon the MILCON schedule.	3	\$150,000 to \$250,000 dependent upon length of shoreline enhanced	FY 2012 - 2014
FW-5: Conservation measures benefiting migratory birds. Installation of devices on electric transmission lines, such as raptor bars, to minimize electrocution and other injury to migratory birds.	2		

FW-6: Conservation measures for Osprey: Construction of osprey nest platforms to avoid osprey nesting on power lines.	2		
FW-7: Conservation measures for Canada geese: Designing landscape to discourage attracting Canada geese and other waterfowl.	3		
Threatened and Endangered Species			
T&E-1: Northern leopard frog study: Conduct survey to determine presence of this amphibian species on ARD Bayview.	1		
Forest Management			
FOR-1: Native Species Forest Tree Planting		\$5,000 (\$2,500 each year)	FY 2011, 2012
FOR-2: Establish property limits and conduct forest inventory for Navy property located west of 12th Ave.		\$7,500	2011

APPENDIX B

NATURAL RESOURCE MANAGER (NRM) DESIGNATION LETTER

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DEPARTMENT OF THE NAVY
NAVAL BASE KITSAP
120 SOUTH DEWEY ST
BREMERTON, WA 98314-5020

5090
Ser PRB4/00156
11 Mar 10

From: Commanding Officer, Naval Base Kitsap, Bremerton, WA
To: Mr. Eric Beckley, NAVFAC NW Environmental, Bremerton, WA

SUBJ: DESIGNATION AS NATURAL RESOURCE MANAGER/COORDINATOR FOR
NAVAL SURFACE WARFARE CENTER ACOUSTIC RESEARCH DETACHMENT
BAYVIEW, IDAHO

Ref: (a) OPNAVINST 5090.1C

1. You are hereby designated as Installation Natural Resources Manager/Coordinator for the Naval Surface Warfare Center Acoustic Research Detachment, Bayview, Idaho.
2. In accordance with reference (a), you shall oversee natural resources issues, conditions of natural resources, status of Integrated Natural Resource Management Plan objectives, and any potential or actual conflicts between mission requirements and natural resources mandates, ensuring that the NBK CO is informed. As installation Natural Resources Manager/Coordinator, you are responsible for the inherently governmental decisions made on behalf of the installation and CO with regard to Sikes Act compliance.


M. J. OLSON

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APPENDIX C

ENVIRONMENTAL ASSESSMENT AND FONSI FOR DEVELOPMENT AND IMPLEMENTATION OF AN INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

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FINAL

**ENVIRONMENTAL ASSESSMENT FOR DEVELOPMENT
AND IMPLEMENTATION OF AN INTEGRATED
NATURAL RESOURCES MANAGEMENT PLAN**

for

**ACOUSTIC RESEARCH DETACHMENT
NAVAL SURFACE WARFARE CENTER
BAYVIEW, IDAHO**



Prepared for:

Naval Surface Warfare Center, Carderock Division
West Bethesda, MD

Prepared by:



Geo-Marine, Inc.
11846 Rock Landing Drive, Suite C
Newport News, Virginia
October 2003

ENVIRONMENTAL ASSESSMENT FOR DEVELOPMENT AND
IMPLEMENTATION OF AN INTEGRATED NATURAL RESOURCES
MANAGEMENT PLAN FOR ACOUSTIC RESEARCH DETACHMENT NAVAL
SURFACE WARFARE CENTER, BAYVIEW, IDAHO

FINAL

Prepared for:

Naval Surface Warfare Center, Carderock Division
West Bethesda, MD

Prepared by:

Geo-Marine, Inc.
Newport News, Virginia

October 2003

EXECUTIVE SUMMARY

ENVIRONMENTAL ASSESSMENT FOR DEVELOPMENT AND IMPLEMENTATION OF AN INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN FOR ACOUSTIC RESEARCH DETACHMENT NAVAL SURFACE WARFARE CENTER BAYVIEW, IDAHO

The U.S. Department of the Navy proposes to develop and implement an Integrated Natural Resources Management Plan (INRMP) for a 5-year period (2004-2008) on the Naval Surface Warfare Center's (NSWC) Acoustic Research Detachment in Bayview, Idaho (ARD Bayview). In accordance with the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (NEPA) (40 Code of Federal Regulations [CFR] Parts 1500-1508, Section [§] 1502.13) and the statutory requirements under the Sikes Act Improvement Act (SAIA) of 1997 (U.S. Code [USC], Title 16, Conservation, § 670 (a) et seq.), this Environmental Assessment (EA) presents the potential environmental impacts that would result from the development and implementation of the proposed action.

ARD Bayview (38 acres) is located in Kootenai County and is bounded on the north and west by the town of Bayview, on the south by Farragut State Park, and Lake Pend Oreille on the east. The installation also maintains outlying parcels (approximately one acre each) on U.S. Forest Service (USFS) property that are operated under a Special Use Permit.

In preparing the INRMP, as required by the SAIA, ARD Bayview has worked in cooperation with the U.S. Fish and Wildlife Service (USFWS) and the Idaho Department of Fish and Game (IDFG) so that the plan reflects the mutual agreement of these parties concerning conservation, protection, and management of fish and wildlife resources on the installation. Final agreement letters from USFWS and IDFG are included in Appendix B of the INRMP that accompanies this EA. Also, as required by the SAIA, the INRMP was provided for public comment and ARD Bayview has taken those comments into account in preparing the INRMP.

The proposed action is to modify the existing natural resources management plan and practices at ARD Bayview by implementing an ecosystem-based conservation program consistent with the military use of the property and the goals and objectives established in the SAIA. Ecosystem

management would include a shift from single species management to management of ecosystems, developing partnerships with stakeholders to achieve shared goals, public involvement in decision making, using the best scientific information available in decision making, and implementing adaptive management techniques.

This EA analyzes, evaluates, and compares three alternatives. Under the no action alternative (Alternative 1), ARD Bayview will continue implementation of the objectives and practices outlined in the 1997 natural resources plan. The proposed action (Alternative 2) is to implement an INRMP that emphasizes compliance and stewardship projects using an ecosystem management approach. Alternative 3 is to implement primarily activities necessary to achieve legal compliance with environmental laws and regulations (compliance only projects). The alternatives must integrate natural resources management with the installation's military use in a manner that ensures military preparedness and provides for sustainable multipurpose uses and conservation of the natural resources.

This EA presents a programmatic assessment of the environmental consequences of the alternatives. The intent of this EA is to evaluate the overall impacts of implementing the management approaches rather than individual projects discussed in the three alternatives. Ecological resources (soils, water, wetlands, wildlife, threatened and endangered species, and vegetation), cultural resources, air quality, and socioeconomics are evaluated in this EA.

The no action alternative (Alternative 1) does not meet SAIA requirements and does not effectively provide for integrated management planning because individual plans were prepared for natural resources components and site-specific management actions were not planned for all management concerns. Alternative 2 satisfies the requirements of the SAIA and INRMP objectives to support the military mission at ARD Bayview, sustain healthy ecosystems, and provide public access for outdoor recreational opportunities. Although consistent with the SAIA and INRMP requirements, Alternative 3 would restrict the ability to properly utilize natural resources on Navy-administered lands because no stewardship activities (or limited stewardship activities) would be implemented.

None of the activities currently being conducted at ARD Bayview or any of the project recommendations in the proposed action or action alternative would result in significant

environmental impacts. The natural resources management actions listed under each alternative would be implemented in compliance with all applicable Navy regulations and federal, state, and local laws. The overall scope of this assessment includes natural resources management activities that protect and enhance soil and water resources through land management, including protection of urban forests and control of invasive species; fish and wildlife, including rare, threatened, and endangered species; and environmental education. These activities would provide long-term benefits to natural resources by maintaining ecosystem integrity for support of biological diversity; consequently, these activities would have very little potential for negative environmental impacts. Coordination with IDFG, USFWS, and USFS as primary stakeholders would ensure that implementation of the INRMP at ARD Bayview provides positive benefits for the protection and management of natural resources. In addition, implementing any of the alternatives analyzed in this EA would not result in adverse cumulative impacts to the resources evaluated when added to past, present, and reasonably foreseeable future actions.

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ACRONYMS AND ABBREVIATIONS

ARD	Acoustic Research Detachment
BA	Biological Assessment
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DoD	Department of Defense
EA	Environmental assessment
EFA	Engineering Field Activity
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
IDFG	Idaho Department of Fish and Game
INRMP	Integrated Natural Resources Management Plan
INST	Instruction
NAAQS	National Ambient Air Quality Standards
NAVFAC	Naval Facilities
NEPA	National Environmental Policy Act
NSWC	Naval Surface Warfare Center
OPNAVINST	Operational Naval Instruction
SAIA	Sikes Act Improvement Act
SHPO	State Historic Preservation Officer
R,T,&E	Rare, Threatened, and Endangered
USC	U.S. Code
USFWS	United States Fish and Wildlife Service

1.0 PURPOSE AND NEED

1.1 Introduction

In accordance with the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (NEPA) (40 Code of Federal Regulations [CFR] Parts 1500-1508, Section [§] 1502.13) and the statutory requirements under the Sikes Act Improvement Act (SAIA) of 1997 (U.S. Code [USC], Title 16, Conservation, § 670 (a) et seq.), this chapter of the Environmental Assessment (EA) briefly specifies the purpose and need for the proposed action. The Navy proposes to develop and implement an Integrated Natural Resources Management Plan (INRMP) for Naval Surface Warfare Center's (NSWC) Acoustic Research Detachment located at Bayview, Idaho (ARD Bayview).

1.2 Purpose and Need for Action

The action is necessary to meet statutory requirements under the SAIA. In November 1997, the SAIA was amended to require the Secretary of the Department of Defense (DoD), to carry out a program to provide for the conservation and rehabilitation of natural resources on military installations. To facilitate this program, the amendments require the military to prepare and implement INRMPs for each military installation in the United States unless the absence of significant natural resources on a particular installation makes preparation of a plan for that installation inappropriate.

The principal use of military installations is to ensure the preparedness of the Armed Forces. The SAIA requires each installation to prepare an INRMP that provides for the following management activities, to the extent that such activities are consistent with use of the installation for military preparedness:

- Conservation and rehabilitation of natural resources on the installation;
- Sustainable multipurpose use of the resources, to include hunting, fishing, trapping, and nonconsumptive uses; and

- Subject to safety requirements and military security, public access to the installation to facilitate such uses.

As required by the SAIA, the INRMP must, to the extent appropriate and applicable, provide for:

- Fish and wildlife management, land management, forest management, and fish and wildlife-oriented recreation;
- Fish and wildlife habitat enhancement or modifications;
- Wetland protection, enhancement, and restoration, where necessary, for support of fish, wildlife, or plants;
- Integration of, and consistency among, the various activities conducted under the plan;
- Establishment of specific natural resources management goals and objectives and time frames for a proposed action;
- Sustainable use of natural resources by the public to the extent that the use is consistent with the needs of fish and wildlife resources;
- Public access to the military installation that is necessary or appropriate, subject to any requirements necessary to ensure safety and military security;
- Enforcement of applicable natural resource laws (including regulations);
- No net loss in the capability of the installation lands to support the military mission of the installation; and
- Such other activities as the Navy determines appropriate to implement natural resources management.

In preparing the INRMP, as required by the SAIA, ARD Bayview has worked in cooperation with the U.S. Fish and Wildlife Service (USFWS) and the Idaho Department of Fish and Game (IDFG) so that the plan will reflect the mutual agreement of these parties concerning conservation, protection, and management of fish and wildlife resources on the installation. The USFWS commented that the threatened bald eagle (*Haliaeetus leucocephalus*) and the bull trout (*Salvelinus confluentus*) may occur in the vicinity of the project. The USFWS encouraged the preparation of a Biological Assessment (BA) for all major construction projects. Though no major construction projects are proposed, the potential impacts from proposed projects are

discussed in this EA. The IDFG identified additional species that may be present in the project area, including the gray wolf (*Canis lupus*), Canada lynx (*Lynx canadensis*), westslope cutthroat trout (*Oncorhynchus clarki lewisi*), and least bladders milk vetch (*Astragalus microcystus*). The State of Idaho lists the least bladders milk vetch as Critically Imperiled and the westslope cutthroat trout is a Species of Special Concern. These comments and responses are presented in Appendix B. Final agreement letters from USFWS and IDFG are also included in Appendix B. Also, as required by the SAIA, the INRMP has been provided for public comment and ARD Bayview has taken those comments into account in preparing the INRMP.

In addition to meeting the SAIA requirements, the INRMP is developed in accordance with the Environmental Conservation Program, DoD Instruction (INST) 4715.3 (DoD 1996) and Operating Naval Instruction (OPNAVINST) 5090.1B CH 3, Environmental and Natural Resources Program Manual (U.S. Department of the Navy 1999).

1.3 Description of the Proposed Action

The proposed action is to modify the existing natural resources management plan and practices at ARD Bayview by implementing an INRMP consistent with the military use of the property and the goals and objectives established in the SAIA. The goal of the INRMP is to implement an ecosystem-based conservation program that provides for conservation and rehabilitation of natural resources in a manner that is consistent with the military mission. The modified INRMP will integrate, coordinate and provide for all natural resources management activities, sustainable multipurpose uses and public access for use of natural resources. Implementation of this goal is subject to safety and military security considerations. The management objectives are to integrate fish and wildlife management, land management, and management for outdoor recreation opportunities, as practicable and consistent with the military mission and established land uses.

The proposed INRMP is to be a five-year planning document that would guide natural resources management activities. Ecosystem management would include a shift from single species management to management of ecosystems, developing partnerships with stakeholders to achieve shared goals, public involvement in decision making, using the best scientific information available in decision making, and implementing adaptive management techniques.

The ARD Bayview Environmental, Safety and Health Department Manager and/or NSWDC Natural Resources Manager would reevaluate the INRMP annually for areas that require additional improvement or alteration. A formal review or revision would occur at least every five years.

ARD Bayview is located in Kootenai County in the northern panhandle of Idaho, approximately 75 miles from the Canadian Border (Figure 1-1). The site encompasses approximately 38 acres and is bounded on the north and west by the town of Bayview, on the south by Farragut State Park, and on the east it adjoins Lake Pend Oreille. The installation contains industrial and administrative buildings, wooded areas, urban forest, parking lots and other paved areas, recreational areas, landscaped areas, and submerged lake bottom.

The installation also maintains outlying parcels on the western shore of Lake Pend Oreille. These parcels are approximately one acre each and are located in Bonner County. They are on U.S. Forest Service property and are operated under a Special Use Permit. Additional resources include floating mobile barges anchored in Lake Pend Oreille.

1.4 Scope of this Environmental Assessment

This EA presents the potential environmental impacts that would result from the development and implementation of a modified INRMP for ARD Bayview. Analyses of the potential environmental consequences for each alternative action are based on a collaborative assessment with the ARD Bayview, Environmental, Safety and Health Manager, NSWDC Natural Resources Manager, government agencies, and public comments regarding the scientific facts and resource assessment methodologies.

This EA presents a programmatic assessment of the environmental consequences of the proposed action and the reasonable alternatives. The management approaches are assessed individually, not by individual management projects discussed in the three alternatives. The intent of this EA is to evaluate the overall impacts of implementing the proposed action rather than individual projects that are included under the proposed action and management alternative.

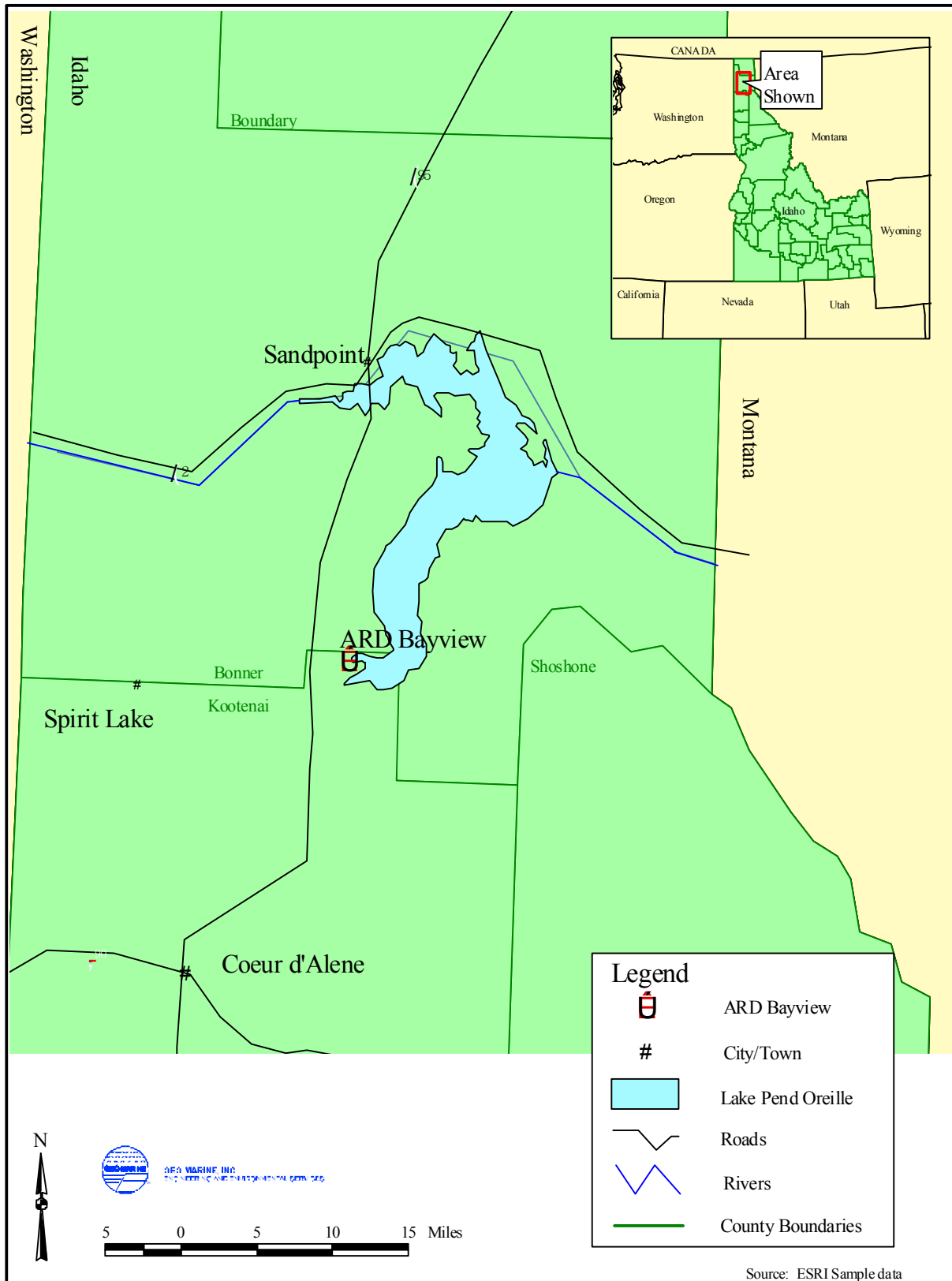


Figure 1-1. Location of ARD Bayview, Kootenai County, Idaho.

Site-specific environmental analyses for future natural resource projects would be tiered to this EA. If the anticipated impacts of a specific natural resource project, project components, knowledge of the affected resources, or circumstances differ substantially from those evaluated in this EA, a supplemental or broader environmental analysis (including possible preparation of an environmental impact statement [EIS] if impacts are significant) would be conducted.

1.4.1 Resources Evaluated

Resources that were evaluated in this EA include ecological resources, cultural resources, air quality, and socioeconomics. The assessment of potential impacts to these resources for each management action and alternative included in the INRMP, described in Section 4.0, was based on the planning criteria outlined in Section 1.4. The resources addressed include:

- Ecological Resources - Management actions could impact soils, water resources including wetlands, wildlife including threatened and endangered species, and vegetation;
- Cultural Resources - Management actions could impact previously identified and/or undocumented cultural resources that occur in the area;
- Air Quality - Potential impacts to air quality could result from management actions, especially prescribed burning in forests and grassland areas; and
- Socioeconomics - Management actions could impact localized populations and/or income and employment. These effects may include impacts to minority and/or low-income populations.

1.4.2 Resources Eliminated from Further Study

Noise generated from the research and development activities conducted for the military mission at ARD Bayview do not limit or constrain conservation and rehabilitation of natural resources. No activities proposed in the INRMP or current management activities generate noise above ambient levels that would pose a concern at ARD Bayview; therefore, the issue was eliminated from further study. Potential impacts to land use resulting from implementation of the proposed action or alternatives were eliminated from further study. Whereas mission activities at ARD Bayview must consider protection measures for natural resources as part of standard operating procedures, implementation of the natural resources program does not formally constrain mission activities or dictate land use. Mission security and safety and/or regulatory requirements are

primary considerations for imposing land use restrictions at the installation. Implementation of the natural resources program at ARD Bayview would not reduce the capability of the installation's lands to support the military mission.

1.5 Regulatory Drivers and Guidance

A list of pertinent laws, executive orders (EOs), regulations, and DoD directives for environmental management, available on the World Wide Web site www.fws.gov/laws/federal/summaries/index.html, is presented in Appendix A. These regulatory drivers and guidances help to avoid negative impacts to the natural resources. The requirements set forth in the laws, regulations, and EOs may be used as appropriate mitigation measures for implementation of projects under the INRMP.

2.0 DESCRIPTION OF ALTERNATIVES

This chapter of the EA describes and compares three alternatives. These alternatives consist of modifications in the level of effort to implement the management objectives for forestry, fish and wildlife, land management, and outdoor recreation. Issues that relate to the military use of the property and affect natural resources management include a limited amount of undeveloped area and future construction requirements for military operations. Future development of facilities to accomplish the military mission could constrain natural resources management opportunities; however, integration of natural resources and mission requirements could improve the natural resources base by reutilization of structure or paved areas to offset potential habitat losses.

The current mission of ARD Bayview is to provide:

- Research, development, testing, and evaluation, fleet support, and in-service engineering for surface and undersea vehicle hull, mechanical, and electrical systems and propulsions;
- Logistics research and development; and
- Support to the maritime administration and maritime industry.

Existing land use and the possibility of future development in support of the military mission are the primary constraints to implementation of the INRMP. Currently, there are small amounts of mature woodland, which act as buffer zones and provide numerous benefits to wildlife and visual buffers. The forested areas and various other natural habitats would be compromised in productivity and resilience by a reduction in size. The INRMP recognizes the value of such areas and recommends maintenance and enhancement of these areas through replanting of degraded sites and control of invasive plant species. Since the Natural Resource Management (NRM) program at ARD Bayview has a strong track record of coordinating natural resources issues with mission requirements, the overall spirit and intent of the INRMP is compatible with the military mission.

Under the no action alternative (Alternative 1), ARD Bayview will continue with the implementation of the objectives and practices outlined in the 1997 natural resources plan. The proposed action (Alternative 2) is to implement an INRMP that emphasizes compliance and

stewardship projects using an ecosystem management approach that is consistent with the military use of the property and the goals and objectives established in the SAIA. Alternative 3 is to implement an INRMP with a lower priority for stewardship projects. Under this alternative, primarily only activities necessary to achieve legal compliance with environmental laws and regulations would be implemented. Therefore, the priority for compliance and stewardship projects represents an alternative to implementing an INRMP for ARD Bayview. The selected alternative would serve as the natural resources management guideline that would be applied through implementation of the INRMP. This EA analyzes, evaluates, and compares the three alternatives.

2.1 Process Used to Formulate the Alternatives

The management approaches that were considered to formulate the alternatives are based on SAIA and the Chief of Naval Operations guidance that installations shall develop and implement an INRMP using an ecosystem management approach. The Navy Environmental and Natural Resources Program Manual (OPNAVINST 5090.1B CH-3) provides program requirements, guidelines, and standards for managing natural resources. The 1997 Integrated Natural Resources Plan for ARD Bayview was prepared in accordance with OPNAVINST 5090.1B CH-3 and Naval Facilities (NAVFAC) P-73 Vol. II, Natural Resources Management Procedural Manual. The SAIA provides guidelines for development and implementation of an INRMP using an ecosystem management approach. The no action alternative is carried forward for analysis in accordance with NEPA 1502.14 (d).

The Environmental Conservation Program (DoDINST 4715.3) provides detailed guidance on programming and budgeting for conservation programs. It defines four classes of conservation programs (Class 0, I, II, III); compliance activities fall into the first three classes; Classes 0, I, and II, and stewardship activities fall into Class III. These criteria are used to make recommendations for management actions under the selected management approach.

Compliance. Classes 0 through II represent projects that are associated with a legal requirement for protection and management of natural resources. Failure to implement these projects would result in disruption of military mission activities.

- Class 0, Recurring Natural and Cultural Resources Conservation Management Requirements. This includes activities needed to cover the recurring administrative, personnel, and other costs associated with managing DoD's conservation program that are necessary to meet applicable compliance requirements or that are in direct support of the military mission.
- Class I, Current Compliance. This includes projects and activities needed because an installation is currently out of compliance; has a signed compliance agreement or has received a consent order; or has not met requirements based on applicable federal or state laws, regulations, standards, EOs, or DoD policies; and/or are immediate and essential to maintain operational integrity or sustain readiness of the military mission.
- Class II, Maintenance Requirements. This includes those projects and activities that are not currently out of compliance, but will be out of compliance if projects or activities are not implemented in time to meet an established deadline beyond the current program year.

Stewardship. Class III, Enhancement Actions, Beyond Compliance. This includes those projects and activities that enhance conservation resources or the integrity of the installation mission, or are needed to address overall environmental goals and objectives, but are not specifically required under any regulation or EO and are not of an immediate nature.

2.2 Alternative Selection Criteria

The selected action must integrate natural resources management with the installation's military use in a manner that ensures military preparedness and provides for sustainable multipurpose uses and conservation of the natural resources. The selected action must comply with all applicable laws and regulations and identify site-specific management actions.

2.3 No Action (Alternative 1)

The no action alternative involves the continued implementation of the objectives and practices outlined in the existing Integrated Natural Resources Management Plan (U.S. Department of the Navy 1997). On-going practices used for management of natural resources at ARD Bayview would continue and there would be no change to the objectives outlined under the current Natural Resources Management Plan. The current plan is technically not a viable alternative and

does not meet SAIA requirements because specific project costs and implementation schedules were not provided in the plan. However, the no action alternative is being carried forward as a baseline for comparison to the other alternatives.

The 1997 Natural Resources Plan was developed as a broad planning tool. ARD Bayview's Environmental, Safety, and Health Manager plays the major role in accomplishing the goals set forth in the plan. Various installation offices, naval personnel, federal and state agencies, and contractors provide support to the natural resources manager. General recommendations are suggested; however, the recommendations are not clearly developed into specific well-defined projects. Project costs and time lines are not included, thus limiting the utility of the 1997 plan. Much effort has been required by the installation natural resources personnel to estimate project costs and develop implementation time lines.

The 1997 natural resources plan was developed as three distinct sections (land management, fish and wildlife, forestry management). Each of these sections stands alone and little effort is made to discuss multiple benefits of management actions. Recommended actions are very general and included:

- Control of noxious weeds;
- Landscaping and erosion control measures for new land disturbances;
- Review of capital development for inclusion into stormwater management plans;
- Use of temporary erosion and sediment control measures during construction;
- Scheduling construction to avoid kokanee spawning and incubation; and
- Monitoring of bald eagles during capital construction projects.

Recommended actions were chosen to target specific goals, rather than developing recommendations with larger scale ecosystem benefits. Furthermore, recommended actions are not discussed in terms of compliance and stewardship level actions and subsequent prioritization. Only these six specific recommendations were made in the 1997 plan.

2.4 Proposed Action (Alternative 2)

In addition to continuing the current management practices, ten projects will be implemented in order to meet compliance and stewardship objectives for the natural resources at ARD Bayview. This alternative focuses on projects that directly relate to mission support, meet legal and Navy requirements for natural resources management, and support regional ecosystem management initiatives. This alternative gives equal consideration to compliance and stewardship actions to produce an ecosystem approach for natural resources management.

There are seven primary goals in the INRMP:

- Implement land management practices that reduce grounds maintenance costs, conserve soil and water, improve real estate values, protect floodplains, abate nonpoint source water pollution, control noxious weeds, and prevent erosion and sedimentation;
- Identify and protect floodplains and rare and endangered species;
- Manage fish, wildlife, and plant resources within ecological limits;
- Support non-consumptive use of non-game fish and wildlife resources;
- Develop an urban forest management plan;
- Manage natural resources to provide opportunities for outdoor recreation; and
- Identify floral and faunal resources present.

These seven primary management goals and the objectives are addressed under three primary management issues: land use management, including urban forest resources and wetlands/floodplain protection; fish and wildlife management, including rare, threatened, and endangered species protection; and outdoor recreation and environmental education.

Land Use Management. Proper land use management provides the foundation for the conservation of all other natural resources components and serves as the basic land use and conservation management guide. Land management encompasses soil and water conservation, wetlands/floodplain protection, protection of specific ecological areas, water quality protection, erosion and sediment control, grounds management, urban forestry, and stormwater management. The primary objectives for land use management include the following:

- Conserve, manage, maintain, and enhance all natural resources in accordance with proven scientific methods, procedures, and techniques;
- Protect real estate from depreciation by implementing appropriate land use practices based upon soil capabilities;
- Minimize or eliminate pollution through proper waste disposal and erosion and sedimentation practices;
- Improve the appearance and ecosystem function of ARD Bayview through the preservation of the natural terrain and vegetation;
- Improve the general health of the forest ecosystem while maintaining ecological balance; and
- Protect known RT&E species and critical habitat.

Fish and Wildlife Management. This section offers concepts and recommendations for protecting, conserving, and managing the fish and wildlife resources at ARD Bayview under the principles of ecosystem management. Fish and wildlife management encompasses nuisance wildlife control, projects to minimize human/wildlife conflict, maintenance of bird nesting sites, threatened and endangered species management, and biodiversity enhancement. The primary objectives for fish and wildlife management include the following:

- Provide sufficient suitable habitat at ARD Bayview to support the habitat requirements for indigenous, threatened, or endangered species using the property. These habitats should be monitored to assess the conservation benefits of the management actions;
- Protect, conserve, and manage ARD Bayview wildlife to achieve balanced species populations within sustainable ecosystem parameters to ensure that habitat degradation does not result;
- Monitor ARD Bayview's wildlife populations, habitat quality and human activities to determine habitat protection needs and improvement opportunities; and
- Improve the biodiversity of resident and migrant species by identifying, protecting, or developing a diversity of habitats.

Outdoor Recreation and Environmental Education. Management activities in this section identify and evaluate outdoor recreation and environmental education opportunities at ARD

Bayview. Outdoor recreation opportunities are limited because of the small size of the installation. Environmental education includes a network of educational signs to increase awareness of natural resources and the impacts that base activities may have on these resources. The primary objectives for outdoor recreation and environmental education include the following:

- Optimize the outdoor recreational and environmental education benefits afforded military and civilian personnel and their families within the capability of the existing resources and the constraints of the military mission;
- Identify potential natural resources and recommend enhancement or preservation actions;
- Ensure ecosystem-level management of natural resources for outdoor recreation, fish and wildlife, forestry, and other purposes.

Projects that will be conducted under the proposed action are presented in Table 2-1. Specific information for these projects is presented in the INRMP that accompanies this EA.

Table 2-1. 2002 ARD Bayview Project Summary.

Project Number	Management Issue Project Name	Compliance or Stewardship	Funding Priority Class
Land Use Management			
1	Invasive Species Survey	C	II
2	Invasive Species Control	C/S	II,III
3	Reforestation/Demolition Site Restoration	C/S	II,III
4	Urban Forest Management Plan	S	III
Fish and Wildlife Management			
5	Osprey Nest Platforms	C	I
6	Baseline Survey of Biological Resources	C	II
7	Fish Monitoring & Coordination	S/C	III, I
8	Native American Fishing & Hunting Rights	S	III
Outdoor Recreation and Environmental Education			
9	Educational Sign Placement	S	III
10	2007 INRMP Update and EA	C	I

C = Compliance

S = Stewardship

2.5 Management for Compliance (Alternative 3)

The alternative to develop and implement the INRMP with emphasis on project management recommendations for compliance activities (legal requirements) subordinates many of the project management recommendations in the proposed action. Projects that support or provide participation in regional ecosystem initiatives and other stewardship activities that represent the Navy's commitment to conservation of natural resources are given a low priority for implementation. Although the project list is the same as for the proposed action, the prioritization of management activities favors projects that are associated with a legal requirement for protection and management of natural resources in order to avoid disruption of military mission activities. The stewardship activities that would be conducted under the no action alternative will not be conducted under Alternative 3 unless project funding in excess of compliance requirements are available. Projects will be implemented in the following order for priorities:

- Osprey Nest Platforms;
- Rare, Threatened, and Endangered (R,T,& E)Species Survey;
- Invasive Species Survey;
- Invasive Species Control;
- Reforestation/Demolition Site Restoration;
- Urban Forest Management Plan;
- Fish Monitoring & Coordination;
- Native American Fishing & Hunting Rights; and
- Educational Sign Placement.

2.6 Alternatives Considered but Eliminated from Further Analysis

An alternative to updating the modified INRMP (proposed action) by implementing only stewardship projects was eliminated from further consideration. Implementation of compliance projects is a legal requirement.

2.7 Comparison of Alternatives

The comparison of alternatives presented in Table 2-2 is based on the information and analyses presented in Chapter 3.0 (Affected Environment) and Chapter 4.0 (Environmental Consequences). Each of the management issues was considered in assessing the decision factors under each alternative and is the basis for providing choices for the decisionmaker and the public.

The no action alternative (Alternative 1) does not meet SAIA requirements and does not effectively provide for integrated management planning because individual plans were prepared for natural resources components and site-specific management actions were not planned for all management concerns. In addition, the No Action Alternative does not include implementation schedules, cost breakdowns for projects, and manpower/staff requirements. Alternative 2 satisfies the requirements of the SAIA and INRMP objectives to support the military mission at ARD Bayview, sustain healthy ecosystems, and provide public access for outdoor recreational opportunities. Although consistent with the SAIA and INRMP requirements, Alternative 3 would restrict the ability to properly utilize natural resources on Navy-administered lands because no stewardship activities (or limited stewardship activities) would be implemented.

Table 2-2. Comparison of Alternatives.

Resource/ Issue	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Management for Compliance
Soil	Benefits from environmental awareness efforts for erosion and sediment control	Benefits from environmental awareness and enhanced soil stability from re-vegetated slopes	Benefits from environmental awareness efforts for erosion and sediment control, but less than Alternative 2
Water	Benefits from review of permitting requirements and stormwater management review	Benefits from compliance actions and enhanced soil stability from re-vegetated slopes	Benefits from review of permitting requirements
Vegetation	No effect	Benefits from reforestation, invasive species, and environmental education management actions	Benefits from invasive species control, but less than Alternative 2
Wildlife	No effect	Benefits from forest, wildlife, and environmental education management actions	Benefits from high priority for osprey nesting management actions, but less than Alternative 2
Cultural	Minimal disturbance from landscaping activities	Minimal ground disturbance from landscaping and installation interpretive sign posts; benefits from investigation of traditional cultural resources	Minimal disturbance from landscaping activities
Air Quality	No effect due to <i>de minimis</i> emissions	No effect due to <i>de minimis</i> emissions	No effect due to <i>de minimis</i> emissions
Socioeconomics	No adverse effect to population or income and employment	No adverse effect to population or income and employment, positive benefits to quality of life for installation personnel	No adverse effect to population or income and employment

3.0 AFFECTED ENVIRONMENT

This chapter describes the affected environment that would be potentially impacted by implementation of any of the alternatives. General physical and biological characteristics are presented in the INRMP for ARD Bayview that is being prepared concurrently with this EA. In accordance with CEQ regulations (40 CFR § 1502.15), the descriptions presented below are no longer than necessary to understand the potential effects of the proposed action and alternatives.

3.1 Ecological Resources

ARD Bayview is located in the northern panhandle of Idaho in the northern Rocky Mountains. The site is a mere 38 acres and includes both terrestrial and aquatic habitats. Elevations range from lake shoreline (2,051 feet, winter; 2,062.5 feet, summer) to 2,290 feet. The minimum elevation on ARD Bayview operations area is approximately 2,051 feet.

Terrestrial resources are typical of the region, and include forested slopes dominated by Douglas fir (*Pseudotsuga menziesii*) and ponderosa pine (*Pinus ponderosa*) with minor representation of western red cedar (*Thuja plicata*), western larch (*Larix occidentalis*), and western hemlock (*Tsuga heterophylla*).

Aquatic resources are represented by seasonally flooded shoreline and submerged lake bottom. The lake bottom substrate composition ranges from finer sediments in the northwest to small, coarse cobble-sized (gravel rock) substrate in the east. The cobbles are appropriately sized for kokanee spawning areas and are heavily used for this purpose (Maiolie et al. 2003).

3.1.1 Soil Resources

Soils resources at ARD Bayview are described in the Soil Survey of Kootenai County Area, Idaho (Soil Conservation Service 1981). The three soils identified at ARD Bayview are Bonner silt loam, Bonner gravelly silt loam, and Kootenai gravelly silt loam. A fourth soil type, Dystrochreptic Arents, is also included based on the intensive development at the site. Dystrochreptic Arents represent human disturbance over Bonner soils. Bonner soils are deep, well-drained glacial outwash soils that form the gentler slopes. The origin of the Kootenai series

is similar to Bonner soils, however, they occur on much steeper slopes (20-45%). Kootenai soils are present on the steep slope between the developed waterfront area and the remote storage area.

3.1.2 Water Resources

No streams or wetlands are located at ARD Bayview. Surface water on the installation is limited to Lake Pend Oreille. There are no floodplains at ARD Bayview, but the shoreline of Lake Pend Oreille fluctuates approximately 12 feet from the winter months to late spring. The lake water level is lowered during winter months to accommodate snow melt in the spring. Lake Pend Oreille is the largest and deepest lake in Idaho (and the fifth deepest lake in the U.S.), encompassing 148 square miles (94,500 acres) and reaching a depth of 1,152 feet. Because of the great size and depth of Lake Pend Oreille, the effects of surrounding land use practices on water quality are likely to be gradual long-term changes. Conversely, the benefits of improved land use practices may be slow to show effect.

Lake Pend Oreille is located in Hydrologic Unit Code 17010214 (Lake Pend Oreille Watershed). Watershed area upstream of Lake Pend Oreille includes part of northern Idaho, most of western Montana, and a small portion of Canada.

3.1.3 Vegetation

Though most of ARD Bayview is developed, three areas still support native forest cover. The first area located near the main gate supports a mature forest canopy including ponderosa pine and Douglas fir. While the canopy is mature forest, the understory and shrub layer have been cleared. This site is used as a picnic area.

The second forested area is located in the southeastern area of the installation. Native forest is present on the slope between Bayview Road and the developed installation. This slope provides a noise and visual buffer as well as slope stabilization. Lastly, the largest forested area surrounds the Remote Storage Area on the southern part of the installation. This is the largest contiguous patch of forest at ARD Bayview (approximately 7 acres). This forest also functions as a buffer to Highway 54 and Bayview Road. Tree species occurring in the forested areas include Douglas-fir, ponderosa pine, and western larch. Understory species include false Solomon's seal

(*Smilacina spp.*), creeping Oregon grape (*Mahonia repens*), and oceanspray (*Holodiscus spp.*) (U.S. Department of the Navy 1997).

The remaining vegetation at ARD Bayview is typical of disturbed sites and includes a mix of native and non-native invasive species. Common plants include common tansy (*Tanacetum vulgare*), spotted knapweed (*Centaurea maculosa*), and Canada thistle (*Cirsium arvense*). Surveys for rare, threatened, and endangered and invasive plant species are both proposed in the INRMP. Two state-listed plant species, Bladdery milk vetch (*Astragalus microcystis*) and black snakeroot (*Sanicula marilandica*), have been identified at Farragut State Park, adjacent to ARD Bayview.

3.1.4 Wildlife

ARD Bayview supports both aquatic and terrestrial wildlife, but because of the small size of the installation, it cannot provide the complete habitat requirements of most species.

Aquatic species include kokanee (*Oncorhynchus nerka*), kamloops trout (*Oncorhynchus mykiss*), bull trout (*Salvelinus confluentus*), brown trout (*Salmo trutta*), rainbow trout (*Oncorhynchus mykiss*), lake trout (*Salvelinus namaycush*), westslope cutthroat trout, lake whitefish (*Coregonus clupeaformis*), mountain whitefish (*Prosopium williamsoni*), northern pike (*Esox lucius*), northern pikeminnow (*Ptychocheilus oregonensis*), smallmouth bass (*Micropterus dolomieu*), largemouth bass (*Micropterus salmoides*), and various catostomids, sculpins, chubs, dace, and warmwater panfish. The bull trout is federally-threatened, while the westslope cutthroat trout is a Idaho Species of Special Concern. The westslope cutthroat trout was under review by the USFWS to determine if federal protection is warranted; a final decision was issued on 8 August 2003 and concluded that the westslope cutthroat trout should not be listed as a threatened species.

The USFWS proposed to designate critical habitat for the Klamath River and Columbia River distinct population segments of bull trout in the Federal Register on February 11, 2003 (Volume 68, Number 28). The proposed critical habitat designation includes approximately 29,720 kilometers (18,471 miles) of streams and 215,585 hectares (532,721 acres) of lakes, reservoirs, and marshes in Oregon, Washington, Idaho, and Montana. Designation would apply only to the waterways, not the adjacent lands.

Terrestrial species include elk (*Cervus elaphus*), moose (*Alces alces*), black bear (*Ursus americanus*), and white-tailed deer (*Odocoileus virginianus*). Because of the small size and extensive development of the installation, the white-tailed deer is the most frequent large mammal currently inhabiting the property. However, discussions with neighboring landowners confirmed the occasional presence of black bear. The IDFG identified the gray wolf and Canada lynx as possibly occurring within the project area. Smaller mammals that utilize the grounds include the raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), river otter (*Lutra canadensis*), mink (*Mustela vison*), and chipmunk (*Eutamias spp.*). According to the USFWS, the threatened bald eagle may occur in the vicinity of the project.

3.2 Cultural Resources

A survey was conducted in 1996 to identify significant archaeological resources at ARD Bayview and review buildings for eligibility for the National Register of Historic Places (Archaeological/National Historic Survey 1996). The only finding was a small scatter of mid-twentieth century cans near the access road to the Remote Storage Area. No significant archaeological resources were identified and the potential for such resources was determined to be low; nor were any buildings determined to be eligible for inclusion on the National Register of Historic Places (Archaeological/National Historic Survey 1996). Based on the lack of findings, an Integrated Cultural Resources Management Plan is not required.

Historically, several groups of Native America Indians inhabited the Bayview area and depended on the resources present for sustenance. These included the Coeur d'Alene, Kalispel, Kootenai, Pend Oreille, and Salish Indians. The reservation, established in the 1873, originally included the Bayview area and Lake Pend Oreille. Through later treaties, the reservation size was greatly reduced, but still exists in Benewah County to the south. The presence of traditional cultural resources has not been investigated with respect to the ARD Bayview property (i.e. traditional fishing or hunting grounds).

3.3 Air Quality

ARD Bayview is located within Region 10 of the U.S. Environmental Protection Agency (EPA). EPA uses six "criteria pollutants" as indicators of air quality: ozone, carbon monoxide, nitrogen

dioxide, sulfur dioxide, particulate matter, and lead. For each of these, EPA has established "primary" standards to protect public health and "secondary" standards to protect other aspects of public welfare, such as preventing materials damage, preventing crop and vegetation damage, or assuring visibility. These standards are called the National Ambient Air Quality Standards (NAAQS). Areas that do not meet NAAQS are called non-attainment areas. Kootenai County is classified as in attainment for all criteria pollutants (EPA 2000). To ensure that federal actions do not interfere with the state's maintenance of the NAAQS, the Clean Air Act (CAA) requires that federal agencies demonstrate that their actions in non-attainment and maintenance areas do not produce emissions above *de minimis* levels for annual criteria pollutant emissions. The General Conformity Rule under the CAA does not apply to attainment areas.

3.4 Socioeconomics

Kootenai County is located in the northwest portion of Idaho, near the Washington border, and includes 1,245 square miles of land area. Coeur d'Alene, the county seat, is the sixth largest city in Idaho (2000 census) and is situated on the shores of Lake Coeur d'Alene. Coeur d'Alene represents about one-third of the county population.

3.4.1 Population

The population estimate for Kootenai County, ID is 112,297 (July 2001 estimate). This is approximately 8.5 percent of the total state population. This population estimate indicates a 3.3 percent increase during the period from April 2001 to July 2001. During the same period, the population statewide increased 2.1 percent. The population is almost equally composed of males and females, with 27.1 percent under the age of 18. The 2000 racial profile consists of White (95.8 percent), American Indian or Alaska Native (1.2 percent), Asian (0.5 percent), Black (0.2 percent), and Other (0.1 percent). The population density is 87.3 persons per square mile (U.S. Census Bureau 2000).

3.4.2 Income and Employment

According to 2000 census data, 41,208 households were reported in Kootenai County with a median household income using the 1997 model-based estimate of \$36,123 (7.5 percent greater than the statewide average). The percentage of persons below the poverty level was 11.5 percent

(the statewide average was 13 percent). The number of people employed in the private non-farm sector in the county was 33,728 (an increase of 76 percent from the 1990 data), while 4,440 people were employed in local government.

4.0 ENVIRONMENTAL CONSEQUENCES

This section of the EA presents a programmatic assessment of the potential environmental impacts from implementation of the three alternatives. None of the activities currently being conducted at ARD Bayview or any of the project recommendations in the proposed action or alternatives would result in significant environmental impacts. The natural resources management actions listed under each alternative would be implemented in compliance with all applicable Navy regulations and federal, state, and local laws. Management projects that are designed to avoid negative environmental impacts, including planning measures for compliance with the requirements of applicable laws and regulations (see Section 1.5), are covered in this EA. The overall scope of this assessment includes natural resources management activities that protect and enhance soil and water resources through land management, including protection of urban forests and control of invasive species; fish and wildlife, including rare, threatened, and endangered species; and environmental education. These activities would provide long-term benefits to natural resources by maintaining ecosystem integrity for support of biological diversity; consequently, these activities would have very little potential for negative environmental impacts.

The proposed action (Alternative 2) would provide greater environmental benefits than either continuing the current management program (No Action Alternative) or implementation of management for the compliance alternative (Alternative 3). Implementation of the INRMP to meet compliance and stewardship objectives would fulfill the requirements in the SAIA and would advance the natural resources management program at ARD Bayview. In comparison, implementation of Alternative 3 would subordinate many of the beneficial natural resources management actions proposed and ultimately could result in decline of the natural resources management program at ARD Bayview. However, this alternative could fulfill the minimal requirements of the SAIA.

4.1 No Action (Alternative 1)

There would be no change in the way natural resources are currently managed with implementation of the no action alternative (Alternative 1). The current plan is based on

multiple use and sustained yield of natural resources. Management actions for individual resources would continue to be nonintegrated and would not be in compliance with the SAIA and Navy guidance. Furthermore, site-specific management actions and implementation schedules would not be provided. Although the current management plan provides recommendations for compliance and stewardship actions, specific natural resources projects are not identified.

4.1.1 Ecological Resources

The current plan would continue to provide some benefits to soils, water resources, vegetation, and wildlife. However, the benefits would be limited due to the lack of specific management actions and lack of integration of actions among resources. Land management actions would be conducted in accordance with state and federal regulations for protection of water quality, wetlands, erosion and sediment control, and noxious weed control. Forest management activities would be limited to firewood collection and timber sales based on management, silvicultural, and resource planning criteria. The Engineering Field Activity (EFA) Northwest Forester would provide technical forestry guidance for forest management actions. Fish and wildlife managements would include temporary stormwater pollution prevention measures, avoidance of major construction during kokanee spawning and incubation periods, and bald eagle monitoring during construction activities. Most recommendations provided in the 1997 plan are intended to minimize the impact of capital improvement construction activities. There are no recommended management actions that would negatively impact ecological resources on ARD Bayview.

4.1.2 Cultural Resources

Protection and management of cultural resources under the no action alternative would continue to be nonintegrated with natural resources management activities. The implementation of the no action alternative would provide minimal disturbance of surface strata during landscaping activities, but would not be likely to adversely impact cultural resources at ARD Bayview.

4.1.3 Air Quality

Under this alternative, there would be no change in air quality as a result of implementing the current plan. There are no natural resources management activities proposed in the current plan that would generate measurable impacts to air quality. Prescribed burning is the only

management activity that could potentially impact air quality. However, the small size of the installation would likely preclude prescribed burning for natural resources management as an effective management practice. Any air emissions from minor construction activities would be negligible for criteria pollutants. Since the area is in attainment for all criteria pollutants, the General Conformity Rule under the CAA does not apply to the current natural resources management activities and impacts to air quality will not be significant.

4.1.4 Socioeconomics

Under this alternative, there would be no change in the potential effects of natural resources management on socioeconomics. The general public does not have access to the natural resources at ARD Bayview because of security limitations. The no action alternative would not adversely impact the human health or the environment of any of the area's populations, including any low-income or minority populations. The no action alternative would not have a disproportionately high and adverse impact on minority or low income populations nor pose environmental health risks and safety risks that would disproportionately affect children (EO 12898, Federal Actions to Address Environmental Justice in Minority Population and Low Income Population, and EO 13045, Protection of Children from Environmental Health Risks and Safety Risks). The only income or employment to impact the regional economy would be very limited work contracted for the noxious weed control management recommendation.

4.2 Proposed Action (Alternative 2)

The implementation of an INRMP with compliance and stewardship project recommendations (Alternative 2) would focus on maintaining and improving native biological diversity, conservation of natural resources, and environmental education. The most important aspect for determining the environmental consequences is that this alternative includes integrated management actions for natural resources activities. Similar to the no action alternative, this alternative would be implemented in compliance with all Navy regulations and federal, state, and local laws.

4.2.1 Ecological Resources

Implementation of the proposed action would result in positive benefits to ecological resources by effectively using an ecosystem approach for implementation of the INRMP. Coordination with the IDFG, USFWS, and the USFS as primary stakeholders in the protection and management of natural resources would ensure that implementation of the natural resources program at ARD Bayview provides positive benefits to ecological resources. The installation will continue to work cooperatively with IDFG and USFWS to monitor impacts to kokanee spawning activity and habitat critical for bull trout. The resource-specific management activities provided in the INRMP would result in long-term positive benefits to soil, water, vegetation, and wildlife by involving the various stakeholders to achieve the optimal management of ecological resources. For example, a rare, threatened and endangered species survey conducted in cooperation with the IDFG would help to identify sensitive species and important habitat resources at ARD Bayview. A partial list of project objectives that would benefit ecological resources is presented below.

- Conserve, manage, maintain, and enhance all natural resources in accordance with proven scientific methods, procedures, and techniques.
- Minimize or eliminate pollution through proper waste disposal and erosion and sedimentation practices.
- Improve the appearance and ecosystem function of ARD Bayview through the preservation of the natural terrain and vegetation.
- Monitor ARD Bayview's wildlife populations, habitat quality and human activities to determine habitat protection needs and improvement opportunities.
- Protect known R,T,&E species and critical habitat.

4.2.2 Cultural Resources

Implementation of the proposed action would provide minimal disturbance of surface strata during landscaping activities, but would not likely cause adverse impacts cultural resources at ARD Bayview. Minor land disturbance would also result from restoration and replanting of demolition sites and from post holes excavated for placement of educational signs. Traditional cultural resources would benefit from investigation to determine if areas of traditional

importance exist on the installation. When necessary, Section 106 Consultations would be conducted with the Idaho State Historic Preservation Office (SHPO) prior to implementing ground-disturbing activities.

4.2.3 Air Quality

Implementation of the INRMP would not impact the air quality at ARD Bayview. Emissions from proposed management activities would be negligible because of the small areas involved and the short-term operations. Minor, short-duration impacts may occur from welding efforts during construction of the osprey nest platform and from equipment used to dig post holes for sign placement. The benefits to air quality by maintaining existing vegetation (that absorbs air contaminants) throughout the installation and restoring vegetation on disturbed sites would be positive but negligible in terms of the air quality control region. Similar to the no action alternative, project activities proposed in the INRMP would produce negligible air emissions for criteria pollutants.

4.2.4 Socioeconomics

Implementation of the proposed action would not impact population or income and employment in the region. The criteria for assessment is similar to the criteria used for the no action alternative. The proposed action would not have a disproportionately high and adverse impact on minority or low-income populations nor pose environmental health risks and safety risks that would disproportionately affect children (EO 12898, Federal Actions to Address Environmental Justice in Minority Population and Low Income Population, and EO 13045, Protection of Children from Environmental Health Risks and Safety Risks). Implementation of the natural resources program at ARD Bayview would not require relocation of personnel to the area, and the total annual cost for operation of the program would not significantly impact the regional economy. Minor positive benefits would result from the contracting of invasive species control tasks and from the purchase of plants for site restoration/enhancement efforts. Implementation of stewardship activities conducted to enhance environmental education opportunities, such as installing educational signs, would provide positive benefits to the quality of life for installation personnel.

4.3 Management for Compliance (Alternative 3)

Whereas implementation of compliance activities addresses the legal requirements for natural resources management under an INRMP, the policy of the Navy is to act responsibly in the public interest to restore, improve, preserve, and properly utilize natural resources on Navy-administered lands. Stewardship activities represent the conscious and active concern for the inherent value of natural resources in all Navy plans, actions, and programs. The environmental consequences of implementing an INRMP without stewardship project management recommendations would include reduced opportunities for environmental education, urban forestry, fisheries management, and research into Native American fishing and hunting rights. Projects such as these would not be conducted, or would only be conducted if funding in excess of compliance projects is available, under this alternative. Projects requiring compliance-level funding would be implemented, such as threatened and endangered species surveys, construction of osprey nest platforms, invasive species survey and control, and site restoration following demolition. Similar to the proposed action (Alternative 2), this alternative would be implemented in compliance with all Navy regulations and federal, state, and local laws. Similar to the proposed action, Alternative 3 would integrate management actions for natural resources activities.

4.3.1 Ecological Resources

Implementation of Management for Compliance (Alternative 3), would have overall positive benefits for ecological resources by maintaining compliance with regulations protecting migratory bird species, identifying and protecting threatened and endangered species, prompt replanting of demolition sites, and controlling invasive species. However, many of the proposed management actions designed to meet ecosystem objectives would not be conducted or would be conducted at minimal levels. The benefits from noncompliance projects such as fish monitoring efforts coordinated with IDFG, preparation of an urban forestry management plan, and environmental awareness and education would not be realized. Optimal integration of natural resources for protection and management of ecological resources at ARD Bayview would not be achieved under implementation of Alternative 3.

4.3.2 Cultural Resources

Implementation of Alternative 3 would provide minimal disturbance of surface strata during site restoration and stabilization activities following building demolition, but would not likely cause adverse impacts cultural resources at ARD Bayview. The considerations for cultural resources protection prior to conducting natural resources activities under the management for compliance alternative would be similar to the proposed action. When necessary, Section 106 consultations would be conducted with the Idaho SHPO prior to implementing ground-disturbing activities.

4.3.3 Air Quality

Implementation of the INRMP would not impact the air quality at ARD Bayview. Emissions from proposed management activities would be negligible because of the small areas involved and the short-term operations. Negligible, short-duration impact may occur from welding efforts during construction of the osprey nest platform. The benefits to air quality by maintaining existing vegetation (that absorbs air contaminants) throughout the installation would be positive but negligible in terms of the air quality control region. Similar to the no action alternative and Alternative 2, project activities proposed in the INRMP would produce negligible air emissions for criteria pollutants.

4.3.4 Socioeconomics

Implementation of Alternative 3 would not significantly impact socioeconomics at ARD Bayview or in the vicinity of the installation. Impacts would be similar to Alternative 2. Alternative 3 would not have a disproportionately high and adverse impact on minority or low income populations nor pose environmental health risks and safety risks that would disproportionately affect children (EO 12898, Federal Actions to Address Environmental Justice in Minority Population and Low Income Population, and EO 13045, Protection of Children from Environmental Health Risks and Safety Risks). Reductions in stewardship management activities because of management for compliance requirements would not impact population or income and employment in the region. The magnitude of projects implemented under Alternative 3 would be insignificant to affect the regional economy. The associated benefits to quality of life for installation personnel from development of environmental education opportunities would not be realized under Alternative 3.

4.4 Cumulative Impacts

Implementing any of the alternatives analyzed in this EA would not result in cumulative impacts to the resources evaluated when added to past, present, and reasonably foreseeable future actions. The integration of natural resources management issues and concerns is the primary basis for determining no cumulative impacts. The incremental impact of the proposed action on the environment over the next five years would result in overall positive benefits to the resources at ARD Bayview. Actions that occur directly or indirectly as a result of natural resources management would tend to benefit the environment by design because natural resources management is first and foremost consistent with the military use of the property. Annual reviews and updates of the INRMP (every five years) allow revisions (adaptive management) to be made to avoid undesirable cumulative impacts. Additionally, coordination with federal, state, and local agencies is required by the SAIA and would further reduce the potential for cumulative impacts.

5.0 PUBLIC INVOLVEMENT AND COORDINATION

In preparing the INRMP in accordance with the SAIA, ARD Bayview has worked in cooperation with the USFWS, and IDFG so that the plan would reflect the mutual agreement of these parties concerning conservation, protection, and management of fish and wildlife resources. The USFWS commented that the threatened bald eagle (*Haliaeetus leucocephalus*) and the bull trout (*Salvelinus confluentus*) may occur in the vicinity of the project. The USFWS encouraged the preparation of a Biological Assessment (BA) for all major construction projects. Though no major construction projects are proposed, the potential impacts from the proposed projects are discussed in this EA. The IDFG identified additional species that may be present in the project area, including the gray wolf (*Canis lupus*), Canada lynx (*Lynx canadensis*), westslope cutthroat trout (*Oncorhynchus clarki lewisi*), and least bladdery milk vetch (*Astragalus microcystus*). The State of Idaho lists the least bladdery milk vetch as Critically Imperiled and the westslope cutthroat trout is a Species of Special Concern. These comments are presented in Appendix B. Final agreement letters from USFWS and IDFG are also included in Appendix B. Also as required by the SAIA, the INRMP has been provided for public comment and ARD Bayview has taken those comments into account in preparing the INRMP.

The following persons and agencies were consulted for preparation of the INRMP:

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U.S. Fish and Wildlife Service, Upper Columbia Fish and Wildlife Office

Ray Henneky/Greg Tourtlotte
Idaho Department of Fish and Game

6.0 LIST OF PREPARERS

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Bobby Clontz, M.S. Geo-Marine, Inc. INRMP Project Manager	INRMP Preparation 10 Years Natural Resources Management	Affected Environment
Nancy Parrish Geo-Marine, Inc. Cultural Resources Manager	5 Years Cultural Resources Management	Cultural Resources Analysis
Bill Spicer NSWC Natural Resources Manager	7 Years Natural/Cultural Resources and NEPA	Technical Review

7.0 REFERENCES

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APPENDIX A
Applicable Environmental Laws and Compliance Regulations

Antiquities Act of 1906 [16 USC 431]
Archeological Resources Protection Act of 1979 [16 USC 470]
Bald Eagle Protection Act of 1940, as amended [16 USC 668 et seq.]
Clean Air Act (CAA) of 1970, as amended [42 USC 7401-7671]
Clean Water Act (CWA) of 1972, as amended 1977 (CWA) [33 USC 1251-1376]
Conservation Programs on Military Reservations of 1960 (Sikes Act) [16 USC 670a-670o]
Determination of Eligibility for Inclusion in the National Register of Historic Places [36 CFR § 63]
Emergency Wetlands Resources Act of 1986 [16 USC 3901]
Endangered Species Act (ESA) of 1973 [16 USC 1531-1544], amended 1988
Environmentally Beneficial Landscaping, April 1994 (EO 50737)
Environmental and Natural Resources Program Manual (OPNAVINST 5090.1B CH-3)
Environmental Conservation Program (DoD DIR 4715.3)
Environmental Protection and Enhancement: Subpart H Historic Preservation [32 CFR § 650]
Erosion Protection Act [33 USC 426]
Exotic Organisms (EO 11987)
Federal Environmental Pesticide Control Act of 1972 [7 USC 136-136y]
Federal Land Policy and Management Act (FLPMA) of 1976 [43 USC 1701 et seq.]
Federal Noxious Weed Act of 1974, as amended [7 USC 2801]
Fish and Wildlife Conservation Act of 1980 [16 USC 2901]
Fish and Wildlife Coordination Act 1934, amended in 1946 [16 USC 661-667e]
Floodplain Management (EO 11988)
Migratory Bird Treaty Act of 1918 [16 USC 703-712]
Multiple-Use Sustained Yield Act of 1960 [16 USC 528]
National Environmental Policy Act (NEPA) of 1969 [42 USC 4321]
National Historic Preservation Act of 1966, as amended [16 USC 470] through 1992
Natural Resources Management Procedure Manual (NAVFAC P-73)
North American Wetlands Conservation Act (of 1989) [16 USC 4401-4412]
Noxious Plant Control Act of 1968 [43 USC 1241 et seq.]
Preservation of American Antiquities [43 CFR § 3]
Protection and Enhancement of Environmental Quality (EO 11514)
Protection and Enhancement of the Cultural Environment (EO 11593)
Protection of Historic and Cultural Properties [36 CFR § 800]
Protection of Wetlands (EO 11990)
Recreational Fisheries (EO 12962)
Sikes Act Improvement Act (SAIA) of 1997 [16 USC § 670 (a) et seq.]
Soil and Water Resources Conservation Act of 1977 [16 USC 2001]
Timber Sales on Military Lands [10 USC 2665]
Wild Bird Conservation Act of 1992 [16 USC 4901 et seq.]

APPENDIX B
Regulatory Coordination on the INRMP



United States Department of the Interior

FISH AND WILDLIFE SERVICE
Upper Columbia Fish and Wildlife Office
11103 E. Montgomery Drive
Spokane, WA 99206

May 22, 2002

Robert B. Clontz, Project Manager
Geo-Marine, Inc.
11846 Rock Landing Drive, Suite C
Newport News, Virginia 23606

Subject: Species List for Updating the Integrated Natural Resources Management Plan for the
U.S. Navy's Acoustic Research Detachment in Bayview, Idaho

Reference Number: 1-9-02-SP-335

Dear Mr. Clontz:

This responds to your April 17, 2002, request for a list of threatened and endangered species that may occur in the vicinity of the proposed actions associated with the U.S. Navy's Acoustic Research Detachment located along the southern shore of Lake Pend Oreille near Bayview, Idaho. Your letter was received in our office on April 22, 2002. Please use the above reference number for all future correspondence regarding this project.

We have reviewed the information you provided. Our records indicate that the following listed, proposed, and candidate species, and designated and proposed critical habitat, may occur in the vicinity of the project and could potentially be affected by it:

Listed Species

Endangered

None

Threatened

Bald eagle (*Haliaeetus leucocephalus*)

Bull trout (*Salvelinus confluentus*)

Proposed

None

Candidate

None

Federal agencies must meet their responsibilities under section 7 of the Endangered Species Act of 1973, as amended (Act), as outlined in Enclosure A. Enclosure A includes a discussion of the contents of a Biological Assessment (BA), which provides an analysis of the impacts of the project on listed and proposed species, and designated and proposed critical habitat. Preparation of a BA is required for all major construction projects. Even if a BA is not prepared, potential project effects on listed and proposed species should be addressed in the environmental review for this project. Federal agencies may designate, in writing, a non-federal representative to prepare a BA. However, the involved federal agency retains responsibility for the BA, its adequacy, and ultimate compliance with section 7 of the Act.

Preparation of a BA would be prudent when listed or proposed species, or designated or proposed critical habitat, occur within the project area. Should the BA determine that a listed species is likely to be affected by the project, the involved federal agency should request section 7 consultation with the U.S. Fish and Wildlife Service (Service). If a proposed species is likely to be jeopardized by the project, regulations require conferencing between the involved federal agency and the Service. If the BA concludes that the project will have no effect on any listed or proposed species, we would appreciate receiving a copy for our information.

If you would like information concerning state listed species or species of concern, you may contact the Idaho Department of Fish and Game, at (208) 334-3402.

This letter fulfills the requirements of the Service under section 7 of the Act. Should the project plans change significantly, or if the project is delayed more than 90 days, you should request an update to this response.

Thank you for your efforts to protect our nation's species and their habitats. If you have any questions concerning the above information, please contact Bryon Holt at (509) 893-8014.

Sincerely,

Suzanne Cholet

For Supervisor

Enclosure

cc: IDFG, Region 1



IDAHO FISH & GAME

PANHANDLE REGION
2750 Kathleen Avenue
Coeur d'Alene, Idaho 83815

Dirk Kempthorne/Governor
Steven M. Huffaker/Director

May 22, 2002

Mr. Robert Clontz, Project Manager
Geo-Marine, Inc.
11846 Rock Landing Drive, Suite C
Newport News, VA 23606

Dear Mr. Clontz:

**REFERENCE: REQUEST FOR PRESENCE OF THREATENED, ENDANGERED
SPECIES FOR USN ACCOUSTIC RESEARCH DETACHMENT, BAYVIEW**

Idaho Fish and Game received your request for information regarding the presence of Federal threatened, endangered or proposed plants or animals within the area of the Navy's Acoustic Research Detachment in Bayview, Bonner County, Idaho. Your letter also states that the proposed action will include "outlying parcels." The location of those parcels is not identified.

Based on records from the IDFG Conservation Data Center, Canada lynx (*Lynx Canadensis*), bald eagle (*Haliaeetus leucocephalus*), and gray wolf (*Canis lupus*) are among the federally listed species that may be present in the Bayview area.

In addition to the wildlife species listed above, the CDC also lists the least bladdery milk vetch (*Astragalus microcystus*) as potentially present in the project area. This plant is classified by the state as Critically Imperiled.

The CDC does not list fish species. However, Lake Pend Oreille supports bull trout (*Salvelinus confluentus*), a threatened species, and westslope cutthroat trout (*Oncorhynchus clarki lewisi*), an Idaho species of special concern. Also, numerous Lake Pend Oreille tributaries in your project area are critical bull trout and westslope cutthroat trout spawning and rearing habitat. Activities in or near tributaries, particularly in unidentified "outlying parcels," may affect bull trout and/or cutthroat trout. We can provide greater detail about potential fish species impacted if outlying parcels are identified.

Please note, that the state's species list does not include all of the species listed by the US Fish and Wildlife Service for our region. If you have not done so already, we recommend that you contact the Fish and Wildlife Service, Upper Columbia Office, 11103 East Montgomery Drive, Spokane WA 99206 for a complete list of federally threatened and endangered species.

Sincerely,

Greg Tourtlotte
Regional Supervisor

GIT:RH:kh

C: Tracey Trent, IDFG Boise

File: geomarine bayview species request

Keeping Idaho's Wildlife Heritage

**Responsibility of Federal Agencies Under Section 7
of the Endangered Species Act**

Section 7(a) - Consultation/Conferencing

- Requires: 1) Federal agencies to utilize their authorities to carry out programs to conserve endangered and threatened species;
- 2) Consultation with the U.S. Fish and Wildlife Service (Service) when a federal action may affect a listed species to ensure that any action authorized, funded, or carried out by a federal agency will not jeopardize the continued existence of listed species, or result in destruction or adverse modification of critical habitat. The process is initiated by the federal agency after determining that the action may affect a listed species; and
- 3) Conferencing with the Service when a federal action may jeopardize the continued existence of a proposed species, or result in destruction or adverse modification of proposed critical habitat.

Section 7(c) - Biological Assessment for Major Construction Activities

Requires federal agencies or their designees to prepare a Biological Assessment (BA) for major construction activities¹. The BA analyzes the effects of the action, including indirect effects and effects of interrelated or interdependent activities, on listed and proposed species, and designated and proposed critical habitat. The process begins with a request to the Service for a species list. If the BA is not initiated within 90 days of receipt of the species list, the accuracy of the list should be verified with the Service. The BA should be completed within 180 days after its initiation (or within such a time period as is mutually agreeable between the Service and the involved federal agency).

We recommend the following for inclusion in a BA: an onsite inspection of the area to be affected by the proposal, which may include a detailed survey of the area to determine if listed or proposed species are present; a review of pertinent literature and scientific data to determine the species' distribution, habitat needs, and other biological requirements; interviews with experts, including those within the Service, state conservation departments, universities, and others who may have data not yet published in scientific literature; an analysis of the effects of the proposal on the species in terms of individuals and populations, including consideration of cumulative effects of the proposal on the species and its habitat; and an analysis of alternative actions considered. The BA should document the results of the impacts analysis, including a discussion of study methods used, any problems encountered, and other relevant information. The BA should conclude whether or not any listed species may be affected, proposed species may be

jeopardized, or critical habitat may be adversely modified by the project. Upon completion, the BA should be forwarded to the Service.

Major concerns that should be addressed in a BA for listed and proposed animal species include:

1. Level of use of the project area by the species, and amount or location of critical habitat;
2. Effect(s) of the project on the species' primary feeding, breeding, and sheltering areas;
3. Impacts from project construction and implementation (e.g., increased noise levels, increased human activity and/or access, loss or degradation of habitat) that may result in disturbance to the species and/or their avoidance of the project area or critical habitat.

Major concerns that should be addressed in a BA for listed or proposed plant species include:

1. Distribution of the taxon in the project area;
2. Disturbance (e.g., trampling, collecting) of individual plants or loss of habitat; and
3. Changes in hydrology where the taxon is found.

Section 7(d) - Irreversible or Irretrievable Commitment of Resources

Requires that, after initiation or reinitiation of consultation required under section 7(a)(2), the Federal agency and any applicant shall make no irreversible or irretrievable commitment of resources with respect to the action which has the effect of foreclosing the formulation or implementation of any reasonable and prudent alternatives which would avoid violating section 7(a)(2). This prohibition is in force during the consultation process and continues until the requirements of section 7(a)(2) are satisfied.

¹ A major construction activity is a construction project, or other undertaking having similar physical impacts, which is a major action significantly affecting the quality of the human environment as referred to in the National Environmental Policy Act [42 U.S.C. 4332 (2)(c)].

USFWS Concurrence Letter to be added when received

IDG&F Concurrence Letter to be added when received



DEPARTMENT OF THE NAVY
COMMANDER, NAVY INSTALLATIONS
2000 NAVY PENTAGON
WASHINGTON, D.C. 20350-2000

5090
Ser CNI N45/4616
15 March 2005

From: Commander, Naval Installations Command
To: Commander, Navy Region Northwest (N45)

Subj: FINDING OF NO SIGNIFICANT IMPACT FOR THE ADOPTION
AND IMPLEMENTATION OF THE 2005-2009 INTEGRATED NATURAL
RESOURCES MANAGEMENT PLAN AT ACOUSTIC RESEARCH DETACHMENT
BAYVIEW, BAYVIEW, IDAHO

Ref: (a) Navy Region Northwest ltr dtd 10 Jan 05, Ser
N45/493

(b) OPNAVINST 5090.1B

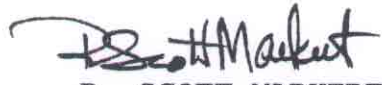
Encl: (1) Finding Of No Significant Impact (FONSI)

1. An Environmental Assessment (EA) dated October 2003 for the subject action was forwarded by reference (a) for review in accordance with reference (b). It has been determined that preparation of an Environmental Impact Statement (EIS) is not required. Accordingly, it is considered that, with implementation of the following paragraph and any mitigation measures described in enclosure (1), compliance with the National Environmental Policy Act has been effected and, in this regard, the project may be initiated.

2. Per OPNAVINST 5090.1B, the action proponent is responsible for publishing a Notice of Availability (NOA) in the appropriate local newspaper(s) upon receipt of the signed FONSI. The purpose of the NOA is to provide public notification of the FONSI while avoiding the cost of publishing the entire FONSI. As such, the NOA should be a succinct, one-page or less, synopsis of the FONSI. The NOA should include the name of the agency, action proponent, title of EA, statement of the proposed action, list of alternatives considered, conclusion, and point of contact with name, telephone number, address, and e-mail address to request copies of the FONSI and/or EA. The NOA should be published for three consecutive days. If the EA/FONSI includes a signed Conformity Determination, the action proponent must publish the NOA within 30 days of signature.

Subj: FINDING OF NO SIGNIFICANT IMPACT FOR THE ADOPTION
AND IMPLEMENTATION OF THE 2005-2009 INTEGRATED NATURAL
RESOURCES MANAGEMENT PLAN AT ACOUSTIC RESEARCH DETACHMENT
BAYVIEW, BAYVIEW, IDAHO

3. Questions regarding this FONSI may be directed to Dan Hayes
at 202-433-4482.


R. SCOTT MARKERT
By direction

FINDING OF NO SIGNIFICANT IMPACT FOR THE ADOPTION AND IMPLEMENTATION OF THE
2005-2009 INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN AT ACOUSTIC
RESEARCH DETACHMENT BAYVIEW, BAYVIEW, IDAHO

DEPARTMENT OF DEFENSE
DEPARTMENT OF THE NAVY

FINDING OF NO SIGNIFICANT IMPACT FOR THE ADOPTION AND
IMPLEMENTATION OF THE 2005-2009 INTEGRATED NATURAL RESOURCES
MANAGEMENT PLAN AT ACOUSTIC RESEARCH DETACHMENT BAYVIEW,
BAYVIEW, IDAHO

Pursuant to section 102 (2) (c) of the National Environmental Policy Act (NEPA) of 1969 and the Council on Environmental Quality regulations (40 CFR Parts 1500-1508) implementing the procedural provisions of NEPA, the Chief of Naval Operations (N45), Department of the Navy, gives notice that an Environmental Assessment (EA) has been prepared for the adoption and implementation of the updated 2005-2009 Integrated Natural Resources Management Plan (INRMP) at Acoustic Research Detachment (ARD) Bayview, located in Bayview, Idaho. Based on the EA it has been determined that an Environmental Impact Statement (EIS) is not required for the proposed action.

Purpose and Need: The proposed action is to fully adopt and implement the updated INRMP, covering the Fiscal Years 2005-2009, pursuant to Sikes Act Improvement Amendments (SAIA) of 1997, 16 U.S.C. § 670a. The purpose and need of the proposed action is to meet statutory requirements imposed by the SAIA, provide management requirements for species listed under the Endangered Species Act, and also meet the requirements of various DOD and Navy instructions.

Alternatives Analyzed: The EA analyzes, evaluates, and compares three alternatives. Under the no action alternative (Alternative 1), ARD Bayview will continue implementation of the objectives and practices outlined in the 1997 natural resources plan. The proposed action (Alternative 2) is to implement an INRMP that emphasizes compliance and stewardship projects using an ecosystem management approach. Alternative 3 is to implement primarily activities necessary to achieve legal compliance with environmental laws and regulations (compliance only projects).

Proposed Action: The proposed action (Alternative 2) is to adopt and implement an updated INRMP for ARD Bayview in a manner that is consistent with the military use of the property and the goals and objectives established in the Sikes Act (as amended). The updated INRMP will be implemented in FY 2005 and remain in effect through FY 2009, with annual updates as needed. The goal of the updated INRMP is to implement an ecosystem-based conservation program that provides for conservation and rehabilitation of natural resources in a manner that is consistent with the military mission; integrates and coordinates all natural resources management activities; provides for sustainable multipurpose uses of natural resources; and provides for public access for use of natural resources subject to safety and military security considerations. The management objectives are to integrate fish and wildlife management, land management, and management for outdoor recreational opportunities, as practicable and consistent with the military mission and established land uses.

FINDING OF NO SIGNIFICANT IMPACT FOR THE ADOPTION AND IMPLEMENTATION OF THE
2005-2009 INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN AT ACOUSTIC
RESEARCH DETACHMENT BAYVIEW, BAYVIEW, IDAHO

There are some specific changes in the updated INRMP over the existing 1997 INRMP.
These changes are:

1. Threatened and endangered species: the updated INRMP establishes management criteria for one additional species listed as threatened under the Endangered Species Act (ESA); bull trout. This species was listed in 1999 and was not addressed adequately in the INRMP of 1997.
2. Ten natural resources projects have been identified to meet compliance and stewardship needs. These are:
 - Invasive Species Survey;
 - Invasive Species Control;
 - Reforestation/Demolition Site Restoration;
 - Urban Forest Management Plan (note: this has been completed and is found in Appendix J of the INRMP);
 - Osprey Nest Platform Relocation;
 - Baseline Survey of Biological Resources (this has been partially completed and is found in Appendix K of the INRMP);
 - Fish Monitoring and Coordination;
 - Native American Fishing and Hunting Rights;
 - Educational Sign Placement;
 - 2009 INRMP Update.

Findings: Based on the analysis in the EA, the Navy has concluded that adopting and implementing the updated INRMP would pose no significant risk to human health and the environment, and will be beneficial to threatened and endangered species that may occasionally be found there. A Finding of No Significant Impact (FONSI) is recommended for the adoption and implementation of the updated INRMP for ARD Bayview under the Preferred Alternative.

The EA addressing this action may be obtained from: Commander, Navy Region Northwest, 1103 Hunley Road, Silverdale, Washington 98315-1103 [Attn: Mr. Robert Campagna].

3-15-2005
Date


C. E. WEAVER
Rear Admiral, U. S. Navy
Commander, Navy Installations Command

APPENDIX D

LAKE PEND OREILLE BULL TROUT CONSERVATION PLAN

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Chapter 3

State(s): Montana, Idaho, and Washington

Recovery Unit Name: Clark Fork River

(Including Lake Pend Oreille, Priest Lake, and Flathead Lake and their respective watersheds)

Region 1

U S Fish and Wildlife Service

Portland, Oregon

DISCLAIMER PAGE

Recovery plans delineate reasonable actions that are believed necessary to recover and protect listed species. Plans are prepared by the U.S. Fish and Wildlife Service, sometimes with the assistance of recovery teams, contractors, State agencies, Tribal agencies, and others. Objectives will be attained and any necessary funds made available subject to budgetary and other constraints affecting the parties involved, as well as the need to address other priorities. Recovery plans do not necessarily represent the views or official positions or indicate the approval of any individuals or agencies involved in plan formulation, other than the U.S. Fish and Wildlife Service. Recovery plans represent the official position of the U.S. Fish and Wildlife Service *only* after they have been signed by the Director or Regional Director as *approved*. Approved recovery plans are subject to modification as dictated by new findings, changes in species status, and the completion of recovery tasks.

Literature Citation: U.S. Fish and Wildlife Service. 2002. Chapter 3, Clark Fork River Recovery Unit, Montana, Idaho, and Washington. 285 p. U.S. Fish and Wildlife Service. Bull Trout (*Salvelinus confluentus*) Draft Recovery Plan. Portland, Oregon.

ACKNOWLEDGMENTS

Many groups and individuals contributed to the development of this Clark Fork River Recovery Unit chapter, either by active participation in one or more of the Clark Fork Recovery Subunit Teams (referred to collectively as the Clark Fork Recovery Unit Teams) or through contributions to previous planning efforts. The following groups and their members contributed to previous planning efforts that, in large part, formed the basis for this chapter:

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The Panhandle Basin Bull Trout Technical Advisory Team

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The Lake Pend Oreille Bull Trout Watershed Advisory Group

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Brett Roper, U.S. Forest Service
Brian Sugden, Plum Creek Timber Company
Glen Rothrock, Idaho Department of Environmental Quality

CLARK FORK RIVER RECOVERY UNIT CHAPTER OF THE BULL TROUT RECOVERY PLAN

EXECUTIVE SUMMARY

CURRENT SPECIES STATUS

The U.S. Fish and Wildlife Service issued a final rule listing the Columbia River and Klamath River populations of bull trout as threatened species on June 10, 1998 (63 FR 31647). The Clark Fork River Recovery Unit (often referred to in this chapter as the Clark Fork Recovery Unit) forms part of the range of the Columbia River population segment. The Clark Fork Recovery Unit is the largest and one of the most diverse recovery units in the species' range, encompassing four recovery subunits (Upper Clark Fork, Lower Clark Fork, Flathead, and Priest) and including 38 existing core areas and about 150 currently identified local populations. Within the Clark Fork Recovery Unit, the historical distribution of bull trout is relatively intact, with some notable exceptions in the headwaters, but abundance has been reduced and some remaining populations are highly fragmented.

HABITAT REQUIREMENTS AND LIMITING FACTORS

Dams have been one of the most important factors in reducing the bull trout population of the Clark Fork Recovery Unit. Large hydroelectric dams 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. Additionally, these dams impacted the habitat that was left behind, affecting reservoir and lake levels, water temperature, and water quality. Smaller irrigation storage dams further fragmented some of the watersheds and made migration for bull trout increasingly difficult. At a few locations, however, benefits have resulted from some dams forming isolation barriers that have prevented the movement of nonnative fish.

The risk of core area and local population extirpation from isolation and fragmentation of habitat in the Clark Fork Recovery Unit is generally increasing, especially where populations of bull trout are in decline. Major dams were the catalyst for much of this disruption, and fragmentation has continued at a finer scale, caused by habitat decline and introductions of nonnative species. While bull trout are present in most historical core areas, substantial evidence indicates that local populations have been extirpated in major portions of this recovery unit, and many populations are at low enough levels to seriously reduce the chances of recolonization. The threat from isolation and fragmentation is real, and as more data are gathered, scientists will gain a better understanding of how bull trout migrate and interact between patches.

Of particular concern is the expansion of congeneric lake trout and brook trout populations in portions of the Clark Fork Recovery Unit. Scientists currently have limited tools available to deal with these intruders, and in many cases there is strong public opposition to controlling or eliminating other salmonids that provide sport fisheries. Though an improving trend is being realized in the quality of stream habitat for bull trout in many watersheds, introductions of nonnative species, particularly in large lakes, has reduced the carrying capacity for bull trout. A key to successful bull trout restoration is the education of both anglers and the nonangling public about the values of native species. Intact native fish ecosystems are increasingly rare, and we must allocate substantial resources to protecting and restoring those that remain.

For over 100 years, forestry practices have caused major impacts to bull trout habitat throughout the Clark Fork Recovery Unit. Because forestry is the primary landscape activity in the basin, the impacts have been widespread. The negative primary effects of past timber harvest, such as road construction, log skidding, riparian tree harvest, clear-cutting, and splash dams, have been reduced by the more progressive practices that have since been developed. But the legacy of the past century has resulted in lasting impacts to bull trout habitat, including increased sediment in streams, increased peak flows, hydrograph and thermal modifications, loss of instream woody debris, channel instability, and increased access by anglers and poachers. These impacts will continue, and they are irreversible in some drainages.

Livestock grazing has had the greatest impact to bull trout in the upper portion of the Clark Fork Recovery Unit. It is of particular concern where allotments are located along spawning and rearing streams. However, though severe site-specific problems may occur, livestock impacts are generally being reduced through better management practices on public and, to a lesser extent, private lands.

Agricultural impacts to bull trout in the Clark Fork Recovery Unit are primarily a result of water demand. Diversions for irrigation can destabilize stream channels, severely interrupt migratory corridors (blockages and dewatering) and, in some cases, entrain fish that are then lost to the ditches. A second, and potentially more serious issue, is the increased water temperature regime common to streams that are heavily diverted and/or subject to receiving irrigation return flows. All of these problems occur and are widespread in much of the Clark Fork Recovery Unit. Some of the worst impacts are in the upper drainages, and these problems are then transmitted to the receiving waters downstream. Overall, agricultural practices continue to represent a significant threat to bull trout recovery in this recovery unit.

Transportation systems are also a major contributor to the decline of bull trout in this recovery unit. Separating the direct effect of the roads and railroads from the human development associated with their construction is difficult. Construction methods during the late 19th and early 20th century, primarily channelization and meander cutoffs, caused major impacts to many of these streams, impacts that are still being manifested. Such impacts seldom occur with new roads. However, significant problems remain that are associated with passage barriers, sediment production, unstable slopes, improper maintenance, and high road densities, all of which impact bull trout. These problems can be addressed only on a site-by-site basis.

The legacy of mining, particularly in the upper portions of the Clark Fork River drainage, will continue to impact bull trout for many centuries to come. Extreme water quality degradation dates back to the 19th century, and purposeful improvement and continued vigilance will be required for many decades before the full potential of the aquatic resources can be restored. Some other portions of the Clark Fork River watershed (*e.g.*, the Flathead and Priest Recovery Subunits)

have not been materially impacted by mining. Meanwhile, existing mines and new mine proposals continue to develop and have the potential to negatively impact some core areas and local bull trout populations.

Ultimately, unmanaged growth and residential sprawl may be one of the biggest threats to the recovery of bull trout in this recovery unit. The entire Clark Fork Recovery Unit holds many of the attributes that increasingly attract people seeking relief from the urban environment. Human population growth in western Montana and northern Idaho has accelerated. The way in which this growth is managed, and our ability to limit the impacts of growth, in particular on bull trout spawning and rearing streams, is pivotal to the success of the bull trout recovery effort.

Increasing human populations have a direct impact on all of the other categories of risk that affect bull trout. Both legal and illegal angling (*i.e.*, poaching) have direct impacts on bull trout populations, despite the implementation of restrictive fishing regulations and strong educational efforts. The problem of illegal take of bull trout is intensified in stream corridors where roads provide access to highly visible (and therefore vulnerable) spawning stocks.

RECOVERY OBJECTIVES

The goal of the bull trout recovery plan is to **ensure the long-term persistence of self-sustaining, complex, interacting groups of bull trout distributed throughout the species' native range so that the species can be delisted**. Specifically, the recovery subunit teams for the four Clark Fork subunits (Upper Clark Fork, Lower Clark Fork, Flathead, and Priest) adopted the goal of **a sustained net increase in bull trout abundance and increased distribution of some local populations within existing core areas in this recovery unit (as measured by standards accepted by the recovery subunit teams, often referred to collectively as the Clark Fork Recovery Unit Teams)**.

RECOVERY CRITERIA

To assess progress toward recovery objectives, the Clark Fork Recovery Unit Teams adopted recovery criteria. The recovery unit teams assumed that no

core area is viable with a population of fewer than 100 adults (see explanation within Recovery Criteria section of this chapter) because of the inherent stochastic and genetic risks associated with populations lower than that amount. The recovery criteria are applied on a core area-by-core area basis. In this recovery unit, a distinction has been made between two types of core areas—primary and secondary core areas—based mostly on the size, connectedness, and complexity of the associated watershed and the degree of natural population isolation.

The following have been designated as primary core areas under recovered conditions in the Clark Fork Recovery Unit: the upper Clark Fork River, Rock Creek, Blackfoot River, Bitterroot River, lower Clark Fork River, Lake Pend Oreille, Priest Lakes and Priest River, Flathead Lake, Swan Lake, and Hungry Horse Reservoir.

The following have been designated as secondary core areas, for the purposes of recovery, in the Clark Fork Recovery Unit: the Clearwater River and associated chain of lakes, West Fork Bitterroot River upstream of Painted Rocks Dam, and 22 lakes in the Flathead Recovery Subunit.

1. **Distribution criteria will be met when the total number of identified local populations (currently numbering about 150) has been maintained or increased and when local populations remain broadly distributed in all existing core areas.**
2. **Abundance criteria will be met when, in all 10 primary core areas, each of at least 5 local populations contains more than 100 adult bull trout. In the Lake Pend Oreille core area, each of at least 6 local populations must contain more than 100 adult bull trout. In the Flathead Lake core area, each of at least 10 local populations must contain more than 100 adult bull trout. In each of the 10 primary core areas, the total adult bull trout abundance, distributed among local populations, must exceed 1,000 fish, and adult bull trout abundance must exceed 2,500 adult bull trout in each of the following lakes: Lake Pend Oreille, Flathead Lake, and Swan Lake.**

The abundance criteria for 24 secondary core areas will be met when each core area with the habitat capacity to do so supports at least one local population containing more than 100 adult bull trout and when total adult abundance in the secondary core areas collectively exceeds 2,400 fish.

3. **Trend criteria will be met when the overall bull trout population in the Clark Fork Recovery Unit is accepted, under contemporary standards of the time, as stable or increasing, based on at least 10 years of monitoring data.**
4. **Connectivity criteria will be met when functional fish passage is restored or determined to be unnecessary to support bull trout recovery at Milltown, Thompson Falls, Noxon Rapids, Cabinet Gorge, and Priest Lake Dams and when dam operational issues are satisfactorily addressed at Hungry Horse, Bigfork, Kerr, and Albeni Falls Dams (as identified through Federal Energy Regulatory Commission license conditions and U.S. Fish and Wildlife Service Biological Opinions).** Restoring connectivity to the extent that the abundance and distribution requirements above are met will probably require that additional passage barriers, identified as inhibiting bull trout migration on smaller streams within the Clark Fork Recovery Unit, be remedied. Restored connectivity of the mainstem of the Clark Fork River will consolidate six existing core areas, which are a result of fragmentation caused by the dams, into two (recovered) core areas in the upper and lower Clark Fork River.

ACTIONS NEEDED

Recovery for bull trout will entail reducing threats to the long-term persistence of populations and their habitats, ensuring the security of multiple interacting groups of bull trout, and providing habitat conditions and access to them that allow for the expression of various life-history forms. The seven categories of actions needed are discussed in Chapter 1; tasks specific to this recovery unit are provided in this chapter.

ESTIMATED COST OF RECOVERY

Total cost of bull trout recovery in the Clark Fork Recovery Unit is estimated at \$71.9 million spread over a 25-year recovery period. Total cost includes estimates of expenditures by local, Tribal, State, and Federal governments and by private businesses and individuals. These costs are attributed to bull trout conservation, but other aquatic species will also benefit. Cost estimates are not provided for tasks which are normal agency responsibilities under existing authorities.

ESTIMATED DATE OF RECOVERY

Expected times necessary to achieve recovery will vary among recovery units because of differences in bull trout status, factors affecting bull trout, implementation and effectiveness of recovery tasks, and responses to recovery tasks. In the Clark Fork Recovery Unit, the current status of bull trout is better than in many other portions of the range, but a tremendous amount of work remains to be done to reconnect and restore impaired habitat and to cope with threats from nonnative species. It may be 3 to 5 bull trout generations (15 to 25 years), or possibly longer, before significant reductions can be made in the identified threats to the species and bull trout can be considered eligible for delisting.

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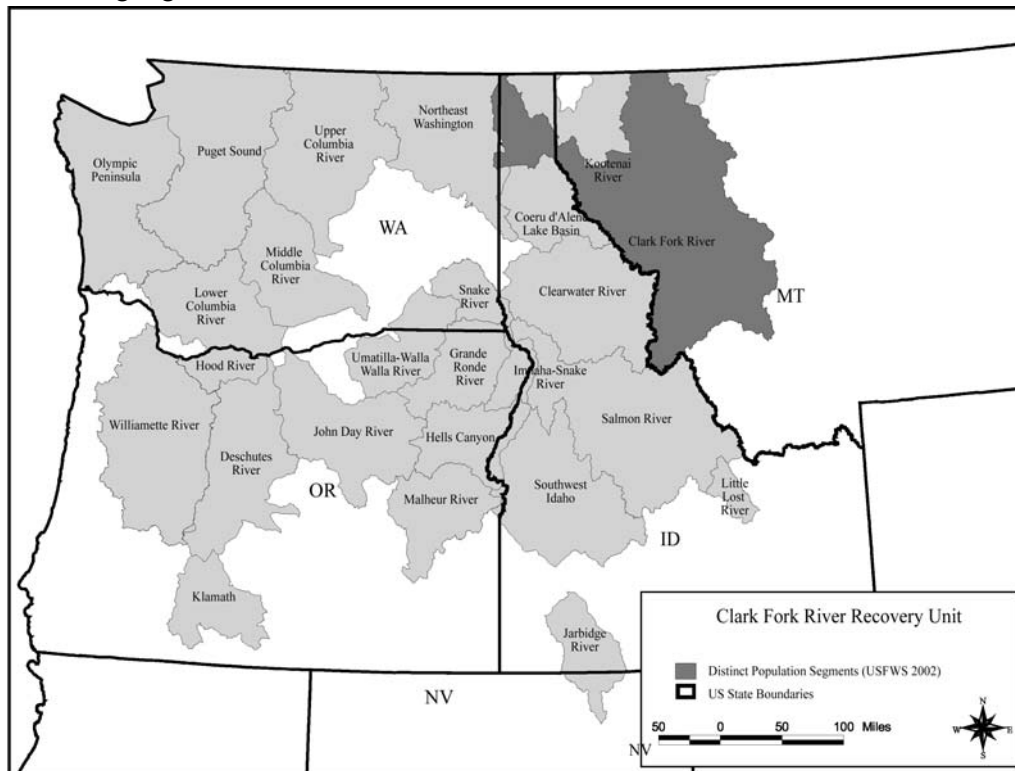
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INTRODUCTION

Recovery Unit Designation

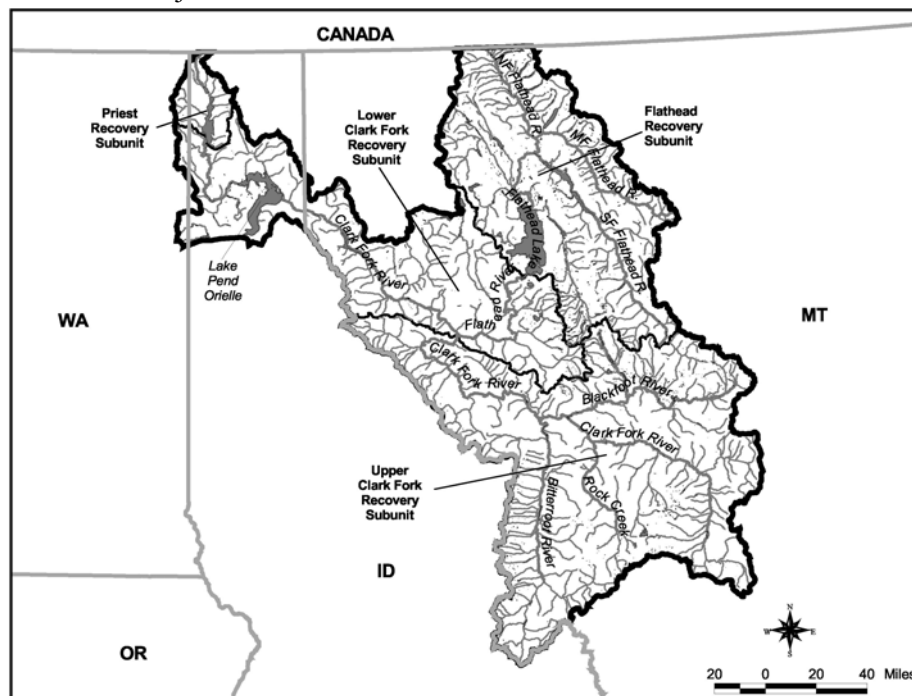
The Clark Fork River Recovery Unit is one of 22 recovery units designated for bull trout in the Columbia River basin (Figure 1). It is the largest recovery unit in the range of bull trout. Historically, the Clark Fork Recovery Unit contained one or more interconnected bull trout populations upstream of Albeni Falls, with migration of adult bull trout possible from Lake Pend Oreille, Priest Lake, and Flathead Lake upstream to most of the rest of the basin. It has been argued by the State of Montana that under the U.S. Fish and Wildlife Service distinct population segment policy, the Clark Fork River bull trout population(s) satisfy the criteria as a separate distinct population segment (Racicot, *in litt.*, 1998). Recent genetic information lends some support to this premise (Spruell *et al.* 2002), but formal action to analyze and reevaluate the designated population segment has not been initiated.

Figure 1. Bull trout recovery units in the United States. The Clark Fork Recovery Unit is highlighted



There is some uncertainty in the historical literature about which, if any, of the falls in the lower Pend Oreille River were absolute barriers to fish migration. Gilbert and Evermann (1895) concluded that Albeni Falls, near the outlet of Lake Pend Oreille, was not likely to provide a passage barrier to upstream migrating fishes. They indicated that Metaline Falls farther downstream might also be passable, though salmon are not known to have passed above that point. There is no information on whether bull trout passed these barriers. The Northeast Washington Recovery Unit Team is developing a separate recovery plan chapter for that portion of the Pend Oreille River between Albeni Falls Dam and Metaline Falls (see Chapter 23). The Clark Fork Recovery Subunit Teams recommend that a reevaluation of the distinct population segment designations for the Columbia River be considered based on genetic information and physical isolation. For recovery planning purposes, and because of the size of the basin and the complexity and diversity of issues associated with recovery planning at this scale, the lower boundary of the Clark Fork Recovery Unit has been set at Albeni Falls Dam and the upstream waters have been divided into four subunits (Figure 2).

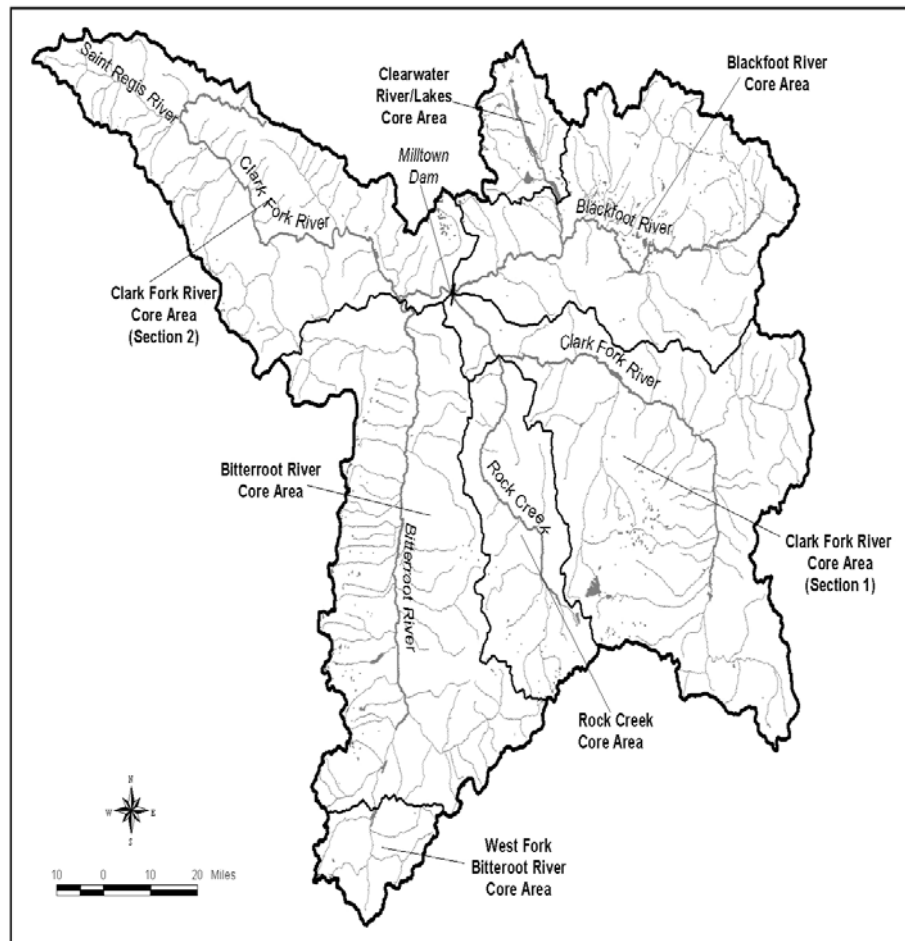
Figure 2. Map of the Clark Fork Recovery Unit showing relationship of recovery subunits and major watersheds.



These divisions are based, in part, on the presence of existing manmade barriers, and they are made to more effectively manage the size and complexity of the basin and to allow the recovery plan to focus upon areas (subunits) with common issues.

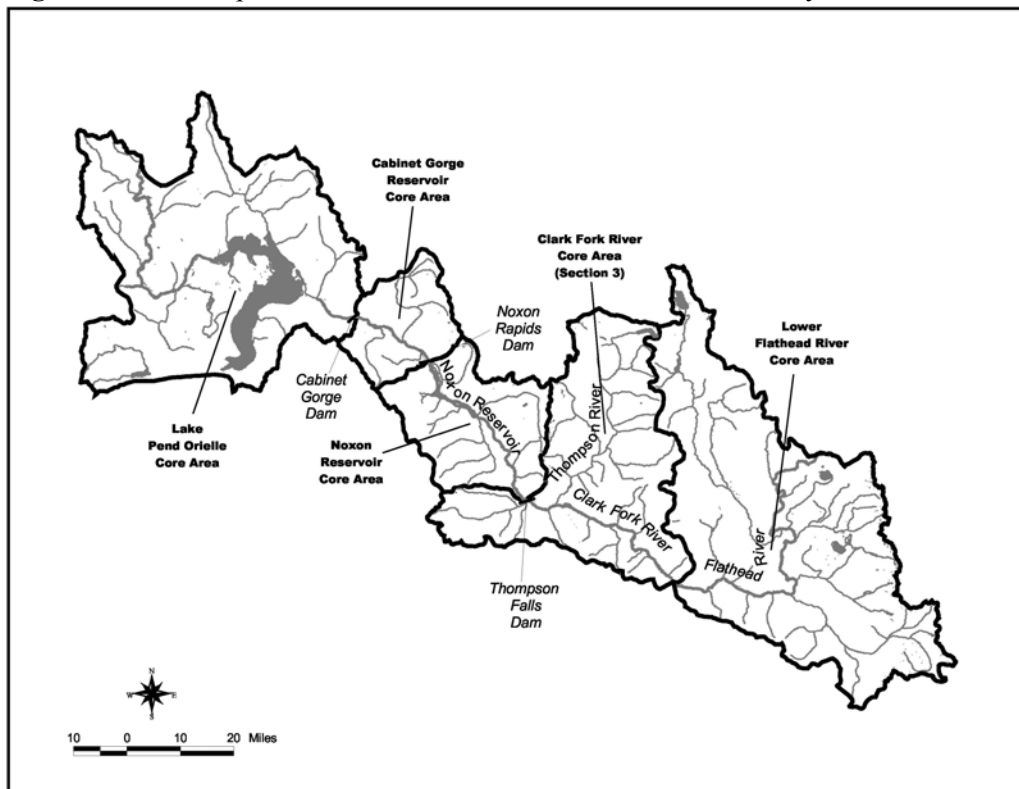
The **Upper Clark Fork Recovery Subunit** (Figure 3) includes the entire Clark Fork River basin in Montana upstream of the junction of the Flathead River. Major watersheds include, in addition to the Clark Fork River itself, the Blackfoot River, Bitterroot River, Rock Creek, and the St. Regis River. This recovery subunit has a drainage area of about 28,500 square kilometers (11,000 square miles) and covers much of the central portion of the Rocky Mountain slopes of western Montana.

Figure 3. Map of core areas in the Upper Clark Fork Recovery Subunit



The **Lower Clark Fork Recovery Subunit** (Figure 4) includes Lake Pend Oreille and its Idaho tributaries and the Clark Fork River and its tributaries in Montana upstream to the confluence with the Flathead River. Major basins include Lake Pend Oreille and direct tributaries in Idaho (the Clark Fork River; Gold, North Gold, Granite, Johnson, Lightning, and Trestle Creeks; and the Pack River watershed); the lower Priest River and tributaries in the East River system; the Bull River, Vermillion River, Prospect Creek, Thompson River, and the mainstem Clark Fork River in Montana. This recovery subunit also includes the Flathead River drainage upstream to Kerr Dam on the outlet of Flathead Lake, incorporating most of the Flathead Indian Reservation and including the Jocko River and Mission Creek watersheds. This recovery subunit has a drainage area of over 15,500 square kilometers (6,000 square miles) in Montana and Idaho.

Figure 4. Map of core areas in the Lower Clark Fork Recovery Subunit



The **Flathead Recovery Subunit** (Figures 5 and 6) includes Flathead Lake and its tributary system (North and Middle Fork Flathead, Stillwater, and Whitefish Rivers), Swan Lake and its tributaries, and the South Fork Flathead River watershed upstream of Hungry Horse Dam. About 27 natural lakes with adfluvial bull trout populations occur in this recovery subunit. A portion of the North Fork Flathead River lies in British Columbia, Canada. The drainage area upstream of Kerr Dam is about 18,400 square kilometers (7,100 square miles, including 427 square miles in British Columbia).

Figure 5. Map of core areas in the north half of the Flathead Recovery Subunit

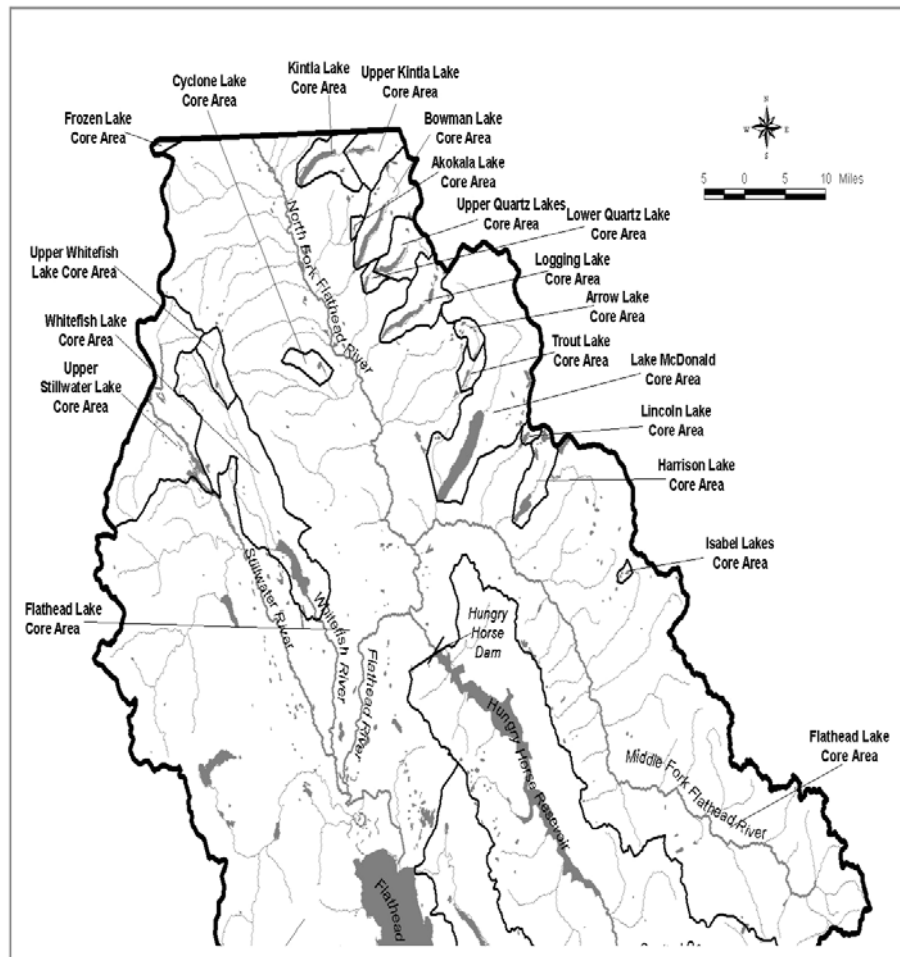
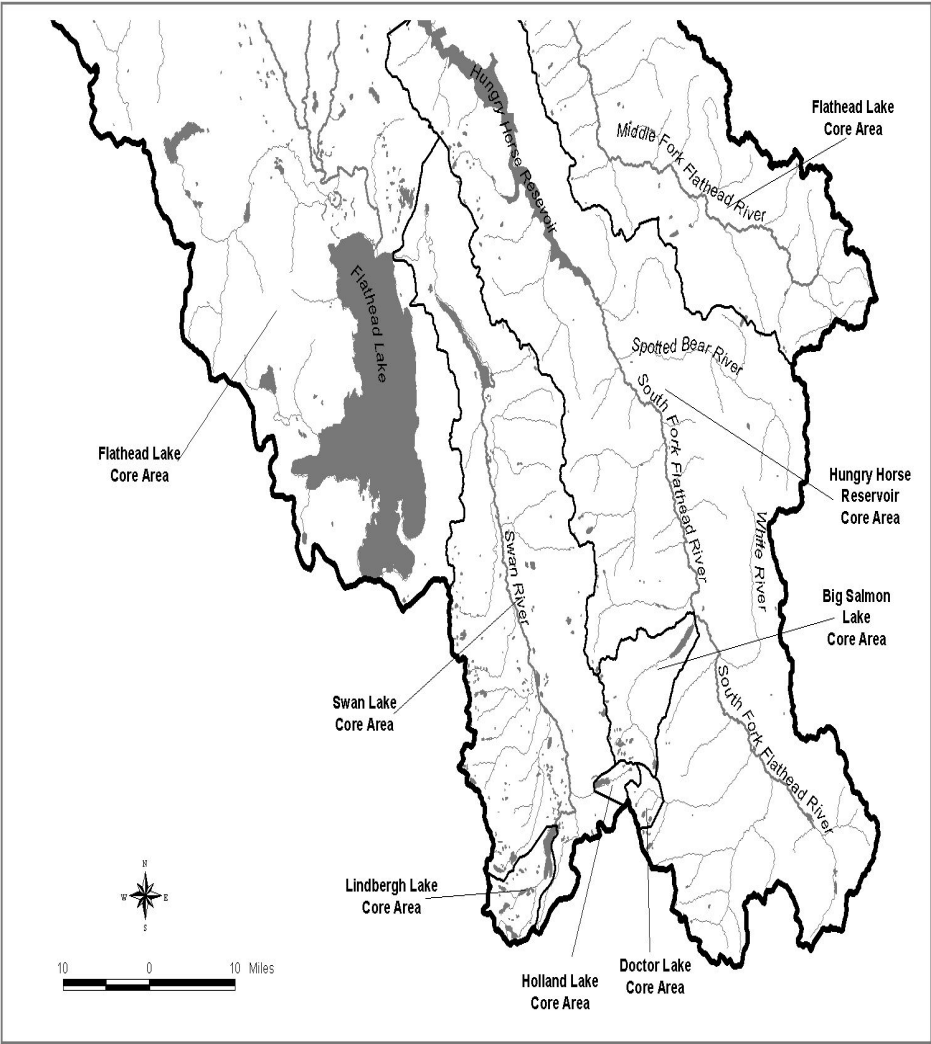
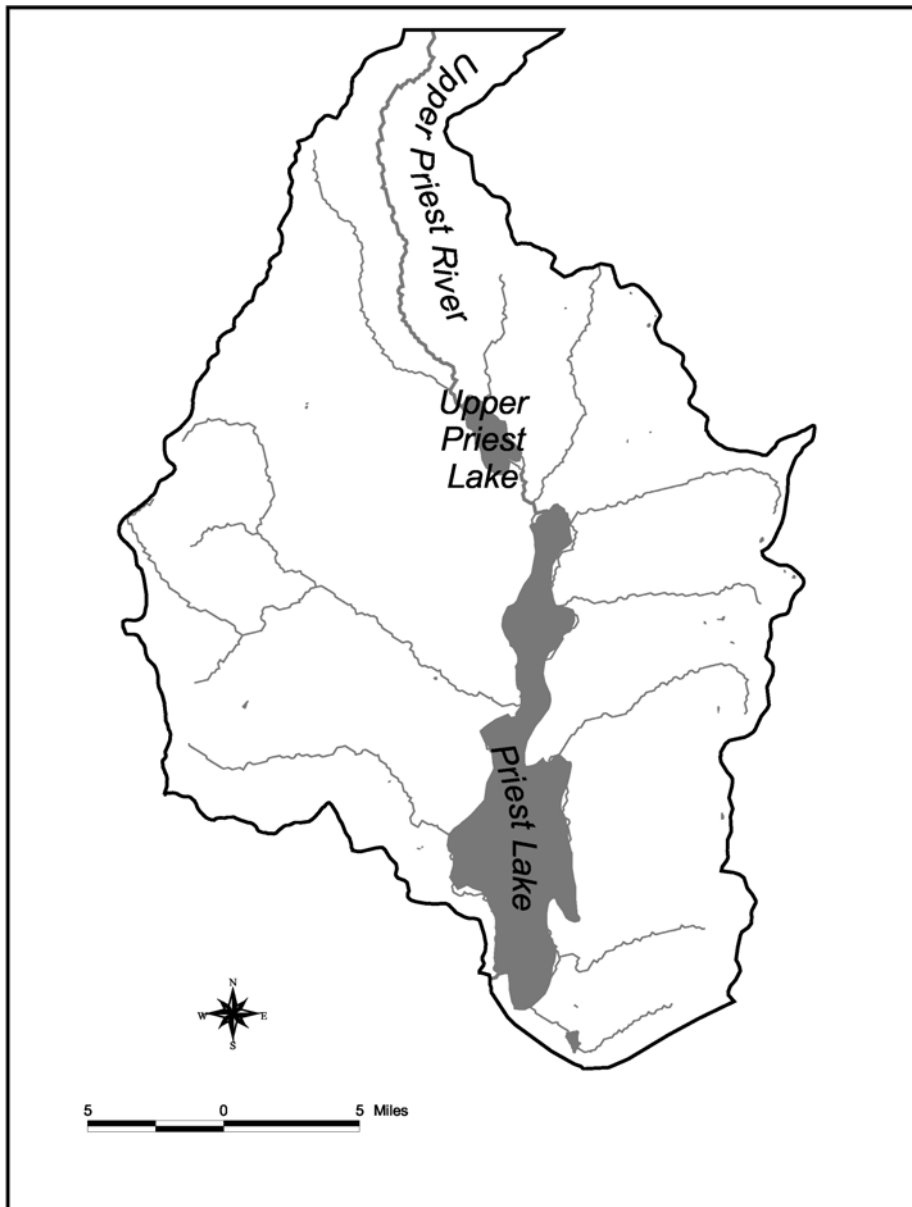


Figure 6. Map of core areas in the south half of the Flathead Recovery Subunit



The **Priest Recovery Subunit** (Figure 7) includes Priest Lake, its direct tributaries, and its tributary system upstream, including the Priest River Thorofare, Upper Priest Lake, and the Upper Priest River. The Priest River watershed is partially isolated from the Pend Oreille system by Priest Lake Dam. The entire Priest River has a drainage area of about 2,500 square kilometers (979 square miles) in Idaho and eastern Washington.

Figure 7. Map of core areas in the Priest Recovery Subunit



While there is no clear dividing line for bull trout recovery efforts between the upper and lower Clark Fork River basins, we have chosen to split the recovery unit at the confluence with the Flathead River. This location was chosen, in part, because reconnecting the migratory corridor of the lower Flathead and Jocko Rivers to Lake Pend Oreille is an important biological issue and critically important to the Confederated Salish and Kootenai Tribes. In a 200-kilometer (120-mile) reach of the Clark Fork River, extending from the mouth of the Flathead River upstream to Milltown Dam, bull trout are rare in the mainstem Clark Fork River. Radio telemetry studies of bull trout that congregate downstream of Milltown Dam have proven these fish are migrants and that they are attempting to return to the upper basin. Therefore, it was appropriate to group this reach of the Clark Fork River with watersheds in the Upper Clark Fork Recovery Subunit.

For similar reasons, the Flathead Recovery Subunit, upstream of Kerr Dam, is considered separate from the rest of the Clark Fork Recovery Unit. Thirty local populations in the Flathead River basin, identified in the status summary that was prepared for the listing rule (USFWS 1998), are all adfluvial stocks. There is little historical evidence of the presence of discrete fluvial or resident stocks in these waters, though recent radio telemetry work in the Flathead River indicates that individual fish may exhibit a primarily fluvial life history. Since 1938, the Flathead River basin has been physically isolated from the rest of the Clark Fork River basin by Kerr Dam, and due to natural thermal characteristics (warm outflow in the fall season), it's not likely that significant two-way genetic interchange with stocks from Lake Pend Oreille has occurred since the retreat of the last ice age about 10,000 years ago. The entire Flathead National Forest and portions of Glacier National Park are located within this subunit.

Geographic Description

The Clark Fork River originates at the confluence of Silver Bow and Warm Springs Creeks in the Deer Lodge Valley of Montana and flows primarily in a northwesterly direction (Figure 2) for about 564 river kilometers (350 miles) to its terminus at Lake Pend Oreille, Idaho (Watson 1985). The Clark Fork River is Montana's largest river in terms of stream discharge, with an average annual stream flow of 630 cubic meters per second (22,230 cubic feet per second) near Cabinet,

Idaho, a few kilometers upstream of the mouth at Lake Pend Oreille. The total drainage area upstream of that point is 57,169 square kilometers (22,073 square miles) (USGS 2001). Downstream of Lake Pend Oreille, the river is renamed the Pend Oreille River. The Pend Oreille River flows across the northeast corner of the State of Washington for about 200 kilometers (125 miles) before joining with the Columbia River in southern British Columbia.

Most of the higher-elevation forested lands within the Clark Fork River drainage are National Forest. Private lands are primarily located within the nonforested valley floors or interspersed as small parcels within Forest Service boundaries. Within portions of the Clark Fork River basin, land ownership (by 4th code hydrologic unit or HUC) is as much as 60 percent private (upper Clark Fork River), but ranges to as high as 98 percent National Forest land in other watersheds (South Fork Flathead River). Substantial private timberlands (primarily Plum Creek Timber Company) occur within the Swan, Flathead, Blackfoot, and portions of the upper Clark Fork River drainages. Much of the upper Flathead River basin is in wilderness or Glacier National Park. Most of the lower Flathead River drainage is on the Flathead Indian Reservation.

Upper Clark Fork Recovery Subunit

The upper reach of the Clark Fork River (upstream of the junction of the Flathead River) is about 395 kilometers (246 miles) long and has an annual average streamflow of about 222 cubic meters per second (7,850 cubic feet per second) (USGS 2001). In an average year, most of the annual runoff occurs in May and June. The periods of greatest consumptive demand for water are July and August (MBTSG 1995e).

Rock Creek enters the Clark Fork River near Clinton at river mile 382 (measured upstream of the confluence of the Pend Oreille River and Columbia River) (MDNRC 1984). Rock Creek has a drainage area of 2,290 square kilometers (885 square miles) and an average annual flow of 15.3 cubic meters per second (541 cubic feet per second) (USGS 2001).

The Blackfoot River flows approximately 214 kilometers (133 miles) in a westerly direction through a mostly forested valley to its confluence with the Clark

Fork River near the town of Bonner, Montana, at river mile 364 (MDNRC 1984). The Blackfoot River has a drainage area of approximately 5,931 square kilometers (2,290 square miles). Average annual discharge near the mouth of the river is 45.2 cubic meters per second (1,597 cubic feet per second) (USGS 2001).

The Bitterroot River is formed at the junction of the East Fork and West Fork Bitterroot Rivers near the town of Conner, Montana, and from there, the mainstem flows north through the irrigated crop- and pastureland of the Bitterroot River valley approximately 137 kilometers (85 miles) to the Clark Fork River near Missoula at river mile 350 (MDNRC 1984). The Bitterroot River has 27 major tributaries on the west side and 12 on the east side, many of which today contain resident bull trout populations. It is speculated, though not documented, that many of these populations historically had a strong migratory component. The approximate mean annual flow of the Bitterroot River is 73.5 cubic meters per second (2,596 cubic feet per second) about 10 kilometers (6 miles) upstream of its confluence with the Clark Fork River (USGS 2001).

Topography and geology of the upper Clark Fork River basin and several of its tributaries were strongly influenced by glacial activity. Glaciers deposited extensive outwashes of gravel and morainal (masses of rock) drifts. These glacial deposits influence streamflows in some reaches of the main rivers and tributaries. Tributaries flowing through glacial deposits often have intermittent sections.

Resident bull trout are now the predominant life history form present in the upper Clark Fork River. Migratory fish are only found in significant numbers in the Rock Creek and Blackfoot watersheds. Fish that migrate out of Rock Creek or the Blackfoot River and pass downstream of Milltown Dam (river mile 364) cannot pass back upstream.

In general, the status of migratory bull trout in the Blackfoot River and Rock Creek drainages appears to be stable or increasing, though no statistically verified trend has yet been described. However, in some streams, numbers of bull trout have declined in recent years. No population data are available for other portions of the drainage such as the Clearwater Lakes system, mainstem Clark Fork River, St. Regis

River, or Fish Creek. However, anecdotal observations indicate an apparent widespread decline in abundance from historical levels in major portions of the basin.

The major life form of bull trout in the Bitterroot River drainage is resident fish that tend to live in higher-elevation streams within the Bitterroot National Forest. Migratory fish in the Bitterroot River are now rare (Nelson 1999), although historically they were more common. Overall, habitat in the drainage is fragmented by dewatering and diversions, and bull trout populations are characterized by local populations of small resident fish that have little or no genetic interchange.

Lower Clark Fork Recovery Subunit

The Lower Flathead River flows south and west for 116 kilometers (72 miles), from Kerr Dam downstream to its confluence with the Clark Fork River (river mile 245); about 60 kilometers (37 miles) upstream of Thompson Falls Dam. The Flathead River has an annual average discharge of 337.6 cubic meters per second (11,920 cubic feet per second) near its confluence with the Clark Fork River (USGS 2001). Flow in this portion of the Flathead River is partially regulated by Kerr Dam, located 6.4 kilometers (4 miles) downstream of the original outlet of Flathead Lake.

The Flathead Indian Reservation is the 486,000-hectare (1.2-million acre) home of the Confederated Salish and Kootenai Tribes. The reservation was established by the Hellgate Treaty in 1855. The entire reservation lies within the Clark Fork River basin and includes the southern half of Flathead Lake and approximately 109 kilometers (68 miles) of the lower Flathead River, as well as its associated tributary streams. Important tributaries for bull trout are the Jocko River and Mission Creek.

Lake Pend Oreille is the largest and deepest natural lake in Idaho (Panhandle Bull Trout Technical Advisory Team 1998). It covered about 33,696 hectares (83,200 acres) under natural conditions, and it now (post-impoundment by Albeni Falls Dam) has a surface area of about 38,362 hectares (94,720 acres) (PBTAT 1998a). The lake has more than 282 kilometers (175 miles) of shoreline, with mean and maximum depths of 164 meters (538 feet) and 351 meters (1,152 feet), respectively. Nearly all of the waters currently accessible to bull trout from Lake Pend Oreille lie within the

State of Idaho, including 15 kilometers (9 miles) of the Clark Fork River upstream to Cabinet Gorge Dam (PBTTAT 1998a).

About 95 percent of Lake Pend Oreille's volume is in the large, southernmost basin, a glacially influenced portion of the Purcell Trench (PBTTAT 1998a). Average hydraulic residence time in the southern basin is estimated to exceed 10 years (PBTTAT 1998a). The main body of Lake Pend Oreille never freezes.

Lake Pend Oreille is an oligotrophic (nutrient-poor) lake. Woods (1991) compared recent water quality data to historical data and reported that the pelagic (open-water) zone of Lake Pend Oreille showed no major temporal changes in nutrient concentrations, chlorophyll *a* concentrations, or Secchi disc water transparency depths since the early 1950's (PBTTAT 1998a). Nutrient concentrations in shoreline areas and in the northern basin of the lake are considerably higher because of urbanization and suspended sediments in Clark Fork River inflow.

Cabinet Gorge Dam, constructed in 1952, partially regulates flows in the Clark Fork River. The Settlement Agreement with the Federal Energy Regulatory Commission for licensing Cabinet Gorge Dam provides for a minimum flow of 141.6 cubic meters per second (5,000 cubic feet per second). River flows are augmented by groundwater inflow, which contributes at least an additional 22.7 cubic meters per second (800 cubic feet per second) below the dam (PBTTAT 1998a). Cabinet Gorge Dam is operated as a peaking facility, and during low flow periods, releases typically vary from 141.6 cubic meters per second (5,000 cubic feet per second) to about 566.4 cubic meters per second (20,000 cubic feet per second) or more on a daily basis. This range may vary depending on availability of water and demand for electricity.

The Clark Fork River watershed upstream of Lake Pend Oreille includes most of western Montana and covers some 59,324 square kilometers (22,905 square miles) (PBTTAT 1998a). Average annual river flow is approximately 629.6 cubic meters per second (22,230 cubic feet per second) (USGS 2001). The river contributes approximately 92 percent of the annual inflow to the lake (PBTTAT 1998a) and most of the suspended sediment load.

The U.S. Army Corps of Engineers operates Albeni Falls Dam on the Pend Oreille River; the dam is located in Idaho near the Washington border. The Clark Fork River is renamed the Pend Oreille River as it exits the lake. This dam, also constructed in 1952, impounds 44 kilometers (28 miles) of the Pend Oreille River and regulates the lake's elevation between 625 meters (2,051 feet) mean sea level (winter) and 629 meters (2,062.5 feet) mean sea level (summer).

The lower Priest River originates at the outlet of Priest Lake. The lower Priest River flows a distance of 72 kilometers (45 river miles) to its confluence with the Pend Oreille River at the City of Priest River. Major tributaries include the Upper West Branch and Lower West Branch Priest Rivers and the East River.

Bull trout have been documented in the East River system and the lower Priest River downstream of Priest Lake. Based on the sizes of fish observed, speculations have been made that the bull trout in the East River are probably migrants from Lake Pend Oreille. East River bull trout may represent a rather unique population, whose adults migrate downstream from the main body of the lake into the Pend Oreille River arm, then up the Priest River system. Until genetic or radiotelemetry studies can confirm this, the lower Priest River fish will be treated as a local population of the Lake Pend Oreille core area. Tributaries to the lower Priest River were probably important historically for foraging and thermal refuge by adult and subadult bull trout.

Land ownership in the basins that are direct tributaries to Lake Pend Oreille is typically 75 to 98 percent U.S. Forest Service, with most of the remaining land in private ownership (PBTTAT 1998a). The exception is the Pack River drainage, which is 55 percent U.S. Forest Service land, 36 percent private land, 7 percent State of Idaho land, and 2 percent Bureau of Land Management land.

The Trestle Creek watershed enters Lake Pend Oreille from the Cabinet Mountains at the northern end of the lake. Trestle Creek is a 5,959-hectare (14,713-acre), third-order watershed that includes several smaller tributaries. Trestle Creek contains some of the highest-quality bull trout habitat remaining in the Lake Pend Oreille/lower Clark Fork River tributary system.

Lightning Creek is approximately 35 kilometers (22 miles) long and drains into the Clark Fork River 4 kilometers (2.5 miles) upstream of Lake Pend Oreille (PBTTAT 1998a). The Lightning Creek channel is unstable, and aerial photos from the 1930's suggest that lower Lightning Creek has shifted from a primarily single channel stream to a highly braided stream with an increased width to depth ratio. A barrier falls is present on Lightning Creek near Quartz Creek. Bull trout spawn in the upper mainstem of Lightning Creek below Quartz Creek, as well as in most major tributaries.

Pack River comprises the second largest watershed draining into Lake Pend Oreille. The Pack River basin has more glacial fluvial deposits than any other basin in the watershed, and the underlying geology is largely granitic in origin. As a result, sand-sized sediment is the primary material that is eroded and transported in streams of this basin. The Pack River basin supports diverse land uses and contains lands under private, State, and Federal ownership. These uses, coupled with the Sundance fire in 1967, have negatively influenced habitat conditions for bull trout in Pack River (PBTTAT 1998a). Loss of riparian vegetation and associated root masses due to fire, salvage, timber harvesting, livestock grazing, or clearing reduces bank stability and results in delivery of fine sediment to the stream channel.

Grouse Creek is a fourth-order watershed with a drainage area comprising 77,857 hectares (31,352 acres). It is an important tributary to the Pack River watershed for bull trout. Grouse Creek flows from the western side of the Cabinet Mountains and drains west by southwest into the Pack River. A large portion of the Grouse Creek watershed lies within the "transient snow zone," identified as lands within an elevation range that exhibits frequent rain-on-snow events, resulting in flooding. The transient snow zone in northern Idaho is estimated at 762 to 1,372 meters (2,500 to 4,500 feet) in elevation (PBTTAT 1998a).

Gold and North Gold Creeks are adjacent drainages entering the southeast end of Lake Pend Oreille in close proximity to each other. Gold Creek is currently the second most important bull trout spawning stream in the watershed (after Trestle Creek), with an average of about 102 redds per year in 1983 to 1998 (LPOWAG 1999). Excess bedload (largely a result of the mining legacy), sediment, and a lack of large woody debris are considered to be the greatest limiting factors for bull trout

habitat in the watershed. North Gold Creek has supported an average of about 30 redds per year and has been impacted by development of a homestead, which is now being reclaimed under U.S. Forest Service ownership. The creek has also been negatively impacted by past timber harvest activities.

Granite Creek is a large 41,264-hectare (16,712-acre) watershed on the east side of Lake Pend Oreille. Bull trout habitat is patchy and has been affected by urban development in the floodplain, roads, and timber harvest. Sullivan Springs is a spring-fed tributary that enters Granite Creek about 1 kilometer (0.6 mile) upstream of the lake, and it is an important spawning stream for bull trout and kokanee salmon. Bull trout spawning activity in the drainage has been erratic, varying from no redds in 1992 to as many as 132 redds in 1997 (LPOWAG 1999).

Bull trout in the interconnected Lake Pend Oreille watershed appear to be entirely adfluvial (PBTTAT 1998a). Some fish make extensive spawning migrations into the larger tributaries beginning in March and April (PBTTAT 1998a). A fall migration also occurs (August and September) into the Clark Fork River (Pratt and Huston 1993) and other Lake Pend Oreille tributaries.

Flathead Recovery Subunit

The North and Middle Forks of the Flathead River drainage comprise most of the remaining unblocked portion of the Flathead River system upstream of Flathead Lake. The headwaters of the North Fork Flathead River are in British Columbia. The North Fork Flathead River flows south into the United States and is bordered by Glacier National Park to the east and the Flathead National Forest to the west. The headwaters of the Middle Fork Flathead River are in the Bob Marshall and Great Bear Wilderness areas. From the confluence with Bear Creek downstream to its junction with the North Fork Flathead River, the Middle Fork Flathead River forms the southern boundary of Glacier National Park.

From the confluence of the North and Middle Forks of the Flathead River, the mainstem Flathead River flows approximately 88 kilometers (55 river miles) to the inlet of Flathead Lake. The South Fork of the Flathead River, controlled by Hungry Horse Dam since 1953, enters the Flathead River approximately 16 kilometers (10 miles) downstream of the confluence of the North and Middle Forks of the Flathead

River. These three forks of the Flathead River have a combined drainage area of 11,561 square kilometers (4,464 square miles) and an average annual discharge of 274.7 cubic meters per second (9,699 cubic feet per second), as measured at Columbia Falls (USGS 2001).

Other major tributaries of the Flathead River include the Stillwater and Whitefish Rivers, which drain the valley floor and mountain ranges to the west. The Whitefish River joins the Stillwater River about 5 kilometers (3 miles) before its confluence with the Flathead River, approximately 35 kilometers (22 miles) upstream of Flathead Lake. Bull trout are rarely encountered today in the Whitefish and Stillwater Rivers. Anecdotal data from newspaper accounts around 1900 indicate that, 100 years ago, bull trout, and particularly westslope cutthroat trout and mountain whitefish, were much more abundant in those streams (Inter Lake, *in litt.*, 1900). Large log drives were conducted down those rivers during that era, and several wooden dams that were built onstream at sawmills and lake outlets appear to have obstructed fish passage. At the dam sites, large numbers of migrating trout and whitefish were harvested by anglers, often with snag hooks and even dynamite, and the combined abuses appear to have rapidly depleted the fish runs (Inter Lake, *in litt.*, 1900). Today, these rivers were judged by the Montana Bull Trout Scientific Group to be low-priority streams for restoration because of the long-term nature of the decline and the existing degraded habitat conditions (MBTSG 1995c). Summer water temperatures are not suitable in these streams for bull trout, and they may also have been marginal historically due to the fact that the rivers flow through large lowland lakes (Upper and Lower Stillwater Lakes and Whitefish Lake).

Land ownership in the 2.4 million-hectare (5.9 million-acre) Flathead River basin (including the South Fork Flathead, Swan, and lower Flathead Rivers) is 40 percent U.S. Forest Service (including 445,500 hectares [1.1 million-acres] of wilderness), 10 percent National Park Service (Glacier National Park), 10 percent Confederated Salish and Kootenai Tribes, 3 percent State of Montana, and 31 percent private (Flathead River Basin Environmental Impact Statement 1983). Nearly 5 percent of the drainage basin lies in the headwaters of the North Fork Flathead River in British Columbia.

Flathead Lake has the largest surface area of any natural freshwater lake in the western United States, covering 49,613 hectares (122,500 acres) (Flathead River Basin Environmental Impact Statement 1983). It has a mean depth of 50 meters (165 feet) and a maximum depth of 113 meters (370 feet). Most of the lake exceeds 20 meters (65 feet) in depth, except for South Bay, which has a maximum depth of 10 meters (33 feet).

The Flathead Lake bull trout population is among the most intensively studied and monitored bull trout populations in the world. Within the Flathead Recovery Subunit, at least 27 natural lakes have historical evidence of bull trout populations, and most of these lake populations form their own bull trout core areas. Some lakes are small (including 8 that are less than 100 acres) and may have historically held only low numbers of bull trout. Available fisheries information indicates that the migratory life form of bull trout predominates in all these lake and river systems. Adult bull trout migrate into tributary drainages, usually upstream of each lake, to spawn. The juvenile fish rear in the tributaries for one to three years before moving back downstream to the river and lake, where they spend several additional years as subadults prior to maturity at the age of about six years (Fraley and Shepard 1989). The resident life form of bull trout may occur in low numbers in some tributary streams, but conclusive documentation of this life form is not currently available.

The Swan River flows generally north for approximately 106 kilometers (66 miles) from its headwaters in the Swan and Mission Mountain ranges to Flathead Lake, where it enters at the town of Bigfork, Montana. Fifty-three named tributaries enter the river from the Swan and Mission Mountain ranges. Three relatively large lakes are linked directly to the Swan River drainage. The southernmost lake, covering 294 hectares (726 acres), is Lindbergh Lake, which the upper Swan River flows through. Approximately 8 kilometers (5 miles) downstream of Lindbergh Lake, Holland Creek enters the river after flowing through the 165-hectare (408-acre) Holland Lake. The Swan River then flows approximately 56 kilometers (35 miles) to 1,085-hectare (2,680-acre) Swan Lake, the largest lake in the drainage. Leaving Swan Lake, the river continues for 23 kilometers (14 miles) downstream to a small run-of-the-river impoundment created by Bigfork Dam. This dam (built after the power plant was first installed in 1902) is 3.67 meters (12 feet) high and contains a 4.1-megawatt hydroelectric facility. It is currently owned and operated by PacifiCorp

and is scheduled for Federal Energy Regulatory Commission relicensing in 2002. Downstream of Bigfork Dam, the Swan River cascades through a 2-kilometer (1-mile) high-gradient reach before entering Flathead Lake. The Swan River drainage area is 1,080 square kilometers (671 square miles), measured at the outlet of Swan Lake.

Land ownership in the Swan River basin is mixed. Approximately 45 percent of the drainage is managed by the Flathead National Forest, 20 percent by Plum Creek Timber Company, 10 percent by the Montana Department of Natural Resources, and 25 percent by other private landowners. Timber production is the dominant land management activity.

Historically, because of the deterrent effect of warmer water in Swan Lake outflows on upstream-migrating adults, fish from Flathead Lake probably did not routinely migrate upstream through Swan Lake. Similarly, warmer lake outflows may have limited travel of other adfluvial bull trout populations among the interconnected lakes in this subunit.

Construction of Hungry Horse Dam in 1953 blocked access to the entire South Fork Flathead River drainage, and about 38 percent of the total stream length that was once available to Flathead Lake bull trout was cut off (Zubik and Fraley 1987). Bull trout upstream of the dam now reach maturity in Hungry Horse Reservoir, or possibly in the South Fork Flathead River, instead of in Flathead Lake or the main Flathead River.

The South Fork Flathead has a drainage area of 4,307 square kilometers (1,663 square miles) and an average annual discharge of 100.5 cubic meters per second (3,549 cubic feet per second), measured 3 kilometers (2 miles) downstream of Hungry Horse Dam (USGS 2001). Water stored in Hungry Horse Reservoir is used for power production, irrigation, recreation, and most recently to provide downstream flows for salmon passage in the lower Columbia River. The usable capacity of the reservoir is 62,907 cubic kilometers (51,000 acre-feet), an amount that allows for substantial flood control storage in the headwaters of the Columbia River system.

Little quantitative information exists about historical bull trout distribution and abundance in the South Fork Flathead River drainage. Before Hungry Horse Dam was

constructed, this drainage was considered a major spawning and rearing area for the migratory bull trout from Flathead Lake (Zubik and Fraley 1987). Anecdotal information suggests that large adult fish from Flathead Lake were seasonally common in the South Fork Flathead River and several of its major tributaries.

A population of migratory bull trout, trapped behind the impoundment, now occupies Hungry Horse Reservoir and the South Fork Flathead River. These fish migrate into tributary drainages to spawn and rear. Land in the South Fork Flathead River drainage is almost entirely (98 percent) within the Flathead National Forest. Reservoir tributaries and the lower one-third of the South Fork River drainage are managed timberlands, while the upper two-thirds of the South Fork Flathead River drainage lies within the Bob Marshall Wilderness Area.

Priest Recovery Subunit

The entire Priest River basin is 2,536 square kilometers (979 square miles) in size (PBTAT 1998b). The basin is primarily within the northwest corner of the Idaho Panhandle, within Bonner and Boundary Counties. Approximately 62 square kilometers (24 square miles) of the basin are in British Columbia, where the headwaters of the Upper Priest River originate in the Nelson Mountain Range. Headwaters of major tributaries on the western side of the basin are located in northeast Washington. The basin is flanked on the east and west sides by the Selkirk Mountain Range. Elevation within the basin ranges from 625 meters (2,051 feet) at low winter pool of Lake Pend Oreille (reservoir) behind Albeni Falls Dam to more than 2,135 meters (7,000 feet) within the Selkirk Mountains.

The lake complex is made up of Upper Priest Lake, a 4.3-kilometer (2.7-mile) connecting channel called the Priest River Thorofare, and Priest Lake. Priest Lake is the third largest natural lake that is entirely within Idaho and second largest in terms of volume. Water levels in the lakes and Priest River Thorofare are partially controlled by an outlet dam and structure at the southwest corner of the lower lake.

The climate in the Priest River watershed is transitional between a northern Pacific coastal type and a continental type (PBTAT 1998b). July and August are the only distinct summer months, and temperatures are relatively mild because of the Pacific maritime influence (average daily summer maximums are around 28 degrees Celsius [82 degrees

Fahrenheit]). Winter temperatures are also relatively mild compared with areas east of the Rocky Mountains. Annual precipitation (rain and melted snow) averages 81 centimeters (32 inches) at lake surface equivalent elevation. Average precipitation within the peaks of the Selkirk Mountains can reach 152 centimeters (60 inches). At elevations above 1,463 meters (4,800 feet), snowfall accounts for more than 50 percent of total precipitation (PBTAT 1998b). The wettest months are normally November, December, and January.

Upper Priest Lake has a surface area of 542 hectares (1,338 acres), a mean depth of 18.3 meters (60 feet), and a volume of 0.1 cubic kilometers (80,000 acre-feet) (PBTAT 1998b). The lake has a short hydraulic residence time, about 3 months on average, and is heavily influenced by the major tributary, Upper Priest River. Lake level is controlled by the outlet dam on Priest Lake since the upper lake, connecting channel, and lower lake are all at the same elevation at summer pool. The main, or lower, Priest Lake has a surface area of 9,437 hectares (23,300 acres), a mean depth of 39 meters (128 feet), and a volume of 3.7 cubic kilometers (3,000,000 acre-feet). Average hydraulic residence time is about three years. The Priest River Thorofare contributes about 40 percent of the annual inflow to Priest Lake.

The Priest River basin has numerous tributaries. The Upper Priest River portion of the watershed complex drains into the upper lake and into the Thorofare, with a total drainage area of 528 square kilometers (204 square miles). Two large tributaries to the lake, Upper Priest River and Hughes Fork, join before entering the northwest corner of the lake. From the Canadian border, Upper Priest River flows through a steep side canyon at a moderate gradient (around 20 meters per kilometer or 100 feet per mile), and then flattens into a fairly large floodplain for the last 3 kilometers (2 miles). A waterfall about 1 kilometer (0.6 mile) south of the border is the limit of upstream fish migration. Hughes Fork has a moderate gradient and includes a large wetland area, Hughes Meadows. Trapper Creek, which drains the northeast corner of the upper lake watershed, and Caribou Creek, which drains to the Thorofare from the east about 1.5 kilometers (1 mile) upstream of its mouth, are the other major watersheds in the Upper Priest Lake drainage. These tributaries originate in the Selkirk Mountains and have typically high gradients.

The main Priest Lake portion of the drainage begins near the mouth of the Priest River Thorofare and extends to the southern end of the lake near the town of Coolin. The Thorofare, draining the upper lake, is by far the highest flow volume tributary to the lower

lake. Major streams draining the Selkirk Range on the east side of the lake are Lion Creek, Two Mouth Creek, Indian Creek, Hunt Creek, and Soldier Creek. All these streams, except Soldier Creek, are relatively confined and of high gradient above the reaches that are near the mouths. The lower end of Soldier Creek has a flat gradient and a large associated wetland. Seven minor flow streams are interspersed between the major east-side tributaries. From Squaw Creek south to Fenton Creek, headwaters are at lower elevations, about halfway up the Selkirk Range. Chase Creek is outflow from Chase Lake. While Chase Creek is a moderately sized subwatershed, Chase Creek flow volume into Priest Lake is low. This watershed is flat, with primarily groundwater resources, which do appear to be hydraulically linked to the lake (PBTAT 1998b).

The west side of the Priest Lake subbasin extends from Beaver Creek, discharging just south of the Thorofare, to the southern end of the lake (PBTAT 1998b). The subbasin has one major stream, Granite Creek, and one moderate-size stream, Kalispell Creek. The remaining tributaries are of low volume. The Granite Creek subwatershed is the single largest in the basin. Headwaters of the South and North Forks Granite Creek are at lower elevations than east-side streams, mostly between 1,200 to 1,500 meters (4,000 to 5,000 feet). Overall, the average gradient of Granite Creek is low, and many flat sections have associated wetlands. The subwatersheds of Reeder Creek, Kalispell Creek, Reynolds Creek, and Lamb Creek have large areas of flat gradient in the middle and lower elevations. The groundwater systems are extensive in these watersheds, and many branch streams go subterranean prior to discharging into the primary tributary channels.

Vegetation of the area varies in association with soil moisture conditions, slope aspect, elevation, precipitation, temperature, wildfire history, and land use patterns. The area is predominately coniferous forest of mixed species. The make-up of coniferous species has changed through time because of timber harvesting and replanting, fire, and plant diseases. The majority of west-side land is in the Kaniksu National Forest (Priest Lake Ranger District). The northern boundary extends to, and includes, the Upper Priest River watershed to the Canadian border. The U.S. Forest Service also manages the three large islands on the lower lake: Kalispell, Bartoo, and Eightmile Islands. The Upper Priest River headwater lands are administered by the British Columbia Ministry of Forests. Private property comprises approximately 10 percent of the west-side land total (PBTAT 1998b). In the Nordman and Lamb Creek areas, some blocks of commercial timberlands are owned by Stimson Lumber, and a few large private holdings are in agricultural use.

More than 90 percent of the east side of the basin is owned by the State of Idaho, with the northern boundary incorporating the Trapper Creek watershed (PBTTAT 1998b). Most of this land is administered by the Idaho Department of Lands under the State Endowment Trust. Some State land is managed by the Idaho Department of Parks and Recreation as the Priest Lake State Park. Through the years, various property exchange agreements have transferred a substantial acreage of private, commercial timberlands to the State, although some blocks of private forest land still exist.

Around the 116 kilometers (72 miles) of Priest Lake shoreline, approximately 26 percent of the property is privately owned (PBTTAT 1998b), and the most concentrated residential and business development has occurred on this property. Within the Federal- and State-owned lands, considerable waterfront development has occurred through lease lot programs.

Information on bull trout distribution in the Priest River basin in pre-development times (pre-1880's) is scarce and is presented mostly in oral histories of long-time residents (PBTTAT 1998b). Few manmade barriers to fish movement existed in the 1800's, so migratory stocks in the Priest Lake basin could access and potentially exchange genetic material with other stocks residing in the Priest River, Pend Oreille River, and Lake Pend Oreille (Gilbert and Evermann 1895; PBTTAT 1998a).

Bull trout have been reported in most of the large accessible tributaries to Upper Priest Lake and Priest Lake (PBTTAT 1998b). The extent and type of bull trout utilization is partially documented.

DISTRIBUTION AND ABUNDANCE

Status of Bull Trout at the Time of Listing

In the status summary prepared for the final listing rule (USFWS 1998), a total of 65 subpopulations of bull trout were recognized within the Clark Fork River basin. In the Upper Clark Fork Recovery Subunit, bull trout subpopulations were identified for the upper Clark Fork River (including Rock Creek), 27 separate streams in the Bitterroot River basin, and the Blackfoot River. In the Lower Clark Fork Recovery Subunit, the subpopulations were identified as Lake Pend Oreille and the Pend Oreille River (downstream of the lake to Albeni Falls Dam), Cabinet Gorge Reservoir, Noxon Reservoir, and the lower Clark Fork River. In the Flathead Recovery Subunit, 29 lakes were identified, Flathead Lake being the largest. Each lake was considered to hold a separate bull trout subpopulation. Because of the degree of physical isolation, most of these disconnected lake-based local populations were referred to as “disjunct” by the Montana Bull Trout Scientific Group (MBTSG 1995c, 1995d, 1996b).

The geographic size of the subpopulations that is recognized by the status summary prepared for the listing rule (USFWS 1998) varies greatly, from the large units in the Clark Fork and Flathead Rivers to the very small watersheds associated with the Bitterroot River and some of the disjunct lakes. About two-thirds (43 of the 65 subpopulations) were considered to be depressed; 3, probably extirpated; 17, of unknown status; and 2, stable (USFWS 1998). Ten of the subpopulations were considered to have a declining trend, including 2 of the largest subpopulations, in Lake Pend Oreille and Flathead Lake. Trend was considered unknown in 53 of the remaining 55 subpopulations, with 1 stable subpopulation in Hungry Horse Reservoir and a single increasing subpopulation in Swan Lake. Over 70 percent (46 of 65) of the bull trout subpopulations in this recovery unit were considered to be at risk of stochastic extirpation due to a single spawning stream and/or small population size. This percentage indicates that fragmentation is a major issue for this recovery unit (USFWS 1998).

The U.S. Fish and Wildlife Service considered introduced species (affecting 48 subpopulations), forestry (47 subpopulations), residential development (32 subpopulations), agriculture (30 subpopulations), grazing (29 subpopulations), water quality impacts (26

subpopulations), dams (14 subpopulations), and mining (6 subpopulations) to be the greatest threats to bull trout in the Clark Fork Recovery Unit (USFWS 1998). The magnitude of threats was rated high for 46 of the 65 subpopulations, and in 50 subpopulations (77 percent) the threats were considered imminent.

The best scientific evidence available indicates that the subpopulation groups that the U.S. Fish and Wildlife Service described in the listing rule are each comprised of one to many local populations. The rest of this recovery chapter addresses recovery actions and analysis of core areas and their local populations, rather than refer to subpopulation groups.

Current Distribution and Abundance

With the probable exception of the upper end of the Clark Fork River drainage (upstream of Rock Creek), which has been severely degraded by contamination by heavy metals, bull trout continue to be present (albeit sometimes in low numbers) in nearly all major watersheds where they likely occurred historically in this recovery unit. Because bull trout exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993), the fish are not expected to simultaneously occupy all available habitats (Rieman *et al.* 1997). This patchiness is evident in some drainages in western Montana, where bull trout are prevalent in tributaries on one side of a watershed, but absent or nearly so on the other. Examples are the Blackfoot River drainage, where bull trout are seldom found in tributaries south of the river, and the North Fork Flathead River, where bull trout are generally absent from the lower ends of Glacier National Park tributaries, most of which drain relatively large glacial lakes that have headwaters containing bull trout. These distribution gaps often reflect natural conditions as bull trout distribution is strongly correlated with habitat suitability (see Chapter 1). It is important to recognize that in some watersheds, or portions of them, bull trout were probably never numerous because of natural habitat limitations.

However, significant local populations of bull trout have been extirpated in recent times. Examples include the migratory form in the Bitterroot River drainage and in portions of the severely degraded upper Clark Fork River drainage. Bull trout numbers have been reduced to remnant status in several lakes in Glacier National Park and elsewhere in lakes in the Flathead River basin, that have been stocked with (or invaded by) lake trout; such lakes include Whitefish, Tally, and Upper and Lower Stillwater Lakes (Fredenberg 2000).

Population trend data is unavailable for bull trout in the lower Clark Fork River drainage prior to construction of Thompson Falls, Noxon Rapids, and Cabinet Gorge Dams. Since construction of the dams, the catch of bull trout during gill net surveys in the reservoirs (between 1960 and 1985) indicates that bull trout declined in Noxon Reservoir but remained somewhat stable in Cabinet Gorge Reservoir (Huston 1985). When Pratt and Huston (1993) evaluated the past and current bull trout population status of the Lower Clark Fork River drainage, they concluded that local bull trout populations in Cabinet Gorge and Noxon Reservoirs are currently stable, but fragile. More recently, Washington Water Power (now Avista) conducted extensive gill net surveys (in preparation for Federal Energy Regulatory Commission relicensing) and documented few bull trout in the catch (Washington Water Power Company 1998). While these local populations persist at this time, they are susceptible to extirpation from events that could cause further declines.

The strongest remaining bull trout population in the Priest River basin is found in Upper Priest Lake (PBTTAT 1998b). These adfluvial fish spawn in tributaries to the Upper Priest River and Trapper Creek. About 100 adults have been estimated (Fredericks 1999).

In recent years, in the Clark Fork River basin, emphasis has been placed on documenting distribution and determining abundance of bull trout by using redd counts (LPOWAG 1999). Because of the large size of the migratory fish and because of the geology of the streams that generally makes redds easy to recognize, redd counts (Spalding 1997) have been shown to provide a repeatable method of indexing spawner escapement in many streams in this recovery unit (Rieman and McIntyre 1996). However, several authors have cautioned that redd counts should not be relied upon as the sole method of population monitoring (Maxell 1999, Rieman and Myers 1997) and that redd counts may, in fact, lead to erroneous conclusions about population status and trend.

Table 1 summarizes the status of redd count information for the core areas designated in this recovery unit. Thirteen core areas have a history of redd count information for at least 3 consecutive years. The most complete database has been accumulated for the Flathead Lake, Swan Lake, and Lake Pend Oreille core areas, with redd counts conducted annually in multiple index streams for most of the past 20 years. Similar trend data has been accumulated for Rock Creek, the Blackfoot River, Priest Lakes and Upper Priest River, and several of the Flathead basin lakes, but the period of record generally goes back 5, or fewer, years. Only sporadic redd counts have been conducted in

the majority of the remaining core areas. In some cases, the numbers of bull trout are too low to accurately identify primary spawning reaches of tributary streams.

Additional effort has been focused in some basins on monitoring juvenile abundance in primary spawning and rearing habitat. The basins with such monitoring data tend to be the same as those with extensive redd count information. In the Flathead River basin, a composite index of juvenile (age 1 and older) abundance has varied from a high of about 7.8 fish per 100 square meters (1,000 square feet) in 1985 to a low of about 0.9 fish per 100 square meters (1,000 square feet) in 1996 (Deleray *et al.* 1999). Assessing trends in bull trout abundance from a single parameter is difficult, given the relatively complex life cycle of the migratory fish. Until sufficient site-specific data has been accumulated to develop more information about natural variability, the interrelationships between juvenile abundance and adult return and between redd counts and juvenile abundance will remain largely speculative. Some of these issues are currently being explored by research projects in the Flathead and Pend Oreille River watersheds. Intensive monitoring of the Flathead, Swan, Hungry Horse, and Pend Oreille Lakes populations is critical to further develop this information. It is also important that these data sets be continually evaluated and methods upgraded for the purpose of developing models and predictive tools.

Table 1. Summary of redd count information for Clark Fork Recovery Unit core areas during the period 1996–2000. Table includes only counts for those local populations that were monitored at least three times during the five-year period.

Recovery Subunit	Core Area	No. of Local Populations Monitored	Mean Total No. Redds Counted per Year (1996–2000)
Upper Clark Fork	Clark Fork Rive Section 1 (Upstream of Milltown Dam)	1	36
	Rock Creek	5	165
	Blackfoot River	5	233
	Clearwater River	0	---
	Clark Fork River Section 2 (Milltown Dam to Flathead River), including Jocko River and Mission Creek	0	---
	West Fork Bitterroot River	1	3
	Bitterroot River	2	60
Lower Clark Fork	Lower Flathead River (including Jocko River and Mission Creek)	0	---
	Clark Fork River Section 3 (Flathead River to Thompson Falls Dam)	0	---
	Noxon Reservoir	0	---
	Cabinet Gorge Reservoir	0	---
	Lake Pend Oreille	17	620
Priest	Priest Lake(s) and Upper Priest River	11	39
Flathead	Frozen Lake	0	---
	Upper Kintla Lake	0	---
	Kintla Lake	0	---
	Akokala Lake	0	---
	Bowman Lake	0	---
	Cerulean, Quartz, and Middle Quartz Lakes	0	---
	Lower Quartz Lake	0	---
	Cyclone Lake	1	1

Recovery Subunit	Core Area	No. of Local Populations Monitored	Mean Total No. Redds Counted per Year (1996–2000)
	Logging Lake	0	---
	Arrow Lake	0	---
	Trout Lake	0	---
	Lake Isabel	0	---
	Harrison Lake	0	---
	Lincoln Lake	0	---
	Lake McDonald	0	---
	Upper Stillwater Lake	1	26
	Upper Whitefish Lake	1	11
	Whitefish Lake	0	---
	Flathead Lake	8	170
	Doctor Lake	0	---
	Big Salmon Lake	1	58
	Hungry Horse Reservoir	7	400
	Lindbergh Lake	0	---
	Holland Lake	1	16
	Swan Lake	10	1,161

REASONS FOR BULL TROUT DECLINE

Ecological processes or conditions that regulate or limit bull trout production are known as limiting factors. In the Clark Fork Recovery Unit, limiting factors are not equally distributed across the basin—what may be a limiting factor for bull trout in one recovery subunit or stream may not be significantly influencing bull trout in another. Therefore, discussion of limiting factors is presented, in context, on a subunit-by-subunit basis.

Water Quality

Upper Clark Fork Recovery Subunit

Water quality in the Clark Fork River is improved downstream of Missoula by dilution from large tributaries such as the Blackfoot and Bitterroot Rivers. However, due to warm summer water temperatures and other habitat limitations, the mainstem Clark Fork River supports lower populations of coldwater salmonids than would be expected. A major water quality issue in this portion of the Clark Fork River mainstem is the addition of nutrients and other pollutants to the river from sources such as the Missoula Municipal Sewage Plant and the Stone Container Corporation Kraft Mill. The primary nonpoint sources of sediments and nutrients are the Bitterroot River and the Blackfoot River (MDHES 1994). There has been a growing concern over increases in algae levels in the river, increases that are stimulated by nutrients and that result in depressed concentrations of dissolved oxygen in mid-summer (Watson 1985).

Many water quality studies have been done, or are underway, in the Clark Fork River. For more detailed information about water quality issues in this river, see, among others, Watson (1985 and 1991), Ingman (1992a, 1992b), and Knudson (1992).

Excessive concentrations of nutrients (phosphorus and nitrogen) also cause water quality problems in the Upper Clark Fork Recovery Subunit. High concentrations of nutrients have led to blooms of filamentous algae in the Clark Fork River upstream of Missoula, impairing beneficial uses of river water (USEPA 1993). The main nutrient point sources are the sewage effluent from the towns of Butte and Deer Lodge.

Dams

Upper Clark Fork Recovery Subunit

Milltown Dam was constructed on the Clark Fork River in 1906 and 1907 just downstream of the confluence with the Blackfoot River (Periman 1985). Milltown Dam is a run-of-the-river facility with no water storage capacity, so the impact on bull trout is related to fish passage and not to dam operations. Each spring, concentrations of several fish species are observed at the base of Milltown Dam. These fish are assumed to be attempting an upstream migration past the dam. Radio transmitters implanted in bull trout that had migrated to the face of the dam revealed that, when these fish were passed upstream, they migrated to streams presumed to be spawning streams in the Blackfoot River and Rock Creek drainages (Swanberg 1997).

Pennsylvania Power and Light of Montana (formerly Montana Power Company), which owns and operates Milltown Dam, is currently operating under a license extension from the Federal Energy Regulatory Commission. The company had earlier announced plans to drop the hydroelectric license and discontinue generating power at the facility. Deliberations are occurring over whether to implement a fisheries mitigation plan that includes provisions for providing selective fish passage at this facility or remove the dam altogether. The decision is complicated immensely by the presence of an accumulation of millions of cubic yards of toxic sediment in the forebay of the dam, a result of the mining legacy upstream in Butte and Anaconda. The entire area is part of a Superfund project of the U.S. Environmental Protection Agency. A number of advocacy groups are pushing for sediment and dam removal, primarily because of the problems with potential pollution of the Missoula aquifer. Fish passage is also a major issue in the deliberations. In addition, northern pike have recently proliferated in the reservoir behind the dam and have been documented to eat bull trout among their prey species (Missoulain, *in litt.*, 2000).

East Fork Dam on the East Fork Rock Creek (southwest of Georgetown Lake) is also a barrier to upstream fish passage. Operation of East Fork Reservoir results in seasonal dewatering of the downstream reaches of East Fork Rock Creek. Trout Creek and Flint Creek are used as a conveyance channel for East Fork Reservoir water and are impacted by excess stream flow.

A small dam at the mouth of the Blackfoot River (at the Stimpson Lumber Mill) may be a seasonal fish passage barrier. The Nevada Creek Dam and dams on the Clearwater Lakes (Seely Lake and Placid Lake) are also fish passage barriers in the Blackfoot River drainage. Fish passage barriers were installed at the outlets of Rainy Lake and Lake Inez in the 1960's in an attempt to control the reintroduction of nongame fish into these lakes, following chemical rehabilitation. Montana Fish, Wildlife and Parks is researching the feasibility of removing these barriers.

There are no hydroelectric facilities in the Bitterroot drainage, but there are several irrigation storage reservoirs in the valley. These dams probably alter nutrient and sediment balance and downstream flow patterns, temperature regimes, and habitat. Fred Burr Dam washed out years ago, and the downstream area is still suffering from the effects of high bedload (sediment not in suspension, dragged or rolled along the river bottom) movement.

Several dams in the Bitterroot River drainage are high in the mountains, generally upstream of local populations of bull trout. Lake Como Dam (on Rock Creek, a Bitterroot River tributary) is a barrier to fish migration. However, the drainage does not support bull trout.

Painted Rocks Reservoir on the West Fork Bitterroot River supports a bull trout core area that includes inflowing tributaries for spawning and rearing. The reservoir is annually drawn down by releases for downstream flow and irrigation purposes. Little water remains in the reservoir during fall and winter months. A minimum pool reservation is needed for bull trout since Painted Rocks has been identified as foraging, migrating, and overwintering habitat. Painted Rocks Dam is a barrier to bull trout migration. However, it is also a barrier to upstream dispersal of brown and rainbow trout and could protect bull trout from possible competition and predation by introduced species.

The Mountain Water Company Dam on lower Rattlesnake Creek blocks fish passage from the Clark Fork River into the upper watershed. It is doubtful that Clark Fork River bull trout successfully spawn in the reaches of Rattlesnake Creek below the dam, although adult bull trout congregate annually below the dam in an attempt to migrate upstream (MBTSG 1996e). Above the dam, Rattlesnake Creek supports bull trout, and the migrants at the dam are probably a fluvial component of that local population. Rattlesnake Creek is the first major watershed downstream of Milltown Dam, which is approximately 10

kilometers (6 miles) upstream on the Clark Fork River from the confluence of Rattlesnake Creek. Montana Fish, Wildlife and Parks biologists are implementing fish passage at this dam, and because the watershed has been protected as a municipal water supply, it has potential to provide significant benefits to bull trout recovery.

Lower Clark Fork Recovery Subunit

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 and of other tributary diversions 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).

Built in 1913 on the Clark Fork River, Thompson Falls Hydroelectric Development eliminated migration and spawning access from Lake Pend Oreille to 86 percent of the Clark Fork River basin, though not all of that basin was historically used by bull trout (Pratt and Huston 1993). Between 1913 and 1951, only 108 kilometers (67 miles) of the Clark Fork River remained barrier free between Lake Pend Oreille and Thompson Falls Dam, providing access to spawning tributaries in Montana. Cabinet Gorge Dam, completed in 1952, further isolated Lake Pend Oreille bull trout from important spawning habitat downstream of Thompson Falls. Before Cabinet Gorge Dam was constructed, bull trout used at least 10 tributary streams in the 93 kilometers (58 river miles) between Thompson Falls and the present site of Cabinet Gorge Dam (PBTTAT 1998a). Noxon Rapids Dam was constructed in the mid 1950's and lies between the other two major dams, creating a series of three impoundments over 113 kilometers (70 miles) of the Clark Fork River.

Thompson Falls Dam is operated by Pennsylvania Power and Light of Montana as a run-of-the-river facility. It has very limited storage capacity. Cabinet Gorge and Noxon Rapids Dams are owned and operated by Avista Corporation. The operational agreement for Noxon Reservoir allows for a 3-meter (10-foot) maximum seasonal drawdown, which may be exceeded under special circumstances. Cabinet Gorge currently functions as a re-regulating facility¹ for Noxon Rapids Dam. Cabinet Gorge drawdowns rarely exceed 1.5

¹ "Re-regulating facility" refers to a secondary dam located downstream of a major hydro dam. The purpose of these types of facilities is to smooth out peaking flows from the larger dam upstream. Water levels in the re-regulating facility show

meters (5 feet) (Huston 1985). The aquatic environment has benefitted to some extent from the water level stability provided by the current Noxon Rapids operational agreement. However, there is some concern that this operational scenario benefits other fish species (*e.g.*, largemouth and smallmouth bass, northern pike) to the detriment of bull trout.

Noxon Rapids Reservoir has a surface area of 3,240 hectares (8,000 acres) at full pool and 2,228 hectares (5,500 acres) at minimum pool (Huston 1985). Discharge from Noxon Dam varies daily and seasonally depending on the river inflow and the demand for electrical power (Huston 1988). Noxon Rapids Reservoir is divided into two distinct habitat types with a broad transition zone that varies depending on river flow and project operation. The upstream end of the reservoir, generally between Beaver Creek Bay and Thompson Falls Dam, is characterized by visible current at almost all times of the year. The portion of the reservoir downstream of Beaver Creek Bay has visible water currents only during spring high water or during severe reservoir drafting (Huston 1985).

Noxon Rapids Reservoir exhibits varying degrees of stratification, depending on river flow and ambient conditions, and occasionally has a weak thermocline (documented in late July 1994 at about 7.5 meters [25 feet] [MBTSG 1996a]). Surface temperatures average about 22 degrees Celsius (72 degrees Fahrenheit) during the hottest days, but uncommonly reach or exceed 24 degrees Celsius (75 degrees Fahrenheit). Generally, oxygen concentrations remain within the tolerance level for salmonids (Huston 1985).

Cabinet Gorge Reservoir is 32 kilometers (20 miles) long and has a surface area of 1,296 hectares (3,200 acres) at full pool and 992 hectares (2,450 acres) at minimum pool (Huston 1988). The reservoir currently has typical daily water level fluctuations of 0.6 to 1.2 meters (2 to 4 feet). The temperature of the reservoir is nearly isothermal, and there is limited coldwater habitat in the reservoir during the warm summer months. However, tributary and groundwater inflows may provide some areas of coldwater refuge for bull trout. Maximum temperature rarely exceeds 22 degrees Celsius (72 degrees Fahrenheit), except in backwater shallows outside the main current pattern. Dissolved oxygen levels in the reservoir are adequate for fish at all depths.

extremes in water fluctuations, but presence of the facility tends to stabilize flows downstream.

Downstream of Cabinet Gorge Dam, bull trout from Lake Pend Oreille are known to take refuge and spawn in coldwater spring areas that are found on the south shore of the Clark Fork River near the State of Idaho's Cabinet Gorge Fish Hatchery. Spawning surveys since 1992 show a high of 18 redds in 1995 and a low of 2 in 1992 (LPOWAG 1999). It is unknown whether these fish are progeny of bull trout spawning successfully in the channel or are fish which have dropped down from upriver tributaries and are unable to return because of Cabinet Gorge Dam. Recent genetic evidence appears to support the latter hypothesis as bull trout sampled from below the dam are genetically similar to upriver stocks (Neraas and Spruell 2000). Juvenile habitat usage in the river is unknown, and no life history information is available for juvenile bull trout that may recruit from the river. The genetic evaluation provided support for passing a limited number of fish upstream above the dam to test the potential benefits to upstream populations, and that passage is currently occurring.

During high flow events, Cabinet Gorge Dam may spill up to 2,832 cubic meters per second (100,000 cubic feet per second) or more in addition to the power plant's generating capacity of approximately 1,062 cubic meters per second (37,500 cubic feet per second). When significant volumes of water are passed over the spillway, atmospheric gases become entrained in the water column. During 1997, gas supersaturation levels, or total dissolved gas, exceeded 140 percent of saturation. The State of Idaho's water quality standard is 110 percent. In 1997, the supersaturated gas plume extended all the way down the Clark Fork River and across the northern end of Lake Pend Oreille. Fish exposed to high total dissolved gas levels for periods of time can be harmed or killed. At this time, the population effects of these high dissolved gas levels are unknown in the lake or river. Studies conducted in the next few years as part of the Settlement Agreement between Avista and the Federal Energy Regulatory Commission are intended to identify impacts resulting from high total dissolved gas levels below Cabinet Gorge Dam and to develop and implement abatement strategies.

Peaking power flows downstream of Noxon and Cabinet Gorge Dams can fluctuate on an hourly basis. Avista maintains a required minimum flow of at least 141.6 cubic meters per second (5,000 cubic feet per second), below Cabinet Gorge Dam in the 11 to 14 kilometers (7 to 9 miles) of river upstream of Lake Pend Oreille (PBTTAT 1998a).

While none of these hydroelectric projects provides upstream fish passage, downstream movement has been demonstrated. Marked hatchery fish planted in Noxon Reservoir have been caught in Cabinet Gorge Reservoir and Lake Pend Oreille (Huston 1985). The turbine intakes on these dams are currently not screened, and evaluation is occurring to determine the effects of unscreened turbine intakes on downstream migrants.

Additional studies funded by Avista during the next 45 years (the term of the Federal Energy Regulatory Commission license) will explore and implement options for upstream passage of adult fish and safe passage for juveniles downstream, experiment with control of nonnative species in selected waters, monitor fish abundance and distribution, and research other elements that emphasize native species restoration (Washington Water Power Company 1998).

Kerr Dam, constructed in 1938 on the Flathead River near Buffalo Rapids (just downstream of Flathead Lake), is operated by Pennsylvania Power and Light of Montana. Formerly operated as a “load-following” or “peaking” facility, it has recently been converted to base load, meaning that flows from the dam no longer fluctuate dramatically and rapidly. Fluctuating flows are known to have reduced the food base (aquatic macroinvertebrates) in the lower Flathead River, a reduction that, in turn, has reduced the carrying capacity of the river for fish (Cross and DosSantos 1988). Pennsylvania Power and Light of Montana recently concluded negotiations with the Federal Energy Regulatory Commission for relicensing of Kerr Dam. The December 2000 relicensing terms include Kerr Dam flow modifications for the protection, mitigation, and enhancement of fisheries in the lower Flathead River, though the extent to which bull trout will benefit is unknown. Further discussion of Kerr Dam impacts is included in the following section (Flathead Recovery Subunit).

Albeni Falls Dam on the Pend Oreille River near the Idaho–Washington border interrupts habitat connectivity with the lower portion of the basin and also regulates water levels in Lake Pend Oreille and at the delta of the Clark Fork River. Gilbert and Evermann (1895) described Albeni Falls as “scarcely more than pretty steep rapids [that] would not interfere at all with the ascent of salmon.” Albeni Falls Dam was built in 1952, about 42 kilometers (26 miles) downstream of the outlet of the lake on the Pend Oreille River. This dam significantly influences water levels in the lake and the Pend Oreille River. During the summer months, the dam holds the lake level artificially high, and the Pend Oreille River

downstream of the natural lake outlet essentially becomes a shallow arm of the lake. During the fall, the gates are opened at Albeni Falls, and water level is drawn down for flood control storage. Although this dam restricts upstream movement and functionally removes any downstream migrants from the Pend Oreille population, these effects are probably much less significant than other effects of this dam, such as those of lake level fluctuations on access to tributary streams and on the prey base (primarily impacts on kokanee salmon). Low winter water levels are thought to be the primary cause for the decline of kokanee salmon in the lake since the late 1960's because the lower lake levels forced kokanee salmon to spawn in shoreline gravels that had high levels of fine sediments (PBTTAT 1998a).

The December 2000 Biological Opinion, emanating from Endangered Species Act formal consultation between the U.S. Fish and Wildlife Service and Federal water project managers (U.S. Army Corps of Engineers, Bonneville Power Administration, and U.S. Bureau of Reclamation), contained reasonable and prudent measures prescribed for fish passage at Albeni Falls Dam (USFWS 2000): "... evaluate the feasibility of reestablishing bull trout passage at Albeni Falls Dam. If the information from these studies warrants consideration of modifications to the Albeni Falls facility, then the U.S. Fish and Wildlife Service will work with the action agencies to implement these measures, as appropriate, or to reinstate consultation, if necessary." As it pertains to lake levels in Lake Pend Oreille, the Biological Opinion stated that "... action agencies shall continue the lake winter elevations study to promote kokanee spawning/recruitment along the shoreline of Lake Pend Oreille."

Albeni Falls Dam and its operations may have negatively influenced overwintering habitat for bull trout. The dam fragments habitat believed to have been historically occupied (Pratt and Huston 1993). Lake Pend Oreille winter drawdown generally begins after Labor Day. Minimum pool (625 meters [2,051 feet] mean sea level) is normally reached between November 15 and December 1, with a target date of November 15 to facilitate kokanee salmon spawning. The Corps of Engineers is participating in the study mentioned above, initiated by the Idaho Department of Fish and Game in 1996, to evaluate benefits of leaving the winter lake level 1.2 meters (4 feet) higher to enhance kokanee salmon spawning on the lake shoreline (PBTTAT 1998a).

Migration by post-spawning bull trout out of Gold Creek may be hindered as an indirect result of lake level fluctuations caused by Albeni Falls Dam. Peak runoff flows in Lake Pend Oreille tributaries generally occur before the Clark Fork River peaks and fills the

lake to its summer elevation (629 meters [2,062 feet] mean sea level). Consequently, coarse bedload material carried downstream by Gold Creek during high flow is deposited in an alluvial fan that has formed near the winter lake level elevation. In the summer, when Albeni Falls Dam brings the lake up to full pool, the alluvial fan is underwater and so cannot armor with silt (and other fine material) and grow vegetation. This water level change leaves a coarse and porous alluvial fan. In years with substantial runoff, when considerable bedload material is deposited at the mouth of the stream, late-season flow cannot maintain itself on top of the porous substrate and goes subsurface, creating difficult downstream migration conditions (PBTTAT 1998a). This scenario also occurs to some extent on several other tributaries.

Flathead Recovery Subunit

The Bigfork Dam on the Swan River, built after the power plant was first installed in 1902 and then later improved, probably blocked some bull trout migration from Flathead Lake into the Swan River. Hungry Horse Dam completely blocked the migration of bull trout from Flathead Lake into the South Fork Flathead River, beginning in 1953. Together, these two facilities reduced by nearly 50 percent the potential spawning and rearing habitat available to Flathead Lake bull trout (Fraley *et al.* 1989), although not all of that habitat was necessarily occupied.

Bigfork Dam blocked the Swan River drainage from Flathead Lake, but the ramifications of this loss to either system are not well understood. Anecdotal evidence from newspaper accounts around 1900 indicates that the mouth of the Swan River (or Big Fork as it was called then) was a very popular fishing spot in the spring (April to May), with apparent concentrations of bull trout and westslope cutthroat, and again in the fall (November), for mountain whitefish (Inter Lake, *in litt.*, 1900). It is not clear whether those fish migrated up the Swan River, were simply drawn there because of proximity to the mouth of the Flathead River, or were drawn there for foraging opportunities or other reasons. The Flathead Recovery Subunit Team presumes that limited genetic interchange between the Swan and Flathead River drainages probably occurred naturally because of thermal regimes. Bigfork Dam currently prevents introduced fish species, especially lake trout present in the Flathead River drainage, from migrating upstream into the Swan River drainage. This isolation is now an overall benefit to Swan Lake, which is treated as a separate bull trout core area.

Bigfork Dam operation has little direct influence on habitat occupied by bull trout. Fish are known to enter the diversion canal and may become trapped when flows are reduced during maintenance activities. PacifiCorp, the current owner of Bigfork Dam, alerts the Montana Fish, Wildlife and Parks before total dewatering of the canal so that fish can be captured and moved back into the river. The Federal Energy Regulatory Commission license for the dam expires in 2002, and the review process for relicensing is underway.

Although Bigfork Dam has eliminated connectivity of the Swan River drainage with the Flathead River drainage, the remainder of the Swan River drainage upstream of Flathead Lake remains intact. A large number of license applications for small hydropower projects in the Swan River drainage during the early 1980's stimulated a major study of their potential effects on fisheries. Had the construction of the 20 proposed microhydro projects proceeded, the estimated total losses of juvenile bull trout was calculated to be 11 to 84 percent in individual streams, or 1 to 8 percent of the drainagewide migratory bull trout production (Leathe and Enk 1985). Although none of the proposed projects has been built to date, future activity may occur at these sites.

Kerr Dam, constructed downstream of the natural outlet of Flathead Lake in 1938, blocked upstream fish passage from the lower Flathead River into Flathead Lake. In early biological surveys, surveyors noted that the falls downstream of Flathead Lake were not fish barriers but "... consist simply of a series of rapids, which do not interfere in the least with the free movement of fish. From this point down Flathead river possesses no falls or obstructions of any kind, and there is none in Clarke Fork until near Lake Pend d'Oreille" (Gilbert and Evermann 1895).

However, because of thermal conditions, routine bull trout migration probably did not occur historically between large lakes, such as Flathead Lake and upstream or downstream lakes. Bull trout are believed to be deterred from migrating upstream into relatively warm effluent waters from lakes during the fall. To date, only casual observation and genetic information support this hypothesis, but research with radio transmitters should be invaluable in further defining these migratory patterns. Regardless, historical habitat connectivity between lakes, which facilitated straying of fish, may have been important for providing genetic exchange and reestablishing

extirpated populations. Downstream movement of fish through Kerr Dam, into the lower Flathead River, has been demonstrated.

Kerr Dam has substantially modified the hydrograph of Flathead Lake, resulting in a longer full pool period in the summer months followed by a more rapid drawdown in winter. This water level scenario has impacted fisheries in the lake, in part by increasing shoreline erosion, both in the lake and in the lower end of the mainstem Flathead River where it enters the lake.

Hungry Horse Dam, completed in 1953, disconnected the South Fork Flathead River drainage from the main Flathead River system. The full ramifications of this loss to Flathead Lake, as well as to the South Fork Flathead River drainage, are not currently known. Preliminary genetic information suggests that, to a great extent, local bull trout populations using the three forks of the Flathead River segregated themselves naturally (Kanda *et al.* 1994). Therefore, the genetic diversity of Flathead Lake bull trout may have been reduced as a result of the dam construction. The bull trout core areas remaining upstream of the dam (Hungry Horse, Big Salmon, and Doctor Lakes) probably preserved the genes of South Fork Flathead River stocks that existed there historically, though some adaptive changes could occur. Hungry Horse Dam has benefitted the South Fork Flathead River in one way, creating an isolation barrier that has kept most of the South Fork Flathead River drainage free from nonnative fish species.

During recent decades, operation of Hungry Horse Dam has resulted in excessive drawdowns. Montana Fish, Wildlife and Parks has recommended a maximum drawdown of 26 meters (85 feet) based on biological considerations. Since 1988, this recommendation has been frequently exceeded, as the U.S. Bureau of Reclamation released water as required to meet the Pacific Northwest Coordinated Agreements for critical water years. Research has shown that reduced reservoir volume directly impacts the size of the aquatic environment for all organisms in the food web. Production of phytoplankton, zooplankton, and aquatic insects is reduced. And reduction in the food base reduces the prey available for predator species like bull trout. Reservoir volume can also be greatly reduced, forcing bull trout and other fish species into riverine habitats. Because of the steep slopes in the reservoir, volume is reduced by approximately 80 percent for drawdowns of 55 meters (180 feet). Biologists at the Montana Fish, Wildlife and Parks are concerned that some local bull trout populations in Hungry Horse

Reservoir may be damaged by continuing deep drawdowns (MFWP 1997a), though to date the overall population appears to have been stable.

Downstream of Hungry Horse Dam, summer releases of cold water may have historically impacted the behavioral patterns and food resources of native bull trout and cutthroat, as well as influenced behavior and distribution of lake trout that invaded the lower river in substantial numbers, beginning in the late 1980's. However, there is limited documentation on the nature of these complex interactions. In 1996, a selective withdrawal system was installed on Hungry Horse Dam. This selective withdrawal system now allows water to be drawn from different levels of the reservoir, allowing for some control of downstream water temperatures and a more natural thermal regime in the summer.

The December 2000 Biological Opinion contained reasonable and prudent measures for operations of Hungry Horse Dam (USFWS 2000): “[i]mplement operational measures at Hungry Horse Dam intended to minimize adverse effects of rapid and severe flow fluctuations on bull trout, including year-round minimum flows and ramping rates, and seasonal water management; conduct studies to monitor the adequacy of the constraints; and provide for modification of the operational constraints depending on study results. ”

The Biological Opinion includes specific flow targets and ramping rates and mandates implementation of the VARQ (or variable flood control) operations to better balance reservoir refill and downstream flow regimes to benefit bull trout and other native fishes (USFWS 2000).

Priest Recovery Subunit

The outlet control structure at the mouth of Priest Lake was constructed in 1951 by the State of Idaho and rebuilt in 1978 (PBTTAT 1998b). It is currently operated and maintained by the Avista Corporation under contract with the Idaho Department of Water Resources. The purpose of the dam is to hold up the summer water level in Priest Lake and the Thorofare for recreation. It is probably a fish barrier (upstream) during the time that it operates. Water release during the fall supplements downstream hydropower production. In winter, the dam's boards are removed; then there is free flow, and fish

passage is not obstructed. The effects of this dam on bull trout in the Priest River system are not currently well understood.

Summary (Dams)

Dams have been one of the most important factors in fragmenting and likely reducing the bull trout population of the Clark Fork Recovery Unit. Large hydroelectric dams permanently interrupted established bull trout migration routes, eliminating access from major portions of the tributary system to the productive waters of Lake Pend Oreille and Flathead Lake. Also, these dams impact the habitat that was left behind by affecting reservoir and lake levels, water temperature, and water quality. Smaller irrigation storage dams have further fragmented some of the previously connected watersheds and made it increasingly difficult for migratory bull trout to thrive. In some locations, most notably in the Swan, Hungry Horse, and Painted Rocks core areas, dams formed isolation barriers that have prevented the movement of nonnative fish.

Forestry Management Practices

Upper Clark Fork Recovery Subunit

Past forestry practices (road construction, log skidding, harvest in riparian areas, clear-cutting, and terracing) were often damaging to watershed conditions and were major contributing causes of bull trout decline (USFWS 1998). The effects of these practices included increased sediment in streams, increased peak flows, thermal modifications, loss of instream woody cover, and channel instability.

In the late 19th and early 20th centuries, mining activity and railroad construction resulted in vast amounts of timber being cut from what was to become the Deerlodge National Forest, in the upper Clark Fork River drainage. Between 1880 and 1918, approximately 50 million board feet were harvested annually from lands surrounding Butte, Montana (MBTSG 1995e, Periman 1994).

The crudely designed road system and skid trails from this era had lingering effects in some areas. In addition, a number of roads were built for other purposes, such as recreation and access to mining claims and private lands. Some of these roads need rehabilitation. Impacts from roads can include high sediment loads, channelization, and valley bottom restriction, resulting in loss of stream pool habitat and loss of riparian

vegetation. Separating the effects of logging roads from those of roads built for, or eventually used for, other purposes is difficult or impossible. Most of the major access roads across National Forest lands were initially built as logging roads.

On the Lolo and Deerlodge National Forests, percent surface fines (a measure of fine sediment) in streams is positively correlated to, among other variables, road densities (Kramer *et al.* 1991). Amounts of fine sediment measured in relatively undeveloped watersheds on the Lolo and Deerlodge Forests appear to be roughly half of those measured in managed watersheds on the same forests (Kramer *et al.* 1994). In the Swan River drainage, bull trout redd counts in spawning tributary watersheds were shown to be negatively correlated with the density of logging roads (Baxter *et al.* 1999).

Log drives down the Blackfoot and Clearwater Rivers had an unquantifiable, but significant, impact on aquatic habitat (MBTSG 1995b). Evermann (1901) wrote of the Blackfoot River:

“At Bonner, a mile or so above the mouth, is a very large sawmill, and the river for 3 or 4 miles above the mill is literally filled with logs which have been cut from the heavily timbered country through which the river flows and which were being floated down to the mill. . . . The mountains on either side are of highly metamorphic sandstone, and in most places densely timbered, but at the present rate of destruction it will not be many years until these magnificent forests are wholly destroyed, the mountains made barren, and the volume and beauty of the streams greatly diminished.”

Evermann (1901) also wrote about Rattlesnake Creek near Missoula (MBTSG 1996e):

“The banks are lined with a heavy growth of trees, bushes, and vines, but this promises not to remain very much longer. The larger timber is being cut off rapidly for wood, which is floated down the stream. At the time of our visit, at least 3 miles of the stream was literally filled with an immense jam of cordwood which had been started down, and above this we saw a constant line of sticks floating by to augment the large amount already in the jam. From the best information we could gain, all of this timber is being cut from Government land, and, whether by Government permission or not, it is certainly to be very greatly deplored.”

The Clark Fork River and Fish Creek were also used for log drives. Log drives were very damaging to fish and fish habitat at the time they occurred (MBTSG 1996e). Some of the impacts to the stream channel (eroded streambed, gouged banks, straightened channel, blocked side channels, and lost instream cover and woody debris) no doubt persist into the present (Sedell *et al.* 1991). Guth and Cohen (1991), in a caption for a photograph of a log jam at Bonner in 1899, state that sometimes logs being floated down river did not behave and that there were tremendous log jams. Dynamite was usually used to break up the logs that formed a jam, with predictable consequences to bull trout.

Many drainages in the Blackfoot River watershed have been extensively logged and have suffered damage from sedimentation. Silvicultural impairment to water quality has been noted in Belmont, Bear, Chamberlain, Deer, Dunham, Keno, Marcum, McElwain, and Richmond Creeks and in the North Fork Blackfoot and West Fork Clearwater Rivers (MDHES 1994). Pierce and Podner (2000) identify potential restoration projects, including improvements to road crossings and restoration of habitat related to impacts from forestry, on 64 streams or stream reaches throughout the Blackfoot River drainage.

Current forestry practices are more progressive, but the risk to bull trout recovery is still high because of the existing road systems and the lingering results of past activities. The Bitterroot National Forest has classified the condition of most watersheds on the forest into three categories: high risk, sensitive, and healthy. These categories are based on two major effects of management on watershed health: first, sediment yields from road construction and, second, increased water yields and peak flows from timber harvesting (Decker 1991). An analysis of the condition of the Bitterroot National Forest streams indicates that about one-third of the streams within the timber base are in healthy condition, one-third are in sensitive condition, and one-third are in high risk condition. Validation studies have found this model to be accurate 80 percent of the time. When the model is not accurate, the streams are usually in worse condition than predicted (Bitterroot National Forest 1991, 1992). On the Bitterroot National Forest, local bull trout populations with estimable numbers of individuals (10 or more fish larger than 12.7 centimeters per 305 meters; *i.e.*, number greater than 5 inches per 1,000 feet of stream) have been found only in drainages classified as healthy or sensitive. In the high risk

drainages, no bull trout have been found at 80 percent of the sites, and the other 20 percent contain very low numbers of bull trout (Clancy 1993).

Studies conducted on the Bitterroot National Forest have found that, based on population estimates, bull trout numbers are negatively correlated with the amount of fine sediment found in the stream (Clancy 1993; MBTSG 1995a). Weaver and Fraley (1993) found that the higher the percentage of the spawning substrate that is less than 0.6 centimeter (0.25 inch) in diameter, the lower the survival to emergence for embryos and fry of bull trout and westslope cutthroat trout. They also found evidence linking disturbance patterns in the preceding 10 years to sediment and water yield. McNeil core samples taken on the Bitterroot National Forest indicated a high average proportion of fine sediment (38 to 41 percent less than 0.6 centimeter) in both developed and undeveloped drainages (Clancy 1991), in large part due to the underlying granitic geological formations. Wolman pebble counts (an alternative method of analysis) in undeveloped watersheds in the Bitterroot National Forest generally indicated less than 25 percent fine sediment that was less than 0.6 centimeter (0.25 inch) in diameter (Decker *et al.* 1993).

Numerous streams are listed as having impaired water quality as a result of silvicultural activities in the middle portion of the Clark Fork River drainage (MDHES 1994). Studying fisheries habitat on the Lolo and Deerlodge National Forests, Kramer *et al.* (1991) found that percent of surface fines in streams is correlated to, among other variables, road densities. Amounts of fine sediment in relatively undeveloped watersheds on the Lolo and Deerlodge Forests appear to be roughly half of those measured in managed watersheds on the same forests (Kramer *et al.* 1994).

Lower Clark Fork Recovery Subunit

The Thompson River has a main logging haul road along one side of the stream and a county road along the other side of the stream for nearly its entire length. Many other streams have logging roads in the riparian zone.

Silviculture has been identified as a source of impaired water quality within the lower Clark Fork River drainage of Montana in Noxon Reservoir, Beaver, Elk, Fish Trap, Graves, Marten, Pilgrim, Prospect, Snake, and Swamp Creeks and in the Middle Fork Bull, Thompson, and Vermillion Rivers, to name some of the major drainages (MDHES

1994). Bull trout in Prospect Creek, the Vermillion River, and the Bull River (all considered local populations of bull trout) have been particularly impacted by past logging activities (Pratt and Huston 1993). Deposited sediment levels in the Bull River and Rock Creek are high enough to significantly reduce bull trout survival to emergence (Huston 1988; Smith 1993). While some of these streams do not currently contain bull trout, they are contributing waters and may prove important in recovery.

A number of stream segments within the Lake Pend Oreille Key Watershed in Idaho are also listed as water quality limited (PBTAT 1998a). Lightning, East Fork Lightning, Porcupine, Wellington, Grouse, North Fork Grouse, Gold, Granite, Trestle, Cocolalla, and Hoodoo Creeks and the Clark Fork and Pack Rivers are all listed for various “pollutants of concern,” including sediment, flow, habitat alteration, thermal modification, metals, and others. Many of these problems are related to past forestry practices.

In both Montana and Idaho, forest managers and regulators have recognized the potential impacts of forest management and have designed practices and rules (such as the Idaho Forest Practices Act and the Montana Streamside Management Zone Law; see Montana Department of State Lands [MDSL 1994]) to reduce impacts resulting from new operations. Best management practices include requiring “leave trees” in riparian areas, prohibiting use of equipment in or near streams, and controlling erosion from roads, trails, and landings.

Unique, unstable, or previously impacted areas may require best management practices that exceed Forest Practices Act minimum standards, up to and including no activity. The current minimum leave tree requirements in the Idaho Forest Practices Act may not adequately protect water temperatures in all cases (PBTAT 1998a). Forest Practices Act minimum standards may also not be adequate to maintain recruitment of large woody debris. The Panhandle Bull Trout Technical Advisory Team (PBTAT 1998a) cited Zaroban *et al.* (1997) as finding that forest practices rules were implemented 97 percent of the time in Idaho and that, when applied, they were 99 percent effective at preventing pollutants from reaching a stream. However, half the timber sales reviewed were still delivering sediment to streams. The impact of this sediment delivery was not assessed. These findings, updated recently by Hoelscher *et al.* (2001), illustrate the need to fully implement all applicable rules to prevent misapplication of any one rule from

delivering sediment to a stream. Federal land management agencies have adopted management guidelines (Inland Native Fish Strategy [or INFISH]) that exceed Idaho and Montana rules and that were designed to protect native fish populations. Impacts from previous forest activities (legacy effects) may limit current management options.

In lower reaches of Trestle Creek, large cedars have been removed from the stream riparian zone, reducing cover, shade, and recruitment of large woody debris (PBTTAT 1998a). Several small headwater streams on National Forest land were harvested, causing some localized stream channel downcutting and loss of some habitat complexity. Timber harvest on private lands still occurs, but is regulated by site-specific best management practices developed in 1994 by the Trestle Creek Local Working Committee.

Approximately 16 percent of the Granite Creek watershed has been harvested (PBTTAT 1998a). Modeling of flow responses to timber harvest suggests that the Granite Creek drainage is at moderate risk for increased peak flows. Past heavy timber harvesting in riparian areas and in some headwater areas has resulted in downcutting in several headwater reaches and accumulation of excess bedload material in downstream reaches.

Compared with other Pend Oreille watersheds, Lightning Creek has been logged extensively. Over 35 percent of the entire watershed has had timber harvest activity. Poor harvest practices in the past have led to severe bank, bed, and channel instability along most of the mainstem. Bedload deposition, peak flows, stream temperature, and intermittency are exacerbated problems in the Lightning Creek drainage. Lightning Creek (from Quartz Creek to its confluence with the Clark Fork River) is currently listed as a section 303(d) water body, not fully supporting beneficial uses. The listed pollutants of concern are sediment load, flow, and habitat alteration (PBTTAT 1998a). Bull trout redd counts in Lightning Creek have also exhibited a steady decline over the past 20 years (LPOWAG 1999).

The current impaired habitat condition in Grouse Creek is a function of early logging (USDA 1993) and natural geology. In the 1920's, Humbird Lumber Company constructed a logging railroad along the creek to provide easy access for harvesting large cedar and white pine trees in the drainage. By 1934, roughly 70 percent of the main

Grouse Creek drainage had been cleared and/or burned. Much of the mainstem of Grouse Creek (84 percent), including much of the land owned by Humbird, is now National Forest land (USDA 1993). Fifty-four percent of the land in the North Fork Grouse Creek drainage is in private (CPI Forest Products) or State (Idaho) ownership and is contained mostly in large tracts of land in the headwaters. In the lower reaches of North Fork Grouse Creek, much of the stream riparian zone is privately owned, either by individual homeowners or by CPI Forest Products.

In the East River, the only drainage in the lower Priest River watershed with a known bull trout population, 25 percent of the watershed has highly erodible soil types, and 41 percent is in the rain-on-snow sensitive zone. Road densities are high, averaging 5.1 kilometers per square kilometer (2.0 miles per square mile), and there are 2.2 road crossings per kilometer (1.4 road crossings per mile) of stream. The percentage of the watershed that has been logged is high, but has not been quantified (PBTTAT 1998b).

Flathead Recovery Subunit

Past forestry practices (road construction, log skidding, riparian tree harvest, clear-cutting, and splash dams) are also a major contributing cause of the decline of bull trout in the Flathead River drainage. The effects on habitat of these practices include increased sediment in streams, increased peak flows, hydrograph and thermal modifications, loss of instream woody debris and channel stability, and increased accessibility for anglers and poachers. Although the heaviest timber harvest occurred in the 1960's and 1970's, past forest practices will continue to impact bull trout because of the remaining road systems, increased water yields, and increased efficiency of water delivery to the streams that results in changes in the runoff timing. Impaired water quality as a result of silvicultural activities has been identified in 325 kilometers (202 miles) of 17 streams in the Flathead River drainage (MDHES 1994).

Extensive logging and road construction began in the Swan River drainage in the early 1950's (MBTSG 1996b). These activities, conducted on private and on State- and federally owned lands, progressively penetrated nearly all major tributary drainages up to the Bob Marshall and Mission Mountains Wilderness boundaries. The extent of timber harvest and road development varies considerably within and between ownerships in the Swan River drainage. The U.S. Forest Service and the Montana Department of Natural Resources and Conservation estimate that 20 percent and 27 percent of their lands,

respectively, have had some degree of timber harvest activity. Plum Creek Timber Company estimates that approximately 70 percent of its land has had some degree of harvest activity.

Riparian and adjacent timber harvest have affected stream channel and streambank cover, stability, and integrity in the Swan River. The Montana Department of Health and Environmental Sciences reports that 79 kilometers (49 miles) of six streams in the Swan River drainage suffer impaired water quality as a result of silvicultural activities (MDHES 1994).

In Swan River basin streams, monitoring of spawning and incubation habitat quality in major spawning tributaries suggests that there are relatively high sediment levels, even under natural conditions (MBTSG 1996b). Slight sediment increases may adversely impact survival of bull trout fry to emergence (Weaver and Fraley 1993). However, in the Swan River drainage, natural variation in sediment levels occurs between streams, largely because of geological and geomorphic differences, and this variation complicates analysis of the effects of human activities on sediment in streams (MBTSG 1996b).

Research conducted by Plum Creek Timber Company suggests that bull trout spawning and distribution in the Swan River is primarily a function of geomorphology and patch size. Bull trout occur mainly in the larger watersheds, that is, those over 2,000 hectares (5,000 acres) (Rieman and McIntyre 1995; Watson and Hillman 1997). Preliminary investigations comparing bull trout spawning locations to riparian land types suggest that bull trout tend to spawn in locations exhibiting specific riparian land types and that the degree of spawning in any tributary may be directly related to availability of specific land types (Watson and Hillman 1997).

Another analysis indicates that Swan River tributaries draining large areas of roadless lands are disproportionally important for the persistence and recovery of westslope cutthroat trout, bull trout, and amphibians (Frissell *et al.* 1995). Road density in other drainages is highly correlated with the proportion of a watershed that has been logged (Hauer and Blum 1991). Baxter *et al.* (1999) found that changes in bull trout redd numbers with time in Swan River tributary streams (1980's and 1990's, as reported by Montana Fish, Wildlife and Parks) was negatively correlated with road density, and they

suggested that prior land use (primarily logging and associated road building) may have negatively affected bull trout populations. Frissell *et al.* (1995) and Trombulak and Frissell (2000) also state that habitat deterioration and the introduction of nonnative fishes that threaten native aquatic biota are both associated with roads and the wide range of human activities that roads encourage or allow.

Research by Butler *et al.* (1995) and Spencer (1991a) indicates that a seasonal deficit in dissolved oxygen has occurred in the deeper portions of Swan Lake in recent years, a phenomenon not observed in earlier surveys. Stable isotope analysis was used to trace the source of the oxygen deficit to input of organic carbon from the Swan River into the lake during spring runoff and further suggested that recently logged tributaries are one important source of organic carbon (Butler *et al.* 1995). Given the potential consequences to bull trout habitat, this phenomenon clearly merits close monitoring and further investigation.

Timber harvest in the South Fork Flathead River began during the 1950's and will probably continue into the future (MBTSG 1995d). Differences are obvious when managed lands are compared with the Wilderness Area upstream. Managed lands present higher risk to bull trout, but the percentage of these lands is a relatively small portion of the entire South Fork Flathead River drainage.

Many problems result from road systems around Hungry Horse Reservoir (MBTSG 1995d). Logging access roads up most of the major tributaries on the managed lands are located in the riparian zone. Streams have been impacted by increased water yields from timber harvest and old road systems (Weaver 1993). The U.S. Forest Service and Montana Fish, Wildlife and Parks are constantly evaluating roads, and improvements are being proposed and implemented.

Priest Recovery Subunit

Approximately half of the Upper Priest Lake drainage basin has soil types that are classified as highly erodible, ranging from 15 percent in the Lime Creek drainage to 86 percent in the Rock Creek drainage (PBTAT 1998b). Half or more of many of the watersheds lie in the rain-on-snow sensitive zone, making them prone to flashy runoff patterns. These characteristics predispose portions of the watershed to habitat degradation when ground-disturbing activities occur. East-side streams are higher

gradient, are bedrock controlled, and generally transport fine sediment through their systems. West-side streams are lower gradient and have a greater accumulation of fine sediment. These characteristics are of special concern because the Upper Priest Lake watershed is the most intact habitat remaining for bull trout in the Priest River basin.

In the Lime Creek subwatershed, portions of the Hughes Fork and Trapper Creek have high road densities, exceeding 3.5 kilometers per square kilometer (1.4 miles per square mile) of land, with many of the roads constructed in the riparian zone (PBTTAT 1998b). Lime Creek has 2.2 road crossings per kilometer (1.4 road crossings per mile) of stream, and several other drainages exceed 0.8 crossings per kilometer (0.5 crossings per mile). Logging has occurred in 5 percent of the Upper Priest River watershed, 18 percent of the Hughes Fork, and 55 percent of Trapper Creek (PBTTAT 1998b). Logging in the Trapper Creek drainage in the 1990's was conducted under site-specific best management practices, with primary emphasis on reducing any contribution of fine sediment to stream channels.

In tributaries draining directly into Priest Lake, the portion of the watershed having highly erodible soils ranges from 10 to 30 percent, with half or more of most watersheds in the rain-on-snow sensitive zone (PBTTAT 1998b). Road densities tend to be lower (less than 3.0 kilometers per square kilometer [1.2 miles per square mile]) in the watersheds where bull trout spawning and rearing still occur (Caribou, Lion, Two Mouth, Indian, and Granite Creeks). Major portions of many watersheds have been logged, including 23 percent of Caribou Creek, 35 percent of Lion Creek, 52 percent of Two Mouth Creek, 36 percent of Indian Creek, and 75 percent of Soldier Creek (PBTTAT 1998a).

Five stream segments within the Priest Lake basin were listed as water quality limited segments on Idaho's 1996 section 303(d) list under the Clean Water Act, including Kalispell, Reeder, Tango, Trapper, and Two Mouth Creeks (PBTTAT 1998b). Streams listed are considered as not fully supporting designated or existing beneficial uses. Many streams in the basin fail to meet temperature standards for salmonid spawning and specific temperature criteria for bull trout protection. The State is currently in the process of determining beneficial uses and support status for water bodies throughout the basin.

Riparian logging historically removed stands of mature cedar in some Priest River drainages. These cedars have often been replaced by early successional species, such as alder in thickets, resulting in decreased recruitment of large woody debris to the stream channels, reduced shading, and lower quality habitat for bull trout. In addition, the Sundance fire, started by accident from a slash burn, burned much of the east side of the drainage.

Culverts on forest roads have been identified as potential fish passage impediments and are found on Hughes Fork, Gold Creek, Granite Creek, South Fork Granite Creek, Kalispell Creek, and the Middle Fork East River (PBTTAT 1998b).

Summary (Forestry Management Practices)

For over 100 years, forestry practices have caused major impacts to bull trout habitat throughout the Clark Fork Recovery Unit. And because forestry is the primary landscape activity in the basin, the impacts have been widespread. Primary effects of timber harvest, such as road construction, log skidding, riparian tree harvest, clear-cutting, splash dams, and others, have been reduced by the more recent development of more progressive practices. However, the legacy effects of the past century have included lasting impacts to bull trout habitat, including increased sediment in streams, increased peak flows, hydrograph and thermal modifications, loss of instream woody debris and of channel stability, and increased accessibility for anglers and poachers. These impacts will continue and are irreversible in some drainages. In addition, insufficient funding to maintain the existing road system has resulted in maintenance deficiencies, even on some well-designed roads. Consequently, impacts of the existing road system are compounded.

Livestock Grazing

Upper Clark Fork Recovery Subunit

The first cattle in this recovery subunit were brought to the Deer Lodge Valley in the 1850's. By the early 1860's, thousands of cattle were grazing in the Deer Lodge and Flint Creek Valleys. Rangelands in the 1880's were commonly overstocked and overgrazed (Periman 1994).

Grazing, both current and historical, causes a major impact on fisheries in some portions of the upper Clark Fork River basin (MBTSG 1995e). Grazing directly affects streams by reducing bank stability and riparian vegetation. These reductions, in turn, increase sediment loads and water temperatures and reduce instream water quality.

Historical grazing use of the Blackfoot River drainage may have been significant in causing the decline of bull trout. Grazing impacts have decreased in recent years as a result of cooperative efforts between landowners and agencies, but that effort needs to continue. Pierce and Podner (2000) identified 30 streams or stream reaches in the Blackfoot River watershed that are still impacted by grazing practices or cattle feedlots that need to be improved.

Lower Clark Fork Recovery Subunit

Some isolated areas in this recovery subunit have been impacted by grazing (particularly in the lower Flathead River portion of the drainage, Thompson River, Elk Creek, Pilgrim Creek, and portions of the Bull River), but overall grazing is not one of the high risk factors (MBTSG 1996a).

Livestock grazing occurs in the Lake Pend Oreille basin but is not prevalent. Following the 1910 fires, sheep grazing was a common use of uplands, but is no longer significant (PBTTAT 1998a). Some negative impacts from livestock are occurring in the lower Priest River and in portions of the mainstem of the East River (Rothrock 2000).

Use of land for agriculture has been ongoing for many years in the Pack River drainage (PBTTAT 1998a). Grazing occurs in the lower two-thirds of the watershed. Much of the Pack River is considered open range. Crop production occurs in the watershed from below the Highway 95 bridge downstream. Large cedar trees and riparian vegetation were removed years ago. Impacts to the stream channel in lower reaches have occurred over a long period of time and continue to be a factor today in degrading habitat condition and decreasing complexity.

Effects of livestock grazing on bull trout recruitment are a significant threat in Twin Creek, a mainstem Clark Fork River tributary just upstream of Lake Pend Oreille (PBTTAT 1998a). In the early 1960's, the lower reach of Twin Creek was channelized, significantly reducing stream length and creating a reach with high width-to-depth ratios

and poor habitat. The channel has not recovered, and grazing has continued to negatively impact the stream and riparian area until recently. A restoration project is now underway.

Flathead Recovery Subunit

The overall risk to bull trout from livestock grazing in this area is low (MBTSG 1995c). There are only a limited number of public allotments, and most of the privately grazed livestock is on the valley floor, where spawning and rearing seldom occur. The Stillwater and Whitefish River watersheds are most heavily affected.

Livestock grazing also occurs near the Swan River and the lower portions of some important tributary drainages (MBTSG 1996b). There is some risk to bull trout, but, at present, grazing is not considered to be a significant factor for bull trout conservation in this drainage.

No grazing occurs in the South Fork Flathead River drainage above Hungry Horse Dam, except for stock used by outfitters and recreationists (MBTSG 1995d). In some instances, recreational stock grazing does impact water quality and streambank stability. The trail system in the wilderness is extensive, and grazing problems are created in areas of high use.

Priest Recovery Subunit

Livestock grazing is not a major problem in the Priest River basin, especially in the watersheds where bull trout spawning and rearing occur (PBTTAT 1998b).

Summary (Livestock Grazing)

Livestock grazing is most widespread and has had the greatest impact to bull trout in the upper portion of the Clark Fork Recovery Unit. Grazing is of particular concern where allotments are located along spawning and rearing streams. While severe site-specific problems may occur, livestock impacts are generally being reduced through better management practices on public and, to a lesser extent, private lands. Livestock grazing does not represent a major threat to bull trout recovery in this recovery unit, but where problems exist, they can be severe.

Agricultural Practices

Upper Clark Fork Recovery Subunit

Impacts to bull trout from agriculture include dewatering, irrigation entrainment, reduced water quality, loss of riparian habitat, and increased water temperature. Water diversions significantly threaten the restoration of bull trout in many portions of the upper Clark Fork River drainage (MBTSG 1995e). Diversions may make fish migration upstream impossible unless passage has been incorporated or added to the design, and downstream migrants may be pulled through unscreened irrigation diversions (entrained) and displaced from stream habitat into ditches where they become lost to the system. In addition, many diversions are simply bulldozed gravel dikes that are frequently a major source of stream instability, leading to bank erosion and channel degradation. Diversions are a particular problem in the Little Blackfoot River drainage, in the upper portions of the Clark Fork River drainage, in the Flint Creek drainage, and in the Bitterroot River drainage (MBTSG 1995a 1995e). The Rock Creek drainage contains relatively few diversions. In both Rock Creek and the Blackfoot River drainage, numerous diversion structures have been renovated to provide fish passage and eliminate entrainment (Pierce and Podner 2000). However, more work needs to be done.

Agriculture also impacts bull trout when farming practices encroach on riparian zones. Such encroachment is a widespread problem in the upper Clark Fork River basin (MBTSG 1995e). Loss of riparian vegetation can result in bank destabilization, warmer water temperatures, and increased sediment loads, among other problems. Agriculture can also impact water quality through increased nutrients. For example, feedlots are known to negatively impact water quality. In some areas of the Upper Clark Fork Recovery Subunit, streams have been channelized for agricultural purposes.

Poor water quality, poor habitat, and depressed fisheries in Nevada Creek and, to some degree, the Blackfoot River below Nevada Creek can be attributed to agricultural practices in the Nevada and Ovando Valleys (MBTSG 1995b). Alteration of stream flows below Nevada Creek Reservoir, including dewatering of the stream channel, has negatively impacted the fishery. Irrigation return flows add excessive amounts of nutrients and sediment and increase water temperatures (Pierce and Peters 1990). McGuire (1991) found evidence of persistent nonpoint source pollution (nutrient enrichment, sedimentation, and elevated water temperatures) in the Blackfoot River

below the confluence of Nevada Creek. Despite substantial progress in this area, irrigation impacts and instream flow problems continue to plague 23 streams or stream reaches in the Blackfoot River watershed (Pierce and Podner 2000).

Seasonally, there are diversion barriers on the upper mainstem Clark Fork River and a large diversion on Warm Springs Creek. Most of the diversions in the upper basin are at least seasonal barriers to fish passage (MBTSG 1995e).

The Upper Clark Fork River drainage contains approximately 626 kilometers (389 miles) of chronically dewatered streams and 14 kilometers (9 miles) of periodically dewatered streams (MFWP 1991). Most of the water diverted from streams for irrigation in this basin is used for raising feed for cattle. Water is diverted from streams to irrigate over 40,500 hectares (100,000 acres) of land upstream of Turah (USGS 1993). Only a handful of the tributary streams located upstream of Rock Creek contain surface flow on a year-round basis. Some other tributary streams contain only warm irrigation return flows in late summer. Flint Creek, the Little Blackfoot River, and the Clark Fork River are among the most impacted (MBTSG 1995e).

Most of the large tributary streams on both sides of the Bitterroot Valley north of Darby are heavily diverted. Some diversions that may be barriers to fish passage also occur on the mainstem Bitterroot River. Approximately 104 kilometers (65 miles) of rivers and streams are estimated to suffer from chronic dewatering in the Bitterroot River drainage (MBTSG 1995a), including North and South Bear Creeks, Big Creek, the Bitterroot River from Corvallis to Stevensville, and Blodgett, Burnt Fork, Carlton, Kootenai, Lolo, Lost Horse, Mill (tributary to Lolo Creek), O'Brien, Rock, Skalkaho, South Fork Lolo, Sweathouse, Sweeney, and Tin Cup Creeks (MFWP 1991).

Dewatering of streams restricts the distribution and movement of bull trout in tributary streams and is probably one of the primary causes for the decline of migratory bull trout from the mainstem Bitterroot River (Nelson 1999). Dewatering also contributes to thermal problems in the tributaries and the mainstem river. Dewatered areas are a barrier, and the complexity of diversions and over-appropriation of water in the Bitterroot Valley severely complicate the potential for restoring bull trout (MBTSG 1995a).

Agricultural impacts to water quality have been noted in 311 kilometers (193 miles) of tributary streams to the Blackfoot River (MDHES 1994). Chronic dewatering is found in 133 kilometers (82.4 miles) of 18 streams within the Blackfoot River drainage (MFWP 1991).

Passage at an irrigation diversion on Dry Creek, a Clark Fork River tributary near Superior, is currently blocked. The entire reach of stream below the diversion goes dry during the irrigation season (MBTSG 1996e). This condition effectively eliminates any potential for spawning and rearing in Dry Creek. In nearby drainages, such as Fish and Cedar Creeks, some lower stream reaches dry up seasonally. However, during the spring runoff, migratory bull trout move upstream into the perennial reaches and survive there to spawn later in the fall. If the Dry Creek irrigation dam were improved to allow fish passage, the potential exists for migratory bull trout spawning and rearing.

Rieman and McIntyre (1993) concluded that temperature is a critical habitat characteristic for bull trout. Temperatures in excess of 15 degrees Celsius (59 degrees Fahrenheit) are thought to limit bull trout distribution in many systems (Fraley and Shepard 1989; Brown 1992). The causes of the thermal problems include dewatering, lack of riparian vegetation to shade the water, and warm irrigation return flows entering tributary streams and the main river.

The upper mainstem Clark Fork River has elevated water temperatures considered detrimental to bull trout from about Perkins Lane Bridge downstream (MBTSG 1995e). For the 92-day period from June through August 1992, water temperatures exceeded 20 degrees Celsius (68 degrees Fahrenheit) on 61, 36, 49, and 35 days near Warm Springs Creek, Deerlodge, Gold Creek, and Turah, respectively. The maximum temperature was over 25 degrees Celsius (77 degrees Fahrenheit) near Warm Springs Creek, Gold Creek, and Turah (USGS 1993). Long reaches of the river between major tributaries exceed the preference range of bull trout because only a few of the major tributaries maintain sufficient flow of cold water in summer to have a cooling effect on the river. Most of these colder tributaries are located from Rock Creek downstream. How much of this condition is natural is unknown, but land and water use have probably exacerbated the natural condition.

In the Little Blackfoot River and Flint Creek, irrigation diversions and return flows result in elevated water temperatures (MBTSG 1995e). The consensus of the biologists and hydrologists working in the area is that water temperatures probably exceed the tolerance limits for bull trout in portions of many of these streams.

Within the Blackfoot River drainage, elevated temperatures are found in Nevada, Douglas, Nevada Spring, Cottonwood (near Helmville), Willow (near Sauerkraut Creek), Union, and Elk Creeks and in the Clearwater River (MBTSG 1995b). Summer water temperatures in Nevada Creek and the Blackfoot River below Nevada Creek were consistently above levels considered optimal for trout (Pierce and Peters 1990). Probable causes of elevated temperatures are grazing in riparian zones, reduced riparian health, chronically low summer flows, warm water releases from Nevada Reservoir, and irrigation return flows.

Elevated summer temperature appears to be a habitat problem in many tributaries and in portions of the mainstem Blackfoot River, but thermal conditions may not act as a migration barrier. Preliminary data indicate that, in the Blackfoot system, fish migration primarily occurs before warm water temperatures occur (Swanberg 1997). Further research is needed to determine the specific causes of temperature increases and the impact on bull trout.

Temperatures in the lower Bitterroot River and some of the tributaries meet or exceed 21 degrees Celsius (70 degrees Fahrenheit) during the summer months (Spoon 1987). This evidence suggests that there may be thermal problems that limit bull trout distribution in the Bitterroot River and in the lower reaches of some of the tributaries (MBTSG 1995a). The probable causes of the thermal problems include dewatering, lack of riparian vegetation to shade streams, warm irrigation return flows entering the tributary streams and river, and warm water releases from irrigation reservoirs and private fish ponds. Further research is needed to determine the specific causes of temperature increases in the mainstem Bitterroot River and the impact on bull trout.

Lower Clark Fork Recovery Subunit

In portions of the lower Flathead River drainage downstream of Kerr Dam, agricultural impacts may have been the primary cause of the loss of bull trout (MBTSG 1996e). From the 1910's until the mid-1980's, stream dewatering for irrigated agriculture

was considered a major fisheries problem in the Flathead River portion of the drainage. In 1985, the Confederated Salish and Kootenai Tribes were able to establish instream flows on streams that are impacted by the Flathead Agency Irrigation District. Although stream dewatering is no longer a major problem in this portion of the drainage, agricultural impacts to water quality remain.

The Flathead Agency Irrigation District, which was constructed beginning about 1910, broke the connection between many of the tributary streams and the lower Flathead River (MBTSG 1996e). Many tributary streams also contain dams, including Crow, Mission, Post, and Dry Creeks. All of these streams, except Crow Creek, are known to have been historical bull trout spawning and rearing streams. The impacts of these tributary dams vary depending on the situation. Some have blocked migratory fish from spawning tributaries, and some have created isolated local populations of bull trout. Each case is unique, and the effects should be evaluated on a case-by-case basis. In total, construction of irrigation diversions, canals, and dams on the tributaries eliminated access to more than 100 kilometers (62 miles) of tributary spawning and rearing habitat in the lower Flathead River watershed (Cross and DosSantos 1988), though some of the watershed may have been unoccupied by bull trout because of natural conditions.

In the lower Flathead River drainage, three irrigation storage reservoirs are now considered to hold isolated fragments of the local bull trout population(s) that once occupied the Mission Creek drainage. Tabor Reservoir (St. Marys Lake) is an irrigation storage facility (approximately 111 surface hectares [274 surface acres] when full); its spawning and rearing habitat is compromised because the only tributary stream (Dry Lake Creek) is completely flooded at full pool and mostly inaccessible due to gradient barriers at minimum pool (MBTSG 1996e). Spawning can only occur when there are suitable lake water levels to inundate passage barriers while still exposing an adequate length of stream. Rearing habitat becomes lentic (without current) during late spring and summer because the entire accessible portion of the stream is inundated at full pool. The lack of spawning and rearing habitat raise concerns about the long-term viability of this local population (Hansen and DosSantos 1993a). Water enters the system from the Upper Jocko canal and may translocate some bull trout from that system. Appropriate dam operations are vital for continued successful reproduction in this local population. The outflow waters are transported through the Dry Creek irrigation ditch system and no

longer have a functional connection to Mission Creek. Reconnection of this fragmented population to its historical source (Mission Creek) is unlikely.

In Mission Reservoir (approximately 117 hectares [289 acres] when full), another small natural lake (terminal glacial moraine) that was dammed, the lake environment is a limiting component of bull trout habitat due to extreme drawdowns for irrigation (Hansen and DosSantos 1993b). The greatest risks to bull trout in this system are hybridization with brook trout, washout of adult fish through the dam, overwinter stress from deficiencies in reservoir habitat, and illegal harvesting (Hansen and DosSantos 1993b). A higher minimum pool was recently negotiated in Mission Reservoir, but further research is necessary to determine the extent that drawdown affects the bull trout in this local population (MBTSG 1996e).

McDonald Reservoir (approximately 100 hectares [250 acres] when full) on Post Creek, a Mission Creek tributary, is also used for irrigation storage. It supports a now isolated, local population of migratory bull trout. This local population is believed to be more secure than those at Tabor and Mission Reservoirs because of more adequate pool volume, a higher-quality spawning stream, and the absence of brook trout. Dam operations have a minor negative impact on this local population (MBTSG 1996e).

The water management operations of the Flathead Agency Irrigation District are severely limiting to the potential recovery of the local population(s) of bull trout in the Mission Creek complex and the Jocko River. The isolated populations in the three reservoirs on Mission Creek will probably never become secure, but with better management strategies, drawdown limits, and instream flow protection, the chances of persistence would increase (MBTSG 1996e).

Elevated temperatures appear to limit bull trout habitat in several tributaries and in the lower Flathead River below Flathead Lake. In the lower Flathead River, summer water temperatures approach 24 degrees Celsius (75 degrees Fahrenheit) (DosSantos *et al.* 1988). Further research is needed to determine the specific causes of thermal problems and the resulting impact on bull trout. In the lower Flathead River, warm water temperatures may be a natural occurrence, the result of waters warming in the shallow South Bay of Flathead Lake. In addition, land use practices in the Mission Valley have

probably elevated temperatures from historical temperature regimes in the lower Flathead River and its tributaries (MBTSG 1996e).

Almost all streams entering the middle reaches of the Clark Fork River (or reservoirs) from the Bitterroot Mountains (south side of the drainage) have naturally occurring intermittent reaches. This intermittency influences the streams' usefulness to bull trout (Pratt and Huston 1993). Intermittency also occurs in streams entering from the north. Intermittency has been exacerbated by both natural and human-caused events. Historical natural events include a major forest fire in 1910 and periodic drought. Human disturbance is primarily from mining, silviculture, and agriculture practices.

The Clark Fork River drainage in Montana, downstream of Thompson Falls Dam, contains only about 10 kilometers (6 miles) of chronically dewatered streams (MFWP 1991); none of these streams are important for bull trout. While the *1994 Montana 305(b) Report* (MDHES 1994) identifies several streams that suffer from impaired water quality resulting from agricultural activities, overall, agricultural impacts to bull trout are minor in this portion of the drainage.

Agricultural impacts to the lower drainages entering Lake Pend Oreille are minor and mostly confined to the Pack River watershed (PBTTAT 1998a). Some low-level impacts may also be occurring in the lower Priest River and in portions of the East River mainstem.

In Hoodoo Creek and Cocolalla Creek, two large drainages that enter the Pend Oreille River downstream of Lake Pend Oreille, bull trout are believed to have been present historically. Both drainages have been subjected to extensive agricultural impacts, including cropland conversion, dredging and straightening of the streams, draining of wetlands, loss of riparian vegetation, and temperature and sediment impacts (PBTTAT 1998a). On Cocolalla Creek, a manmade barrier downstream of Round Lake eliminates access for migratory fish. The cumulative impacts of these and other human activities have eliminated bull trout from these watersheds.

Flathead Recovery Subunit

Agriculture impacts to water quality in the Flathead Recovery Subunit occur primarily in the lower reaches of the upper Flathead River, Ashley Creek, and the

Stillwater River (MBTSG 1995c). Though the latter two streams are not generally occupied by bull trout, they do contribute to the water quality degradation of the lake and river system. The Montana Department of Health and Environmental Sciences state that 206 kilometers (128 miles) of streams in the Flathead River watershed suffer impaired water quality as a result of agricultural activities (MDHES 1994). Montana Fish, Wildlife and Parks has identified 31 kilometers (19 miles) of streams that are chronically dewatered and 145 kilometers (90 miles) of streams that are periodically dewatered as a result of irrigation withdrawals (MFWP 1991). Not all of these stream segments are occupied by bull trout. The impacts of agriculture on bull trout in this watershed may have been more significant historically than they are at the present time. Current impacts to bull trout from agricultural activities in the Flathead River basin are believed to be low.

Relatively few irrigation diversions occur in this region of Montana. Most of the irrigation water is withdrawn through the use of pumps, so diversions are not a major problem for bull trout.

The outlet streams from the large glacial lakes in Glacier National Park are naturally too warm in the summer to attract bull trout. The valley portions of the Stillwater and Whitefish Rivers also exceed bull trout preference ranges. The extent to which the current thermal regime in these rivers is human-caused is unknown since no data exist prior to 1900.

There is no agricultural development in the South Fork Flathead River drainage upstream of Hungry Horse Dam (MBTSG 1995d) and relatively little in the Swan River drainage (MBTSG 1996b).

Priest Recovery Subunit

Agriculture is not a major land use in the Priest River basin and is not a major problem, especially in the watersheds where bull trout spawn and rear (PBTAT 1998b).

Summary (Agricultural Practices)

Agricultural impacts to bull trout in the Clark Fork Recovery Unit are primarily a result of water demand. Diversions for irrigation can destabilize stream channels, severely interrupt migratory corridors (blockages and dewatering), and, in some cases,

entrain fish, which are then lost down the ditches. A second, and potentially more serious, issue is the increased water temperature regime common to streams that are heavily diverted and/or subject to receiving irrigation return flows. All of these problems occur and are widespread in the Clark Fork Recovery Unit. Some of the worst impacts are in the upper drainages, and these problems are then transmitted to the receiving waters downstream. Overall, agricultural practices represent a significant threat to bull trout recovery in this recovery unit.

Transportation Networks

Upper Clark Fork Recovery Subunit

Two railroads, a secondary highway, and Interstate 90 have been constructed through the Clark Fork River Valley (MBTSG 1995e). These intrusions have adversely affected stream channels that provided habitat for bull trout. Railroad and highway construction have also affected some tributary streams.

Some railroad and highway stream crossings are fish passage barriers. In addition, some streams were channelized during road and railroad construction, resulting in shortening of stream channels, increased erosion, higher water velocities, and loss of fish habitat. These developments probably had a major impact at the time they were constructed, and the impacts continue today.

Beginning in the 1880's, railroads were built all across Montana. By 1940, two rail lines between Butte and Missoula followed the Clark Fork River (MBTSG 1995e). There were also spurs between Drummond and Phillipsburg along Flint Creek, from Butte to Georgetown along Warm Springs Creek, and along the Little Blackfoot River (Periman 1994). Although most of these railroads are no longer operating, they had a significant impact on these rivers because of the modifications that were made to stream channels during railroad construction.

Major road development began in the 1860's with the construction of the Mullan Trail (Periman 1994). At the present time, all of the major drainages have paved roads, and most of the minor drainages have roads of varying types. The Clark Fork River has major transportation corridors on both sides of the river: a four-lane interstate highway and a railroad. A considerable amount of the river has been channelized.

Some culverts in the upper Clark Fork River drainage are barriers to fish passage. However, in some areas, impassable culverts assist in keeping introduced fish out of a watershed. Culvert barriers are not considered a significant threat to bull trout in the Upper Clark Fork Recovery Subunit at this time, except in localized instances. Historically, impassable culverts may have been a major problem for migratory bull trout in the Blackfoot River drainage. However, in recent years, some of the most problematic culverts have been replaced, including culverts in Bear, Belmont, Blanchard, Chamberlain, and Rock Creeks. Problems remain, in particular in the upper Blackfoot River drainage (*e.g.*, North Fork Cottonwood Creek); see Pierce and Podner (2000).

A major highway corridor parallels much of the mainstem Blackfoot River. Potential spills of toxic substances are a concern along all transportation corridors (MBTSG 1995b). Road maintenance may impact bull trout when road sanding or deicing materials enter the stream or when road grading increases stream sediment loads.

Several canyon meanders of the East Fork Bitterroot River were straightened for U.S. Highway 93, and the location of the highway remains problematic along much of the Bitterroot River (MBTSG 1995a). The Skalkaho Highway is located on a major geologic fault, is poorly designed, and drains large sediment loads into the adjacent streams. The St. Regis River has experienced severe impacts from channelization due to interstate highway and railroad construction (MBTSG 1996e).

Lower Clark Fork Recovery Subunit

The mainstem Clark Fork River is a major transportation corridor. Nearly 296 kilometers (184 miles) of 14 streams are reported to suffer water quality impairment because of highway, road, and bridge development in the mid-reaches of the Clark Fork River drainage (MDHES 1994). In the Lower Clark Fork River drainage, two core areas (Prospect Creek and the Bull River) have major roads that parallel the streams (MBTSG 1996a). The railroad along the lower reaches of the Jocko River restricts the floodplain and, in some locations, forms a dike.

Roads and railroads in the Lake Pend Oreille basin have been constructed to provide access for timber harvest, mining, and recreation and to provide infrastructure for urban development, travel, and commerce. Many larger stream drainages within the

Lake Pend Oreille Key Watershed, including the lower Priest River and the East River, have roads of varying quality that run parallel to the channels (PBTTAT 1998a).

On steep or unstable slopes, roads that are poorly planned, constructed, or maintained have washed out or triggered large debris flows that have filled stream channels with sediments and resulted in instability even decades after the roads have been abandoned (PBTTAT 1998a). Such roads will continue to degrade until they are identified and either upgraded or properly abandoned. Many roads were originally built for mining or timber harvest purposes and were subsequently taken over by counties or road districts for public use and residential access. Maintenance is often infrequent and not adequate to limit sediment delivery to streams.

Construction of new roads may result in sedimentation if adequate sediment delivery mechanisms are not considered. In Lightning Creek, a 98 percent increase in mass wasting occurred in third-, fourth-, and fifth-order streams after logging roads were constructed (PBTTAT 1998a). New road construction in the Cabinet Mountains portion of the basin poses a threat of mass wasting because altered hydrology can increase the slippage of glacial tills perched on bedrock slip-planes (PBTTAT 1998a).

The Lightning Creek watershed has an extensive forest road system. Road erosion, road failure (slides), and culvert blockage have been large contributors of bedload and sediment to Lightning Creek (PBTTAT 1998a). Poor road location and design (built on wood slash fill) in many areas have resulted in slides, slumps, and increased peak runoff flows; the potential for road failure is compounded by the fact that, geologically, this watershed is already conducive to natural mass wasting. Landslide activity in Lightning Creek is strongly related to both road and road/clear-cutting impacts, and slide erosion rates are 88 times greater for roaded areas and 97 times greater for road/clear-cut areas than for unmanaged forest areas (PBTTAT 1998a). In 1989, of the total amount of slide material volume measured (246,000 cubic meters [22,533 cubic yards]) in Lightning Creek, road and road/clear-cutting impacted slides were 58 percent of all slides and 75.5 percent of the total slide volume (PBTTAT 1998a). Most of these slides (75 percent) originated on road fill slopes or immediately below the road.

Road construction has also resulted in loss of riparian forest canopy and loss of recruitment of large organic debris to the stream. The main Lightning Creek channel is

highly impacted and unstable in most reaches (PBTTAT 1998a). Lower reaches of this stream exhibit severe bedload deposition. Bedload deposition creates migration barriers (intermittency) in many locations, barriers that may have shifted timing of bull trout migration in Lightning Creek. The Lightning Creek channel, near its mouth, is overly widened and extensively braided. The channel in this area continues to carve a new course during high spring flows each year. The railroad and highway bridges on lower Lightning Creek may be contributing to the bedload aggradation problem by constricting flows and creating a deposition area. Past road repair/maintenance in Lightning Creek has been troublesome and costly. Repair costs for the 1980 road failure/slide event alone were more than \$875,000 (PBTTAT 1998a).

Existing information on watershed conditions in East Fork Lightning Creek indicates that the system is in poor condition as a result of flooding, road construction and the subsequent failures, and logging activity (PBTTAT 1998a). A logging road parallels East Fork Lightning Creek for much of the lower 3 kilometers (2 miles), and there are several stream crossings within the drainage. The Lightning Creek drainage has one of the highest precipitation rates of any location in Idaho, and serious flooding as a result of rain-on-snow events or spring melt has been documented over 12 times since the 1890's (PBTTAT 1998a). Currently, portions of the road have been captured by the creek, and East Fork Lightning Creek is generally considered to be highly unstable, with impaired fish habitat conditions. This creek received significant volumes of landslide debris into the stream channel because of the location of roads in relation to the stream channel (PBTTAT 1998a). During 1994, bull trout juveniles were observed in isolated side channels that were created by excess bedload and failure of the road.

Current watershed conditions in Trestle Creek are closely associated with past road building in the drainage (USDA 1995). Roads built on unstable geology in Cochran Draw and in the headwaters contributed elevated bedload to the stream channel (PBTTAT 1998a). In-channel bedload problems originate from blocked road culverts, past road failures, and subsequent land slides. From 1994 to 1995, the U.S. Forest Service obliterated and recontoured 29 to 32 kilometers (18 to 20 miles) of problem, or potential problem, roads in the Trestle Creek watershed to reduce the risk of mass wasting. Currently, only two short spur roads that can access riparian areas of Trestle Creek exist on National Forest land.

Roads built in the Trestle Creek floodplain have also resulted in loss of instream woody debris and removal of riparian vegetation and tree canopy, both important for stream shading. Approximately 5 kilometers (3 miles) of county road run parallel to Trestle Creek in its lower section, but less than 1 kilometer (0.6 mile) of road is located immediately adjacent to the stream (PBTTAT 1998a). In some locations, the road occupies the floodplain and has reduced the amount of riparian vegetation that provides large woody debris and shade to the stream. Highway 200 acts as a dike that prevents Trestle Creek from using its floodplain and constricts the stream channel, resulting in deposition of bedload material. Consequently, this portion of stream channel requires periodic dredging to keep the stream under the bridge, and the quality of fish habitat is diminished in this area. Channel braiding and water loss to subsurface flow can result from excessive bedload deposition. On National Forest lands, bedload is the most prominent factor affecting the channel and decreasing the pool volume in Trestle Creek (USDA 1995). Excess bedload also contributes to loss of habitat in some lower reaches of Trestle Creek. The current high level of bedload aggradation (build-up) at the railroad trestle and near the stream mouth poses risks for trestle failure and stream intermittency.

The Kickbush Gulch slide has a history of failures that have contributed fine sediment to Gold Creek (PBTTAT 1998a). In 1996, a large road failure in the Kickbush area contributed significant amounts of road and hill-slope material to this stream. Separate Bonneville Power Administration and Avista transmission lines span Gold Creek in the lower reach near Lakeview (PBTTAT 1998a). In the early 1950's, timber and vegetation were cleared in a 76-meter (250-foot) corridor for line construction. The lines cross, then run parallel to, Gold Creek at one location. Loss of woody debris recruitment may affect this portion of stream, and shade is diminished.

Road failures have occurred in upper reaches of the Granite Creek watershed (PBTTAT 1998a). Road density is about 1.2 kilometers per square kilometer (0.46 mile per square mile) of watershed. In the winter of 1995 to 1996, a portion of the Kilroy Bay Road failed during flooding, and the road has been relocated.

There are over 8 kilometers (5 miles) of roads in the Char Creek watershed, and average road density is between 0.6 and 1.2 kilometers per square kilometer (0.23 to 0.46 miles per square mile). Landslide activity was related to roads in the Char Creek portion of the watershed (PBTTAT 1998a). Most of the roads are within a small tributary

watershed with four stream crossings. Roads were constructed on steep slopes, and road failures have contributed bedload to Char Creek and East Fork Lightning Creek downstream.

A road parallels Porcupine Creek for most of its length, crossing several headwater channels (PBTAT 1998a). Evidence of fill slope failures at headwater stream crossings is common, and failed culverts can be seen at the bottom of slides in the Porcupine Creek channel. Landslides from road failures probably occurred recently (within the last 10 years).

Grouse Creek has an extensive road network, including a raised bed road that bisects the floodplain in some locations (PBTAT 1998a). The drainage was historically railroad logged, and remnants of the rail grade are still evident in the floodplain. More analysis work is needed on roads in the drainage to assess impacts and whether corrective measures need to be taken. Road repair work following the 1995 to 1996 floods resulted in localized channelization near bridges and road corridors.

Pack River has an extensive road system on private, State, and Federal lands. Because of the sandy soils, fine sediment is readily transported from roads to stream channels. Three railroads (Burlington Northern Santa Fe, Union Pacific, and Montana Rail Link) and two highways (U.S. 95 and Idaho 200) cross lower Pack River in the migration corridor, creating a risk to migrating bull trout from toxic spills.

Flathead Recovery Subunit

Overall, stream crossings and culverts are not a significant problem in the Flathead River drainage (MBTSG 1995c, 1995d, 1996b). Highways and railroads have impacted bull trout in a few areas, most significantly on Bear Creek in the Middle Fork Flathead River drainage. This stream has been heavily channelized and often receives foreign substances from train derailments. There is potential for a spill of toxic materials to have a catastrophic impact on this stream and on the Middle Fork and mainstem Flathead River downstream.

State Secondary Road 486 traverses the entire length of the North Fork Flathead River into British Columbia. An interior road in Glacier National Park on the other side of the river also encroaches on the floodplain in some locations. Several landslides have

been problematic for the maintenance of this road, and the dust from heavy traffic contributes sediment to the system (MBTSG 1995c). Proposed paving of a portion of the main North Fork Road has been portrayed as a controversy, the press pitting bull trout against grizzly bears. The impacts of dust to bull trout are probably minimal since the river is foraging, migrating, and overwintering habitat. However, paving the road will increase access to the drainage, compounding the problems related to angling, poaching, and development.

Highway 83 parallels the Swan River along its entire length. Analysis of sediment taken from deep within Swan Lake shows a spike corresponding with initial highway construction (Spencer 1991b). A recently completed project to widen this highway, along with installation of telephone and utility systems throughout the region, raised concerns about increased sedimentation, and precautions were taken. To date, the Flathead Recovery Subunit Team is not aware of any documented adverse impacts. Many stream crossings on the east side of the Swan River create the potential for catastrophic impacts resulting from a toxic material spill (MBTSG 1996b). The Swan River drainage has no major tributary to buffer catastrophic impacts. Threats resulting from the transportation system in the drainage will probably become greater in the future as the highway is improved and traffic increases.

Since the time of dam and road construction in the early 1950's, numerous tributaries to Hungry Horse Reservoir (*e.g.*, Felix, Harris, Murray, and Riverside Creeks) in the South Fork Flathead River drainage have been blocked by impassable culverts (MBTSG 1995d). In most instances, the blockages were on streams that are potential spawning habitat for westslope cutthroat trout or mountain whitefish, and use by bull trout, especially for juvenile rearing, is possible. In 1996 and 1997, projects to correct passage barriers to seven streams were successfully completed (Knotek *et al.* 1997), and follow-up monitoring has shown that juvenile bull trout are using streams upstream of former barriers.

Priest Recovery Subunit

As typically occurs in watersheds with an extensive history of timber harvest, many of the major haul roads have encroached on the riparian zone. The close proximity of these roads to the streams makes it difficult to prevent sediment from entering the streams (PBTAT 1998b). Increased use of these poorly designed and located road

systems by recreationists adds to the problem in this watershed. Roads closely parallel the Hughes Fork, the lakeshore of Priest Lake, and Gold, Lion, Two Mouth, Granite, Indian, Kalispell, and Soldier Creeks (PBTTAT 1998b).

Though the streambed of the mainstem Hughes Fork above Hughes Meadows is primarily composed of sand, the stream is hydrologically stable. During the 1940's, a reach of the stream running through Hughes Meadows was channelized for construction of an airstrip, and this reach is now extremely unstable (PBTTAT 1998b). This instability is apparent further downstream in the excessive depositional features and the lack of sufficient large woody debris.

Summary (Transportation Networks)

Transportation systems were a major contributor to the decline of bull trout in this recovery unit. Separating the direct effect of the roads and railroads from the development associated with their construction is difficult. Separating the effects of transportation corridors in forested habitat from the legacy effects of forest management is also difficult. Construction methods during the late 19th and early 20th century, primarily channelization and meander cutoffs, caused major impacts on many of these streams—impacts that are still being manifested. Such impacts seldom occur with new roads. However, significant problems remain and are associated with passage barriers, sediment production, unstable slopes, improper maintenance, and high road densities. All of these problems impact bull trout and can only be addressed on a site-by-site basis.

Mining

Upper Clark Fork Recovery Subunit

Over a century of mining and smelting activity in the Butte and Anaconda areas has resulted in designation of the nation's largest Superfund site with the U.S. Environmental Protection Agency. Descriptions of the river from early researchers clearly indicate that Silver Bow and lower Warm Springs Creeks and the upper Clark Fork River were void of fish prior to 1900 as a result of mining-related pollution (Evermann 1901).

To this day, the entire 40-kilometer (25-mile) length of Silver Bow Creek is fishless due to mining wastes originating in Butte. The bed, banks, and much of the

floodplain of Silver Bow Creek and the upper Clark Fork River are contaminated with mine tailings. Some recovery of the upper Clark Fork River has occurred because of improved waste treatment and reductions in the discharge of mining wastes to the river. Still, fish populations in the upper 193 kilometers (120 miles) of the Clark Fork River remain depressed in some reaches because of mining wastes (Phillips and Lipton 1995).

Declines in fish abundance are attributed to copper that originated from eroding tailings that were piled on the riverbanks. The eroding pilings increased copper loading and elevated copper concentrations for a prolonged period in a downstream direction. Copper concentrations are diluted downstream of major tributaries (Phillips and Lipton 1995).

Most other drainages in the upper Clark Fork River basin have also been impacted by mining activity. The first Montana gold discovery was at Gold Creek (tributary to the Clark Fork River) in 1852. In the placer gold rush period of 1859 to 1866, individual prospectors, looking for gold, panned along creeks. If gold was found, the stream banks were sampled to locate the source of the mineral. In the 1870's, hydraulic mining came into heavy use. The large-scale destruction from hydraulic mining is still very much in evidence in the Upper Clark Fork Recovery Subunit (Periman 1994). At least 562 kilometers (349 miles) of streams within the upper Clark Fork River basin have been identified as impaired by mining (MDHES 1994). Further downstream, damage was done by placer mining in the St. Regis River and in Ninemile, Cedar, Trout, and Quartz Creeks (MBTSG 1996e). Other streams that have impaired water quality as a result of mining include Cache, Cedar, Crow, Josephine, Kennedy, Little McCormick, and Trout Creeks, as well as the Clark Fork River and Oregon Gulch (MDHES 1994).

Placer and hardrock mining have occurred in both the Little Blackfoot River and Rock Creek drainages. In the Little Blackfoot River, pollution from historic mines continues to impact fisheries resources (MBTSG 1996e). The Brooklyn mine in the Boulder Creek drainage has been identified as having adverse effects and is scheduled for reclamation. The Rock Creek drainage contains the Gem Mountain Mine, as well as several historic mining districts. Exploration continues today for new hard rock developments. Most Clark Fork River and Flint Creek tributary streams have historic

and/or current mines. Mining, both past and present, continues to be a major threat to the restoration of bull trout in the upper Clark Fork River drainage (MBTSG 1996e).

Mining in the headwaters of the Blackfoot River began in approximately 1865. A variety of minerals and commodities, including gold, silver, lead, and copper, were recovered from numerous small placer and hard rock mining operations. Although milling has not been widespread in the drainage, milled tailings were discharged into the headwaters at several sites (Moore *et al.* 1991).

Mining has had an extensive impact on aquatic ecosystems in the Blackfoot River drainage (MBTSG 1995b). Numerous mines have been developed in the southern and western portions of the basin. Impacts include the direct loss of aquatic habitat and, particularly in the upper portions of the drainage, chemical contamination. Overall, the Montana Department of Environmental Quality lists 11 streams in the Blackfoot River drainage that suffer water quality impairment from mining activities, including Day Gulch and Beartrap, Douglas, Elk, Jefferson, Poorman, Sandbar, Washington, Washoe, West Fork Ashby, and Willow Creeks (MDHES 1994). Pierce and Podner (2000) also identify Seven Up Pete and Sauerkraut Creeks as needing restoration from past mining activities.

Mine drainage from adits and waste piles continues to contaminate waters in the headwaters of the Blackfoot River drainage (MBTSG 1995b). Contaminant input from mine effluent in the headwaters of the Blackfoot River is apparent from downstream trends of solute constituents. The pH of effluent in contaminated tributaries that flow into the upper 5 kilometers (3 miles) of the river ranges from 3 to 6.5. Concentrations of sulfate are extremely high in the more acidic tributaries and decrease downstream of those sources (Moore *et al.* 1991). Alkalinity is also depressed for about 32 kilometers (20 miles) because of the effects of acid mine drainage (Ingman *et al.* 1990). Both acidity and sulfate concentration lessen downstream of the headwater sources in the Blackfoot River (Moore *et al.* 1991). Inflows of limestone groundwater or springs below Lincoln enhance the river's buffering capacity against changes in pH and the effects of metals (Ingman *et al.* 1990).

Trace metal contamination originates from a small number of sources on Blackfoot River headwater tributaries, particularly the Mike Horse Mine. Concentrations

of solutes decrease rapidly in the upper few kilometers below their sources. However, solute metal contaminants transfer to the particulate phase, and at least some cadmium and zinc remain bioavailable over long stretches of the river (Moore *et al.* 1991).

In 1975, the tailings dam at the Mike Horse Mine washed out, sending tons of metal-contaminated tailings into the upper Blackfoot River (MBTSG 1995b). These tailings continue to impact aquatic life in the Blackfoot River. Studies of fish populations conducted before and after the tailings pond failure indicate acute mortalities of brook and cutthroat trout (Moore *et al.* 1991; Spence 1997), and fish population densities remain reduced (Peters and Spoon 1989; Moore *et al.* 1991).

New mines may be developed in the Blackfoot River drainage in the future. A large open-pit gold mine (the McDonald Gold Project) was proposed near Lincoln. It was the subject of heated public policy debate until development of the mine was blocked by a 1999 State law resulting from a successful citizen-sponsored ballot initiative prohibiting new cyanide heap leach mining projects. Given the presence of valuable ore bodies, new mining will probably continue to be of interest in the basin.

Toxic sediment from tailings on the upper Clark Fork River has been trapped and deposited in the small reservoir behind Milltown Dam on the Clark Fork River just downstream of the confluence of the Blackfoot River (MBTSG 1995e). Recently, Pennsylvania Power and Light of Montana (formerly Montana Power Company), the owners of the dam, announced that it would no longer generate power at this run-of-the-river hydroelectric facility due to economic considerations. However, there continues to be an enormous risk to downstream fish populations and water quality because of the sediment deposits. Pennsylvania Power and Light of Montana, the Federal Energy Regulatory Commission, and the public will probably make a decision on the ultimate fate of this facility over the next few years. Ideally, the dam would be removed and the sediments hauled away from the floodplain for permanent disposal, but the costs associated with this solution are high.

Past or present mining activity has been limited in the Bitterroot River drainage and is not a significant issue in this area (MBTSG 1995a). Hughes Creek, a tributary of the West Fork Bitterroot River, has had extensive placer and dredge mining.

The State of Montana and partners successfully negotiated an out-of-court settlement with Atlantic Richfield Corporation for damages to the ecosystem of the upper Clark Fork River valley from the mining legacy effects at Butte and Anaconda. The settlement totaled approximately \$213 million. Separate compensation for damages to the Clark Fork River itself are still being negotiated. A great deal of information has been collected on the upper Clark Fork River in connection with the litigation between the State of Montana and Atlantic Richfield Corporation (MDOJ 1999). This information will be helpful for planning bull trout restoration projects.

Tens of millions of dollars will be available for restoration of aquatic habitat in the 21st century as a result of this settlement. Plans are now being developed for effectively using the money (MDOJ 1999). Though such a remediation effort is unprecedented, the magnitude of the problem is immense. The 1995 remediation plan states: “. . . the most that can be achieved in the way of restoration of the Upper Clark Fork River Basin within the lifetimes of persons alive today is to ameliorate natural resource injuries, enabling the resource and the services provided by the resources to recover substantially” (State of Montana and Rocky Mountain Consultants 1995)

Lower Clark Fork Recovery Subunit

Permits are currently being sought to operate an underground copper/silver mine and mill that could produce 10,000 tons of ore per day in the Rock Creek drainage of the Lower Clark Fork Recovery Subunit near Noxon. The proposed tailings impoundment would store about 100 million tons of tailings near the confluence of Rock Creek and the Clark Fork River. The Rock Creek drainage has been identified as one of two spawning and rearing streams for migratory bull trout living in Cabinet Gorge Reservoir (MBTSG 1996a). Sediment levels in Rock Creek already exceed 40 percent fines (Smith 1993, 1994), which is high enough to significantly reduce bull trout survival to emergence. This mine and mill complex pose a high risk to bull trout in the Rock Creek drainage and, potentially, in downstream waters.

There are areas in the Lake Pend Oreille basin that have been impacted by underground and open-pit mining operations and the resulting effluent from these closed or abandoned mines (PBTAT 1998a). Many sites are not now being operated or have been abandoned without reclamation. Toxic substances (primarily heavy metals) emanating from abandoned mine sites could block migratory corridors or impact life

stages of bull trout, but, to date, heavy metals have not been identified as a significant water quality problem in the direct tributaries to Lake Pend Oreille. Increased sedimentation or release of toxins into surface or groundwater may occur if specified best management practices are not designed and implemented.

On some tributaries to Lake Pend Oreille, mining companies still hold water rights to divert stream water for power and mining operations (PBTAT 1998a). Thirteen separate water rights for surface water diversion are held in Trestle Creek, totaling 0.74 cubic meters per second (26.17 cubic feet per second) (PBTAT 1998a). One of these water rights is for 0.71 cubic meters per second (25 cubic feet per second) and was initially granted for a mining claim; the water right does not appear to have been used for well over five years (PBTAT 1998a).

Past mining operations in the Gold Creek watershed, which drains into the south arm of Lake Pend Oreille, have impacted this stream and continue to affect channel equilibrium. Both Chloride Gulch and Gold Creek, above the confluence with West Gold Creek, exhibit channel disequilibrium and intermittency as a result of excess bedload inputs stemming from mining operations (PBTAT 1998a). These streams go dry for most of the summer season in areas where width-to-depth ratios, channel confinement, and channel sinuosity are outside normal ranges. All intermittent reaches in Gold Creek are located downstream of areas where extensive mine waste deposits were placed directly in the stream. Waste from the Conjecture Mine has already contributed an estimated 38,000 cubic meters (50,000 cubic yards) of sediment into the channel, with another 84,000 cubic meters (110,000 cubic yards) available with future runoff (USDA 1997). The Weber Mine in Gold Creek and the Idaho Lakeview Mine in Chloride Gulch have introduced and continue to supply the stream channel with large sediment loads.

Flathead Recovery Subunit

At the present time, mining is not known to be impacting bull trout in the Flathead River drainage (MBTSG 1995c). However, there is a large coal deposit in the North Fork Flathead River drainage in British Columbia. If the deposit is mined, as was proposed in the 1970's, a potential loss of 10 percent of the spawning stock of Flathead Lake migratory bull trout was estimated (Fraley *et al.* 1989). Also water quality impacts could be experienced downstream. Because the coal is in Canada, the United States has

relatively little control over mine plans, except under the authority of the International Joint Commission.

Exploratory oil and gas development has been sporadic in the Flathead River basin, but has continued for nearly a century without any fields being developed. Location and full development of a large deposit would be a major concern because of the fragile and pristine nature of much of this ecosystem.

Current and historical mining does not threaten the Swan Lake or South Fork Flathead River bull trout populations (MBTSG 1996b, 1995d). No existing mining operations occur other than recreational gold panning. However, a few mining claims are scattered in the South Fork Flathead River drainage (*e.g.*, Baptiste), but none are currently active.

Priest Recovery Subunit

Mining is not a common activity in this drainage, and impacts to bull trout from previous mine exploration have been low to nonexistent. The Continental Mine in the Boundary Creek watershed of the Kootenai River drainage was often accessed from the Upper Priest River side, causing some road-related impacts (PBTTAT 1998b).

Summary (Mining)

The legacy effect of mining, particularly in the upper Clark Fork River drainage, will continue to impact bull trout for many decades to come. Because of extreme water quality degradation in the upper watershed, dating back to the 19th century, continued vigilance and purposeful improvement will be required for many decades before the full potential of the aquatic resources can be restored. Some major portions of the Clark Fork River watershed have never been materially impacted by mining. Meanwhile, existing mines and new mine proposals continue to develop and have the potential to negatively impact some core areas and local bull trout populations.

Residential Development

Upper Clark Fork Recovery Subunit

The impacts of residential development in the upper Clark Fork River watershed vary by location, but where impacts occur, they can be severe. Some impacts may be partially mitigated by an active program to acquire conservation easements to protect

fragile lands in riparian zones. Newly adopted rules, such as those by Missoula County to require protection of riparian zones, have been difficult to enforce and represent the exception, and not the norm.

For many years, excessive nutrients have been reported throughout the mainstem Clark Fork River. The communities of Butte and Deer Lodge discharge municipal sewage effluent into the Clark Fork River and are the main point sources for nutrients in the upper Clark Fork River (MDHES 1994).

The human population is growing in the Blackfoot River drainage, particularly in the area around Lincoln. Lewis and Clark County grew 17.3 percent in the decade of the 1990's, according to U.S. Census Bureau statistics (Inter Lake, *in litt.*, 2001). Alteration of riparian zones is often a major impact associated with residential and commercial development. Some areas in the upper portions of Rock Creek, the Ninemile Creek Valley, and the lower portions of Rattlesnake Creek are under development pressure. Many other areas have potential for future development.

The lower Bitterroot River has been determined to be a major nonpoint source of nutrient pollution in the upper Clark Fork River basin, primarily from sewage effluent from towns and also from land development along the river (USEPA 1993). About 628 kilometers (390 miles) of stream in the Bitterroot, including the entire mainstem, are impaired or partially impaired for beneficial uses of the water (MDHES 1994). Sources of impairment are primarily from agriculture (siltation and flow modification), silviculture (siltation and habitat modification), and resource extraction. However, land development, road and highway modifications, and wastewater effluent also contribute to impairment (MDHES 1994).

Since the 1930's, there has been rapid growth of home building along riparian zones in the Bitterroot Valley (Javorsky 1994). In the 1990 to 1994 time period, Ravalli County had the highest population growth (22.8 percent) in Montana, and that rapid pace has not abated (MBTSG 1995a). Streambank modification and destabilization and municipal point source pollution have been identified as sources of impairment of water quality in the Bitterroot River (MDHES 1994). Rural residential development is a high risk to long-term aquatic ecosystem health in the Bitterroot River drainage. Development

exacerbates temperature problems, increases nutrient loads, decreases bank stability, and increases pressures to alter stream and riparian habitats.

Bull trout in headwater streams in the Bitterroot River drainage are not currently being directly impacted because many of the remaining local bull trout populations are on lands owned by the U.S. Forest Service. However, the potential to restore migratory fish in the Bitterroot River is being severely compromised by uncontrolled urban sprawl in the Bitterroot Valley.

Lower Clark Fork Recovery Subunit

The northwest corner of Montana remains sparsely populated. However, in recent years, the human population has been increasing, and in the future, rural residential development may be a high risk to the restoration of bull trout (MBTSG 1996a). In the decade of the 1990's, Lincoln, Sanders, Lake, and Mineral Counties grew 7.8 percent, 18.0 percent, 26.0 percent, and 17.2 percent, respectively (Inter Lake, *in litt.*, 2001). Growth is particularly evident in watersheds bordered by private lands, such as along the Bull and the Jocko Rivers.

In some watersheds in the Pend Oreille portion of the lower Clark Fork River basin, housing subdivisions and urban development are expanding. Trestle Creek has considerable residential development along 5.6 kilometers (3.5 miles) of its lower reach (PBTAT 1998a). Some residents have cleared riparian zone areas and removed canopy cover to increase views and to plant lawns and gardens. Homeowners in riparian areas sometimes remove large woody debris from the channel to reduce the perceived risk of floods. Removal of these pool-forming features (*i.e.*, trees and wood) from the stream has reduced pool frequency and volume in the lower 5 kilometers (3 miles) of stream running through private land. Homes exist in the natural floodplain now, and further subdivision is occurring for new homes. Surface erosion occurs because of roads and driveways. Urban encroachment in Trestle Creek has contributed to stream channel instability and disequilibrium, bedload and sediment input, increased stream temperatures in lower reaches, and other streambed damage. Although not verified, other threats may include septic system leakage and associated impacts to water quality (PBTAT 1998a).

Granite Creek was reportedly dredged in the reach below the Kilroy Bay Road after a large flood in the early 1970's (PBTTAT 1998a). A significant portion of the floodplain downstream of the Kilroy Bay Road has been subdivided and developed. Removing timber and constructing roads for access to lots have also impaired floodplain function. Restoration efforts are underway to partially mitigate these problems.

The lower reach of Strong Creek runs within the city limits of East Hope. This stream runs between houses and lawns that have replaced riparian vegetation on both sides of the channel. Septic systems may also affect the stream but have not been evaluated. The channel is diked on its northwest bank between the highway and the mouth, resulting in a confined channel.

Flathead Recovery Subunit

The impact of residential development will become increasingly important to bull trout recovery in the Flathead Recovery Subunit. An increasing human population has led to increased lake eutrophication because of nutrient enrichment in Flathead Lake and other large natural lakes within the basin (Flathead Basin Commission 1999). During the 1990's, the human population in Flathead County grew by 25.8 percent, the sixth highest rate of growth among Montana's 56 counties (Inter Lake, *in litt.*, 2001). Recent evidence indicates that the downward trend in water quality in Flathead Lake may be leveling off, in part because of an aggressive campaign by the Flathead Basin Commission and other private and public interests. Unmanaged growth and increased development pose a serious threat to water quality in many of the lakes in the basin (MDHES 1994).

Some residential development is also ongoing in the tributaries used by spawning bull trout in the North and Middle Fork Flathead River drainages (MBTSG 1995c). Domestic sewage from these developments and changes to stream morphology caused by building in the floodplain could reduce habitat quality in the tributaries.

Golf courses often impact riparian areas, causing bank erosion and reduced water quality. Ski area development is expanding into the headwater areas of Big Creek, an important bull trout spawning stream in the North Fork Flathead River drainage (MBTSG 1995c). Downhill ski areas create permanent clear-cuts that have the potential to increase sediment loads and water yields and to change hydrologic patterns.

The human population in the Swan River Valley is also growing rapidly (MBTSG 1996b). The Swan Valley is in Lake and Missoula Counties, which grew in human population by 26.0 percent and 21.8 percent, respectively, during the decade of the 1990's (Inter Lake, *in litt.*, 2001). Requests for State 310 permits to alter the bed and/or immediate banks of streams in the drainage are increasing. Private land in the drainage is concentrated along the Swan River and the lower portions of the tributary drainages. These reaches provide critical migratory corridors and rearing habitat. It is likely that some corporate timber holdings in the drainage may be sold in the future. Such a sale could allow development adjacent to major spawning and rearing areas, though the recent development of a Habitat Conservation Plan with Plum Creek Timber Company is designed, in part, to minimize such impacts (USFWS *et al.* 2000).

Only a few small tracts of private land and scattered mining claims occur in the South Fork Flathead River drainage. Therefore, limited rural residential development is possible upstream of Hungry Horse Dam (MBTSG 1995d).

Priest Recovery Subunit

A study conducted by the Idaho Department of Environmental Quality in 1993 to 1995 examined several components of the lake system, including trophic status indicators of the limnetic zone (open waters), the bathymetry (shape and depth of the basin), plant growth in littoral (near-shore) zones, quantity and quality of inflow waters, characteristics of selected groundwater aquifers, and watershed characterization using a geographical information system (PBTTAT 1998b). Conclusions developed from the three-year water quality study include the following: 1) open waters of Priest and Upper Priest Lakes can be classified as oligotrophic; 2) lake waters of shallow near-shore sampling sites showed no indication of nutrient enrichment linked to onshore human development; 3) both lakes do exhibit a marked decline in water clarity during spring runoff in tributaries; 4) phytoplankton growth in Priest Lake may be co-limited by phosphorus and nitrogen, at least during summer months; 5) attached algae growth in the littoral zone of many Priest Lake shoreline areas appears excessive given the low nutrient content of ambient near-shore waters; 6) the primary nutrient fueling sources relating to attached algae biomass were not determined; 7) phosphorus, nitrogen, and sediment loading from various sources into Priest Lake was determined as low to moderate, except that loading per area of runoff from some residential areas can be

high; 8) some isolated areas of groundwater sampling indicate an altering of back-groundwater quality by sewage effluent plumes; and 9) project consultants consider human-induced nutrients and sediments as a potential threat for deterioration of Priest Lake water quality (Rothrock and Mosier 1997).

Most of the residential development in this watershed is seasonal and is related to the growing recreational demands from the expanding urban areas in northern Idaho and eastern Washington. Impacts are particularly acute on the shore of Priest Lake (PBTAT 1998b). Most of the drainages that contribute to Priest Lake have experienced growing recreational and urban use, with impacts most pronounced in the watersheds of Two Mouth, Granite, and Kalispell Creeks. Urbanization increases the demand for flood control, stream crossings, water diversion or withdrawal, and other stream channel alterations that are potentially harmful to bull trout. These impacts will be expected to increase as the popularity of this area for recreational activities continues to grow.

Summary (Residential Development)

Ultimately, unmanaged growth and residential sprawl may be among the biggest threats to the recovery of bull trout in this recovery unit. The entire recovery unit holds many of the attributes that are increasingly attractive to people seeking relief from the urban environment, and human population growth in western Montana and northern Idaho has accelerated. The way in which this growth is managed and our ability to limit the impacts of growth, in particular on bull trout spawning and rearing streams, are pivotal to the success of the bull trout recovery effort. Increasing human populations have a direct impact on all of the other categories of risk that affect bull trout.

Fisheries Management

Upper Clark Fork Recovery Subunit

The introduced sport fish species found in the upper Clark Fork River drainage in Montana include brook trout, brown trout, rainbow trout, lake trout, Yellowstone cutthroat trout, kokanee salmon, Arctic grayling, largemouth bass, northern pike, yellow perch, pumpkinseed sunfish, and fathead minnow. Walleye, apparently from

illegal transplants, have been found in several waters. To date, however, walleye are not known to have established reproducing populations in this headwaters portion of the Columbia River.

Brook trout and lake trout, the two common species most closely related to bull trout, are believed to represent the greatest threat to bull trout in the Clark Fork River basin as a whole. Brook trout are present in nearly all mainstem Clark Fork River tributaries. Bull trout hybridize with brook trout, and the offspring are generally sterile. The available data indicate that brook trout presence can create an unstable situation, resulting in a dramatic decline or replacement of bull trout (Leary *et al.* 1983).

Brook trout are widely distributed in the Blackfoot River drainage (MBTSG 1995b). Belmont Creek, Landers Fork, and Copper Creek are the only significant bull trout watersheds in the drainage where brook trout are not found. Brook trout are also common in tributary streams of the Bitterroot River (MBTSG 1995a). Approximately 75 percent of the bull trout streams within the Bitterroot River drainage contain brook trout, although not necessarily in the same stream reaches as the bull trout. Some genetic analysis has been done. Streams that are known to contain bull trout x brook trout hybrids in the Bitterroot River drainage include Bear, Gold, Slate, Woods, Nez Perce, Tin Cup, Trapper, Watchtower, and South Fork Lolo Creeks (Leary, *in litt.*, 1991, 1993). Data from the South Fork Lolo Creek and Tolan Creek indicate that brook trout may be expanding their range and numbers at a relatively rapid rate in some habitats.

Brown trout are also suspected to adversely affect bull trout (Nelson 1965; Moyle 1976; Pratt and Huston 1993). At this point, the nature of the negative interaction between bull trout and brown trout, interaction thought to include elements of competition and predation, is not well understood. However, the result of the species' interaction is suspected to be detrimental to bull trout, given the apparent overlap in niches for the two species.

The greatest numbers of brown trout in the upper Clark Fork River occur in the upstream reaches near the town of Warm Springs, where numbers of catchable brown trout consistently exceed 1,600 fish per kilometer (1,000 fish per mile) (MBTSG

1995e). Numbers of brown trout decline rapidly in downstream progression to only about 80 fish per kilometer (50 fish per mile) near Bearmouth. Further downstream, below the confluence with Rock Creek, brown trout numbers increase again (MBTSG 1995e).

Hatchery plants of 10,000 hatchery-reared juvenile brown trout were made in the Huson study section of the Clark Fork River for three successive years from 1986 through 1988 (Berg 1989). Saturation plants of the fish were made to evaluate the potential of using juvenile hatchery brown trout to enhance the existing population of brown trout for the sport fishery. Enhancement of catchable brown trout was not observed in subsequent years, and the plants were discontinued (MBTSG 1995e).

The density of brown trout is relatively even within the mainstem of the Blackfoot River from the mouth upstream to Monture Creek (MBTSG 1995b). But because of differing densities of rainbow trout, the percentage of the overall trout population that is comprised of brown trout varies. In the Johnsrud area, brown trout comprise approximately 5 to 10 percent of the total trout population, and the brown trout numbers appear to be increasing. Further upstream, near the Monture Creek confluence with the Blackfoot River, overall trout densities are lower and brown trout comprise approximately 30 to 40 percent of the trout population. In recent years, total trout densities of all species appear to be increasing in this portion of the Blackfoot River drainage (MBTSG 1995b).

In the section of the Blackfoot River above Monture Creek and below the town of Lincoln, trout numbers (dominated by brown trout) are higher than in the section immediately downstream. The lower portions of Monture Creek and the associated spring creek system are important spawning areas for brown trout. Above the town of Lincoln, brown trout numbers decline (Pierce and Podner 2000).

Brown trout are common in the lower reaches of several tributary streams of the Blackfoot River, as well as in the mainstem river (Pierce and Podner 2000). The Blackfoot River drainage would be a good location for research on brown trout–bull trout interactions because the ranges of the two species overlaps and because historical baseline data are available.

The impact of recent habitat improvement efforts in the Blackfoot River watershed on the relative abundance of brown trout and bull trout is unknown (MBTSG 1995b). If these projects benefit brown trout to a greater extent than they benefit bull trout, they could have the unintended consequence of increasing brown trout numbers at the expense of bull trout. Monitoring is ongoing to determine the specific impacts and to establish general guidelines for habitat improvements to be most beneficial to native species. Fishing regulations in the Blackfoot River have been adjusted to focus angler harvest on brown trout (MFWP, *in litt.*, 2000).

In the past, private ponds have not been a major source of introduced species spreading throughout the upper Clark Fork River drainage (MBTSG 1995e). However, as more people move into the area and build ponds, the risk from fish stocked in private ponds increases. Although private ponds are required to be licensed by Montana Fish, Wildlife and Parks before they are stocked with fish, some people are unaware of the law, or circumvent it. The concern is that brook trout, or other species, may spread from ponds into waters where they do not currently exist. Fish diseases could also potentially be introduced through private fish stocking.

At the present time, the trout species stocked in the headwaters of the Clark Fork River drainage by Montana Fish, Wildlife and Parks are rainbow trout and westslope cutthroat trout. Westslope cutthroat trout are native throughout the Clark Fork River drainage and are stocked into some of the high mountain lakes in the Clark Fork, Blackfoot, and Bitterroot River basins (MBTSG 1995a, 1995b, 1995e). Rainbow trout are stocked into other lowland lakes. This stocking program is not believed to be detrimental to bull trout.

Additional fish species currently stocked in the Blackfoot River drainage by Montana Fish, Wildlife and Parks are largemouth bass, Arctic grayling, and kokanee salmon. Largemouth bass are stocked in Placid and Seeley Lakes. Interactions between largemouth bass and bull trout are unknown, and the agency stocking policy in these waters should be reviewed (MBTSG 1995b).

In the past, Montana Fish, Wildlife and Parks; other agencies; and individuals stocked a wider variety of nonnative species, including brook trout and brown trout.

Brook trout are no longer stocked west of the continental divide. Fish from past stocking have established self-sustaining populations in many waters of the Clark Fork River valley. Legacy effects of these past stocking practices pose a significant threat to the survival of bull trout today (MBTSG 1995a, 1995b, 1995e).

The illegal introduction of nonnative species by private parties is a growing problem in western Montana (Vashro, *in litt.*, 2000). In addition to the risks posed by spreading introduced species, there is also a risk of introducing fish pathogens. In the upper Clark Fork River drainage, most of the identified risk is from illegal stocking of brook trout. Brook trout may be placed in an important bull trout drainage where they do not currently exist or have been removed (MBTSG 1996c).

Illegal stocking of warmwater or coolwater species such as the northern pike, largemouth bass, or walleye also poses a significant risk to native species. The presence of illegally introduced walleye and northern pike in the Clearwater River drainage is of concern (MBTSG 1995b). And northern pike are present in low numbers in the Clark Fork River in the Superior and St. Regis areas (MBTSG 1996e). Predicting what species might be illegally introduced or what impact those fish may have on the native fauna is impossible. But continued illegal fish introductions will complicate restoration efforts for bull trout.

Efforts of fisheries managers in the upper Clark Fork River watersheds have concentrated on addressing the water quality and habitat problems that affect the river. Much of the recreational fishing in the drainage occurs in the lakes and tributary streams.

In 1999, the mainstem Clark Fork River, upstream of the Bitterroot River, received approximately 40,000 angler days of fishing pressure, and use has been up sharply in recent years (MFWP 2000a). The Blackfoot River is one of the most popular fisheries in the region, and use has increased dramatically with the advent of the movie *A River Runs Through It*. In 1999, angling pressure on the Blackfoot River was estimated at 46,385 angler days (MFWP 2000a), up from 20,043 angler days in 1991 (MFWP 1992). Fishing pressure in 1999 on the Bitterroot River was estimated at 110,931 angler days (MFWP 2000a), up from 52,776 angler days in 1991 (MFWP

1992). The doubling of angler use on these streams over just an eight-year period is significant and is one of the major challenges facing fisheries managers. Angler bycatch of bull trout, including associated incidental or accidental mortality, is a major concern on these heavily fished streams. Pierce *et al.* (2002) list the upward trend in recreational use of the Blackfoot River combined with “the inability of a growing number of anglers to identify bull trout” as a major challenge to the conservation of wild trout.

The evolution of fisheries management priorities in Montana is demonstrated by a case study of Rock Creek. In 1958 to 1959, a creel survey on Rock Creek determined that bull trout comprised 5 percent of the catch. The total catch from Rock Creek was estimated to be 50,300 game fish, meaning that approximately 2,515 bull trout were caught (Averett and Whitney 1959). In 1959, the creel survey was expanded to include the tributaries. A total of 120 bull trout that were checked were harvested from the tributaries. The majority of these (103 fish) came from Ranch Creek. Bull trout were also harvested from Welcome, Gilbert, Cougar, Stoney, and Wyman Creeks (MBTSG 1995e).

In the 1970's, fisheries management in Rock Creek began to change dramatically with the termination of the stocking program for catchable trout. In 1979, creel limits were greatly reduced, and terminal gear restrictions were imposed. These changes were successful in increasing the number of rainbow trout longer than 28 centimeters (11 inches) in the stream (MBTSG 1995e).

Today, Rock Creek supports a significant sport fishery. In 1993, Rock Creek supported 27,400 angler days (MFWP 1994), and bull trout were 1 percent of the catch, meaning that approximately 203 bull trout were caught and released in the creek. In 1999, angler use on Rock Creek was estimated at 40,108 angler days (MFWP 2000a).

Currently, the management goal of the Montana Fish, Wildlife and Parks for Rock Creek is to maximize the opportunities for catching trout over 36 centimeters (14 inches) long (MFWP 1989). The Rock Creek sport fishery is comprised primarily of rainbow and brown trout. The strategy for obtaining the management goal is to restrict harvest to three brown trout under 30 centimeters (12 inches) per day. Rainbow trout,

cutthroat trout, and bull trout must be released. Brook trout are exempt from the special limits and have a limit of 20 fish daily (MFWP, *in litt.*, 2000).

The current bull trout management objective for the Blackfoot River, according to the Montana Fish, Wildlife and Parks' 1990 management plan for the river, is to increase the standing crop of adult bull trout larger than 2.3 kilograms (5 pounds) to one fish per 300 meters (1,000 feet) (MBTSG 1995b). This goal has not been met, but Montana Fish, Wildlife and Parks biologists have stated that they believe this bull trout management objective is conservative.

The Bitterroot River is primarily a rainbow and brown trout fishery and is managed with a complex suite of regulations that emphasize the opportunity to produce larger fish and protect native species from harvest (MBTSG 1995a). If bull trout are to persist in the Bitterroot River over the long term, the focus of fisheries management and regulations may need to continue to evolve toward a goal of further protecting imperiled native species (MBTSG 1995a).

In the past, bull trout harvest (both legal and illegal) may have been a significant risk factor to the species in the upper Clark Fork River portions of the watershed (MBTSG 1995e). The current risk from legal angling is reduced because harvest of bull trout is no longer legal in these drainages. However, misidentification of bull trout and lack of compliance with regulations continue to plague attempts to reduce angler-induced bull trout mortality. A 1999 creel survey on the Blackfoot River determined that bull trout comprised only 2.4 percent of the trout catch but that 8.2 percent of the bull trout caught were kept illegally (Schmetterling and Bohneman 2000). Surprisingly, that proportion (8.2 percent) of bull trout kept was higher than for rainbow trout (7.4 percent) and brown trout (7.5 percent), both of which could be legally harvested if under 30 centimeters (12 inches). Results of the creel survey also showed that anglers reported catching brook trout with much greater frequency than brook trout are known to occur in the mainstem river and that 31 percent of brook trout reportedly caught were kept. If, as suspected, many of those brook trout were in fact juvenile bull trout, the problem of unintentional harvest because of misidentification may be even greater than documented (Pierce and Podner 2000).

Another problem is hooking mortality of bull trout that are caught unintentionally and then released (MBTSG 1995a, 1995b, 1995e). Currently, very little data is available for assessing this issue, but increasing angler participation would be expected to result in an increase in hooking mortality of bull trout. If future data indicate that hooking mortality is a significant problem, additional angling restrictions may be sought on some streams, particularly during spawning season. The drainages that receive higher-than-average fishing pressure (such as Rock Creek, the Bitterroot River, and the Blackfoot River) are more likely to experience hooking mortality problems than more lightly fished waters are.

Accurate information on targeted illegal harvest (poaching) is difficult to obtain. However, there is anecdotal information that concentrations of large bull trout are targeted by poachers (MBTSG 1995a, 1995b, 1995e). In areas where the local population is small, the loss of even a few fish can be significant. Illegal harvest probably continues in the Blackfoot River drainage (MBTSG 1995b). During summer 1994, two of seven bull trout equipped with radio tags disappeared and, because of circumstantial evidence, were suspected to have been illegally harvested.

Lower Clark Fork Recovery Subunit

The introduced fish species found in the lower portions of the Clark Fork River drainage in Montana include Yellowstone cutthroat trout, brook trout, brown trout, rainbow trout, lake trout, lake whitefish, largemouth bass, smallmouth bass, black crappie, northern pike, yellow perch, pumpkinseed, burbot, yellow bullhead, black bullhead, fathead minnow, and central mudminnow. Individual walleye, apparently from illegal transplants, have been found in several waters. To date, however, walleye are not known to have established reproducing populations.

Brook trout are believed to be a particularly high risk in lentic environments and are present in most streams in the lower Clark Fork River drainage that are currently used by bull trout. Brook trout are known to be extensively hybridized with bull trout in Mission Creek (Hansen and DosSantos 1993b).

Brown trout also use most of the waters inhabited by bull trout in the drainage (MBTSG 1996a). Brown and bull trout are known to spawn in the same area of the

Bull River. Brown trout spawn later in the fall than bull trout and may disturb bull trout redds built earlier in the season (Pratt and Huston 1993). Brown trout are common in the Jocko River and also occur in the lower Flathead River (MBTSG 1996a).

Lake trout have been documented to migrate downstream of Flathead Lake through or over Kerr Dam (Carty *et al.* 1997). However, the habitat in Noxon and Cabinet Gorge Reservoirs is probably not suitable for a self-sustaining lake trout population, in part because of warm water temperatures, and many of these fish are suspected to pass through the system into Lake Pend Oreille.

In the mainstem Clark Fork River reservoirs, yellow perch and pumpkinseed are two of the most abundant species present (MBTSG 1996a). Although the interactions between these introduced species and bull trout are not clear, the possibility of adverse interspecies interactions are considered a high risk to bull trout (MBTSG 1996a). Evaluations of the species complex and interactions in the reservoir fish fauna are a high priority under the Avista mitigation program (Washington Water Power Company 1998).

Northern pike are also present in the mainstem reservoirs of the Clark Fork River. Northern pike have been in the lower Clark Fork River drainage since at least the 1950's and are reproducing and well established (MBTSG 1996a). Given the predacious behavior of the northern pike, predation and/or competition between this species and bull trout may occur. The presence of walleye probably resulted from at least two separate illegal introductions into the lower Clark Fork River drainage, but reproduction has not been documented.

Northern pike and largemouth bass have become established in the Flathead River. More recently, smallmouth bass have begun to provide an increasingly popular sport fishery, with trophy class specimens and a new State record caught. The source of these fish is suspected to have been a stocking error by the U.S. Fish and Wildlife Service, with smallmouth bass included with a plant of largemouth bass in Lower Crow Reservoir (L. Evarts, Confederated Salish and Kootenai Tribes, pers. comm., 2000).

In recent times, the fish species stocked in this portion of the Clark Fork River drainage by Montana Fish, Wildlife and Parks are brown trout, westslope cutthroat trout, Kamloops rainbow trout, and largemouth bass (MBTSG 1996a). Westslope cutthroat trout are native throughout the drainage and are stocked into some of the high mountain lakes in the basin. Brown trout were stocked in the Clark Fork River in the 1980's and in lakes in the upper Thompson River drainage in the 1990's. Kamloops rainbow trout are stocked into Noxon Rapids Reservoir under an informal agreement with Idaho Department of Fish and Game.

The portions of the lower Clark Fork River drainage that received the most significant angling pressure in 1999 were the Clark Fork River (22,525 angler days), Thompson River (11,189 angler days), lower Flathead River (3,180 angler days), and Noxon Reservoir (11,330 angler days) (MFWP 2000a). Fishing pressure in Cabinet Gorge Reservoir is quite low (estimated 608 angler days in 1999; MFWP 2000a) because of the historically poor fishery. Fishing pressure is growing on most of these waters.

Immediately prior to closure of Noxon Rapids Dam in August 1958, Thompson Falls Reservoir and the Clark Fork River downstream to Cabinet Gorge Reservoir were chemically treated with rotenone to remove the existing fish populations (Huston 1985). During that era, such treatment was a common management strategy prior to filling a new reservoir. The hope was that poisoning, followed by stocking of rainbow trout, would result in an improved sport fishery for rainbow. Huston (1985) summarized fishery management activities in Noxon and Cabinet Gorge Reservoirs between the early 1950's and the mid-1980's. Montana Fish, Wildlife and Parks stocked a variety of species, strains, and sizes of introduced fish in an attempt to establish a sport fishery. These efforts were largely unsuccessful.

In the early 1980's, management emphasis in the mainstem reservoirs of the Clark Fork River shifted away from coldwater salmonids and toward a warmwater bass fishery (MBTSG 1996a). Largemouth bass had persisted in the reservoirs, even following the chemical treatment of the late 1950's, and smallmouth bass were stocked into Noxon Reservoir several times, beginning in 1982. At about the same time, reservoir operations were modified to reduce drawdown. Since that time, bass

numbers have increased, along with numbers of northern pike, yellow perch and pumpkinseed, and the bass fishery is currently providing a sought-after sport fishery in Noxon Reservoir (Huston 1985). The management goal of maintaining a viable sport fishery for introduced species may prove to be in conflict with the goal of restoring bull trout in this drainage, so further evaluation is underway (MBTSG 1996a).

Accurate information on illegal harvest is difficult to obtain. Pratt and Huston (1993) describe poaching techniques and locations in the lower Clark Fork River. Dynamiting, spearing, snagging, and shooting were all historically used by poachers in this area. Heavy snagging harvest is known to have once occurred in the Bull River. Also, hooking mortality in snag fisheries tends to be high (Long 1997). In areas where the population is small, the loss of even a few fish can be significant.

Lake Pend Oreille

Lake Pend Oreille represents a critical sanctuary for the remaining stock of adfluvial bull trout in the Clark Fork River basin. Like the waters upstream, the lake supports a wide variety of introduced species (see description in the subsection on the Lower Clark Fork Recovery Subunit). Bull trout across their range often appear restricted to waters upstream of the waters used by introduced rainbow trout and brown trout (PBTAT 1998a). However, in some key watersheds, bull trout and rainbow trout evolved together. Bull trout and rainbow trout are found together in many Lake Pend Oreille tributary stream reaches, and they have coexisted in the lake since rainbows were introduced there in 1919. In 1941, the Gerrard strain of rainbow trout, which is predaceous and grows to large sizes, was introduced. Gerrard rainbows use the same prey base (kokanee salmon) as large bull trout, and the potential for competition exists. Videgar (2000) analyzed stomach contents from 180 Kamloops rainbow trout taken from Lake Pend Oreille and found that 76.8 percent of the diet was kokanee salmon; 11.4 percent, other rainbow trout; and 5.3 percent, bull trout. Videgar estimated the number of Kamloops rainbow trout in Lake Pend Oreille at about 15,000 fish with fork length greater than 40 centimeters (16 inches).

Competitive interaction may occur between rainbow and bull trout juveniles for limited food and space, but potential impacts are not known. Watson and Hillman (1997) found that bull trout distribution is negatively correlated with rainbow trout distribution, even in drainages where rainbow trout are native. Pratt and Huston

(1993) report that rainbow trout in the Clark Fork/Pend Oreille drainage seem to use lower reaches of streams occupied by bull trout, while bull trout nursery areas generally lie higher in the watershed. Because bull trout and rainbow trout have coexisted in Lake Pend Oreille tributaries for many decades and because changes in bull trout abundance in the Lightning Creek basin appear to be independent of rainbow trout abundance, the Panhandle Bull Trout Technical Advisory Team (PBTAT 1998a) did not consider rainbow trout to be a significant threat to bull trout in the Lightning Creek complex. In February 2000, the Idaho Fish and Game Commission took the unusual step of issuing emergency regulation changes for Lake Pend Oreille and the lower Clark Fork River to conserve kokanee salmon and encourage harvest of Kamloops rainbow trout, with the intent to prevent a collapse of the weak kokanee salmon population (IDFG, *in litt.*, 2000). This action, if successful in reducing the Kamloops rainbow trout, could benefit bull trout.

In 1925, the U.S. Fish Commission stocked 100,000 lake trout into Lake Pend Oreille and its tributaries (Pratt and Huston 1993), and lake trout may also have migrated downstream of Flathead Lake, where they were introduced 20 years earlier. Lake trout are firmly established in Lake Pend Oreille, but impacts on bull trout populations are not known. A 1997 to 1998 study by the University of Idaho to assess population size of lake trout and other salmonid predators in Lake Pend Oreille indicated that approximately 2,000 lake trout with fork length over 30 centimeters (16 inches) were in Lake Pend Oreille (Vidergar 2000). However, estimates for lake trout harvested from Lake Pend Oreille in 2000, based on more recent creel survey data, were over 4,000, and managers are concerned that lake trout populations are rapidly expanding (Corsi, *in litt.*, 2001). The fisheries managers of the Idaho Department of Fish and Game have proposed experimental lake trout suppression through liberal angler harvest (bag limits on lake trout in Lake Pend Oreille were recently removed) and have also proposed trap netting as one way to protect bull trout and restore the kokanee salmon forage base (Corsi, *in litt.*, 2001). Lake trout may prey opportunistically on juvenile bull trout, but bull trout were found to make up only 1.5 percent of the diet in a sample of 242 lake trout stomachs examined (Vidergar 2000). Kokanee salmon made up 87.4 percent of the lake trout diet, and rainbow trout made up 5.5 percent in that study.

Replacement of bull trout by lake trout has occurred in other lakes where lake trout have been introduced (Donald and Alger 1993). In Lake Pend Oreille, as in Flathead and Priest Lakes, the presence of *Mysis* shrimp (*Mysis relicta*), an important forage item for lake trout, may provide lake trout with an additional competitive advantage.

It is possible that the relative abundance of kokanee salmon in Lake Pend Oreille previously enabled bull trout to compete with lake trout and, therefore, that kokanee abundance helps prevent a rapid decline in the bull trout populations (PBTAT 1998a). Most lakes where bull trout are declining do not have an abundance of prey species such as kokanee salmon (Bowles *et al.* 1991; Donald and Alger 1993). An introduced species, kokanee salmon are important prey for bull trout, lake trout, and the lake's other top-level predator, Garry rainbow trout. Kokanee salmon populations have been in decline since the 1960's, following the construction of Albeni Falls and Cabinet Gorge Dams and the introduction of *Mysis* shrimp. Ongoing investigations by the University of Idaho and the Idaho Department of Fish and Game are examining the impacts of winter drawdown of the lake by Albeni Falls Dam. Currently, the lake is being held at a higher level through the winter to provide more suitable spawning habitat for kokanee salmon. Continued decline of the kokanee salmon population could lead to competition, or more intense competition, among bull trout and other predators and causes concern for the bull trout population, as well for the fishery in general.

The Pack River supports spawning, rearing, and multiple age classes of brook trout. Densities of brook trout are expected to be high in some reaches, but this expectation needs to be verified with updated information. Snorkelers observed large brook trout, up to 46 centimeters (18 inches) long, in middle reaches of the Pack River mainstem (PBTAT 1998a). Although no genetic work has been done, the presence of larger brook trout could increase the potential for hybridization. Degraded habitat conditions in this stream may give brook trout a competitive advantage over other salmonid species, an advantage described by Fausch (1988) for other streams. Genetics work in the Pend Oreille watershed so far has identified brook trout x bull trout hybrids in Porcupine Creek, and fish believed to be brook trout x bull trout hybrids have been noted in North Fork Grouse Creek (PBTAT 1998a).

Lake whitefish and Arctic grayling were also stocked into Lake Pend Oreille. Grayling were never documented in catch records, but lake whitefish became established and are still present today. *Mysis* shrimp were planted in Lake Pend Oreille in 1966 by the Idaho Department of Fish and Game to provide additional forage for kokanee salmon in Lake Pend Oreille. *Mysis* shrimp were stocked after fishery managers received favorable reports from British Columbia that kokanee salmon grew rapidly and attained large size in Kootenay Lake by feeding on introduced *Mysis* shrimp. In Lake Pend Oreille, *Mysis* shrimp negatively impact survival of fry of kokanee salmon (PBTTAT 1998a) and may aid the growth and survival of lake trout.

Pratt and Huston (1993) summarized the use of artificially propagated bull trout in the lower Clark Fork/Pend Oreille system. During 1949 and 1950, bull trout eggs were collected from tributaries to the lower Clark Fork River in Montana. The Idaho Department of Fish and Game raised a portion of these eggs in hatcheries at Clark Fork, Montana, and McCall, Idaho. In 1952, approximately 9,700 juvenile fish from the program were released into Spring Creek and the lower Clark Fork River in Idaho. Spring Creek does not currently support bull trout, and the introduction does not appear to have been successful.

In 1966, hatchery-reared Dolly Varden from Alaska were introduced in some tributaries to Lake Pend Oreille (J. Mallet, Idaho Department of Fish and Game, as cited in Pratt and Huston 1993, p. 65–66), but this introduction was not believed to be successful (PBTTAT 1998a). Additional introductions from brood stock originating from the Alaska fish probably occurred into the mid-1970's. To date, genetic evaluations have not shown a Dolly Varden influence on pure bull trout stocks in Lake Pend Oreille (Pratt and Huston 1993; Spruell and Allendorf 1998). More recently (1991), a limited number of bull trout from the lower Clark Fork River and Gold Creek were artificially spawned. Progeny from these fish were marked with a fin clip and released in 1993 into mountain lakes in the Pend Oreille basin and into Lake Pend Oreille (PBTTAT 1998a). The success of these programs is unknown because no marked fish have been recovered, though not all assessments have been completed. Currently, there is no stocking of hatchery-reared bull trout in the Pend Oreille drainage.

A kokanee salmon trap on Sullivan Springs is operated by the Idaho Department of Fish and Game as an egg collection station for kokanee salmon. The trap consists of two picket weirs isolating a section of stream about 14 meters (45 feet) long. In some years, bull trout spawn in this area before the weir is installed (in 1997, three redds were counted in the trap area). In November and December, thousands of kokanee salmon enter the trap, where they are collected and spawned. Disturbance or loss of bull trout redds in the trap area may occur as a result of activity associated with kokanee salmon spawning (PBTTAT 1998a). In 1999, the Idaho Department of Fish and Game began implementing corrective measures.

Lake Pend Oreille supports a significant fishery. In 1991, anglers expended an estimated 465,000 hours fishing the lake, with approximately 65 percent of the effort targeting trout and 35 percent targeting kokanee salmon (PBTTAT 1998a). Bull trout comprised a relatively small percentage of the trout harvest, but provided trophy-sized fish. The world record bull trout, weighing 14.5 kilograms (32 pounds) was taken from Lake Pend Oreille in 1949. The portions of the lake that are within a 91-meter (100-yard) radius of the mouths of tributary streams have the same seasons and regulations as the streams to provide additional protection to bull trout. On January 1, 1996, the Idaho Department of Fish and Game closed Lake Pend Oreille and the Clark Fork River to harvest of bull trout (PBTTAT 1998a). Harvest of bull trout had been closed in all other tributary streams in Lake Pend Oreille in 1964. Although seasons for harvest have been closed, misidentification of bull trout, often as brook trout or lake trout, can result in incidental harvest (Schmetterling and Long 1999).

Poaching has long been recognized as a problem in the lower Clark Fork/Pend Oreille basin and remains a problem in some watersheds, with peak activity occurring in July, August, and September when large fish are in tributaries and are easily taken (Long 1997). Bull trout spawners from Lake Pend Oreille are particularly vulnerable to poaching because they often enter small tributary streams several months prior to spawning and congregate in pools. In some watersheds, such as Pack River and Lightning Creek, extensive road systems provide easy access to prime spawning areas (PBTTAT 1998a). Poaching is known to occur in Gold Creek as individuals generally target the same pools each year.

Hooking mortality from catch-and-release fishing is most likely to occur in Lake Pend Oreille during the summer, when surface temperatures are warm and fish are caught from deeper water. Past creel surveys have shown that catch rates and catch of bull trout are typically highest in late spring and early fall, with declines during mid-summer. Increased interest in lake trout fishing during mid-summer may increase the number of bull trout that are caught and subjected to potential hooking mortality. Currently, there is no estimate of hooking mortality for bull trout caught from the lake.

Flathead Recovery Subunit

In Flathead Lake, bull trout coexist with 23 other fish species, only 10 of which are native (MBTSG 1995c). The introduced fish species found in the Flathead River basin include Yellowstone cutthroat trout, brook trout, brown trout, rainbow trout, lake trout, Arctic grayling, kokanee salmon, lake whitefish, largemouth bass, northern pike, yellow perch, pumpkinseed, brook stickleback, central mudminnow, and black bullhead. Individual walleye, apparently from illegal transplants, have been found in the Flathead River drainage. To date, however, walleye are not known to have established reproducing populations. *Mysis relicta* occurs, as an introduced species, throughout the drainage.

Brook trout pose a threat to bull trout in some tributaries of the Middle Fork Flathead River, although hybridization has not been documented to date. Brook trout have not been found in tributaries of North Fork Flathead River (MBTSG 1995c).

Because of competition and hybridization, the introduced species that presents the greatest existing risk to bull trout in the Swan River drainage is the brook trout (MBTSG 1996b). Recent genetic data (Kanda *et al.* 1994) and observations from Squeezer Creek within the Swan River drainage (Kitano *et al.* 1994) indicate that large, spawning, migratory bull trout mate with smaller brook trout, producing hybrid offspring. Hybrids have been observed in several of the primary bull trout nursery streams. Hybridized offspring are typically sterile (Leary *et al.* 1983).

Brook trout are widely dispersed throughout the Swan River drainage. Leathe and Enk (1985) reported brook trout presence in 40 of 74 tributary stream reaches surveyed. Brook trout were the most abundant species in low-gradient reaches.

Degraded habitat conditions appear to favor brook trout over westslope cutthroat trout in stream reaches where channel gradient is 6 percent or less (Leathe and Enk 1985). There are no bull trout streams in the Swan River drainage that do not contain resident brook trout populations.

In 1999, a reproducing population of brown trout was documented in the Flathead River basin upstream of Kerr Dam for the first time. At least two year classes of naturally produced juvenile fish and several large adults were electrofished from a short reach of Mill Creek, a spring-fed tributary to the Flathead River just upstream of Flathead Lake. Since Creston National Fish Hatchery is located on the upper end of Mill Creek, the likely source of the brown trout is escapement from a population held at the hatchery in the early 1980's (Leary 2000). State and Federal fishery managers are attempting control actions to eradicate this population before it spreads.

Lake trout were introduced into Flathead Lake in 1905 (Spencer *et al.* 1991) and produced a limited, but trophy fishery for most of the 20th century. However, with the establishment of *Mysis* shrimp in Flathead Lake, first discovered in 1981, lake trout populations underwent a dramatic expansion. Estimated angler harvest of lake trout currently exceeds 40,000 fish annually (MFWP/CSKT 2000), and the population number is much higher, though not currently quantified.

With the increase in the lake trout population, subadult lake trout became common in the river systems connected to Flathead Lake. Their presence has been documented as far upstream as Bear Creek on the Middle Fork Flathead River (160 kilometers [100 miles] upstream of the lake) and beyond the Canadian border on the North Fork Flathead River (183 kilometers [114 miles] upstream of the lake). One lake trout with a radio tag traveled up and down the North Fork Flathead River, forayed into the Middle Fork Flathead River drainage, and then swam down the mainstem Flathead River toward Flathead Lake before being caught by an angler, all within a period of a few months (Muhlfeld *et al.* 2000). In an assessment of the seasonal distribution and movement of native and nonnative fishes in the Flathead River system upstream of Flathead Lake, Muhlfeld *et al.* (2000) documented spatial and temporal overlap of juvenile bull trout and westslope cutthroat trout with nonnative lake trout and northern pike. They concluded that this overlap may increase

the probability of predation on the native salmonids migrating downstream to Flathead Lake. Muhlfeld *et al.* (2000) also suggest that lake trout migration in the Flathead River system is at least partially a temperature-induced response, with the river habitat not preferred as water temperatures exceed 10 degrees Celsius (50 degrees Fahrenheit) and probably unsuitable as temperatures approach 15 degrees Celsius (59 degrees Fahrenheit).

Lake trout have been documented as preying on young bull trout and cutthroat in Flathead Lake. Deleray *et al.* (1999) examined 449 lake trout stomachs collected in 1996. Combined diet information indicated that 99 percent of the diet (by weight) was fish and that over three-fourths of the biomass consumed was lake whitefish. Insects, *Mysis* shrimp, and other noninvertebrates comprised only 1 percent of the diet, but made up a higher percentage of the diet in small lake trout (under 500 millimeters [20 inches]). Information on predator food habits was also collected for lake trout (and northern pikeminnow) in the Flathead River (Zollweg 1998). All of these studies indicate a low incidence of trout and char in lake trout diets. However, because of their high abundance, predator populations probably impose a significant source of mortality for species such as bull trout and westslope cutthroat trout (Deleray *et al.* 1999). Additional lake trout food habits data are being analyzed.

Of 27 natural lakes in the Flathead Recovery Subunit known to have contained native populations of bull trout, 11 (41 percent) now contain lake trout (Fredenberg 2000). Three of these lake trout populations resulted from government stocking programs (Flathead Lake in 1905, Whitefish Lake in 1941, Tally Lake in 1985), but the rest apparently resulted from unauthorized stocking or natural invasion. Lake trout have now been detected or reported in each of the watershed's 8 natural lakes that cover more than 404 surface hectares (1,000 surface acres); lake trout inhabit lentic habitat that covers over 57,500 total surface hectares (142,000 acres) (Fredenberg 2000). The remaining lakes, or the bull trout lakes that are not believed to contain lake trout, together occupy only 1,800 surface hectares (4,500 surface acres).

The introduction of lake trout is suspected as the primary factor contributing to the decline of bull trout in several lakes in Glacier National Park (*e.g.*, McDonald, Kintla, Bowman, and Logging Lakes) (Fredenberg 2000). Similarly, the introduction

of lake trout and/or brook trout is suspected of playing a role in the extirpation of bull trout from seven lakes in southern Canada (Donald and Stelfox 1997).

Donald and Alger (1993), in their study of 34 Rocky Mountain lakes in Montana, Alberta, and British Columbia, concluded that lake trout can limit the distribution and abundance of bull trout in mountain lakes. They stated that lacustrine populations of bull trout usually cannot be maintained if lake trout are introduced. Evidence that lake trout is the dominant species include 1) displacement of indigenous bull trout populations by introduced lake trout, 2) unsuccessful "natural" colonization by bull trout of suitable low-elevation lakes that support lake trout, and 3) relatively high mortality of sympatric bull trout populations. Bull trout and lake trout exhibited substantial niche overlap with respect to food utilization and their growth, an overlap suggesting that competition may contribute to the disjunct distribution of these species (Donald and Alger 1993).

A scientific advisory team that was convened in 1997 by Montana Fish, Wildlife and Parks and the Confederated Salish and Kootenai Tribes concluded that "Lake trout have come to dominate the fish community of Flathead Lake since the introduction of the opossum shrimp, and now represent the greatest obstacle to restoring the bull trout population. The panel concluded that the lake trout population has to be reduced by 70 to 90 percent from present levels if bull trout are to return to population levels of the 1980's " (McIntyre 1998). In spring 2000, a citizens' advisory committee was convened by Montana Fish, Wildlife and Parks and the Confederated Salish and Kootenai Tribes to recommend management alternatives for Flathead Lake and the Flathead River system. Using that panel's recommendations and other input, the management agencies adopted a Flathead Lake and River Fisheries Co-Management Plan in November 2000. The goals of the 10-year plan are to 1) increase and protect native trout populations, 2) maintain a viable recreational/subsistence fishery, and 3) protect habitat and water quality (MFWP/CSKT 2000). Implementation of strategies identified in the plan is now underway.

Mysis shrimp were stocked by Montana Fish, Wildlife and Parks in Whitefish, Tally, and Ashley Lakes in the Flathead drainage in 1968 and in Swan and Holland Lakes in the Swan drainage in 1975 (Rumsey 1988). The shrimp apparently drifted

downstream into Flathead Lake from one or more of these sources and were first collected there in fall 1981 (Leathe and Graham 1982). The inadvertent introduction of these shrimp into Flathead Lake resulted in major changes in the lake's food web, including the abrupt loss of kokanee salmon, and is believed to have facilitated the increase in lake trout numbers (Spencer *et al.* 1991).

The presence of *Mysis* shrimp generally benefits deep-dwelling fish species by providing a food source, but the shrimp may impact planktivorous fish by reducing the available crustacean zooplankton (Nesler and Bergersen 1991). Many lakes with established *Mysis* shrimp populations have experienced a decline or, in some cases, complete loss of kokanee salmon. However, kokanee salmon have persisted in Swan Lake in spite of the presence of *Mysis* shrimp. Some kokanee salmon use *Mysis* shrimp as a food source, particularly during winter months (MBTSG 1996b). Bull trout in Swan Lake also use *Mysis* shrimp as a significant source of food, and the shrimp may result in improved growth and survival of subadults. Stomach samples from bull trout collected by gill-netting in 1988 and 1995 showed that, in both years, 67 percent of samples with food present contained *Mysis* shrimp (MBTSG 1996b). At this time, the presence of *Mysis* shrimp in Swan Lake does not appear to be detrimental to bull trout and may, in fact, benefit bull trout by providing an important source of food.

It is noteworthy that Swan Lake does not have an established lake trout population, although a single specimen was caught from the river upstream of Swan Lake in 1998 and two more adult-sized fish were verified from the lake in 1999 (Fredenberg, *in litt.*, 1999). Additional specimens have since been caught. The Montana Bull Trout Scientific Group reported that the greatest future threat to maintaining the bull trout populations of Swan Lake was the potential introduction of lake trout (MBTSG 1996b). Swan Lake appears to have suitable habitat for lake trout, and the food web, including abundant *Mysis* shrimp and kokanee salmon food sources, may provide the opportunity for the lake trout population to expand rapidly. Swan Lake already contains populations of illegally introduced northern pike, yellow perch, largemouth bass, brook stickleback, and central mudminnow. The threat of lake trout to the integrity of the strongest remaining natural bull trout population in Montana should not be underestimated.

Of the other introduced species established in the Flathead Recovery Subunit, the northern pike is the one of most concern, and it is now widely distributed. A single illegal introduction of pike into Echo Lake in the late 1960's led to widespread illegal introductions throughout northwest Montana. An evaluation of the ecology and food habits of pike in the Flathead River upstream of Flathead Lake is currently underway (Muhlfeld *et al.* 2000). Preliminary results show that pike are fairly mobile, with some individuals moving seasonally and temporally between sloughs and throughout the system (MFWP/CSKT 2000). Biologists are attempting to collect a representative set of stomach samples to further assess the potential interaction of this species with salmonids. Preliminary analysis of pike stomachs from the Flathead River and associated sloughs has found that bull trout may be seasonally significant in the diet, comprising as much as 84 percent of the biomass in one sample period (Muhlfeld, *in litt.*, 2001). Pike and lake trout have both become well established in the Stillwater Lakes, providing little hope for bull trout recovery in those lakes, although a bull trout population is hanging on in the river upstream. Pike are established in Flathead, Tally, Whitefish, and Swan Lakes. Impacts of pike in these systems are unknown.

Hatchery stocking with nonnative fish has been extensive in lakes throughout the Swan River drainage (MBTSG 1996b). From the mid-1920's through the mid-1980's, "undesignated" cutthroat trout (probably Yellowstone cutthroat) were planted in Swan, Holland, and Lindbergh Lakes. Rainbow trout were also introduced in these three lakes, beginning in the mid-1920's. After 1966, Montana Fish, Wildlife and Parks discontinued these plants. Beginning in the late 1980's, Montana Fish, Wildlife and Parks stocked pure-strain westslope cutthroat trout in these three large lakes. Although not known to directly threaten bull trout, the plants of Yellowstone cutthroat and rainbow trout have adversely affected native cutthroat trout and may have had indirect or unknown impacts on bull trout (MBTSG 1996b).

Similar stocking practices occurred in the lakes of Glacier National Park. The emphasis on producing a fishery to attract anglers was a driving force of the park management in the early days. And, in fact, Creston National Fish Hatchery, built in 1939 and 1940, was originally a National Park Service facility, and the enabling legislation for the hatchery required that all fish reared there be stocked in waters of

Glacier National Park (Fredenberg 1997). In 1944, the hatchery was transferred to the U.S. Fish and Wildlife Service.

Kokanee salmon stocking in Lindbergh Lake began in 1944, and this program continues today (MBTSG 1996b). Coho salmon were planted in Lindbergh Lake in 1948. Kokanee salmon were first planted in Holland Lake in 1951. Because natural reproduction of kokanee salmon in the lake is limited, this fishery is still maintained by stocking of the salmon. Swan Lake never received kokanee salmon plants, but a substantial shoreline spawning population developed, probably due to downstream drift from Lindbergh and/or Holland Lakes. Also, kokanee salmon from Flathead Lake may have moved upstream to Swan Lake over the Bigfork Dam fish ladder after 1959.

Nearly 80 high mountain lakes exist in the Swan River drainage (MBTSG 1996b). Many of these lakes have been stocked with rainbow and/or cutthroat trout, both Yellowstone and westslope. Currently, only westslope cutthroat trout are stocked. Twenty-five other valley floor lakes in the Swan River drainage are managed fisheries, with most being stocked. In lakes with outlets to the river, management emphasis is directed to native westslope cutthroat trout. In some isolated water bodies or closed basins, rainbow trout have been, and may continue to be, stocked.

Stocking of fish in the Swan River and its tributaries has also been extensive (MBTSG 1996b). Brook trout were the earliest introductions, beginning in 1926 and extending until 1950. Although only six tributaries were known to have been stocked during that period, brook trout are now widely distributed. Cutthroat and rainbow trout were also stocked into tributary streams, and rainbow trout stocking also occurred directly in the Swan River. After 1968, the stocking of tributaries was largely discontinued.

Hungry Horse Dam, which is an isolating mechanism for the watershed upstream of it, could be considered a positive contribution to the fishery resource because of preventing the natural spread of introduced species upstream (MBTSG 1995d). At the present time, only a few small populations of rainbow trout, Yellowstone cutthroat trout, hybrid cutthroat trout, and Arctic grayling exist in the

South Fork Flathead River watershed. In the future, this barrier could become even more valuable as introduced species of fish continue to disperse throughout the mainstem Flathead River drainage. Montana Fish, Wildlife and Parks has made a commitment to manage the South Fork Flathead River and Hungry Horse Reservoir for native species (MFWP 1997b)

The problems created for native species by illegal fish introductions in the Flathead River basin are increasingly severe (MBTSG 1995c). These illegal introductions are not subjected to any environmental analysis, are almost always detrimental to native species, generally involve warmwater species (bass, perch, pike, and walleye) and/or nongame species (*e.g.*, minnows and bullheads), and are usually irreversible. In part, agency stocking efforts of the past have contributed to this problem of introduced species by providing closer sources of many of these species for transplant stock. This problem has been manifested mainly in lakes, perhaps because introductions in lakes have been more successful than those elsewhere, and is currently out of control in the Flathead River basin. Montana Fish, Wildlife and Parks has documented 220 illegal introductions in the northwest portion of the State that involve 122 different waters, with most of the introductions occurring in the past 20 years. Despite stepped-up educational and enforcement efforts, the problem has only worsened (Vashro, *in litt.*, 2000).

Flathead Lake and the Flathead River receive substantial angling pressure. Approximately 47,000 to 53,000 angler days per year are expended on the lake (Evarts *et al.* 1994, MFWP 2000a), and an estimated 31,223 angler days were spent in 1999 on the mainstem Flathead River upstream of the lake (MFWP 2000a). In addition, an estimated 5,352 angler days were spent in 1999 on the Middle Fork Flathead River and 6,590 angler days on the North Fork Flathead River (MFWP 2000a). Recent trends in angler use on the Flathead River system have been relatively stable (MFWP 2000a) as have recent use trends for the Flathead Lake fishery since a decline in use followed the collapse of the kokanee salmon fishery in the late 1980's (Evarts *et al.* 1994).

In 1999, anglers also expended an estimated 7,568 days fishing Hungry Horse Reservoir and 11,488 days fishing the South Fork Flathead River (MFWP 2000a).

Estimated angling pressure on Swan Lake in 1999 was 12,716 angler days (MFWP 2000a). On the Swan River, anglers expended an estimated 16,319 angler days in 1999 (MFWP 2000a).

Since at least the 1950's, fisheries management programs in the Flathead River basin have attempted to protect native species (bull trout and westslope cutthroat) (MBTSG 1995c). Despite those attempts, native populations have decreased, resulting in increasingly restrictive angling regulations. A collateral rise in populations of introduced species (particularly lake trout and northern pike) led to a shift in angler support toward those species. These events created a dilemma within the regulatory environment, which in recent times has attempted to provide quality angling opportunities for both native and introduced species—a difficult challenge.

In the past, legal angler harvest of bull trout throughout the Flathead River basin was significant. Harvest and escapement figures in 1981 suggest that anglers may have taken up to 40 percent of the adult bull trout that entered the river that year (Fraley *et al.* 1989).

Angling regulations for bull trout in the Flathead River basin have been gradually tightened over the past 45 years (MBTSG 1995c). The earliest regulations allowed an aggregate limit of 15 trout, but imposed a minimum size limit of 46 centimeters (18 inches) for bull trout. Spawning stream closures first occurred in 1953 in the North Fork Flathead River and in 1962 in the Middle Fork Flathead River. In 1985, bull trout were assigned a separate limit of one fish and the minimum length was dropped.

Since July 6, 1992, it has been illegal to “take and/or intentionally fish for bull trout” (MFWP, *in litt.*, 2000) throughout northwest Montana. In addition, all the primary spawning streams and the rivers around their mouths are closed to fishing entirely. There is one current exception to the no-take regulation: Swan Lake, with a daily limit of one fish. The Swan River and tributaries are closed to fishing for bull trout. Bull trout management objectives for Swan Lake are focused on maintaining the local populations at a stable level (MBTSG 1996b). According to a Swan Lake creel survey conducted in 1983 to 1984, bull trout were the third most abundant fish species harvested. Creeled bull trout averaged 46 centimeters (18 inches) long (Leathe and Enk 1985). The total

estimated harvest was 739 bull trout (Leathe and Enk 1985). A more recent survey, conducted in 1995, indicated an estimated 482 bull trout were harvested (Rumsey and Werner 1997). This level of harvest has not deterred an increasing trend in population of bull trout in Swan Lake, and the fishery has remained open; this lake is the only one under Montana Fish, Wildlife and Parks jurisdiction where fishing for bull trout is legal.

Hungry Horse Reservoir remained open to bull trout harvest until March 1995, when it was closed due to concern about the impact of deep reservoir drawdowns on the fish community. The Montana Bull Trout Scientific Group estimated that roughly 100 to 250 bull trout were harvested annually in Hungry Horse Reservoir between 1985 and 1993 (MBTSG 1995d). The most recent estimate of harvest was that anglers removed less than 10 percent of the adult population of bull trout from the reservoir in 1993 (MBTSG 1995d). Montana Fish, Wildlife and Parks has interpreted the data as indicating a stable trend in bull trout numbers in the South Fork Flathead River since the dam was built in the 1950's, and the agency has opened discussions with the U.S. Fish and Wildlife Service to explore options for reopening the fishery to angling, with the possibility of allowing some controlled harvest (MFWP 2000b). The potential for illegal introduction by anglers wishing to supplement their potential harvest remains a major concern in this drainage (MBTSG 1995d).

With increasing fishing pressure, some hooking mortality is inevitable, as well as problems with identifying fish that are caught (*i.e.*, mistaking bull trout for lake trout, brook trout, or other species). Illegal harvest of bull trout in northwest Montana has been an ongoing problem for at least 100 years. After Long (1997) interviewed poachers in northwest Montana to learn about their fishing habits and success rate, he estimated that, on average, 22 bull trout were killed per week per poacher during 3 months, July through September. Of the 9 poachers interviewed, 7 felt that poaching could have a major impact on reducing bull trout numbers. The numbers of fish harvested per poacher were much higher than expected, pointing out the danger that illegal harvest posed to local bull trout populations, especially because of the species' declining status (Long 1997). In response to this information, Montana Fish, Wildlife and Parks increased enforcement efforts, and penalties for illegal harvest of bull trout were raised.

Risks to bull trout from biological sampling have been minimal in past years, but may increase as more research and management activities occur. The number of research projects is increasing, and some projects involve invasive procedures. Risk due to electrofishing injury is unquantified for bull trout, but evidence suggests that most large trout are susceptible to electrofishing injury. As a result of research by the Montana Fish, Wildlife and Parks on the impact of electrofishing on fish, electrofishing techniques and equipment have been modified to minimize that risk. Also, a Montana Fish, Wildlife and Parks policy limits the use of electrofishing in waters that contain species of concern.

Priest Recovery Subunit

Bull trout are the only char species native to Priest Lake and the Priest River drainage. Brook trout are widely distributed throughout much of the historical range of bull trout in the Priest River watershed, including portions of nearly all spawning and rearing streams (PBTTAT 1998b). Lake trout are dispersed throughout the lakes, the Thorofare, and occasionally in the lower Priest River. Brown trout also occur in the lower Priest River and the East River.

Brook trout populations appear to be increasing in the system, particularly in tributaries on the west side of Priest Lake and the Upper Priest River. The tributaries west of Priest Lake have high sediment loads (due partially to geology) and generally fewer bull trout (PBTTAT 1998b). Finclips from 118 bull trout that were collected during 1997 to 1999 in the Upper Priest River drainage, including the lake and eight tributaries, are awaiting analysis to determine whether hybridization with brook trout is occurring and to assess the genetic attributes of the population(s) (Fredericks and Venard 2000).

Lake trout were introduced into Priest Lake by the U.S. Fish Commission in 1925. With the introduction of *Mysis* shrimp in the 1960's, the population expanded dramatically, all but eliminating kokanee salmon and bull trout from the lake by the early 1980's. Fishery managers attempted a variety of methods to restore a diverse fishery, including stocking nonnative rainbow trout and Yellowstone cutthroat and producing westslope cutthroat in net pens, but none of the efforts yielded adequate returns to the fishery to justify continuing the programs. Lake trout now provide the only significant fishery in Priest Lake, and bull trout have been reduced to remnant status. Regulations

for lake trout allow a two-fish limit for any size fish. There is some indication that the lake trout population in Priest Lake is expanding, including the fact that they are pioneering upstream into new waters (PBTTAT 1998b).

Lake trout have been present in Upper Priest Lake for over a decade, but have increased at an alarming rate during recent years (PBTTAT 1998b). *Mysis* shrimp are present in both lakes, having been introduced in the 1960's. In 1997, the Idaho Department of Fish and Game conducted an intensive survey in Upper Priest Lake to assess lake trout population and bull trout abundance and to evaluate the feasibility of removing lake trout (Fredericks 1999). This survey confirmed the presence of a well-established lake trout population. The size distribution of lake trout depicted a relatively young and expanding population. The collection of numerous juvenile lake trout suggested that they are reproducing successfully in Upper Priest Lake (Fredericks 1999). Movement of sonic- and spaghetti-tagged lake trout demonstrated that migration between Upper Priest Lake and Priest Lake is common.

In 1998, the Idaho Department of Fish and Game removed 912 lake trout from Upper Priest Lake by gill-netting (Fredericks and Venard 2000). In 1999, an additional 321 lake trout were removed. Ratios of bull trout to lake trout were similar in both years (about 5:100). However, return rates of tagged fish provided a clear indication that interchange of lake trout between the two lakes is common and that the upper lake cannot be treated as a closed system. Lake trout reduction in Upper Priest Lake is the most viable option for protecting and restoring the Upper Priest Lake bull trout population, but such reduction is unlikely to succeed unless a method can be established to control lake trout immigration through the Thorofare. Initial indications are that lake trout move through the area primarily at night, and mostly in the fall, although winter and spring periods were not sampled. Options to reduce lake trout movement are complicated by the strong public sentiment against obstructing free boat passage between the lakes. Further study will focus on seasonal and 24-hour use patterns of the Thorofare by lake trout and native fish species, with an eye toward developing alternatives to control fish migration (Fredericks and Venard 2000). An alternative strategy of suppressing lake trout in Priest Lake to reduce pioneering migrations into Upper Priest Lake is also being examined.

Upper Priest Lake has been managed as a catch-and-release fishery since 1994, with barbless hooks required and no bait allowed. Much of the fishing in the lake is associated with inexperienced anglers, who may be less able to identify bull trout and therefore more likely to keep bull trout than more experienced fishermen may be. Illegal harvest is an issue in the Priest River watershed, but the impact is largely unquantified.

Current management direction is to continue the existing lake trout fishery in Priest Lake and to attempt to maintain Upper Priest Lake as a refuge for native species. However, the latter lake is being seriously compromised by the increasing brook trout populations and the influx of lake trout. The current adult population of bull trout in Upper Priest Lake is estimated to be fewer than 200 fish (Corsi, *in litt.*, 2001). The existing studies should identify some of the biological factors associated with the feasibility of controlling lake trout, and the Idaho Department of Fish and Game has submitted a proposal to the Bonneville Power Administration for funding of a lake trout removal program, which would be combined with efforts to develop a migration barrier in the Thorofare (Corsi, *in litt.*, 2001).

If bull trout in Upper Priest Lake can be protected and restored, options for eventually restoring bull trout in Priest Lake may remain viable. But if bull trout are extirpated in Upper Priest Lake, successfully restoring the species to this core area is doubtful. The recently approved Idaho Department of Fish and Game five-year fisheries management plan for the Pend Oreille River drainage (including the Priest Lakes system) has an objective of restoring a fishable population of bull trout in Upper Priest Lake, an objective to be accomplished by programs to disrupt lake trout immigration through the Thorofare and to actively suppress lake trout. The Idaho Department of Fish and Game also proposes a significant reduction in lake trout in main Priest Lake with an objective of restoring a “more traditional fishery” based on native species, primarily bull trout and westslope cutthroat trout, with a yield fishery for kokanee salmon (IDFG 2001).

Summary (Fisheries Management)

Of all the threats to bull trout recovery, the expanding presence of nonnative species may prove to be the most intractable. In particular, expansion of congeneric lake trout and brook trout is of greatest concern for bull trout recovery in the Clark Fork Recovery Unit. Scientists currently have limited tools available to deal with these

intruders, and, in many cases, there is strong public opposition to controlling or eliminating other salmonids that provide sport fisheries. The impact of introductions of nonnative species, which are essentially “biological pollutants,” in most cases may be permanent. While the status of stream habitat for bull trout in many watersheds throughout the Recovery Unit has had an improving trend, the effects of nonnative species introductions, particularly in large lakes, may permanently reduce the capacity of these waters to support bull trout. This issue ranks as one of the highest priorities for expenditure of research, education, and enforcement dollars. Angling regulations in most waters have gone as far as they can to protect native species, short of completely closing angling to further reduce the take that occurs from hooking mortality and species misidentification. A key to successful bull trout restoration is educating both anglers and the nonangling public about the values of native species. Anglers and the management agencies must be convinced to sacrifice short-term satisfaction for long-term gains to native species populations. Intact native fish ecosystems are increasingly rare, and we must allocate substantial resources to protecting and restoring those that remain.

Isolation and Habitat Fragmentation

Upper Clark Fork Recovery Subunit

Several elements determine the degree of threat that is posed by the isolation and fragmentation of bull trout habitat. One is the likelihood of catastrophic events occurring, along with the relative frequency, intensity, timing, and location of such catastrophes. We must consider natural calamities such as fire, flood, and landslides (which can be exacerbated by man's activities), as well as man-caused catastrophes such as pollution or introduction of exotic diseases or organisms. For example, whirling disease has recently been introduced to numerous waters where bull trout are found. While not believed to pose an immediate threat to bull trout populations, whirling disease is spreading in streams such as the Blackfoot River (Pierce and Podner 2000), with uncertain effects. The population level consequences to bull trout of any catastrophe will depend on the extent and quality of the habitat; the distribution, abundance, and genetic variability of the population (adaptability); and other factors. Therefore, the larger and more interconnected the system is, the more likely that the bull trout population will survive catastrophic events or that it will be able to recolonize from other sources

following a catastrophe. For these reasons, this recovery plan places a high level of importance on the interconnectivity of bull trout populations.

In the upper Clark Fork and Bitterroot River drainages, fire, flood and drought are more likely to occur than landslides or rain-on-snow events. The intense fire season of 2000 burned a substantial portion of the upper Bitterroot River drainage. “Rain-on-snow” is a common term used to describe cloudy weather periods when warm winds and rain combine to produce rapid snowmelt. These events generally occur during early to mid-winter periods. Human activities have increased the chances of some of these events occurring. However, these events are of concern to bull trout recovery primarily because local bull trout populations are fragmented. Even Rock Creek and the Blackfoot River, both of which retain habitat connectivity within their tributaries, are disconnected from the mainstem Clark Fork River and Lake Pend Oreille by Milltown Dam and the series of dams downstream. Under current conditions, if a catastrophic event were to cause a localized or widespread extirpation of populations, the opportunity for the fish to naturally recolonize the habitat from downstream or adjacent watersheds is extremely limited.

Disruption of migratory corridors probably leads to the loss of the migratory life history form (Nelson 1999), and resident stocks living upstream of barriers are at an increased risk of extinction (Rieman and McIntyre 1993). Restoration of the migratory life history form is needed for the long-term persistence of bull trout in many portions of the upper Clark Fork River drainage.

If a local population is small enough, random genetic variation among individuals can lead to long-term declines in fitness, and the local population may go extinct. As a local population is restricted in abundance, or as the variation in its birth rate or survival increases, the predicted mean time to extinction will decrease (Rieman and McIntyre 1993).

The Montana Bull Trout Scientific Group judged that the risk of extirpation is high for local populations of bull trout in the core areas of the upper Clark Fork River basin and in the Bitterroot River basin (MBTSG 1995a, 1995e). This high risk is partly because of habitat isolation and fragmentation and low population abundance. The risks

to bull trout in the Blackfoot River and Rock Creek are somewhat lower because of greater degree of habitat connectivity and the presence of more robust populations (MBTSG 1995b, 1995e). However, bull trout densities are generally low throughout the upper Blackfoot River tributary system (MBTSG 1995b), with the exception of Copper Creek (Pierce and Podner 2000). Telemetry studies have indicated that bull trout from the lower portion of the Blackfoot River drainage did not migrate to the upper drainage and that separate local populations may occur (Swanberg 1997). Even systems that appear to be functionally connected, such as the Blackfoot River system, may have long reaches where poor water quality, degraded habitat, or other factors result in fragmentation of bull trout populations. In 1999, electrofishing of nearly 6.5 kilometers (4 miles) of the upper Blackfoot River (upstream of the North Fork) resulted in the capture of only three bull trout. The status of bull trout in the upper Blackfoot River remains precarious (Pierce and Podner 2000).

Time series monitoring of local bull trout populations on the Bitterroot National Forest began in 1989, too recently to establish long-term trends. However, available evidence indicates that resident and migratory bull trout are probably continuing to decline from their historical distribution and abundance (MBTSG 1995a). Resident fish are now the predominant life form in the Bitterroot River drainage (Nelson 1999). Migratory fish are rare and are only found in upstream portions of the Bitterroot River and in Painted Rocks Reservoir. For resident fish, the risk varies by location. Some local populations in tributaries on the east side of the valley are at lower risk (adults number in the thousands in some of these tributaries), but in the west-side tributaries local populations are at high risk because of low numbers (MBTSG 1995a).

Lower Clark Fork Recovery Subunit

Prior to hydroelectric development in the lower Clark Fork River drainage, migratory bull trout from the Clark Fork River and Lake Pend Oreille had access to tributary streams both within the lower Clark Fork River drainage and upstream of Thompson Falls Dam (MBTSG 1995e, 1996a, 1996e). Historically, the Clark Fork River was used as a migration corridor between its tributaries and Lake Pend Oreille. Some tributaries within the lower Clark Fork River drainage were used for spawning and rearing. The bull trout biology and life history patterns were probably similar to those

currently documented in other tributaries to Lake Pend Oreille or in the Flathead Lake and River system (Fraley and Shepard 1989).

As dams were built, the migratory corridor for spawning bull trout was blocked. Reservoirs upstream of those dams were filled concurrently with chemical treatments being made for rehabilitation, further compounding the loss of bull trout (MBTSG 1996a). Dam construction isolated migratory fish from Lake Pend Oreille from their natal tributaries and created run-of-the-river reservoir habitats behind Cabinet Gorge, Noxon Rapids, and Thompson Falls Dams. The resulting reservoir habitats are not adequate substitutes for Lake Pend Oreille. Currently, the tributary spawning and rearing habitats still exist (although degraded), but foraging, migrating, and overwintering habitats for migratory adult and subadult fish have changed significantly. Over time, the fish expressing the migratory life history pattern were largely replaced by fish that expressed the resident life form in the tributaries. These changes have occurred over a period dating back nearly a century (Thompson Falls Dam was built in 1913).

The shift from larger, more migratory adfluvial populations to smaller, more isolated migratory and resident populations in the lower Clark Fork River has dramatically increased the likelihood of extirpation for a given stock (MBTSG 1996a). Resident bull trout are typically smaller in body size than their migratory counterparts. Because fecundity is related to size, the migratory strategy can confer an adaptive strategy by increasing reproductive potential. In productive environments, migratory forms should dominate resident forms and should be more resilient and more resistant to environmental variation and stressors (Rieman and McIntyre 1993). In addition, migratory fish are more likely to stray between streams than resident fish, a behavior that provides for genetic exchange and higher chances of refounding locally extinct populations. In their study of demographic requirements for bull trout, Rieman and McIntyre (1993) concluded that maintenance of the migratory life history form is necessary for the long-term survival of the species.

The processes of extinction do not operate independently (MBTSG 1996a). For example, habitat changes that stress or isolate population segments, and therefore reduce abundance, may increase the local population's susceptibility to other risks such as environmental instability or detrimental genetic effects. Low abundance may result in

loss of genetic diversity that could reduce fitness and increase sensitivity to environmental variation.

Underlying geology is an important characteristic that influences fish distribution, abundance, and growth (PBTTAT 1998a). Streams on the northern and eastern side of the lower Clark Fork River basin (watersheds in the Cabinet and Bitterroot Mountains) are primarily within the Belt Series bedrock type, meaning that they are underlain by sedimentary deposits of clay, silt, and sand. Streams draining the Selkirk Mountains are in the Kaniksu batholith and are underlain primarily by granite. The basin was substantially altered by major glacial events in the late Pleistocene period. The present Clark Fork River valley was alternately plugged and scoured by dams of ice and deposited debris from glacial Lake Missoula.

As a result of this history, watersheds in the Cabinet Mountains tend to be prone to rapid runoff events, in-channel erosion, and occasional mass wasting (PBTTAT 1998a). Groundwater seeps and springs are also more prevalent in tributaries draining the Cabinet Mountains north of Lake Pend Oreille. These Belt Series streams tend to be more productive and have much less fine sediment than streams draining the granitic soils of the Selkirk Mountains. Granitic soils tend to be nutrient-poor, and fish growth is typically slower in streams flowing from granitic watersheds. Natural waterfalls are found throughout the stream tributaries of the Clark Fork River basin and prevent use of several tributaries, or portions of tributaries, by migratory fish (PBTTAT 1998a).

Forest fires have had a profound impact on vegetation within the Clark Fork River watersheds during the last century. The forest fire of 1910 burned an estimated 1,215,000 hectares (3,000,000 acres) in western Montana and northern Idaho, with the most severely burned areas on the west-southwest flanks of the Clark Fork River valley (PBTTAT 1998a).

Past management activities and successful wildfire control have caused a shift in forest species composition and stocking levels, predisposing forests to large-scale mortality. Drought conditions can further dispose these forests to increased wildfire incidence and intensity, resulting in significant negative impacts on water quality and fish habitat. At least four large wildfires (during 1910, the 1930's, and 1967), and numerous

smaller fires, have burned in the lower Clark Fork River watershed in this century (PBTAT 1998a). Large fires have often left riparian vegetation intact along larger streams, and bull trout have persisted in the basin following large wildfires. However, wildfire may result in short- or longer-term loss of, or reductions in, bull trout use of specific streams or stream reaches. Intense fires may increase natural sediment delivery to streams when hydrophobic soils are created. At the same time, fires can significantly increase recruitment of large woody debris to stream channels. Where post-fire salvage operations have removed woody debris from stream-side areas, or created other disturbances such as roads and fire breaks, impacts to fish may be increased (Rieman and Clayton 1997). Although stream habitat in the most severely burned drainages is recovering from past fires, legacy effects from these fires will continue to lower overall productivity for bull trout in some stream reaches.

Flathead Recovery Subunit

In the Flathead Lake, Swan Lake, and South Fork Flathead River (Hungry Horse Reservoir) core areas, the risk to bull trout from environmental instability is reduced due to the predominance of the migratory life form and the relatively connected habitat remaining for these fish (MBTSG 1995c, 1995d, 1996b). If a natural or human-caused event causes bull trout to be eradicated from a small portion of the basin (local populations), other fish from within the drainage may colonize the vacant habitat. For populations in the core areas centered in smaller lakes, the risks from catastrophic events are higher because the isolation factor and restricted habitat make survival and/or recolonization less likely (MBTSG 1995c). In spite of barriers on the South Fork Flathead and Swan River that have cut off nearly half the watershed, the remaining upper Flathead River (North and Middle Forks) is one of the largest drainages (nearly 200,000 hectares [500,000 acres]) that still maintains good interconnections between spawning and rearing habitat and between the foraging, migrating, and overwintering habitat for migratory fish. There are substantial genetic differences between local populations spawning in the North Fork and Middle Fork Flathead River tributaries that should not be disrupted (Kanda *et al.* 1994).

At present, the Swan River drainage provides habitat for one of the strongest collections of local migratory bull trout populations remaining in the State of Montana (MBTSG 1996b). At least 23 tributaries support some level of juvenile bull trout rearing

(Leathe and Enk 1985). Bull trout spawning occurs in at least 10 tributary drainages. Major spawning and rearing areas in the Swan River drainage are highly groundwater influenced, a condition that reduces the risk from drought conditions.

Evidence of past influence from flooding or rain-on-snow events is seen in several drainages of Flathead River basin tributaries, in large part due to the massive flood in 1964. Problems are particularly evident in the Middle Fork Flathead River watershed (MBTSG 1995c). In the Swan River drainage, channel stability problems have been observed during redd counts of bull trout in Goat, Squeezer, Jim, Piper, Cold, Woodward, and Soup Creeks.

Natural water temperatures over 15.5 degrees Celsius (60 degrees Fahrenheit) occur in the late summer and fall downstream of most lakes in the Flathead River basin; these temperatures deter migratory bull trout spawners from entering these systems from downstream (MBTSG 1995c). These conditions probably serve as natural isolating mechanisms, protecting the genetic adaptations of each core area, but also serving to increase the risk of local extirpation, particularly in some of the smaller systems.

Priest Recovery Subunit

Impact from management activities on the Upper Priest River is relatively low. Natural barriers limit the amount of habitat available to migratory bull trout (PBTTAT 1998b). Malcom Creek has a steep cascade about 0.8 kilometer (0.5 mile) upstream of the mouth that is probably a barrier. Rock Creek has a long rock chute barrier about 1.6 kilometers (1 mile) upstream of the mouth. The upper reaches of Cedar Creek also have bedrock chute barriers. Additional natural barriers occur on Trapper, Caribou, Lion, Two Mouth, Granite, North Fork Granite, and Kalispell Creeks and on the Upper Priest River. Dewatering, due to subsurface flow, occurs with regularity on portions of Kalispell Creek (PBTTAT 1998b).

Summary (Isolation and Habitat Fragmentation)

Rieman and Allendorf (2001) used a generalized, age-structured simulation model to relate the effective population size (N_e) to adult numbers under a range of life histories and other conditions characteristic of bull trout populations. They concluded that “cautious long-term management goals for bull trout populations should include an

average of at least 1000 adults spawning each year. Where local populations are too small, managers should seek to conserve a collection of interconnected populations that is at least large enough in total to meet this minimum.” This collection of interconnected populations is defined as a core area population. The core area represents our best approximation of a biologically functioning unit.

Rieman and Allendorf (2001) pointed out that few local bull trout populations (indeed, few core areas) support spawner numbers averaging 1,000 or more per year. They noted that populations smaller than 1,000 should not be written off as lost causes, but that those populations should be recognized as facing greater threats associated with small population size and, therefore, as probably requiring more aggressive management and more immediate attention to mitigate those threats (Rieman and Allendorf 2001).

In the Clark Fork Recovery Unit, the risk of core area and local population extirpation from habitat isolation and fragmentation is generally increasing as populations of bull trout decline. Major dams were the catalyst for much of this disruption, and fragmentation has continued at a finer scale because of habitat decline and introductions of nonnative species. While bull trout are present in most historical core areas, there is substantial evidence of extirpation of local populations throughout this recovery unit, and many populations are at levels low enough to seriously reduce the chances of recolonization. The threat from isolation and fragmentation is real, and as more data is gathered, we anticipate gaining a better understanding of how bull trout migrate and interact between patches (Rieman and McIntyre 1995).

CONSERVATION MEASURES

Over the last decade, significant planning efforts to restore and recover bull trout have been initiated, and many on-the-ground activities specifically designed to benefit bull trout and other native salmonids within the Clark Fork Recovery Unit have been implemented. Ultimately, the measure by which these efforts should be judged is the degree to which they have produced positive response in the numbers and security of local bull trout populations. However, because most of these efforts are relatively young and could not be expected to produce measurable population response for several bull trout generations, judging the success of most of those programs at this time is premature. Because most programs have been government-led or funded, and they are most easily summarized by jurisdiction, we depart from the prior format for this section. Following is a brief summary of the existing and ongoing conservation activities.

State of Idaho

The Idaho Department of Fish and Game developed a management plan for bull trout in 1993 (Conley 1993), and the State of Idaho approved a plan for the conservation of bull trout in July 1996 (Batt 1996). The overall approach of the plan is to use existing groups established by Idaho Legislation, that is, watershed advisory groups and basin advisory groups that were formed to strengthen water quality protection and improve compliance with the Clean Water Act through locally developed, site-specific programs.

Lake Pend Oreille was designated as one of 59 key watersheds in the State of Idaho. The Lake Pend Oreille Watershed Advisory Group was one of the first to form, in August 1997. With partial funding provided by Avista Corporation and with the assistance of a consultant, the watershed advisory group progressed rapidly. The Panhandle Bull Trout Technical Advisory Team developed a problem assessment (PBTAT 1998a), which the watershed advisory group used as the basis for the Lake Pend Oreille Bull Trout Conservation Plan—the first, and only, such plan completed in the State of Idaho (LPOWAG 1999).

The mission statement of the Lake Pend Oreille Bull Trout Conservation Plan is to “[d]evelop and implement a locally accepted conservation plan which will provide for a population of bull trout with long term viability and a harvestable surplus, while

minimizing disruption to the lifestyles and industries of the area's population" (LPOWAG 1999). The plan identifies 12 high-priority watersheds for bull trout and describes a series of restoration actions in each of these watersheds. For each action, a coordinating entity (*i.e.*, responsible party) is designated. Actions are categorized as fisheries management, habitat management, education, enforcement, or monitoring needs.

The U.S. Fish and Wildlife Service supports the Lake Pend Oreille Bull Trout Conservation Plan as an excellent road map for the process of bull trout recovery in the greater Lake Pend Oreille watershed and encourages its full implementation. The plan also lists specific measures and activities that have occurred in the various watersheds draining into Lake Pend Oreille to protect and enhance bull trout (LPOWAG 1999). These measures and activities include restrictive angling regulations, scientific studies, educational efforts, riparian and wetland protection, road stabilization and sediment source remediation, and multiple watershed assessments and inventories, to name just a few. It should be noted that these activities are being carried out in a cooperative fashion by a broad group of agencies and private entities, with multiple sources of public and private funding, and not by the State of Idaho alone.

The Priest Lake Bull Trout Watershed Advisory Group also directed the Panhandle Basin Technical Advisory Team to develop a bull trout problem assessment. A draft of that document was prepared in December 1998, but was not completed. The existing draft contains background information but few specific recovery actions (PBTTAT 1998b). The Priest Lake Watershed Advisory Group has not actively met for several years and the entire Basin Advisory Group/Watershed Advisory Group process is currently on hold, pending further direction from the Governor's office.

The Idaho Department of Fish and Game, with section 6 funding from the U.S. Fish and Wildlife Service, is also conducting an evaluation of the threat from nonnative species (*i.e.*, lake trout and brook trout) in Upper Priest Lake. Recommendations for solutions are being pursued through a number of avenues.

The Idaho Department of Lands has been actively graveling roads that parallel bull trout streams to help minimize sediment delivery. The agency has also adopted a

more stringent standard for stream shading to insure that timber harvest activities near streams will not increase stream temperatures above the preferred range for bull trout and other coldwater salmonids.

State of Montana

Beginning in 1990, the State of Montana initiated several formal bull trout planning activities, increased enforcement efforts on bull trout streams, and stepped up actions for habitat restoration and habitat monitoring. In 1993, the Governor of Montana appointed the Bull Trout Restoration Team to produce a plan that maintains, protects, and increases bull trout populations. The team appointed a scientific group (Montana Bull Trout Scientific Group) to provide the restoration planning effort with technical expertise.

The scientific group wrote 11 basin-specific status reports and 3 technical, peer-reviewed papers about the role of hatcheries (MBTSG 1996d), the suppression of nonnative fish species (MBTSG 1996c), and land management (MBTSG 1998). A draft restoration plan that defined and identified strategies for ensuring the long-term persistence of bull trout in Montana was released for public comments in September 1998 (MBTRT 1998). In June 2000, the final restoration plan was issued (MBTRT 2000). The plan synthesizes the scientific reports and provides recommendations for achieving bull trout restoration in western Montana. It focuses activities on 12 restoration/conservation areas and was designed to complement and be consistent with this recovery plan. The Montana Restoration Plan relies on voluntary actions, promoted by watershed groups, but has no legislative or legal authority beyond existing State law. Implementation of the Montana Restoration Plan has not officially begun; it is expected to mesh with implementation of this recovery plan.

A multitude of habitat restoration projects, such as removing fish passage barriers, screening irrigation diversions, fencing riparian areas, restoring streams, and monitoring habitat have been completed or are underway in Montana (Graham and Clinch, *in litt.*, 1997). Angling regulations have become more restrictive than in the past, brook trout are no longer stocked, and genetic studies are ongoing. As in Idaho, these activities are being carried out in a cooperative fashion by a broad group of State,

Federal, and Tribal agencies and private entities, with multiple sources of public and private funding.

The Blackfoot Challenge is an organization developed by concerned people in the Blackfoot Valley with the purpose of supporting cooperative resource management, helping manage for the future, and keeping the area's desired characteristics. The Challenge is comprised of individuals, landowners, residents, recreationists, special-interest groups, and Federal, State, and local resource management agencies. Participants in the Challenge come together to coordinate efforts, distribute information, and foster open communication. Members of the Challenge have assisted in initiating a number of stream improvement projects. To date, improvement measures for fish habitat, wetlands, and rangeland have been applied, or are in progress, in at least 34 streams. The results of these projects have been substantial localized improvement in water quality and fisheries resources (Pierce and Podner 2000).

In 1999, the State of Montana reached a partial settlement of its Natural Resource Damage Assessment Program lawsuit with Atlantic Richfield Corporation (MDOJ 1999). The settlement decree requires that at least \$500,000 of the approximately \$130 million settlement be spent on bull trout recovery projects over the next 10 years. In addition, approximately \$10 million will be made available annually through competitive grants to restore, replace, rehabilitate, or acquire fish and wildlife habitat that was injured from the mining and smelting activities. An additional allocation of up to \$5 million (still under negotiation) will be spent on restoring bull trout habitat. In total, this settlement provides substantial financial resources for restoring bull trout and bull trout habitat in the upper Clark Fork River basin.

The Montana Bull Trout Scientific Group reported that about 724 kilometers (450 miles) of streams in the upper Clark Fork River basin were impaired or partially impaired for beneficial uses (MBTSG 1995e). In April 2000, the Montana Department of Environmental Quality released a revised draft section 303(d) list, which incorporates a different approach to listing impaired water bodies, based upon 1997 legislative amendments to the Montana water quality laws (MDEQ 2000). When finalized, the new section 303(d) list will be more thoroughly documented, but less inclusive, than past lists. The upper Clark Fork River is among the State's highest-priority streams for

incorporating into the total maximum daily load process (MDHES 1994). Although algae and metals continue to affect the mainstem and tributaries in the upper basin, the U.S. Environmental Protection Agency (USEPA 1993) reports slightly improving trends because of stricter standards and clean-up measures.

The objectives of the South Fork Flathead Conservation Agreement—signed in 1997 by Montana Fish, Wildlife and Parks, U.S. Fish and Wildlife Service, Bonneville Power Administration, U.S. Bureau of Reclamation, U.S. Forest Service, and Confederated Salish and Kootenai Tribes—are to 1) ensure proactive involvement in addressing factors affecting bull trout, 2) facilitate interagency communication and coordination, and 3) provide a fishable population of bull trout in the South Fork Flathead River drainage. As monitoring of the bull trout population continues, criteria will be developed to determine the conditions under which a fishing season for bull trout may be reestablished.

Several other significant funding sources for bull trout restoration have been developed in Montana. The Montana Future Fisheries Improvement Program awards approximately \$750,000 annually for projects that restore or enhance habitat for wild fish, with preference given to projects that emphasize native species. House Bill 647, passed in the 1999 State Legislature, roughly doubled the annual funding for restoring or enhancing fish habitat, with specific directives to benefit bull trout and cutthroat trout. License agreements from the Federal Energy Regulatory Commission for Cabinet Gorge, Noxon Rapids, and Kerr Dams provide tens of millions of dollars for fisheries restoration, much of which is for bull trout, over the decades the licenses are in effect. The State of Montana also receives approximately \$1 million annually from the Bonneville Power Administration, through the Northwest Power Planning Council, for native fish restoration. Collectively, these and other funding sources provide a solid foundation for implementing many of the actions described in this recovery plan.

Federal Activities

Aside from the standard Columbia River basin guidelines for land management, water management, and the Endangered Species Act that apply to Federal actions (see Chapter 1), several significant Federal efforts have had specific implications for bull trout in the Clark Fork Recovery Unit. In December, 2000, the U.S. Fish and Wildlife Service

issued a Biological Opinion for the Federal Columbia Power System (USFWS 2000) (see Chapter 1 for a discussion of the Biological Opinion). The Biological Opinion requires that issues about dam operation for bull trout at the Albeni Falls Dam be adequately addressed.

The U.S. Fish and Wildlife Service has negotiated a Habitat Conservation Plan with Plum Creek Timber Company. The Habitat Conservation Plan includes bull trout and other native salmonids occurring on over 688,500 hectares (1.7 million acres) of corporate lands, primarily (over 90 percent) within the Clark Fork Recovery Unit. A Final Environmental Impact Statement was published in September 2000, and the Habitat Conservation Plan was signed in December 2000. Successful implementation of the Habitat Conservation Plan is expected to raise standards for private timberland management activities and, therefore, reduce impacts of future actions and remediate existing problems to the benefit of bull trout.

The diverse land uses and economic activities in the Clark Fork River drainage have led to numerous water quality problems. A century of mining and smelting has left the upper Clark Fork River and some of its tributaries polluted by toxic metals and other chemicals. Overall, metals contamination is most prevalent in the headwater tributaries, Silver Bow Creek, and the lower reaches of Warm Springs Creek (MDHES 1994). The Environmental Protection Agency's National Priority List has listed four Superfund sites in the upper Clark Fork River basin, including the mainstem Clark Fork River from Warm Springs Creek to Milltown Dam. Since 1982, the Environmental Protection Agency, together with other State, Federal, and private entities, has worked to investigate and prescribe clean-up procedures (USEPA 1993).

The Federal Energy Regulatory Commission relicensing process has provided a timely Federal nexus to positively influence bull trout recovery at several major private hydroelectric dams, including Cabinet Gorge, Noxon Rapids, Thompson Falls, Milltown, Kerr, and Bigfork. All but one of these dams have recently been, or currently are, subject to relicensing, and substantial changes in operations as well as major sources of money for recovery activities have been, and are, being negotiated. The Avista Settlement Agreement, for example, for relicensing Noxon Rapids and Cabinet Gorge Dams will provide over \$1.25 million dollars per year for 45 years to restore and improve habitat

and fish passage under Washington Water Power's Native Salmonid Restoration Plan (Washington Water Power Company 1998). Funding for portions of this plan are matched by State and Federal agencies.

The Northwest Power Act, in part requiring mitigation for past and present impacts to fish and wildlife from Federal hydropower projects, has directed tens of millions of dollars of Bonneville Power Administration funds to a series of fisheries recovery actions in western Montana and northern Idaho. With the 1998 Endangered Species Act listing of bull trout, a larger proportion of those funds were directed toward actions directly related to recovery of the species.

The U.S. Fish and Wildlife Service has established several staff positions in western Montana under the Partners for Fish and Wildlife Program, and these new employees have focused on developing funding opportunities and directing U.S. Fish and Wildlife Service funds toward cooperative habitat restoration, water development, and easement programs to benefit native fish. The benefits of these efforts include the successful program guided by the Blackfoot Challenge.

Native American Tribal Activities

The Confederated Salish and Kootenai Tribes have taken an active role in conserving and restoring bull trout habitat, particularly in the Flathead and Jocko River drainages. They have been actively involved in the Montana Restoration Plan development and have applied substantial financial resources, such as from Federal Energy Regulatory Commission relicensing of Kerr Dam and from settlements from Atlantic Richfield Corporation, toward restoration of bull trout.

Canadian Government Activities

The Province of British Columbia has dedicated resources to protecting the North Fork Flathead River drainage, including research and management efforts that were helpful in avoiding proposed coal mine developments in the drainage that would have directly threatened bull trout spawning and rearing habitat for adfluvial fish migrating from Flathead Lake. British Columbia has also implemented and enforced stricter angling regulations to accommodate the United States' concerns and continue to cooperate in recovery planning efforts.

STRATEGY FOR RECOVERY

A core area represents the closest approximation of a biologically functioning unit for bull trout. The combination of core habitat (*i.e.*, habitat that could supply all elements for the long-term security of bull trout, including for both spawning and rearing, as well as for foraging, migrating, and overwintering) and a core population (*i.e.*, bull trout inhabiting a core habitat) constitutes the basic core area unit on which to gauge recovery within a recovery unit.

In the Clark Fork Recovery Unit (Table 2), core areas were most easily delineated for adfluvial populations (*e.g.*, typically the lake where adults reside and interconnected watershed upstream). For fluvial or anadromous populations, delineating core areas requires that some judgment calls be made in determining the extent of historical and current connectivity of migratory habitat, while considering natural and manmade barriers, survey and movement data, and genetic analysis. For resident populations, we must consider whether local populations are remnants from previously existing migratory bull trout and whether reconnecting fragmented habitat would restore a migratory core area. Overall, the hierarchy of population units was mutually exclusive both within a level (*e.g.*, core areas did not overlap) and among levels (*e.g.*, a core area did not occur within portions of more than one recovery unit or subunit).

Table 2. List of local populations (in bold) by core area, in the Clark Fork Recovery Unit. Streams designated by (mc) are migratory corridors only and are not considered to host their own local population.

RECOVERY UNIT AND SUBUNIT	CORE AREA	LOCAL POPULATION
Clark Fork RU Upper Clark Fork RSU	Clark Fork River Section 1 (Upstream of Milltown Dam)	Clark Fork River Warm Springs Creek Racetrack Creek Little Blackfoot River Flint Creek Boulder Creek Harvey Creek
	Rock Creek	Rock Creek Middle Fork Rock Creek East Fork Rock Creek West Fork Rock Creek Ross Fork Rock Creek Upper Willow Creek Stony Creek Wyman Creek Hogback Creek Cougar Creek Wahlquist Creek Butte Cabin Creek Welcome Creek Ranch Creek Brewster Creek Gilbert Creek
	Blackfoot River	Blackfoot River Landers Fork North Fork Blackfoot River Monture Creek Cottonwood Creek Belmont Creek Gold Creek
	Clearwater River and Clearwater lake chain	Clearwater River (upstream of Salmon Lake) West Fork Clearwater River Deer Creek Morrell Creek Owl Creek (mc) Placid Creek

RECOVERY UNIT AND SUBUNIT	CORE AREA	LOCAL POPULATION
	Clark Fork River Section 2 (Milltown Dam to Flathead River)	Clark Fork River (mc) Rattlesnake Creek Petty Creek Fish Creek Trout Creek Cedar Creek St. Regis River
	West Fork Bitterroot River	All tributaries upstream of Painted Rocks Dam
	Bitterroot River	West Fork Bitterroot River (downstream of Painted Rocks) East Fork Bitterroot River Warm Springs Creek Bitterroot River Sleeping Child Creek Skalkaho Creek Blodgett Creek Fred Burr Creek Burnt Fork Creek
Clark Fork RU Lower Clark Fork RSU	Lower Flathead River	Mission Creek (mc) Post Creek (trib. to McDonald Lake) Mission Creek (trib. to Mission Reservoir) Dry Creek (trib. to Tabor (St. Marys) Res.) Jocko River South Fork Jocko River Middle Fork Jocko River North Fork Jocko River
	Clark Fork River Section 3 (Flathead River to Thompson Falls Dam)	Clark Fork River (mc) Thompson River (mc) Fishtrap Creek West Fork Thompson River
	Noxon Rapids Reservoir	Prospect Creek Graves Creek Vermillion River
	Cabinet Gorge Reservoir	Rock Creek Bull River

RECOVERY UNIT AND SUBUNIT	CORE AREA	LOCAL POPULATION
	Lake Pend Oreille (LPO)	Clark Fork River Twin Creek Lightning Creek Rattle Creek Wellington Creek Porcupine Creek East Fork Lightning Creek Johnson Creek (trib. to LPO) Gold Creek (trib. to LPO) North Gold Creek (trib. to LPO) Granite Creek (trib. to LPO) Trestle Creek (trib. to LPO) Pack River (trib. to LPO) Grouse Creek Priest River East River (mc) Middle Fork East River (mc) Uleda Creek Tarlac Creek
Clark Fork RU Flathead RSU	Frozen Lake	Unnamed headwater tributary (and stream flowing out of Frozen Lake)
	Upper Kintla Lake	Kintla Creek (trib. to Upper Kintla Lake)
	Kintla Lake	Kintla Creek (trib. to Kintla Lake)
	Akokala Lake	Akokala Creek (trib. to Akokala Lake)
	Bowman Lake	Bowman Creek (trib. to Bowman Lake)
	Cerulean Lake Quartz Lake Middle Quartz Lake	Quartz Creek (trib. to Middle Quartz Lake)
	Lower Quartz Lake	Quartz Creek (trib. to Lower Quartz Lake)
	Cyclone Lake	Cyclone Creek (entire drainage)
	Logging Lake	Logging Creek (trib. to Logging Lake)
	Trout Lake	Camas Creek (trib. to Trout Lake)
	Arrow Lake	Camas Creek (trib. to Arrow Lake)
	Isabel Lake(s)	Park Creek (trib. to Lower Isabel Lake)
	Harrison Lake	Harrison Creek (trib. to Harrison Lake)
	Lincoln Lake	Lincoln Creek (trib. to Lincoln Lake)

RECOVERY UNIT AND SUBUNIT	CORE AREA	LOCAL POPULATION
	Lake McDonald	McDonald Creek (trib. to Lake McDonald)
	Doctor Lake	Doctor Creek (trib. to Doctor Lake)
	Big Salmon Lake	Big Salmon Creek (trib. to Big Salmon Lake)
	Hungry Horse Reservoir	South Fork Flathead River (mc) Danaher Creek Youngs Creek Gordon Creek White River Little Salmon Creek Bunker Creek Spotted Bear River Sullivan Creek (trib. Hungry Horse Res.) Wheeler Creek (trib. H. Horse Res.) Wounded Buck Creek (trib. H. Horse Res.)
	Upper Stillwater Lake	Stillwater River (trib. to Upper Stillwater Lake)
	Whitefish Lake	Swift Creek (trib. to Whitefish Lake)
	Upper Whitefish Lake	East Fork Swift Creek (trib. and downstream)
	Lindbergh Lake	Swan River (trib. to Lindbergh Lake)
	Holland Lake	Holland Creek (trib. to Holland Lake)
	Swan Lake	Swan River (mc) Elk Creek Cold Creek Jim Creek Piper Creek Lion Creek Goat Creek Woodward Creek Soup Creek Lost Creek

RECOVERY UNIT AND SUBUNIT	CORE AREA	LOCAL POPULATION
	Flathead Lake	Flathead River (mc) North Fork Flathead River (U.S. / B.C.) Howell Creek (B. C.) Kishinehn Creek (B. C.) Trail Creek Whale Creek Red Meadow Creek Coal Creek Big Creek Middle Fork Flathead River (mc) Strawberry Creek (includes Trail) Bowl Creek Clack Creek Schafer Creek (includes Dolly Varden) Morrison Creek (Includes Lodgepole) Granite Creek Long Creek Bear Creek Ole Creek Park Creek Nyack Creek
Clark Fork RU Priest RSU	Priest Lakes	Upper Priest River Hughes Fork Gold Creek Trapper Creek (trib. to Upper Priest Lake) Lion Creek (trib. to Priest Lake) Two Mouth Creek (trib. to Priest Lake) Granite Creek (trib. to Priest Lake) North Fork Granite Creek South Fork Granite Creek Indian Creek (trib. to Priest Lake) Kalispell Creek (trib. to Priest Lake) Soldier Creek (trib. to Priest Lake)

Recovery Goals and Objectives

The specific goal of the bull trout recovery plan is to **ensure the long-term persistence of self-sustaining, complex, interacting groups of bull trout distributed throughout the Clark Fork River basin so that the species can be delisted.**

Specifically, the recovery subunit teams for the four Clark Fork River subunits (Upper Clark Fork, Lower Clark Fork, Flathead, and Priest) adopted the goal of **a sustained net increase in bull trout abundance, and increased distribution of some local populations, within existing core areas in this recovery unit (as measured by standards accepted by the recovery subunit teams, often referred to collectively as the Clark Fork Recovery Unit Teams).**

- ▶ Maintain current distribution of bull trout and restore distribution in previously occupied areas within the Clark Fork Recovery Unit.
- ▶ Maintain stable or increasing trends in abundance of bull trout in each subunit of the Clark Fork Recovery Unit.
- ▶ Restore and maintain suitable habitat conditions for all bull trout life history stages and strategies.
- ▶ Conserve genetic diversity and provide opportunity for genetic exchange.

Within that general guidance, the Clark Fork Recovery Unit Teams developed specific recovery criteria for the Clark Fork Recovery Unit. Bull trout are distributed among about 150 local populations within 38 core areas of the recovery unit (see Table 2). As more information on fish distribution and genetics is collected and analyzed, the number of local populations identified will probably increase. In this recovery unit, the historical distribution of bull trout is relatively intact, and no vacant core habitat is recommended at this time for reestablishment of extirpated local populations. Instead, emphasis is placed on securing the existing distribution within core areas and increasing the abundance and connectivity of local populations.

The Upper Clark Fork, Lower Clark Fork, Flathead, and Priest Subunit Recovery Teams adopted the following objective for the Clark Fork Recovery Unit:

A sustained net increase in bull trout abundance, and increased distribution of some local populations, within existing core areas in this recovery unit (as measured by standards that the Clark Fork Recovery Unit Teams develop).

To assess progress toward this objective, each recovery subunit team adopted recovery criteria for its respective subunit. Relevant numerical standards are presented in Table 3. The standards for adult abundance, presented in Table 3, are based in part on recent historical information about the size of the adult population, as well as its potential, given the extent of the interconnected watershed.

Inherent stochastic, as well as genetic, risks are broadly acknowledged to be associated with low population levels of any species, but, to date, there has been a great deal of uncertainty about the proper application of theoretical population standards to bull trout. Rieman and Allendorf (2001) proposed that 1,000 spawning adults is a cautious management goal for long-term maintenance of genetic variation in a core area population of bull trout. The Clark Fork Recovery Unit Teams estimate that, of the 38 core areas identified in the Clark Fork Recovery Unit, only about 10 core areas have the potential to support 1,000 or more adult bull trout, even under recovered conditions.

Based in part on the analysis of Rieman and Allendorf (2001), the Clark Fork Recovery Unit Teams also assumed that a core area cannot maintain genetic viability for even the short term with spawning populations of fewer than roughly 100 adults. Rieman and Allendorf (2001) concluded that a cautious interpretation would be that approximately 100 adult bull trout, spawning each year, would be required to minimize the risk of inbreeding in a population. For some of the isolated core areas in the Clark Fork Recovery Unit, even this level of population abundance will be difficult to attain.

Table 3. Numeric standards necessary to achieve recovered abundance of bull trout in primary and secondary core areas of the Clark Fork Recovery Unit of the Columbia River drainage

CORE AREAS	Existing Number (Estimated) Local Populations	Existing Number (Estimated) Local Populations with > 100	Recovered Minimum Number Local Populations with > 100	Recovered Minimum Number Core Area Total Adult Abundance
<u>PRIMARY</u>				
Upper Clark Fork River Complex (Sections 1 and 2 combined)	13	0	5	1,000
Rock Creek	14	2	5	1,000
Blackfoot River	7	3	5	1,000
Bitterroot River	9	2	5	1,000
Lower Clark Fork River Complex (Clark Fork River Section 3, Lower Flathead River, Noxon Reservoir, and Cabinet Gorge Reservoir)	16	0	5	1,000
Lake Pend Oreille	14	3	6	2,500
Flathead Lake	19	9	10	2,500
Swan Lake	9	7	5	2,500
Hungry Horse Reservoir	10	5	5	1,000
Priest Lakes	12	0	5	1,000
TOTAL - PRIMARY CORES	123	31	56	14,500
<u>SECONDARY</u> - Clearwater River	5	0	1	Maximize with goal of > 100 in each
West Fork Bitterroot	1	1	1	
Flathead Disjuncts (22 separate adfluvial cores)	22 (1 each)	1	22 (1 each)	
TOTAL - SECONDARY CORES	28	2	24	2,400

The numerical criteria proposed by the Clark Fork Recovery Unit Teams to ensure replication of populations and to function as minimum recovery standards for adult abundance of bull trout in the Clark Fork Recovery Unit (Table 3) are based in part upon Rieman and Allendorf's (2001) estimates of the minimum population levels required for maintaining long-term genetic variability (1,000 adults) and genetic viability (100 adults). However, the Clark Fork Recovery Unit Teams also used the best professional scientific judgment of their members in setting those standards. At this time, the proposed recovery standards are based primarily on genetic concerns. Over time, protection of other ecological and biological attributes that contribute to population viability and long-term population stability will also need to be considered. Rieman and Allendorf (2001) cautioned that the guidelines they presented represent conservative minimum standards for the conservation of genetic variability and not "goals that will assure the viability of any population." They also noted that mitigation of extinction threats associated with demographic processes may require larger population sizes regardless of the genetic issues. They concluded that maintaining genetic diversity is essential, but not necessarily sufficient, for effective conservation.

It must be noted, however, that many of the small isolated populations in the Clark Fork Recovery Unit (defined below as secondary core areas) are essentially stranded local populations that have apparently persisted for a very long time, even thousands of years, at population levels very similar to current levels. Most such populations will continue to exist at a high degree of genetic risk and will be subject to high risk of extirpation from stochastic events. As more numerical data are collected and as trends are more clearly documented, the abundance standards should be further refined in their application as recovery criteria.

For purposes of recovery in this unit, the Clark Fork Recovery Unit Teams divided the entire unit into primary and secondary core areas, based mostly on the size, connectedness, and complexity of the watershed. The distinction between primary and secondary core areas indicates that a different set of standards are needed for recovery criteria, particularly for addressing abundance. The distinction does not infer a different level of importance for recovery purposes.

Primary Core Areas: Primary core areas in the Clark Fork Recovery Unit are typically located in watersheds of major river systems, often contain large lakes or reservoirs, and have migratory corridors that usually extend 50 to 100 kilometers (30 to 60 miles) or more. Each primary core area includes 7 to 19 identified local populations of bull trout. In recovered condition, a primary core area is expected to support at least 5 local populations with 100 or more adults each and to contain 1,000 or more adult bull trout in total.

The following areas have been designated as primary core areas in the Clark Fork Recovery Unit:

1. **Upper Clark Fork River** (includes two currently fragmented population segments, upstream and downstream of Milltown Dam, that are currently treated as separate core areas). Note that these core areas were historically connected and must be functionally rejoined under recovered conditions.
2. **Rock Creek**
3. **Blackfoot River**
4. **Bitterroot River**
5. **Lower Clark Fork River** (includes four currently fragmented population segments: Lower Flathead River, Thompson Falls Reservoir, Noxon Reservoir, and Cabinet Gorge Reservoir; these segments are currently treated as separate core areas). Note that these core areas were historically connected and must be functionally rejoined under recovered conditions.
6. **Lake Pend Oreille**
7. **Priest Lakes and Priest River**

8. **Flathead Lake**

9. **Swan Lake**

10. **Hungry Horse Reservoir**

Secondary Core Areas: Secondary core areas are based in smaller watersheds and typically contain adfluvial populations of bull trout that have become naturally isolated, with restricted upstream spawning and rearing habitat extending less than 50 kilometers (30 miles). Each secondary core areas includes one identified local population of bull trout (the Clearwater River is an exception, with as many as five local populations) and is not believed to contain sufficient size and complexity to accommodate 5 or more local populations with 100 or more adults to meet the abundance criteria defined above for primary core areas. Most secondary core areas have the potential to support fewer than a few hundred adult bull trout, even in a recovered condition. In extreme cases, secondary core areas may include small isolated lakes that occupy as little as 10 surface hectares (25 acres) and that are connected to 100 meters (about 100 yards) or less of accessible spawning and rearing habitat. In most cases, these conditions are natural, and, in some situations, these bull trout have probably existed for thousands of years with populations that seldom exceed 100 adults.

Collectively, the 24 secondary core areas may support a broad range of the genetic and phenotypic diversity that is representative of bull trout in the Clark Fork Recovery Unit.

The following areas have been designated as secondary core areas for the Clark Fork Recovery Unit:

1. **Clearwater River** and associated chain of lakes
2. **West Fork Bitterroot River** upstream of Painted Rocks Dam
- 3.–24. **22 lakes in the Flathead Recovery Subunit** (see Table 2)

It is noted that, for the portions of these watersheds in Montana, the primary core areas are functionally equivalent to the Restoration/Conservation Areas (also known as RCAs) designated by the Montana Bull Trout Restoration Team 2000. The secondary core areas generally represent the waters referred to as “disjunct” by the Montana Scientific Group.

Recovery Criteria

Listed below are the proposed recovery criteria for the Clark Fork Recovery Unit. As for the objectives identified in Chapter 1, the intent of recovery criteria within this recovery unit is to maximize the likelihood of persistence. Such persistence will be achieved, in part, by seeking to perpetuate the current distribution and by maintaining or increasing abundance of all local bull trout populations that are currently identified in the Clark Fork Recovery Unit (Table 2). Numerical summary of the recovery criteria is presented in Table 3.

Achieving the recovery criteria, including increasing monitoring and evaluation, will require the cooperative efforts of State, Federal, and Tribal resource management agencies; government and private landowners and water users; conservation organizations; and other interested parties. Criteria will only be achieved through reducing threats to bull trout, in part as a result of implementing tasks identified in the Recovery Measures Narrative section of this recovery plan, as well as by taking advantage of other new conservation and recovery opportunities as they arise.

1. **Distribution criteria will be met when the total number of identified local populations (currently numbering about 150) has been maintained or increased and when local populations remain broadly distributed in all existing core areas (Table 2).** This criteria must be applied with enough flexibility to allow for adaptive changes in the list of local populations (both additions and subtractions), based on best available science, as the body of knowledge concerning population and genetic inventory grows. It is also accepted that some secondary core areas may be at high risk of, or are currently undergoing, extirpation.

The distribution criteria cannot be met if major gaps develop in the current distribution of bull trout in the primary core areas of the Clark Fork Recovery Unit. Reconnecting fragmented habitat, as well as documenting new or previously undescribed local populations, should allow the documented distribution of bull trout to increase as recovery progresses. An exception to such an increase may occur in the Flathead Recovery Subunit where historical distribution is nearly intact.

The intention of the Clark Fork Recovery Unit Teams is also to maintain the existing bull trout distribution within all secondary core areas, but the teams recognize that stochastic events or deterministic processes already occurring are likely to cause a loss of distribution in some cases. The significance of such losses in the ultimate determination of whether or not distribution criteria have been met need to be judged on a case-by-case basis.

2. **Abundance criteria will be met when, in all 10 primary core areas, each of at least 5 local populations contain more than 100 adult bull trout. In the Lake Pend Oreille Core Area, each of at least 6 local populations must contain more than 100 adult bull trout. In the Flathead Lake Core Area, each of at least 10 local populations must contain more than 100 adult bull trout. In each of the 10 primary core areas, the total adult bull trout abundance, distributed among local populations, must exceed 1,000 fish; total abundance must exceed 2,500 adult bull trout in Lake Pend Oreille, Flathead Lake, and Swan Lake.**

Lake Pend Oreille, Flathead Lake, Swan Lake. These three core areas represent the largest natural adfluvial populations of bull trout in the Clark Fork Recovery Unit and perhaps the largest within the species' range in the United States. Each of these lakes has consistently supported spawning populations of adfluvial bull trout that produce over 500 redds annually in the currently connected portions of its watershed. Higher standards established for these three core areas reflect their higher biological potential, as well as their significance in maintaining high population levels, to conserve genetic variability within this recovery unit. These higher standards are based, in part, upon professional scientific judgment after evaluation of the existing 20 years of data for these waters.

In Lake Pend Oreille, 13 relatively complete basinwide redd counts were conducted between 1983 and 2000. These counts found an average of 657 redds in 18 streams (range 412 to 881). The 2000 redd count located 740 redds. Five drainages (Grouse, Gold, Granite, Trestle, and Lightning Creeks) consistently support over 25 redds, with the strongest (Gold and Trestle Creeks) normally exceeding 100 redds each. Johnson Creek also exceeded the 25 redd level in two of the 4 years between 1997 and 2000.

In Flathead Lake, 7 basinwide bull trout redd counts, conducted in 30 streams across 24 drainages between 1980 and 2000, found an average of 628 redds (range 236 to 1,156). The most recent basinwide count in 2000 found 555 bull trout redds, reflecting a rebounding trend from lows of the 1990's. Nine drainages (Big, Coal, Whale, Trail, and Howell [British Columbia] Creeks in the North Fork Flathead watershed and Ole, Morrison, Schafer, and Strawberry Creeks in the Middle Fork Flathead watershed) averaged 25 redds or more during the 21-year survey period, and several more drainages approached that level.

In the Swan Lake Core Area, basinwide redd counts were conducted annually between 1995 and 2000 and found an average of 752 bull trout redds in 10 streams across 8 drainages. Redd counts ranged from 703 to 861 during that period, and 717 redds were counted in 2000. Five drainages (Woodward, Goat, Lion, Jim, and Elk Creeks) consistently produced redd counts of 50 to 250 redds each, and 2 additional streams (Lost and Cold Creeks) produce about 20 to 30 redds.

Conversion of redd counts or other indices to adult numbers should be developed on a case-by-case basis, using the best available science and conversion factors that may be unique to each population. In many adfluvial populations, alternate-year spawning appears to be the norm. On the other hand, when Carnefix *et al.* (2001) used radio telemetry to track movements of 96 bull trout in the Rock Creek core area over a 3-year period, they concluded that nearly all of the fish they followed spawned annually.

Remaining Seven Primary Core Areas. In the other seven primary core areas, there are generally insufficient data over too short a period of record to provide a statistical analysis of abundance. Flathead, Pend Oreille, and Swan Lakes are thought to

represent unique situations because of the high number of extant local populations of adfluvial origin, and these lakes may not reflect the norm for the other seven primary core areas in the Clark Fork Recovery Unit. The standard criteria we have adopted for the remaining core areas are 5 local populations with 100 or more adults each and 1,000 or more adults in total.

The default abundance criteria for primary core areas—five local populations with 100 or more adults and 1,000 or more adult fish in total—is designed to protect genetic integrity and to reduce chances of stochastic extirpation by replicating local populations in these core areas. As more information becomes available, the default criteria for each primary core area should be evaluated and may be adjusted to reflect that new information. The recovery unit teams emphasize that these criteria must be adaptive if we are to fully protect and restore bull trout in this recovery unit.

The abundance criteria for 24 secondary core areas will be met when each of these core areas with the habitat capacity to do so supports at least 1 local population containing more than 100 adult bull trout and when total adult abundance in the secondary core areas collectively exceeds 2,400 fish. Some of the weakest and smallest secondary core areas do not have sufficient habitat available to meet this criteria, even in a recovered condition, and these cases must be factored into the evaluation of whether or not these criteria have been attained.

Extirpation of bull trout in as many as one-fourth of the secondary core areas (6 or fewer) is expected to occur over the next 25 years, or is already in process, based upon the evaluation of existing trend and status information. This eventuality should not prevent overall abundance criteria from being attained if each of the primary core areas and the remaining secondary core areas (75 percent) meet their individual criteria. Reasonable recovery efforts must continue in all primary and secondary core areas to minimize the chance of local extirpations. Consideration must be given to using whatever means necessary to maintain or restore at-risk populations to protect the genetic and phenotypic diversity that these core areas represent in the Clark Fork Recovery Unit.

3. **Trend criteria will be met when the overall bull trout population in the Clark Fork Recovery Unit is accepted, under contemporary standards of the time, to be stable or increasing, based on at least 10 years of monitoring data.**
4. **Connectivity criteria will be met when functional fish passage is restored or determined to be unnecessary to support bull trout recovery at Milltown, Thompson Falls, Noxon Rapids, Cabinet Gorge, and Priest Lake Dams and when dam operational issues are satisfactorily addressed at Hungry Horse, Bigfork, Kerr, and Albeni Falls Dams (as identified through license conditions of the Federal Energy Regulatory Commission and the Biological Opinion of the U.S. Fish and Wildlife Service).** Restoring connectivity so that the abundance and distribution requirements above can be met will probably require remedying additional passage barriers identified as inhibiting bull trout migration on smaller streams within the Clark Fork Recovery Unit. Restored connectivity of the mainstem Clark Fork River will consolidate six existing core areas, a result of fragmentation caused by the dams, into two (recovered) core areas in the upper and lower Clark Fork River.
 - a) In the Upper Clark Fork Recovery Subunit, fish passage must be provided at Milltown Dam, or the dam must be removed and the migratory corridor restored (Federal Energy Regulatory Commission relicensing process).
 - b) In the Lower Clark Fork Recovery Subunit, fish passage needs must be fully evaluated at Thompson Falls, Noxon, and Cabinet Gorge Dams and be provided where determined biologically feasible and necessary (Federal Energy Regulatory Commission license conditions). Additional concerns relating to water level manipulation and flow regulation through the operations of Kerr Dam (Federal Energy Regulatory Commission license conditions) and Albeni Falls Dam (USFWS 2000) must also be evaluated and mitigative or restorative actions implemented.
 - c) In the Flathead Recovery Subunit, no major barriers currently require passage. Concerns related to water level manipulation and flow regulation

through the operations of Kerr (Federal Energy Regulatory Commission license conditions) and Hungry Horse (USFWS Biological Opinion) Dams must be resolved, and conditions established by Federal Energy Regulatory Commission relicensing of Bigfork Dam must be met.

d) In the Priest Recovery Subunit, fish passage needs must be fully evaluated at Priest Lake Dam (Federal Energy Regulatory Commission license), and year-round fish passage must be provided if determined biologically necessary.

In all recovery subunits, substantial gains in reconnecting fragmented habitat may be achieved by restoring passage over and around many of the barriers that are typically located on smaller streams, including water diversions, road crossings, and culverts. Such barriers on small streams are not listed individually in the recovery criteria. In fact, many have not been identified. But, they are collectively important to recovery, and some are highlighted in the recovery narrative portion of this plan. A list of all such barriers should be prepared in the first five years of implementation. Substantial progress must be made in providing passage over at least half of these sites, consistent with the protection of upstream populations of westslope cutthroat trout and other native fishes, to meet the bull trout recovery criteria for connectivity.

ACTIONS NEEDED

Recovery Measures Narrative

In this chapter and all other chapters of the bull trout recovery plan, the recovery measures narrative consists of a hierarchical listing of actions that follows a standard template. The first-tier entries are identical in all chapters and represent general recovery tasks under which specific (*e.g.*, third-tier) tasks appear when appropriate. Second-tier entries also represent general recovery tasks under which specific tasks appear. Second-tier tasks that do not include specific third-tier actions are usually programmatic activities that are applicable across the species' range; they appear in *italic type*. These tasks may or may not have third-tier tasks associated with them; see Chapter 1 for more explanation. Some second-tier tasks may not be sufficiently developed to apply to the recovery unit at this time; they appear in *a shaded italic type (as seen here)*. These tasks are included to preserve consistency in numbering tasks among recovery unit chapters and intended to assist in generating information during the comment period for the draft recovery plan, a period when additional tasks may be developed. Third-tier entries are tasks specific to the Clark Fork Recovery Unit. They appear in the Implementation Schedule that follows this section and are identified by three numerals separated by periods.

The Clark Fork Recovery Unit chapter should be updated as recovery tasks are accomplished or revised as environmental conditions change and as monitoring results or additional information become available. The Clark Fork Recovery Unit Teams should meet annually to review annual monitoring reports and summaries and to make recommendations to the U.S. Fish and Wildlife Service.

UPPER CLARK FORK RECOVERY SUBUNIT

- 1 Protect, restore, and maintain suitable habitat conditions for bull trout.
 - 1.1 Maintain or improve water quality in bull trout core areas or potential core habitat.

- 1.1.1 Reduce general sediment sources. Stabilize roads, crossings, and other sources of sediment delivery. Implement Watershed Improvement Needs activities throughout the Bitterroot River watershed and sediment source reduction activities identified by comprehensive U.S. Forest Service survey(s) elsewhere. Priority watersheds include **Bitterroot River:** Cameron, Camper, Fred Burr, Lolo (Highway 12), Martin, Meadow, Moose, Overwhich, Piquett, and Warm Springs Creeks and the Nez Perce Fork, East Fork, and mainstem Bitterroot Rivers; **Blackfoot River:** Arrastra, Belmont, Dick, Elk, Hogum, McElwain. Moose, Murray, Nevada, Poorman, Rock, Sauerkraut, Seven Up Pete, Warm Springs, and Wilson Creeks; **Clark Fork River:** Boulder, Cedar, Dry, Fish, Flint, Racetrack, Rattlesnake, Tamarack, and Warm Springs Creeks and the St. Regis and mainstem Clark Fork Rivers; **Little Blackfoot River:** Dog, Ontario, and Telegraph Creeks and numerous sites identified in survey; **Rock Creek:** Stony and Upper Willow Creeks and Middle Fork, Ross Fork, West Fork, and mainstem Rock Creek.
- 1.1.2 Upgrade problem roads. Increase maintenance of extensive secondary road systems of the U.S. Forest Service, Plum Creek Timber Company, and State lands by increasing application of best management practices, with emphasis on remediation of sediment-producing hotspots and maintenance of bridges, culverts, and crossings in drainages supporting bull trout spawning and rearing. Decommission surplus forest roads, especially those that are chronic sources of sediment and/or those located in areas of highly erodible geological formations. Remove culverts and/or bridges on closed roads that are no longer maintained. Paving or graveling portions of major roads that encroach on riparian zones to reduce sediment delivery may be appropriate, but such resurfacing must be considered on a case-by-case basis along with other factors, such as the impacts of easier accessibility for anglers. Priority watersheds include

Bitterroot River: Nez Perce Fork Road (improve), Meadow and Moose Creek roads in the East Fork, roads along the mainstem and Slate Creek in the West Fork Bitterroot River, and Skalkaho Highway; **Blackfoot River:** Poorman Creek (pave portions of Stemple Pass Road to reduce sediment delivery to the creek) and South Fork Poorman Creek (reroute a portion of the county road up the creek to the hillside to eliminate one culvert and three fords within a 0.4-kilometer [0.25-mile] stream reach); **Clark Fork River:** Fish Creek Road, State Highway 1 along Flint Creek, I-90 corridor, Upper Warm Springs Creek Road, Foster Creek, Storm Lake Road, and South Boulder Creek Road; **Rock Creek:** Skalkaho Highway (State Highway 38) along the West Fork, mainstem Rock Creek Road (needs management plan), Copper Creek, and Upper Willow Creek.

1.1.3 Clean up mine waste. Control mining runoff by removing or stabilizing mine tailings and waste rock deposited in the stream channel and floodplains and by restoring stream channel function. Priority watersheds include **Bitterroot River:** Hughes Creek in the West Fork Bitterroot, Stansbury Vermiculite Mine; **Blackfoot River:** Beartrap, Day Gulch, Douglas, Elk, Jefferson, Poorman, Sandbar (tributary to Willow), Sauerkraut, Seven Up Pete, Washington, Washoe, West Fork Ashby, and Willow Creeks and the mainstem Blackfoot River (downstream of the Mike Horse Dam that partially washed out in 1975); **Clark Fork River:** Dunkleberg (Forest Rose), Douglas (Wasa), Boulder (Nonpariel site), Cedar, Ninemile, Quartz, and Trout Creeks and the St. Regis River; **Little Blackfoot River:** Charter Oak, Golden Anchor, Ontario, and numerous other mine sites; **Rock Creek:** Frog Pond basin and sites in Middle Fork Rock Creek and Stony Creek drainages.

1.1.4 Implement Atlantic Richfield Corporation mitigation. Implement mitigation activities resulting from the Atlantic Richfield

Corporation settlement for heavy metals contamination of at least 562 kilometers (349 miles) of streams and 5,000 hectares (13,000 acres) of the Clark Fork River floodplain between Warm Springs Creek and Milltown Reservoir from past mining and ore-processing activities in the Butte and Anaconda areas. Impacts to surface water, streambed sediments, benthic macroinvertebrates, trout populations, riparian wildlife, and vegetation have been documented in the Clark Fork and Blackfoot River watersheds, and a mitigation plan is being developed through an advisory board process.

- 1.1.5 Monitor McDonald Gold Mine. Monitor the application status of the former McDonald Gold Mine near Lincoln and, if mine operations move forward, implement mitigation actions to reduce the potential negative effects on water quality and quantity.
- 1.1.6 Restore fish passage at Milltown Dam. Monitor and participate (representing bull trout concerns) in Superfund processes designed to decide the fate of Milltown Dam and the heavy metal deposits stored behind it. Fully restoring fish passage and eliminating the threat of toxic sediment discharge during runoff events are important elements for reducing fragmentation and supporting bull trout recovery.
- 1.1.7 Assess and mitigate nonpoint thermal pollution. Assess and attempt to mitigate effects on bull trout from thermal increases (nonpoint sources) that negatively impact receiving waters and migratory corridors downstream. Priority watersheds include **Bitterroot River:** Blodgett, Fred Burr, Kootenai, Roaring Lion, Lolo, Sawtooth, Skalkaho, Sleeping Child, and Tin Cup Creeks and the mainstem and East Forks of the Bitterroot River; **Blackfoot River:** Cottonwood (near Helmville), Douglas, Elk, Nevada, Nevada Spring, Union, and Willow (near Sauerkraut) Creeks and the Clearwater River; **Clark Fork River:** Fish, Flint,

Ninemile, Petty Creeks and the entire mainstem of the Clark Fork River; **Little Blackfoot River:** throughout the drainage; **Rock Creek:** Upper Willow Creek.

- 1.1.8 Reduce nutrient input. Reduce nutrient delivery throughout the Bitterroot and Clark Fork River watersheds by improving sewage disposal, agricultural practices, and silvicultural practices.
- 1.1.9 Implement water quality regulations. Enforce water quality standards and implement a total maximum daily load program.
- 1.1.10 Minimize recreational development in bull trout spawning and rearing habitat. Minimize impacts from expansion or development of new golf courses, ski areas, campgrounds, fishing access sites, and second home or other recreational developments in the corridors of bull trout spawning and rearing streams.
- 1.2 Identify barriers or sites of entrainment for bull trout and implement tasks to provide passage and eliminate entrainment.
 - 1.2.1 Eliminate entrainment in diversions. Screen both water diversions and irrigation ditches to reduce entrainment losses or eliminate unneeded diversions. Priority watersheds include **Bitterroot River:** Bass, Blodgett, Burnt Fork, Chaffin, Fred Burr, Hughes, Kootenai, Lolo, Mill, Roaring Lion, Sawtooth, Skalkaho, Sleeping Child, Sweathouse, Tin Cup, and Tolan Creeks and the East Fork, Nez Perce Fork, and West Fork Bitterroot Rivers; **Blackfoot River:** Poorman Creek and mainstem Blackfoot River between Landers Fork and Poorman Creeks and between Lincoln and Nevada Creeks; **Clark Fork River:** Twin Lakes Creek in the Warm Springs Creek drainage, Flint Creek watershed, the mainstem Clark Fork River (five Missoula Valley diversions); **Little Blackfoot River:** Dog Creek and other creeks not yet evaluated; **Rock Creek:** East Fork Rock

Creek (Flint Creek Diversion), Ross Fork Rock Creek (diversions), and Upper Willow Creek (diversions).

- 1.2.2 Provide fish passage around diversions. Install appropriate fish passage structures around diversions and/or remove related migration barriers to facilitate bull trout movement. Priority watersheds include **Bitterroot River:** Burnt Fork, Fred Burr, Lolo, Skalkaho (Republican Ditch and others), Sleeping Child, and Warm Springs (Highway 93 crossing) Creeks; **Clark Fork River:** Dry and Lower Willow Creeks in Flint Creek drainage and Rattlesnake, Storm Lake, and Twin Lakes Creeks in Warm Springs Creek drainage; **Little Blackfoot River:** throughout drainage (survey is needed).
- 1.2.3 Eliminate culvert barriers. Monitor road crossings for blockages to upstream passage and, where beneficial to native fish, replace or improve existing culverts that impede passage. Priority watersheds include **Bitterroot River:** Bugle, Hughes, Lolo, Moose, Upper Mine, and Warm Springs Creeks and the upper West Fork and Nez Perce Fork of the Bitterroot River; **Blackfoot River:** Arrastra (Section 24), Cotter (tributary to Copper Creek), Cottonwood, Hogum, Moose, Poorman, Sauerkraut, and Spring Creeks; **Clark Fork River:** Fish Creek, Tamarack Creek, and St. Regis River; **Little Blackfoot River:** Hat Creek; **Rock Creek:** Skalkaho Highway crossings on West Fork Rock Creek (Duncie Creek, Fuse Creek, and others).
- 1.2.4 Restore connectivity over other manmade barriers. Investigate manmade barriers that were installed to eliminate upstream fish movement through Rainy, Alva, and Inez Lakes in the Clearwater River drainage, in Harvey Creek (Upper Clark Fork River), and in any other streams. Assess advisability and feasibility of restoring passage.

- 1.2.5 Improve instream flows. Restore connectivity and opportunities for migration by securing or improving instream flows and/or acquiring water rights. Priority streams identified to date (see also Montana Fish, Wildlife and Parks dewatered streams list) include **Bitterroot River:** Bass, Big, Blodgett, Chaffin, Fred Burr, Kootenai, Lolo, Lost Horse, Mill, North Bear, O'Brien, Roaring Lion, Rock, Sawtooth, Skalkaho, Sleeping Child, South Bear, South Fork Lolo, Sweathouse, Sweeney, Tin Cup, Tolan, and Warm Springs Creeks and the East Fork, Burnt Fork, and mainstem of the Bitterroot River from Corvallis to Stevensville; **Blackfoot River:** Cottonwood (stream miles 9 to 11) and Poorman Creeks and the mainstem Blackfoot River between Landers Fork and Poorman Creek; **Clark Fork River:** Cedar, Dry, Grant, Petty, and Twin Lakes Creeks and the Flint Creek drainage (including Douglas and Lower Willow Creeks); **Rock Creek:** Beaver Creek (tributary to Upper Willow).
- 1.2.6 Consider fish salvage, as needed. Consider implementing fish salvage programs, as needed, as an interim measure to address stranding while long-term solutions are developed (*e.g.*, Blackfoot River between Landers Fork and Poorman Creeks, East Fork Rock Creek at Flint Creek diversion).
- 1.2.7 Consider passage around natural barriers. Evaluate and make recommendations concerning potential benefits of fish passage around, or establishment of resident bull trout populations upstream of, natural barriers as a way to conserve genetic diversity in existing bull trout populations in the following areas: **Bitterroot River:** Bass, Daly, North Lost Horse, Overwhich, and Sweathouse Creeks upstream of falls; **Blackfoot River:** Arrastra Creek (section 24), Landers Fork (Silver King Falls), and North Fork Blackfoot River above North Fork Falls.

- 1.3 Identify impaired stream channel and riparian areas and implement tasks to restore their appropriate functions.
 - 1.3.1 Conduct watershed problem assessments. Identify site-specific threats (problem assessment) that may be limiting bull trout in watersheds that have not already been evaluated, including the Bitterroot River, Little Blackfoot River, middle portions of the Clark Fork River, and Rock Creek drainages.
 - 1.3.2 Prioritize actions on waters with restoration potential. As recovery progresses, identify highest-priority actions—ones that will contribute most to recovery—on streams in the Bitterroot River drainage where bull trout occurrence is incidental (or on contributing waters with no bull trout). Areas include Bass, Bear, Big, Cameron, Camp, Chaffin, Gird, Hayes, Lost Horse, Miller, One Horse, Patte, Rye, St. Clair, Sweeney, and Willow Creeks and the West Fork Bitterroot River downstream of Painted Rocks.
 - 1.3.3 Revegetate denuded riparian areas. Revegetate to restore shade and canopy, riparian cover, and native vegetation. Priority watersheds include **Bitterroot River:** Blodgett, Fred Burr, Hughes, Meadow, Mill, Skalkaho, Sleeping Child, and Sweathouse Creeks and the East Fork, West Fork, Burnt Fork, and mainstem of the Bitterroot River; **Blackfoot River:** the mainstem Blackfoot River between the North Fork Blackfoot River and Arrastra Creek, Dunham Creek, Landers Fork, Nevada Creek, and other sites throughout the drainage; **Clark Fork:** Cedar, Dry, Fish, Ninemile, South Fork Lower Willow, and Petty Creeks and the St. Regis and mainstem Clark Fork Rivers; **Little Blackfoot River:** throughout the drainage; **Rock Creek:** the East Fork, Middle Fork, and Ross Fork of Rock Creek.
 - 1.3.4 Improve grazing practices. Reduce negative effects of grazing by improving management practices and/or fencing riparian areas.

Priority watersheds include **Bitterroot River:** Bugle, Camp (west fork), Fred Burr, Gird, Lolo, Meadow, Mill, Skalkaho, Sleeping Child, and Tolan Creeks and the Burnt Fork, East Fork, and mainstem Bitterroot River; **Blackfoot River:** the mainstem Blackfoot River (from Lincoln to mouth) and Beaver, Blanchard, Belmont, Cottonwood, Dick, Douglas, Elk, Frazier, Hogum, Humbug, Keep Cool, Kleinschmidt, McElwain, Monture, Murray, Nevada, Nevada Spring, Poorman, Rock, Sauerkraut, Shanley, Warren, Wasson, Willow, and Yourname Creeks; **Clark Fork River:** Cedar, Petty, Racetrack, Tamarack, and Twin (St. Regis River drainage) Creeks and other sites (largely private lands) throughout the upper Clark Fork River drainage; **Little Blackfoot River:** Dog, Elliston, and Hat Creeks and the mainstem Little Blackfoot River; **Rock Creek:** the entire upper drainage, especially the upper mainstem Rock Creek, Middle Fork Rock Creek, Meadow Creek, Beaver Creek, Ross Fork, Sand Basin, Stoney Creek, and U.S. Forest Service allotments on Upper Willow Creek.

- 1.3.5 Restore stream channels. Conduct stream channel restoration activities where such activities are likely to benefit native fish and only where similar results cannot be achieved by other, less costly and less intrusive means. Priority watersheds include **Bitterroot River:** Blodgett, Burnt Fork, Fred Burr, Hughes, Lolo, Mill, O'Brien, Overwhich, Skalkaho, Sleeping Child, and Sweathouse Creeks and the East Fork (Highway 93 reconstruction) and Nez Perce Fork Bitterroot Rivers; **Blackfoot River:** Cottonwood, Dunham, Kleinschmidt, Landers Fork, Moose, Rock, Sauerkraut, and Warren Creeks; **Clark Fork River:** South Fork Lower Willow Creek in the Flint Creek drainage; **Rock Creek:** Stony Creek (Moose Gulch, Shively Gulch), Upper Willow Creek (Shylo Gulch, Miners Gulch), and the East Fork and West Fork of Rock Creek (Coal Gulch).

- 1.3.6 Improve instream habitat. Increase or improve instream habitat by restoring recruitment of large woody debris, restoring pool development, or by initiating other appropriate activities, wherever the need is identified. Priority watersheds include **Blackfoot River:** Chamberlain and Gold Creeks, the mainstem Blackfoot River upstream of Lincoln, and the Landers Fork; **Bitterroot River:** Burnt Fork, Lolo, and Moose Creeks and the East Fork Bitterroot River downstream of Camp Creek; **Clark Fork River:** Ninemile Creek; **Little Blackfoot River:** portions of the Little Blackfoot River that have been channelized by railroad and highway development.
- 1.3.7 Minimize potential stream channel degradation. Ensure that negative effects on bull trout of ongoing flood control activities are minimized (*e.g.*, dredging, channel clearing, and bank stabilization on the Clark Fork, Blackfoot, and Bitterroot Rivers).
- 1.3.8 Manage beaver to function naturally in maintaining wetlands. Manage beaver populations to maintain wetland complexes that provide important biological filters (*e.g.*, Mike Renig Gulch in the Little Blackfoot River drainage).
- 1.3.9 Reduce riparian firewood harvest. Implement campaigns, such as with signs, to improve public awareness or implement regulatory actions to eliminate firewood cutting in riparian areas, especially in the Rock Creek and Skalkaho Creek drainages.
- 1.3.10 Reduce impacts from campsite use. Identify and mitigate impacts from concentrated use of campsites on the Burnt Fork and Skalkaho Creeks in the Bitterroot River drainage; on the North Fork and mainstem Blackfoot Rivers and Monture, Copper, and Gold Creeks; on Middle Fork and mainstem Rock Creeks; and on Racetrack Creek in the upper Clark Fork River drainage.

1.3.11 Mitigate for transportation corridor encroachment on streams.

Mitigate for impacts from the legacy effects of highway and railroad encroachment, channel straightening, channel relocation, and undersized bridges on the Bitterroot River (U.S. 93), Blackfoot River (Montana 200), Clark Fork River (I-90), Lolo Creek (U.S. 12), and St. Regis River (I-90).

1.3.12 Reduce impacts to Foster Creek. Identify and mitigate potential impacts (from sediment, water use, use of riparian areas) of the Anaconda Job Corps Center development on Foster Creek in the Warm Springs Creek drainage of the upper Clark Fork River drainage.

1.4 Operate dams to minimize negative effects on bull trout.

1.4.1 Reduce reservoir operational impacts. Review reservoir operational concerns (*e.g.*, water level manipulation, minimum pool elevation) and provide operating recommendations for East Fork Reservoir (East Fork Rock Creek), Georgetown Lake (Flint Creek), Nevada Reservoir (Nevada Creek in Blackfoot River drainage), and Painted Rocks Reservoir (West Fork Bitterroot River).

1.4.2 Provide instream flow downstream of dams. Maintain or exceed established instream flows downstream of Painted Rocks Reservoir (West Fork Bitterroot River), East Fork Reservoir (East Fork Rock Creek), and Georgetown Lake (Flint Creek). Establish instream flows from high-elevation reservoirs in the Bitterroot National Forest on Bass, Big, Blodgett, Burnt Fork, Fred Burr, and Tin Cup Creeks.

1.4.3 Operate Milltown Dam to minimize impact on native fish. If the dam is not removed, operate to minimize potential for downstream discharge of heavy metal deposits in Milltown

Reservoir. Operate the dam to minimize northern pike reproduction and maximize survival and downstream passage of bull trout juveniles and adults. Restore upstream fish passage.

- 1.4.4 Evaluate fish passage at Painted Rocks Dam. Evaluate advisability and need for upstream fish passage at Painted Rocks Dam (West Fork Bitterroot River).

- 1.5 Identify upland conditions that negatively affect bull trout habitats and implement tasks to restore appropriate functions.

- 1.5.1 Mitigate for legacy effects of mining-related timber management practices. Continue to mitigate for legacy effects of mining-related timber harvest and for other impairment from poor silvicultural practices in the last century in the following areas:
Blackfoot River: Bear, Belmont, Chamberlain, Deer, Keno, Marcum, McElwain, and Richmond Creeks and the North Fork Blackfoot and West Fork Clearwater Rivers; **Clark Fork River:** Fish, Rattlesnake, and Trout Creeks and the St. Regis River.

- 1.5.2 Monitor fire effects and mitigate effects where necessary. Monitor effects from wild fires and pursue habitat restoration actions where warranted, especially in the upper portions of the Bitterroot River drainage (where there were fires in 2000).

- 2 Prevent and reduce negative effects of nonnative fishes and other nonnative taxa on bull trout.

- 2.1 Develop, implement, and evaluate enforcement of public and private fish stocking policies to reduce stocking of nonnative fishes that affect bull trout.

- 2.1.1 Review fish stocking programs. Review annual fish stocking programs to minimize potential conflict with this bull trout recovery plan.
- 2.1.2 Regulate private fish ponds. Reduce the risk of inadvertent introduction of nonnative fish from private fish ponds by closely regulating existing permits to ensure that only permitted species are stocked and that fish barriers are maintained and by attaching conditions to future permits.
- 2.1.3 Encourage development of commercial sources of westslope cutthroat trout. Develop and maintain an approved and available source of genetically diverse native westslope cutthroat trout for private pond stocking. Follow stocking guidelines developed by the Montana Westslope Cutthroat Trout Technical Committee.
- 2.2 *Evaluate policies for preventing illegal transport and introduction of nonnative fishes.*
- 2.3 Inform the public about ecosystem concerns of illegal introductions of nonnative fishes.
 - 2.3.1 Discourage unauthorized fish introductions. Implement educational efforts about the problems and consequences of unauthorized fish introductions.
 - 2.3.2 Develop bull trout education program. Develop a public information program with a broad emphasis on bull trout ecology and life history requirements and with a more specific focus on regionally or locally important recovery issues.
- 2.4 *Evaluate biological, economic, and social effects of control of nonnative fishes.*

- 2.5 Implement control of nonnative fishes where found to be feasible and appropriate.
 - 2.5.1 Experimentally remove established brook trout populations.
Evaluate opportunities for experimentally removing brook trout from selected streams and lakes. Priority watersheds include
Bitterroot River: Blodgett, Boulder, Fred Burr, Hughes, Kootenai, Lolo, Martin, Meadow, Mill, O'Brien, Overwhich, Piquett, Roaring Lion, Sawtooth, Skalkaho, Slate, Sleeping Child, Springer, Tin Cup, Trapper, and Warm Springs Creeks and the East Fork, Burnt Fork, and Nez Perce Fork Bitterroot Rivers;
Blackfoot River: Cottonwood, Hogum, Nevada (upstream of Shingle Mill), Poorman, Sauerkraut, and South Fork Poorman Creeks and the North Fork Blackfoot River upstream of the falls;
Clark Fork River: Lower Twin Lake and Storm Lake Creek in the Warm Springs Creek drainage; **Little Blackfoot River:** Bison, Hat, Elliston, and Ontario Creeks; **Rock Creek:** East Fork Reservoir and upstream waters.
 - 2.5.2 Suppress northern pike in Clearwater Lakes chain. Continue assessment of predator–prey interactions in Clearwater Chain of Lakes, with emphasis on the northern pike threat and suppression of those populations.
 - 2.5.3 Reduce brown trout numbers in portions of mainstem rivers. Continue to encourage harvest of brown trout in the mainstem Blackfoot, Clark Fork, and Bitterroot Rivers and in Rock Creek by maintaining liberal angling regulations.
- 2.6 Develop tasks to reduce negative effects of nonnative taxa on bull trout.
 - 2.6.1 Evaluate bull trout–brown trout interaction. Evaluate the interaction between bull trout and brown trout populations in the

Blackfoot River drainage, including the potential threat of brown trout redds superimposed on bull trout redds.

- 3 Establish fisheries management goals and objectives compatible with bull trout recovery and implement practices to achieve goals.
 - 3.1 Develop and implement State and Tribal native fish management plans integrating adaptive research.
 - 3.1.1 Implement adaptive management of native fish management plans. Develop and implement native fish management plans that emphasize integration of research results into management programs.
 - 3.1.2 Aggressively protect remaining native species complexes. Protect integrity of all intact native species assemblages, such as in Harvey Creek (upper Clark Fork River), Belmont and Copper Creeks, and the Landers Fork of the Blackfoot River, by aggressively removing any nonnative invaders.
 - 3.2 Evaluate and prevent overharvest and incidental angling mortality of bull trout.
 - 3.2.1 Minimize unintentional mortality of bull trout. Continue to develop and implement sport angling regulations and fisheries management plans, guidelines, and policies that minimize incidental mortality of bull trout in all waters, especially the most heavily fished reaches of Rock Creek and the Bitterroot, Blackfoot, upper Clark Fork, and Clearwater Rivers.
 - 3.2.2 Evaluate enforcement of angling regulations and oversee scientific research. Ensure compliance with angling regulations and scientific collection policies and target bull trout spawning and staging areas for enforcement.

- 3.2.3 Implement angler education efforts. Inform anglers about special regulations and about how to identify bull trout and reduce hooking mortality of bull trout caught incidentally, especially in the most heavily fished migratory habitat of mainstem rivers.
- 3.2.4 Solicit information from commercial guides. Develop a reporting system to collect information on bull trout caught and released by commercial fishing guides on the Bitterroot River, Blackfoot River, and Rock Creek.
- 3.3 Evaluate potential effects of introduced fishes and associated sport fisheries on bull trout recovery and implement tasks to minimize negative effects on bull trout.
 - 3.3.1 Evaluate site-specific conflicts with introduced sport fish. Determine site-specific level of predation, competition, and hybridization of bull trout with introduced sport fish and assess effects of those interactions, especially with brook trout, brown trout, and northern pike in the Blackfoot, Bitterroot, and Clark Fork Rivers.
- 3.4 Evaluate effects of existing and proposed sport fishing regulations on bull trout.
 - 3.4.1 Evaluate effects of existing and proposed angling regulations on bull trout in heavily fished waters. Rapidly increasing angler pressure has led to increasing concerns about angling regulations, species complexes, unintentional mortality, and other angler-related issues affecting bull trout on the most heavily fished waters of Rock Creek and the Blackfoot, Bitterroot, and Clark Fork Rivers. An investigation of these issues should be made, and recommendations on how to reduce impacts to bull trout recovery should be developed and adaptively implemented.

- 4 Characterize, conserve, and monitor genetic diversity and gene flow among local populations of bull trout.
 - 4.1 Incorporate conservation of genetic and phenotypic attributes of bull trout into recovery and management plans.
 - 4.1.1 Conduct genetic inventory. Continue coordinated genetic inventory throughout recovery subunit, with emphasis on upper Clark Fork and Clearwater River drainages, to contribute to establishing a program to understand the genetic baseline and to monitor genetic changes throughout the range of bull trout (see Chapter 1 narrative).
 - 4.2 *Maintain existing opportunities for gene flow among bull trout populations.*
 - 4.3 *Develop genetic management plans and guidelines for appropriate use of transplantation and artificial propagation.*
- 5 Conduct research and monitoring to implement and evaluate bull trout recovery activities, consistent with an adaptive management approach using feedback from implemented, site-specific recovery tasks.
 - 5.1 *Design and implement a standardized monitoring program to assess the effectiveness of recovery efforts affecting bull trout and their habitats.*
 - 5.2 Conduct research evaluating relationships among bull trout distribution and abundance, bull trout habitat, and recovery tasks.
 - 5.2.1 Identify suitable unoccupied habitat. Identify suitable bull trout habitat that is unoccupied, if any. Within five years, complete a comprehensive list of all known passage barriers that prevent upstream-migrating bull trout from accessing suitable habitat.

- 5.2.2 Investigate bull trout movement and distribution. Investigate movement, distribution, and status of bull trout in the Bitterroot, middle Clark Fork, Clearwater, Little Blackfoot, and St. Regis River drainages and make recovery recommendations.
- 5.2.3 Evaluate importance of contributing waters. Evaluate the importance and contribution to bull trout recovery of streams with only incidental bull trout presence.
- 5.2.4 Map spawning habitat. Develop a comprehensive map of primary bull trout spawning reaches in tributaries for the purpose of focusing protection and recovery efforts.
- 5.2.5 Coordinate monitoring of fish movement. Develop a coordinated fish marking and tracking strategy (*e.g.*, standardized PIT tags and radio implant frequencies) throughout the Clark Fork River basin so that marked fish are recognized and reported when captured in other States or different project jurisdictions (*e.g.*, Lake Pend Oreille, Avista, Milltown).
- 5.2.6 Evaluate water temperature as a limiting factor. Evaluate water temperature as a limiting factor and/or migration barrier in the mainstem of the Bitterroot, Blackfoot, Clearwater, and Clark Fork Rivers.
- 5.3 Evaluate the adequacy and effectiveness of current and past best management practices in maintaining or achieving habitat conditions conducive to bull trout recovery.
 - 5.3.1 Develop and implement best management practices for managing water diversions. Establish best management practices for constructing, maintaining, and operating water diversion structures.

- 5.3.2 Implement best management practices for grazing in riparian zones. Establish best management practices for grazing management and establish a monitoring program in riparian zones.
- 5.3.3 Expand monitoring of forestry best management practices. Continue and expand monitoring of compliance and effectiveness of Montana Forestry best management practices and recommend adjustments to best management practices to correct any documented deficiencies.
- 5.3.4 Protect groundwater inflow sources. Inventory and protect important stream reaches with groundwater inflow.
- 5.4 Evaluate effects of diseases and parasites on bull trout and develop and implement strategies to minimize negative effects.
 - 5.4.1 Monitor fish health in private hatcheries. Closely regulate fish health in private hatcheries that supply fish for private ponds (State and Federal hatcheries are already closely monitored).
 - 5.4.2 Prevent spread of fish pathogens. Survey and evaluate fish health before implementing major fish passage projects.
 - 5.4.3 Evaluate effects of whirling disease on bull trout. Continue experimental evaluation (and limited field survey) of the potential effects of whirling disease on bull trout.
- 5.5 *Develop and conduct research and monitoring studies to improve information concerning the distribution and status of bull trout.*
- 5.6 Identify evaluations needed to improve understanding of relationships among genetic characteristics, phenotypic traits, and local populations of bull trout.

- 5.6.1 Investigate status of migratory and resident life history forms.
Investigate the genetic and/or behavioral basis of resident and migratory bull trout in the Bitterroot River basin.
 - 5.6.2 Research origin of migratory bull trout at Milltown Dam.
Continue to investigate life history and spawning habitat of bull trout congregating below Milltown Dam.
- 6 Use all available conservation programs and regulations to protect and conserve bull trout and bull trout habitats.
- 6.1 Use partnerships and collaborative processes to protect, maintain, and restore functioning core areas for bull trout.
 - 6.1.1 Support watershed group restoration efforts. Support collaborative efforts by local watershed groups already established in Montana, such as the Bitterroot Water Forum, Blackfoot Challenge, Trout Unlimited Chapters, and Clark Fork Coalition, to accomplish site-specific protection and restoration activities consistent with this recovery plan.
 - 6.1.2 Protect habitat. Provide long-term habitat protection through purchase, conservation easements, watershed restoration, management plans, land exchanges, and other methods. Opportunities have been identified on the Blackfoot River and the Little Blackfoot River upstream of Hwy. 12 crossing; Hughes Creek in the West Fork Bitterroot River drainage; and Fish Creek, the mainstem Clark Fork River, and Rock Creek.
 - 6.1.3 Integrate watershed restoration efforts on public and private lands. Integrate watershed analyses and restoration activities on public lands in the headwaters and on private lands lower in the watersheds to ensure activities are complementary for bull trout

restoration (*e.g.*, Bitterroot River, Dunham Creek, Fish Creek, Landers Fork of the Blackfoot River, Rattlesnake Creek, Rock Creek, and Warm Springs Creek).

- 6.1.4 Develop strategy for implementation participation. Develop participation plans to support implementation or recovery actions in the Upper Clark Fork Recovery Subunit.
- 6.2 Use existing Federal authorities to conserve and restore bull trout.
 - 6.2.3 Complete Federal Energy Regulatory Commission licensing of Milltown Dam. Complete Federal Energy Regulatory Commission licensing or decommissioning of Milltown Dam (beyond current license expiration date of December 31, 2006) and implement mitigation plan and/or dam removal.
 - 6.2.4 Implement Plum Creek Habitat Conservation Plan. Carry out compliance monitoring and U.S. Fish and Wildlife Service commitment to adaptive management planning under the Plum Creek Native Fish Habitat Conservation Plan, primarily applicable to waters of the Blackfoot River and upper Clark Fork River watersheds.
- 6.3 Evaluate enforcement of existing Federal and State habitat protection standards and regulations and evaluate their effectiveness for bull trout conservation.
 - 6.3.1 Fully implement State habitat protection laws. Fully implement the Montana Streamside Management Zone Law (1993), Montana Stream Protection Act (1965), and Montana Natural Streambed and Land Preservation Act (1975) to maximize legal protection of bull trout habitat under State law and evaluate the effectiveness of these laws in conserving bull trout habitat.

- 6.3.2 Encourage floodplain protection. Encourage local governments to develop, implement, and promote restrictive regulations for floodplains to mitigate extensive habitat loss and stream encroachment from rural residential development throughout the Bitterroot, Blackfoot, and upper Clark Fork River drainages because these and other effects of development exacerbate temperature problems, increase nutrient loads, decrease bank stability, alter instream and riparian habitat, and change hydrologic response of affected watersheds.

- 7 *Assess the implementation of bull trout recovery by recovery units and revise recovery unit plans based on evaluations.*

LOWER CLARK FORK RECOVERY SUBUNIT

- 1 Protect, restore, and maintain suitable habitat conditions for bull trout.
 - 1.1 Maintain or improve water quality in bull trout core areas or potential core habitat.
 - 1.1.1 Reduce general sediment sources. Stabilize roads, crossings, and other sources of sediment delivery. Priority watersheds include **Idaho:** Gold, Granite, Grouse, Lightning, North Gold, and Trestle Creeks and the Middle Fork East River and Pack River; **Montana:** Elk, Fish Trap (Thompson River tributary), Marten, Pilgrim, Prospect, Rock, Snake Swamp, West Fork Elk (Bull River tributary) Creeks and the Bull, South Fork Bull, South Fork Jocko, Thompson, Vermilion, and West Fork Thompson Rivers.
 - 1.1.2 Upgrade problem roads. Increase maintenance of extensive secondary road systems—U.S. Forest Service, Plum Creek Timber Company, and State lands—by increased application of best management practices, with emphasis on remediating sediment-producing hotspots and on maintaining bridges,

culverts, and crossings in drainages that support bull trout spawning and rearing. Decommission surplus forest roads, especially those that are chronic sources of sediment and those that are located in areas of highly erodible geological formations. Remove culverts and bridges on closed roads that are no longer maintained. Eliminate one of two main roads paralleling either side of Thompson River to reduce impacts of sediment and floodplain encroachment.

- 1.1.3 Clean up mine waste. Control mining runoff by removing or stabilizing mine tailings and waste rock formerly deposited in the stream channel and floodplain of upper South Gold Creek and Chloride Gulch.
- 1.1.4 Evaluate and, if necessary, mitigate impacts from Rock Creek Mine. Develop and implement an aggressive mitigation program to protect bull trout in the Rock Creek watershed if the Rock Creek Mine (Sterling Mining Company) is developed.
- 1.1.5 Implement Atlantic Richfield Corporation mitigation on Flathead Indian Reservation. Implement Confederated Salish and Kootenai Tribes/Atlantic Richfield Corporation settlement to improve water quality in Flathead Reservation streams.
- 1.1.6 Assess and mitigate nonpoint thermal pollution. Continue to evaluate adequacy of existing thermal regime in the lower Flathead River, Thompson River, and mainstem Clark Fork River reservoirs in meeting needs of migratory bull trout and explore options to correct conditions.
- 1.1.7 Reduce nutrient input. Assess and, if needed, address effects of nutrient enrichment from Missoula Municipal Sewage Plant, Stone Container Mill, and shoreline development at Lake Pend Oreille .

- 1.1.8 Implement water quality regulations. Evaluate enforcement of water quality standards and implement total maximum daily load program.
- 1.1.9 Minimize recreational development in bull trout spawning and rearing habitat. Minimize impacts from expansion or development of new golf courses, ski areas, campgrounds, fishing access sites, and second home or other recreational developments in the corridors of bull trout spawning and rearing streams.
- 1.2 Identify barriers or sites of entrainment for bull trout and implement tasks to provide passage and eliminate entrainment.
 - 1.2.1 Eliminate entrainment in diversions. Screen both water diversions and irrigation ditches or eliminate unneeded diversions (evaluate Grouse Creek, Swamp Creek, and others, as identified by watershed groups).
 - 1.2.2 Provide fish passage around diversions. Install appropriate fish passage structures around diversions and/or remove related migration barriers in **Idaho:** Granite Creek, Strong Creek; **Montana:** Crow Creek, Dry Creek, Jocko River, Mission Creek, Post Creek, Swamp Creek, and others, as identified.
 - 1.2.3 Eliminate culvert barriers. Monitor road crossings for blockages to upstream passage, and, where beneficial to native fish, replace or improve existing culverts that impede passage (*e.g.*, Blue Creek, Middle Fork East River, and North Fork East River).
 - 1.2.4 Mitigate Trestle Creek flume impacts. Investigate effects of the Trestle Creek flume and develop a plan to minimize and mitigate negative effects of the flume and unused water rights.

- 1.2.5 Improve instream flows. Restore connectivity and opportunities for migration by securing or improving instream flows. This task can be accomplished in part by acquiring water rights from willing sellers in Montana (priority streams identified to date are Rock and Swamp Creeks) or by designating minimum flows through the statutory process in Idaho (*e.g.*, Trestle Creek).
- 1.2.6 Consider fish salvage, as needed. Consider implementing fish salvage programs, as needed, as an interim measure to address stranding while long-term solutions are developed (*e.g.*, Rock Creek).
- 1.3 Identify impaired stream channel and riparian areas and implement tasks to restore their appropriate functions.
 - 1.3.1 Conduct watershed problem assessments. Identify site-specific threats (problem assessment) that may be limiting bull trout in watersheds that have not already been evaluated (*e.g.*, East River)
 - 1.3.2 Revegetate denuded riparian areas. Revegetate to restore shade and canopy, riparian cover, and native vegetation. Priority watersheds include **Idaho:** Pack River and Twin Creek; **Montana:** meadow portion of mainstem Bull River, Jocko River, Prospect Creek, Rock Creek, and Vermilion River.
 - 1.3.3 Improve grazing practices. Reduce negative effects of grazing with improved grazing management or riparian fencing. Priority watersheds include **Idaho:** Grouse Creek, Lightning Creek, Twin Creek; **Montana:** Jocko River, Pilgrim Creek, Post Creek, Swamp Creek, and Thompson River (upper mainstem and tributaries), Little Thompson River, and Fish Trap Creek.
 - 1.3.4 Restore stream channels. Conduct stream channel restoration activities where they are likely to benefit native fish and only

where similar results cannot be achieved by other, less costly and less intrusive means. Priority watersheds include **Idaho:** Grouse, Lightning, and lower Twin Creeks and the Pack River; **Montana:** Barrey and Copper (both Bull River tributaries), Fish Trap (Thompson River tributary), Graves, Marten, Prospect, and Rock Creeks and the Jocko, Vermilion, and West Fork Thompson Rivers.

1.3.5 Improve instream habitat. Increase or improve instream habitat by restoring recruitment of large woody debris, restoring pool development, or by initiating other appropriate activities (*e.g.*, deforested power line crossing on South Gold Creek, East River).

1.3.6 Minimize potential stream channel degradation. Ensure that negative effects to bull trout of ongoing flood control activities (*e.g.*, dredging, channel clearing on Lightning Creek) are minimized.

1.3.7 Manage beaver to function naturally in maintaining wetlands. Manage beaver populations to maintain wetland complexes that provide important biological filters, while also closely examining beaver dams on a case-by-case basis to take action to minimize disruption of bull trout migration through migratory corridors because of beaver dams.

1.4 Operate dams to minimize negative effects on bull trout.

1.4.1 Evaluate and restore upstream fish passage at mainstem Clark Fork and Pend Oreille River dams. Investigate and implement upstream fish passage at Albeni Falls (USFWS Biological Opinion), Cabinet Gorge and Noxon Rapids (Avista fish passage protection, mitigation, and enhancement measures), and Thompson Falls Dams, as needed, to reconnect fragmented core habitat of bull trout with Lake Pend Oreille.

- 1.4.2 Provide safe passage downstream through dams and reservoirs.
Provide safe downstream fish passage from Montana tributaries through Thompson Falls, Noxon Rapids, and Cabinet Gorge Dams and Reservoirs for juvenile and adult bull trout migrating to Lake Pend Oreille.
- 1.4.3 Reduce reservoir operational impacts. Review reservoir operational concerns (*e.g.*, water level manipulation) and provide operating recommendations through the Federal Energy Regulatory Commission license and/or Federal consultation for Lake Pend Oreille (USFWS Biological Opinion), Cabinet Gorge, Noxon Rapids, and Thompson Falls Reservoirs.
- 1.4.4 Research and recommend instream flows and minimum pools on the Flathead Agency Irrigation District. Conduct research on operations of Flathead Agency Irrigation District reservoirs and recommend simulated natural flow regimes and implement minimum pool levels in St. Marys, Mission, and McDonald Reservoirs.
- 1.4.5 Provide instream flow downstream of dams. Maintain or exceed established minimum flow releases of 1,500 cubic meters per second (5,000 cubic feet per second) downstream of Cabinet Gorge Dam and 975 cubic meters per second (3,200 cubic feet per second) downstream of Kerr Dam, as provided for in the respective Federal Energy Regulatory Commission licenses. Evaluate instream flow for adequacy and recommend revision, as needed.
- 1.4.6 Research and recommend instream flow in lower Flathead River. Complete instream flow research on lower Flathead River (Kerr Dam Mitigation) and implement ramping rate and minimum flow recommendations.

- 1.4.7 Maintain passage through alluvial fans in Lake Pend Oreille.
Maintain physical passage through alluvial fans (resulting from reservoir fluctuation from operations of Albeni Falls Dam) on streams that enter Lake Pend Oreille (*e.g.*, North Gold and South Gold Creeks).
- 1.4.8 Assess impact of Lake Pend Oreille water levels on kokanee salmon. Continue research on the response of the kokanee salmon population in Lake Pend Oreille to modified winter lake levels per the U.S. Fish and Wildlife Service Biological Opinion (USFWS 2000) as kokanee salmon are an important food source for bull trout and may help to reduce competition between bull trout and other top predators.
- 1.4.9 Avoid gas supersaturation. Reduce gas entrainment, which causes supersaturation conditions believed to be detrimental to bull trout, at Noxon Rapids and Cabinet Gorge Dams and evaluate potential problems of gas supersaturation at Kerr and Thompson Falls Dams.
- 1.5 Identify upland conditions that negatively affect bull trout habitats and implement tasks to restore appropriate functions.
 - 1.5.1 Monitor fire effects and mitigate effects where necessary.
Monitor effects from wild fires and pursue habitat restoration actions where warranted.
- 2 Prevent and reduce negative effects of nonnative fishes and other nonnative taxa on bull trout.
 - 2.1 Develop, implement, and evaluate enforcement of policies on public and private fish stocking to reduce stocking of nonnative fishes that affect bull trout.

- 2.1.1 Review fish stocking programs. Review annual fish stocking programs to minimize potential conflict with this bull trout recovery plan.
- 2.1.2 Regulate private fish ponds. Reduce the risks of inadvertent introduction of nonnative fish from private fish ponds by closely regulating existing permits to ensure that only permitted species are stocked and that fish barriers are maintained and by attaching conditions to future permits.
- 2.1.3 Encourage development of commercial sources of westslope cutthroat trout. Develop and maintain an approved and available source of genetically diverse native westslope cutthroat trout for private pond stocking. Follow stocking guidelines developed by the Montana Westslope Cutthroat Trout Technical Committee.
- 2.2 Evaluate policies for preventing illegal transport and introduction of nonnative fishes.
 - 2.2.1 Optimize enforcement of laws and policies that prohibit unauthorized fish transplant and stocking. Strengthen enforcement of existing laws and continue to work to improve the legal and policy framework for preventing unauthorized fish transplant and stocking.
- 2.3 Inform the public about ecosystem concerns of illegal introductions of nonnative fishes.
 - 2.3.1 Discourage unauthorized fish introductions. Implement educational efforts about the problems and consequences of unauthorized fish introductions.
 - 2.3.2 Develop bull trout education program. Develop a public information program with a broad emphasis on bull trout ecology

and life history requirements and a more specific focus on regionally or locally important recovery issues.

- 2.4 Evaluate biological, economic, and social effects of control of nonnative fishes.
 - 2.4.1 Assess superimposition of brown trout and kokanee salmon redds on bull trout redds. Assess the threat of kokanee salmon redds superimposed on bull trout redds in Granite Creek (including Sullivan Springs) and of brown trout redds superimposed on bull trout redds in the Bull River, Twin Creek, and other sites, as identified.
 - 2.4.2 Evaluate northern pike and smallmouth bass in the lower Flathead River. Evaluate, and if necessary control expansion of northern pike and recent accidental introduction of smallmouth bass in the lower Flathead River and waters downstream.
- 2.5 Implement control of nonnative fishes where found to be feasible and appropriate.
 - 2.5.1 Experimentally remove established brook trout populations. Evaluate opportunities to experimentally remove brook trout from selected streams and lakes. Priority watersheds include **Idaho:** East Fork Lightning Creek, North Fork Grouse Creek, Porcupine Creek, Porcupine Lake, and Twin Creek; **Montana:** Clear Creek (Prospect Creek tributary); Copper, Elk, and Graves Creeks (upstream of falls); Marten, Mosquito, and Pilgrim Creeks; and the South Fork Bull River.
 - 2.5.2 Suppress lake trout in Lake Pend Oreille. Continue assessment of predator–prey interactions in mainstem reservoirs and Lake Pend Oreille. In Lake Pend Oreille, evaluate the threat of lake trout and

analyze options for using commercial-type fishing gear to reduce lake trout numbers.

- 2.5.3 Suppress brown trout in Bull River. Evaluate and experimentally remove brown trout from Bull River and other drainages, as necessary. Block access for spawning brown trout to the East Fork Bull River. Conduct evaluation of potential response of native species.

2.6 *Develop tasks to reduce negative effects of nonnative taxa on bull trout.*

- 3 Establish fisheries management goals and objectives compatible with bull trout recovery and implement practices to achieve goals.

- 3.1 Develop and implement State and Tribal native fish management plans integrating adaptive research.

- 3.1.1 Implement adaptive management of native fish management plans. Adaptively integrate research results into management programs and native fish management plans.

- 3.1.2 Implement Avista Native Salmonid Restoration Plan. Develop and implement an aggressive management strategy for bull trout for the Bull River and other watersheds in the regulated portion of the mainstem Clark Fork River drainage consistent with the Avista Native Salmonid Restoration Plan and Montana Fish, Wildlife and Parks policies. According to the Avista Native Salmon Restoration Plan, and consistent with genetic guidelines, management strategy may include stock transfer, controlled propagation, and/or rearing of bull trout for the purposes of genetic attribute maintenance, refugia, reintroduction, or otherwise supporting recovery.

3.2 Evaluate and prevent overharvest and incidental angling mortality of bull trout.

3.2.1 Minimize unintentional mortality of bull trout. Continue to develop and implement sport angling regulations and fisheries management plans, guidelines, and policies that minimize unintentional mortality of bull trout in Lake Pend Oreille, the Clark Fork River, and the mainstem reservoirs.

3.2.2 Evaluate enforcement of angling regulations and oversee scientific research. Ensure compliance with angling regulations and scientific collection policies and target bull trout spawning and staging areas for enforcement.

3.2.3 Implement angler education efforts. Inform anglers about special regulations and about how to identify bull trout and reduce hooking mortality of bull trout caught incidentally in Lake Pend Oreille, the Clark Fork River, and the mainstem reservoirs.

3.2.4 Solicit information from commercial guides. Develop a reporting system to collect information on bull trout that are caught and released from charter boats and by commercial fishing guides on Lake Pend Oreille and the Clark Fork River.

3.3 Evaluate potential effects of introduced fishes and associated sport fisheries on bull trout recovery and implement tasks to minimize negative effects on bull trout.

3.3.1 Evaluate site-specific conflicts with introduced sport fish. Determine site-specific level of predation, competition, and hybridization of bull trout with introduced sport fish and assess the effects of those interactions, especially for lake trout, Kamloops rainbow trout, and brook trout in Lake Pend Oreille and tributaries and for brown trout, rainbow trout, brook trout,

northern pike, largemouth and smallmouth bass, and possibly walleye in the watershed upstream of Cabinet Gorge Dam.

3.3.2 Regulate mainstem reservoirs to inhibit reproduction of nonnative fish. Evaluate options to regulate water levels on Thompson Falls, Noxon Rapids, and Cabinet Gorge Reservoirs and Lake Pend Oreille in a pattern to reduce survival of nonnative species that are detrimental to bull trout recovery.

3.4 Evaluate effects of existing and proposed sport fishing regulations on bull trout.

3.4.1 Evaluate opportunities for regulated bull trout fisheries. Evaluate management proposals to allow carefully regulated fisheries for, and potential harvest of, bull trout (in Lake Pend Oreille or other waters) where monitoring of the population status provides a clear record that a harvestable surplus can be maintained and that such harvest will benefit, or at least not be detrimental to, recovery goals.

4 Characterize, conserve, and monitor genetic diversity and gene flow among local populations of bull trout.

4.1 Incorporate conservation of genetic and phenotypic attributes of bull trout into recovery and management plans.

4.1.1 Conduct genetic inventory. Continue coordinated genetic inventory throughout recovery subunit and analysis of origin of bull trout captured downstream of Cabinet Gorge Dam.

4.2 *Maintain existing opportunities for gene flow among bull trout populations.*

- 4.3 *Develop genetic management plans and guidelines for appropriate use of transplantation and artificial propagation.*
- 5 Conduct research and monitoring to implement and evaluate bull trout recovery activities, consistent with an adaptive management approach using feedback from implemented, site-specific recovery tasks.
 - 5.1 *Design and implement a standardized monitoring program to assess the effectiveness of recovery efforts affecting bull trout and their habitats.*
 - 5.2 Conduct research to evaluate relationships among bull trout distribution and abundance, bull trout habitat, and recovery tasks.
 - 5.2.1 Identify suitable unoccupied habitat. Identify suitable unoccupied habitat, if any. Within five years, complete a comprehensive list of all known passage barriers that prevent upstream-migrating bull trout from accessing suitable habitat.
 - 5.2.2 Evaluate habitat suitability (i.e., thermal conditions) in reservoirs. Continue to evaluate suitability of mainstem reservoir habitat for bull trout and investigate potential methods for temperature manipulation.
 - 5.2.3 Investigate bull trout movement and distribution. Determine movement and seasonal use of different habitat types by adult and subadult migratory bull trout with emphasis on Lake Pend Oreille and the mainstem Clark Fork River and reservoirs.
 - 5.2.4 Coordinate monitoring of fish movement. Develop a coordinated fish marking and tracking strategy (e.g., standardized PIT tags and radio implant frequencies) throughout the Clark Fork River basin so that marked fish are recognized and reported when

captured in other States or different project jurisdictions (*e.g.*, Lake Pend Oreille, Avista, Milltown).

5.2.5 Research origin of bull trout that migrate to Cabinet Gorge Dam.

Investigate life history of bull trout spawning in the mainstem Clark Fork River below Cabinet Gorge Dam.

5.2.6 Evaluate feasibility of maintaining fluvial/resident populations.

If restoration of adfluvial bull trout runs from Lake Pend Oreille upstream of Cabinet Gorge Dam does not succeed, refocus strategy toward establishing multiple fluvial and resident populations, consistent with the Native Salmonid Restoration Plan.

5.2.7 Map spawning habitat. Develop a comprehensive map of primary tributary reaches of bull trout spawning for focusing protection and recovery efforts.

5.3 Conduct evaluations of the adequacy and effectiveness of current and past best management practices in maintaining or achieving habitat conditions conducive to bull trout recovery.

5.3.1 Evaluate efficacy of trap/transport project. Conduct an assessment to determine whether transported juvenile fish survive better than those migrating volitionally through the lower Clark Fork River dams.

5.4 Evaluate effects of diseases and parasites on bull trout and develop and implement strategies to minimize negative effects.

5.4.1 Monitor fish health in private hatcheries. Closely regulate fish health in private hatcheries that supply fish for private ponds (State and Federal hatcheries are already closely monitored).

- 5.4.2 Prevent spread of fish pathogens. Survey and evaluate fish health before implementing major fish passage projects.
- 5.5 Develop and conduct research and monitoring studies to improve information concerning the distribution and status of bull trout.
 - 5.5.1 Evaluate Middle Fork East River. Assess bull trout population status in the Middle Fork East River and determine whether this local population has a migratory component. If that component is present, assess the extent of the foraging, migrating, and overwintering habitat and whether the population's origin is derived from Priest Lake or Lake Pend Oreille.
- 5.6 *Identify evaluations needed to improve understanding of relationships among genetic characteristics, phenotypic traits, and local populations of bull trout.*
- 6 Use all available conservation programs and regulations to protect and conserve bull trout and bull trout habitats.
 - 6.1 Use partnerships and collaborative processes to protect, maintain, and restore functioning core areas for bull trout.
 - 6.1.1 Support watershed group restoration efforts. Support collaborative efforts by local watershed groups that are already established in Montana and Idaho to accomplish site-specific protection/restoration activities consistent with this Recovery Plan.
 - 6.1.2 Protect habitat. Provide long-term habitat protection through purchase, conservation easements, watershed restoration, management plans, and other methods. Emphasize in **Idaho:** Gold, Granite, Grouse, Johnson, Lightning, North Gold, Trestle,

and Twin Creeks and the Pack River watershed; in **Montana:** Bull River, Prospect Creek, and Jocko River watersheds.

- 6.2 Use existing Federal authorities to conserve and restore bull trout.
 - 6.2.1 Monitor compliance with Avista Federal Energy Regulatory Commission Settlement Agreement. Monitor compliance with Avista Settlement Agreement (Federal Energy Regulatory Commission license) for operations of Cabinet Gorge and Noxon Rapids Dams.
 - 6.2.2 Evaluate existing Federal Energy Regulatory Commission license conditions at Thompson Falls Dam. Evaluate compliance with Federal Energy Regulatory Commission Order and the potential need to reopen license for purposes of fish passage at Thompson Falls Dam.
 - 6.2.3 Implement Federal Energy Regulatory Commission license conditions for Kerr Dam. Monitor compliance with Kerr Dam Federal Energy Regulatory Commission license conditions and operations in the Flathead River downstream of Kerr Dam.
 - 6.2.4 Federal Columbia River Power System Biological Opinion. Monitor compliance with U.S. Fish and Wildlife Service Biological Opinion (USFWS 2000) (Federal Columbia River Power System) related to operation of Albeni Falls Dam on the outlet of Lake Pend Oreille.
 - 6.2.5 Expedite Flathead Agency Irrigation District Biological Opinion. Expedite a Biological Assessment and Biological Opinion for the Flathead Agency Irrigation Project to eliminate the existing take.
 - 6.2.6 Implement Plum Creek Habitat Conservation Plan. Carry out compliance monitoring and U.S. Fish and Wildlife Service

commitment to adaptive management planning under the Plum Creek Native Fish Habitat Conservation Plan.

6.3 Evaluate enforcement of existing Federal and State habitat protection standards and regulations and evaluate their effectiveness for bull trout conservation.

6.3.1 Fully implement State and Tribal habitat protection laws. Fully implement the Montana Streamside Management Zone Law (1993), Montana Stream Protection Act (1965), Montana Natural Streambed and Land Preservation Act (1975), Idaho Forest Practices Act (1974), Idaho Lake Protection Act (1973), Idaho Stream Channel Protection Act (1967), and Idaho Code 36-906 addressing fish passage (pre-1900) to maximize legal protection of bull trout habitat under State law and evaluate the effectiveness of these laws in conserving bull trout habitat.

6.3.2 Encourage floodplain protection. Encourage local governments to develop, implement, and promote restrictive regulations for floodplains to mitigate extensive habitat loss and stream encroachment from rural residential development throughout the lower Clark Fork River drainage because these and other effects of development exacerbate temperature problems, increase nutrient loads, decrease bank stability, alter instream and riparian habitat, and change hydrologic response of affected watersheds.

7 *Assess the implementation of bull trout recovery by recovery units and revise recovery unit plans based on evaluations.*

FLATHEAD RECOVERY SUBUNIT

1 Protect, restore, and maintain suitable habitat conditions for bull trout.

- 1.1 Maintain or improve water quality in bull trout core areas or potential core habitat.
 - 1.1.1 Reduce general sediment sources. Stabilize roads, stream crossings, trails, natural landslides, and other sources of sediment delivery. Priority watersheds include Big, Coal, Trail, Red Meadow, and Whale Creeks and the North Fork Flathead River; Cauldrey, Howell, and Kishinehn Creeks and the British Columbia portion of the (North Fork) Flathead River; Cold, Elk, Goat, Jim, Kraft, Lion, Lost, Piper, Squeezer, and Woodward Creeks and the Swan River; Granite Creek and the Middle Fork Flathead River; Quintonkon, Sullivan, Wheeler, and Wounded Buck Creeks and the South Fork Flathead River; tributaries to Cyclone, Frozen, Holland, Lindbergh, McDonald, and Tally Lakes; Swift Creek and the Whitefish River; the Stillwater River drainage; and the mainstem Flathead River.
 - 1.1.2 Address forest road maintenance and hotspots. Increase maintenance of extensive secondary road systems on U.S. Forest Service, Plum Creek Timber Company, and State lands by increased application of best management practices, with emphasis on remediating sediment-producing hotspots and maintaining bridges, culverts, and crossings in drainages that support bull trout spawning and rearing. Decommission surplus forest roads, especially those that are chronic sources of sediment and those that are located in areas of highly erodible geological formations. Remove culverts and bridges on closed roads that are no longer maintained.
 - 1.1.3 Improve maintenance along transportation corridors. Improve maintenance of all major roads and railroads along riparian corridors to reduce impacts of sediment and floodplain encroachment. When reconstruction occurs, advocate moving major problem reaches out of riparian corridors. Improve

capability for quick response for dealing with potential hazardous material spills (especially on Highway 93, Highway 2 east of Kalispell, the North Fork Flathead River, Swan Highway, and major east–west rail lines).

- 1.1.4 Modify problem reaches of trail system. Improve or relocate portions of the U.S. Forest Service and Glacier National Park trail system to eliminate stream crossings in known bull trout spawning reaches (*e.g.*, Granite Creek on the Middle Fork Flathead River) and minimize human activity at these locations.
- 1.1.5 Monitor existing and future coal mine development in British Columbia. Monitor sediment and potential acid mining runoff related to existing and proposed coal mining activities in the British Columbia portion of the North Fork Flathead River.
- 1.1.6 Minimize recreational development in bull trout spawning and rearing habitat. Minimize impacts from expansion or development of new golf courses, ski areas, campgrounds, fishing access sites, and second home or other recreational developments in the corridors of bull trout spawning and rearing streams.
- 1.1.7 Assess nutrient input and increase water quality monitoring and remediation. Assess and continue to address effects of nutrient enrichment from municipal sewage plants, agriculture, forestry, and development of lakeshores. Increase water quality monitoring in major lake basins (*e.g.*, Flathead, Swan, Whitefish, McDonald). Focus water quality remediation efforts on rapidly developing and implementing total maximum daily load programs for impaired water bodies (section 303[d] list) that contain bull trout.

- 1.1.8 Implement water quality regulations. Evaluate enforcement of water quality standards and implement total maximum daily load program.
- 1.2 Identify barriers or sites of entrainment for bull trout and implement tasks to provide passage and eliminate entrainment.
 - 1.2.1 Eliminate entrainment in diversions. Screen both water diversions and irrigation ditches or remove those that are no longer needed.
 - 1.2.2 Provide fish passage around diversions. Install appropriate fish passage structures around diversions and/or remove related migration barriers. Consider native fish genetic concerns and the potential for invasion by nonnatives (*e.g.*, Bigfork Dam) when making evaluations.
 - 1.2.3 Eliminate culvert barriers. Monitor road crossings for blockages to upstream passage and, where beneficial to native fish, replace or remove existing culverts or bridges that impede passage. Consider native fish genetic concerns and the potential for invasion by nonnatives when making evaluations. The following drainages are of highest priority for this task: Big, Coal, Trail, Red Meadow, and Whale Creeks in the North Fork Flathead River drainage; Cauldrey, Howell, and Kishinehn Creeks and the British Columbia portion of the mainstem (North Fork) Flathead River; Cold, Elk, Fatty, Goat, Jim, Kraft, Lion, Lost, Piper, Soup, Squeezer, and Woodward Creeks in the Swan River drainage; Clark, Paola, and Tunnel Creeks in the Middle Fork Flathead River drainage; Quintonkon, Sullivan, Wheeler, and Wounded Buck Creeks in the South Fork Flathead River drainage; tributaries to Cyclone, Frozen, Holland, Lindbergh, McDonald, and Tally Lakes; Swift Creek and the Whitefish River; and the Stillwater River drainage.

- 1.2.4 Improve instream flows. Restore connectivity and opportunities for migration by securing or improving instream flows and acquiring or leasing water rights from willing sellers. The highest-priority streams are those with bull trout spawning and rearing.
- 1.3 Identify impaired stream channel and riparian areas and implement tasks to restore their appropriate functions.
 - 1.3.1 Conduct watershed problem assessments. Identify site-specific threats (problem assessment) that may be limiting bull trout in watersheds that have not already been evaluated. Evaluate adfluvial populations in Akokala, Arrow, Big Salmon, Bowman, Cerulean, Cyclone, Doctor, Frozen, Harrison, Holland, Isabel, Kintla (2), Lindbergh, Logging, McDonald, Quartz (3), Stillwater (2), Tally, Trout, Upper Whitefish, and Whitefish Lakes and quantify population numbers, trends, and extent of habitat used.
 - 1.3.2 Revegetate denuded riparian areas. Revegetate past riparian harvest zones to restore shade and canopy, riparian cover, and native vegetation.
 - 1.3.3 Improve grazing practices. Reduce negative effects of grazing by fencing riparian areas or improving management practices. Priority watersheds include Hay Creek in the North Fork Flathead River drainage and Logan Creek (Tally Lake).
 - 1.3.4 Restore stream channels. Conduct stream channel restoration activities where evaluation indicates that such activities are necessary to restore proper stream function and only where similar results cannot be achieved by other, less costly and less intrusive means. Priority watersheds include Bear Creek in the Middle Fork Flathead drainage.

- 1.3.5 Improve instream habitat. Increase or improve instream habitat by restoring recruitment of large woody debris or by initiating other appropriate methods. Streams include Big, Coal, Red Meadow, and Whale Creeks in the North Fork Flathead River drainage and Bear Creek in the Middle Fork Flathead River drainage.
- 1.3.6 Minimize potential stream channel degradation. Ensure that negative effects to bull trout of ongoing flood control and streambank stabilization activities (*e.g.*, riprap, dredging, channel clearing) are minimized.
- 1.4 Operate dams to minimize negative effects on bull trout.
 - 1.4.1 Reduce reservoir operational impacts. Review Flathead Lake and Hungry Horse Reservoir operational concerns (*e.g.*, water level manipulation) and support operating recommendations that provide enforceable drawdown limits and refill guidelines through Federal Energy Regulatory Commission license (Kerr) and/or Federal consultation (Hungry Horse Reservoir; USFWS Biological Opinion). The Variable Flow Flood Control model should be implemented by water managers to provide comprehensive, long-term, balanced, and predictable allocation of water resources from Hungry Horse Reservoir that will limit the duration and frequency of deep reservoir drawdowns, improve reservoir refill probability, and produce a more naturally shaped dam discharge pattern downstream (USFWS 2000). Once implemented, these strategies must be evaluated to determine the effects on bull trout recovery.
 - 1.4.2 Provide instream flow downstream of dams. Maintain or exceed recommended instream flow levels in the lower South Fork Flathead River (USFWS 2000), using results of current research, and minimize peaking flows in the mainstem Flathead River

downstream of Hungry Horse Dam. Consider bull trout concerns when developing flood control release patterns.

1.4.3 Evaluate selective withdrawal at Hungry Horse Dam. Evaluate the adequacy of the selective withdrawal system in partially restoring the normal summer thermal regime in the Flathead River downstream of Hungry Horse Dam and assess whether it meets the needs of migratory bull trout. Refine operations if necessary.

1.4.4 Avoid gas supersaturation from Hungry Horse Dam. Avoid conditions for potential gas entrainment to cause nitrogen supersaturation below Hungry Horse Dam that is detrimental to bull trout.

1.4.5 Evaluate impact of dam operations on bull trout predators. Continue research on response of introduced predators (*i.e.*, lake trout and northern pike) to Flathead Lake and Flathead River water level and temperature manipulations and provide recommendations for operation of Hungry Horse and Kerr Dams to favor native species.

1.5 Identify upland conditions that negatively affect bull trout habitats and implement tasks to restore appropriate functions.

1.5.1 Monitor fire effects and mitigate effects where necessary. Monitor effects from wild fires and pursue habitat restoration actions where warranted.

2 Prevent and reduce negative effects of nonnative fishes and other nonnative taxa on bull trout.

2.1 Develop, implement, and evaluate enforcement of policies for public and private fish stocking to reduce stocking of nonnative fishes that affect bull trout.

- 2.1.1 Upgrade fish hatchery practices. Evaluate all fish-stocking programs and private and public hatchery practices to minimize the risk of further inadvertent introduction of nonnative species, strains, or pathogens to the Flathead River drainage.
- 2.1.2 Regulate private fish ponds. Reduce the risks of inadvertent introduction of nonnative species from private fish ponds by closely regulating existing permits to ensure that only permitted species are stocked and that fish barriers are maintained and by attaching conditions to future permits.
- 2.1.3 Encourage development of commercial sources of westslope cutthroat trout. Develop and maintain an approved and available source of genetically diverse native westslope cutthroat trout for private pond stocking. Follow stocking guidelines developed by the Montana Westslope Cutthroat Trout Technical Committee.
- 2.2 Evaluate policies for preventing illegal transport and introduction of nonnative fishes.
 - 2.2.1 Optimize enforcement of laws and policies that prohibit unauthorized fish transplant and stocking. Strengthen enforcement of existing laws and continue to work to improve the legal and policy framework for preventing unauthorized fish transplant and stocking.
- 2.3 Inform the public about ecosystem concerns of illegal introductions of nonnative fishes.
 - 2.3.1 Discourage unauthorized fish introductions. Focus an intensive public education campaign in the Flathead River basin to reduce the rampant spread of nonnative fish species; to date at least 220 unauthorized introductions have occurred into 121 waters in

northwest Montana. Strong enforcement of existing laws prohibiting illegal introduction is needed.

- 2.3.2 Develop bull trout education program. Develop public information program with a broad emphasis on bull trout ecology and life history requirements and a more specific focus on regionally or locally important recovery issues.
- 2.4 Evaluate biological, economic, and social effects of control of nonnative fishes.
 - 2.4.1 Develop protocols for suppressing nonnative fish. Conduct research and develop protocols to describe the most effective methods for suppressing or eradicating nonnative fish populations from waters where they negatively impact bull trout recovery, with emphasis on lake trout, brook trout, and northern pike.
 - 2.4.2 Discourage illegally introduced sport fish populations. Adopt an aggressive approach to angling regulations and fisheries management that avoids legitimizing fisheries for illegally established populations of nonnative fish and that supports minimizing the presence of and/or removing illegally introduced fish.
- 2.5 Implement control of nonnative fishes where found to be feasible and appropriate.
 - 2.5.1 Experimentally remove established brook trout populations. Evaluate opportunities for, and conduct experimental removal of, brook trout from selected streams and lakes. Priority watersheds include Bear Creek (Middle Fork Flathead River) and selected sites within the Swan River and upper Stillwater River drainages.

- 2.5.2 Suppress brown trout in Mill Creek. Remove newly established reproducing brown trout population from Mill Creek in the Flathead River drainage.
- 2.6 Develop tasks to reduce negative effects of nonnative taxa on bull trout.
 - 2.6.1 Reduce/minimize impacts of northern pike. Evaluate and, if warranted, control expansion of northern pike in the Flathead River and associated sloughs or other waters to minimize predation on bull trout.
 - 2.6.2 Consider installing barriers to hinder spread of nonnative fish. In portions of the Flathead Recovery Subunit, threats of invasion in isolated lakes by nonnative fish, especially lake trout from downstream, may exceed concerns over fragmentation due to barriers. In some such situations, consider barrier installation downstream of vulnerable adfluvial bull trout populations: for example, Frozen, Cyclone, Holland, Lindbergh, and Quartz Lakes.
- 3 Establish fisheries management goals and objectives compatible with bull trout recovery and implement practices to achieve goals.
 - 3.1 Develop and implement State and Tribal native fish management plans integrating adaptive research.
 - 3.1.1 Implement adaptive management of native fishes in Flathead Lake and Flathead River. Implement the Flathead Lake and River Co-Management Plan so that it accommodates bull trout recovery goals and minimizes the emigration of lake trout upstream and downstream through the Flathead River system. Monitor and evaluate the effectiveness of the management plan in meeting bull trout recovery goals and make adaptive changes, if necessary.

Continue assessment of predator–prey interactions in Flathead Lake, with emphasis on lake trout.

3.1.2 Develop and implement a Swan Lake management strategy.

Develop and implement a management strategy for Swan Lake that seeks to eliminate recently discovered individual lake trout by whatever means possible. Intensify management activities to protect bull trout if lake trout are found to establish or reproduce. Maintain Bigfork Dam as an upstream fish barrier.

3.1.3 Aggressively protect remaining native species complexes.

Manage the lakes thought to contain uncompromised adfluvial bull trout populations (*i.e.*, currently not known to contain extensive populations of competing nonnative species) to minimize the risk of nonnative fish introductions; use aggressive protective regulations and information and education campaigns. Lakes include Akokala, Arrow, Big Salmon, Cerulean, Cyclone, Doctor, Frozen, Isabel, Lower Quartz, Middle Quartz, Trout, Upper Kintla, Upper Quartz, and Upper Whitefish Lakes.

3.2 Evaluate and prevent overharvest and incidental angling mortality of bull trout.

3.2.1 Minimize unintentional bull trout mortality. Montana Fish, Wildlife and Parks; Confederated Salish and Kootenai Tribes; and Glacier National Park should continue to develop and implement sport angling regulations and fisheries management plans, guidelines, and policies that minimize incidental mortality of bull trout.

3.2.2 Evaluate enforcement of angling regulations and oversee scientific research. Ensure compliance with angling regulations and Federal, State, and Tribal policies for scientific collection and target bull trout spawning and staging areas for enforcement.

Poaching is a particularly sensitive problem in the recovery subunit due to the vulnerability of large migratory spawners from Flathead, Holland, Swan, Lindbergh, and other lakes.

- 3.2.3 Implement angler education efforts. Inform anglers about special regulations and how to identify bull trout and reduce hooking mortality of bull trout that are caught incidentally in Flathead Lake, the Flathead River and tributaries, and other fisheries.
 - 3.2.4 Solicit information from commercial guides. Develop a reporting system to collect information on bull trout that are caught and released from charter boats and by commercial fishing guides on Flathead Lake and the Flathead and Swan Rivers.
 - 3.2.5 Coordinate with British Columbia fisheries monitoring and management authorities. Continue close communication with the British Columbia Ministry of Environment to carefully monitor the potential effects of the bull trout fishery and management program in the Flathead River in British Columbia.
- 3.3 Evaluate potential effects of introduced fishes and associated sport fisheries on bull trout recovery and implement tasks to minimize negative effects on bull trout.
- 3.3.1 Evaluate site-specific conflicts with introduced sport fish. Determine the site-specific level of predation, competition, and hybridization of bull trout with introduced sport fish (especially lake trout, brook trout, and northern pike) and take management actions to minimize the effects of those interactions while maintaining or restoring a viable bull trout population in lakes that are currently at risk, including Bowman, Harrison, Holland, Kintla, Lindbergh, Logging, Lake McDonald, Upper and Lower Stillwater, Tally, and Whitefish Lakes. Evaluate and implement

site-specific opportunities to eliminate nonnatives and restore native fish communities in Glacier National Park lakes.

3.4 Evaluate effects of existing and proposed sport fishing regulations on bull trout.

3.4.1 Evaluate opportunities for regulated bull trout fisheries. Evaluate management proposals to allow carefully regulated fisheries for, and potential harvest of, bull trout (in Hungry Horse Reservoir, in accordance with the existing Conservation Agreement, or in other waters) where monitoring of the population status provides a clear record that a harvestable surplus can be maintained and that such harvest will benefit, or at least not be detrimental to, recovery goals. Such fisheries may provide a unique opportunity to fish for native species that anglers will value and, consequently, may help protect these waters from unauthorized introductions.

4 Characterize, conserve, and monitor genetic diversity and gene flow among local populations of bull trout.

4.1 Incorporate conservation of genetic and phenotypic attributes of bull trout into recovery and management plans.

4.1.1 Conduct genetic inventory. Continue coordinated genetic inventory and protect genetic diversity throughout recovery subunit, with emphasis on analyzing bull trout from adfluvial core areas and assessing the hybridization threat with brook trout. Core areas include Akokala, Arrow, Big Salmon, Bowman, Cerulean, Cyclone, Doctor, Frozen, Harrison, Holland, Isabel, Kintla (2), Lindbergh, Logging, Lake McDonald, Quartz (3), Stillwater (2), Tally, Trout, Upper Whitefish, and Whitefish Lakes.

4.2 *Maintain existing opportunities for gene flow among bull trout populations.*

4.3 *Develop genetic management plans and guidelines for appropriate use of transplantation and artificial propagation.*

5 Conduct research and monitoring to implement and evaluate bull trout recovery activities, consistent with an adaptive management approach using feedback from implemented, site-specific recovery tasks.

5.1 Design and implement a standardized monitoring program to assess the effectiveness of recovery efforts affecting bull trout and their habitats.

5.1.1 Develop standardized monitoring procedures. Conduct in-depth statistical analysis of existing bull trout databases for the Flathead River and Swan River populations (including redd counts and juvenile abundance estimates over the past 20 years) to validate and interpret trends, assess potential information gaps, and identify future monitoring needs. Continue to conduct annual index monitoring to support and expand long-term database. Develop standardized bull trout monitoring procedures to apply throughout the Clark Fork Recovery Unit.

5.2 Conduct research evaluating relationships among bull trout distribution and abundance, bull trout habitat, and recovery tasks.

5.2.1 Identify suitable unoccupied habitat. Identify suitable unoccupied habitat, if any. Within five years, complete a comprehensive list of all known passage barriers that prevent upstream-migrating bull trout from accessing suitable habitat.

5.2.2 Map spawning habitat. Develop a comprehensive map of primary tributary reaches of bull trout spawning for focusing habitat protection and recovery efforts.

5.3 *Conduct evaluations of the adequacy and effectiveness of current and past best management practices in maintaining or achieving habitat conditions conducive to bull trout recovery.*

- 5.4 Evaluate effects of diseases and parasites on bull trout and develop and implement strategies to minimize negative effects.
 - 5.4.1 Monitor fish health in private hatcheries. Closely regulate fish health in private hatcheries that supply fish for private ponds (State and Federal hatcheries are already closely monitored).
 - 5.4.2 Prevent spread of fish pathogens. Survey and evaluate fish health before implementing new fish passage projects.
- 5.5 Develop and conduct research and monitoring studies to improve information concerning the distribution and status of bull trout.
 - 5.5.1 Increase monitoring of adfluvial bull trout populations in smaller lakes. Increase monitoring of adfluvial populations to determine population status, distribution, movement, and seasonality of use of different habitat types by adult and subadult bull trout in the following lakes and their watersheds: Akokala, Arrow, Bowman, Cerulean, Cyclone, Doctor, Frozen, Harrison, Holland, Isabel, Kintla (2), Lindbergh, Logging, McDonald, Quartz (3), Stillwater (2), Trout, Upper Whitefish, and Whitefish Lakes.
 - 5.5.2 Evaluate bull trout population and habitat in Tally Lake watershed to determine potential core area status. Bull trout have been historically documented in low numbers in this lake, but there is a natural barrier on the lower reaches of the inlet stream (Logan Creek) and whether the accessible portion of Logan Creek ever provided suitable spawning and rearing habitat is uncertain. Presence of bull trout may have been only incidental, a result of upstream migration in the Stillwater River system. Verification of historical presence and abundance, as well as of historical habitat suitability, is needed to determine core area status of this water.

- 5.6 Identify evaluations needed to improve understanding of relationships among genetic characteristics, phenotypic traits, and local populations of bull trout.
 - 5.6.1 Investigate status of migratory and resident life history forms of bull trout. Investigate potential existence of fluvial or resident bull trout populations in the Flathead River and Swan River tributaries, where only adfluvial migrants have previously been documented.
 - 5.6.2 Assess hybridization threat with brook trout in the Swan River drainage. Assess significance of brook trout hybridization in the Swan River drainage and establish benchmarks to measure and/or prevent any further increase in the rate of hybridization.
- 6 Use all available conservation programs and regulations to protect and conserve bull trout and bull trout habitats.
 - 6.1 Use partnerships and collaborative processes to protect, maintain, and restore functioning core areas for bull trout.
 - 6.1.1 Support watershed group restoration efforts. Support collaborative efforts by local watershed groups to accomplish site-specific protection/restoration activities consistent with this recovery plan. The Swan River drainage is a priority because of its strong status of existing bull trout populations, the diverse mixture of public and private lands, and the pressures of rapidly expanding development. A draft total maximum daily load program is being developed in the Swan River drainage, relying upon an methodology based on assessment of road-induced sedimentation and instream sediment sources.
 - 6.1.2 Protect habitat. Provide long-term habitat protection on State and private lands through habitat conservation plans, land exchanges, purchases, conservation easements, management plans, and other methods. Emphasis should be on identified bull trout spawning and rearing streams.

6.1.3 Support habitat protection and monitoring in British Columbia.

Work collaboratively with the British Columbia Ministry of Environment and other Canadian governmental and nongovernmental entities to ensure that bull trout habitat is protected and enhanced in the Flathead River watershed upstream of the international border.

6.2 Use existing Federal authorities to conserve and restore bull trout.

6.2.1 Monitor compliance with Kerr Dam Federal Energy Regulatory Commission Order and Biological Opinion.

Monitor compliance with the Order of the Federal Energy Regulatory Commission (and the Biological Opinion of the U.S. Fish and Wildlife Service) for operations of Kerr Dam and ensure that recovery needs of bull trout are met.

6.2.2 Minimize impacts of Bigfork Dam through Federal Energy Regulatory Commission relicensing process.

Minimize impacts of Bigfork Dam operations on bull trout (*e.g.*, entrainment) through the relicensing process of the Federal Energy Regulatory Commission and through compliance with Biological Opinion of the U.S. Fish and Wildlife Service.

6.2.3 Monitor compliance with Federal Columbia River Power System Biological Opinion for Hungry Horse Dam.

Monitor compliance with the Biological Opinion for Federal Columbia River Power System operations of Hungry Horse Dam and evaluate effectiveness in conserving bull trout.

6.2.4 Implement Plum Creek Habitat Conservation Plan.

Carry out compliance monitoring and U.S. Fish and Wildlife Service commitment to adaptive management planning under the proposed Plum Creek Native Fish Habitat Conservation Plan, with emphasis on the Swan River basin due to concentrated Plum Creek Timber Company land holdings.

6.3 Evaluate enforcement of existing Federal and State habitat protection standards and regulations and evaluate their effectiveness for bull trout conservation.

6.3.1 Fully implement State and Tribal habitat protection laws. Fully implement the Montana Streamside Management Zone Law (1993), Montana Stream Protection Act (1965), Montana Natural Streambed and Land Preservation Act (1975), and Montana Water Quality Act (1997) to maximize legal protection of bull trout habitat under State law and evaluate the effectiveness of these laws in conserving bull trout habitat.

6.3.2 Encourage floodplain protection. Encourage local and Confederated Salish and Kootenai Tribal governments to develop, implement, and promote restrictive regulations to protect floodplains and lakeshores in Flathead, Lake, and Missoula Counties to mitigate extensive habitat loss and stream encroachment from rural residential development throughout the Flathead River drainage. These effects and others related to development are of particular concern in watersheds that support bull trout spawning and rearing because they exacerbate temperature problems, increase nutrient loads, decrease bank stability, and alter instream and riparian habitat.

7 *Assess the implementation of bull trout recovery by recovery units and revise recovery unit plans based on evaluations.*

PRIEST RECOVERY SUBUNIT

- 1 Protect, restore, and maintain suitable habitat conditions for bull trout.
 - 1.1 Maintain or improve water quality in bull trout core areas or potential core habitat.
 - 1.1.1 Reduce general sediment sources. Stabilize roads, stream crossings, trails, natural landslides, and other sources of sediment delivery in the Priest River drainage, where sedimentation is especially problematic because of the prevalence of highly erodible soil types and rain-on-snow events. Priority watersheds are those with known bull trout populations, including Granite, Lion, Trapper, and Two Mouth Creeks; and the Upper Priest River and its tributaries.
 - 1.1.2 Address forest road maintenance and hotspots. Emphasize maintenance of extensive secondary road systems of U.S. Forest Service and State lands by increased application of best management practices, with focus on remediating sediment-producing hotspots and maintaining bridges, culverts, and crossings in drainages supporting bull trout spawning and rearing. Decommission surplus forest roads, especially those that are chronic sources of sediment and/or those that are located in areas of highly erodible geological formations. Remove culverts and/or bridges on closed roads that are no longer maintained. The Idaho Department of Lands has made significant efforts in this arena, but areas that will continue to require particular attention include portions of the drainages of Hughes Fork and Indian, Kalispell, Lion, Soldier, and Two Mouth Creeks.
 - 1.1.3 Improve maintenance along transportation corridors. Improve maintenance of all major roads along riparian corridors to reduce impacts of sediment and floodplain encroachment. When reconstruction occurs on roads that are in the floodplain, advocate

moving major problem reaches out of riparian corridors. Improve the capability of quick response for dealing with potential hazardous material spills.

- 1.1.4 Minimize recreational development in bull trout spawning and rearing habitat. Minimize impacts from expansion or development of new golf courses, ski areas, campgrounds, fishing access sites, and second home or other recreational developments in the corridors of bull trout spawning and rearing streams.
- 1.1.5 Assess and reduce nutrient input from forestry practices and lakeshore development. Assess and continue to address effects of nutrient enrichment from forestry practices and lakeshore development. Continue to monitor water quality in the Priest River basin. Focus water quality remediation efforts on rapidly implementing total maximum daily load programs for impaired water bodies that contain bull trout (section 303[d] list includes Kalispell, Trapper, and Two Mouth Creeks).
- 1.1.6 Implement water quality regulations. Evaluate enforcement of water quality standards and implement total maximum daily load program.
- 1.2 Identify barriers or sites of entrainment for bull trout and implement tasks to provide passage and eliminate entrainment.
 - 1.2.1 Eliminate culvert barriers. Monitor stream crossings for blockages to upstream passage and replace or remove existing culverts or bridges that impede passage. Problem areas have been identified on Granite Creek, Hughes Fork, Kalispell Creek, and South Fork Granite Creek.
 - 1.2.2 Improve instream flows. Restore connectivity and opportunities for migration by securing or improving instream flows and acquiring water rights; the highest priority should be assigned to bull trout

spawning and rearing streams. Kalispell Creek has currently been identified as one such stream with intermittent dewatering problems.

1.3 Identify impaired stream channel and riparian areas and implement tasks to restore their appropriate functions.

- 1.3.1 Conduct watershed problem assessments. Identify site-specific threats (problem assessment) that may be limiting bull trout in watersheds that have not already been evaluated. In particular, quantify population numbers, trends, and extent of habitat used in the following watersheds: Caribou Creek, Granite Creek, Hughes Fork, Indian Creek, Kalispell Creek, Upper Priest River, Priest River, and Soldier Creek. Assessments have been completed in Lion, Trapper, and Two Mouth Creeks.
- 1.3.2 Revegetate denuded riparian areas. Develop site-specific plans to promote revegetation of past riparian harvest zones (and some other stream sections lacking woody vegetation for other reasons) to ensure sufficient shade and canopy, large woody debris recruitment, riparian cover, and native vegetation to support native salmonids. Highest-priority streams are those with existing bull trout populations.
- 1.3.3 Improve grazing practices. Reduce negative effects of grazing with riparian fencing or improved management practices. Problems in the Priest River drainage are restricted to a few isolated locations that are not generally associated with bull trout spawning and rearing streams.
- 1.3.4 Restore stream channels. Conduct stream channel restoration activities, but only where similar results cannot be achieved by other, less costly and less intrusive means. Priority watersheds include the Hughes Fork downstream of Hughes Meadow.

- 1.3.5 Improve instream habitat. Explore opportunities to improve instream habitat by increasing amounts of large woody debris (*e.g.*, on lower Hughes Fork and Caribou, Granite, Indian, Kalispell, Lion, and Two Mouth Creeks).
- 1.3.6 Minimize potential stream channel degradation. Ensure that negative effects to bull trout from ongoing flood control and streambank stabilization activities (*e.g.*, riprap, dredging, channel clearing) are minimized, in part through implementing the U.S. Army Corps of Engineers 404 program and the Idaho Stream Channel Protection Act.
- 1.4 Operate dams to minimize negative effects on bull trout.
 - 1.4.1 Minimize impacts of dam operations on bull trout in Priest Lake. Review operations of Priest Lake Outlet Structure and support operating recommendations that minimize effects on bull trout, including two-way fish passage and adequate instream flows.
 - 1.4.2 Minimize impacts of Albeni Falls Dam on bull trout in the Priest River. Review Lake Pend Oreille operational concerns (*e.g.*, water level manipulation that may affect free passage or habitat quality in the lower Priest River) and include operating recommendations through Federal consultation for Lake Pend Oreille that are consistent with needs of bull trout in the Priest River system.
 - 1.4.3 Provide upstream passage over barriers. Investigate and implement upstream fish passage at Albeni Falls Dam and over the Priest Lake Outlet Structure, as needed, to reconnect fragmented bull trout core habitat with Lake Pend Oreille.
- 1.5 Identify upland conditions that negatively affect bull trout habitats and implement tasks to restore appropriate functions.

- 1.5.1 Monitor fire effects and mitigate effects where necessary. Monitor effects from wild fires and pursue habitat restoration actions where warranted.
- 2 Prevent and reduce negative effects of nonnative fishes and other nonnative taxa on bull trout.
 - 2.1 Develop, implement, and evaluate enforcement of public and private fish stocking policies to reduce stocking of nonnative fishes that affect bull trout.
 - 2.1.1 Review fish stocking programs. Evaluate all fish-stocking programs and private and public hatchery practices to minimize the risk of further inadvertent introduction of nonnative species to the Priest River drainage.
 - 2.1.2 Regulate private fish ponds. Reduce the risks of inadvertent introduction of nonnative fish from private fish ponds by closely regulating existing permits to ensure that only permitted species are stocked and that fish barriers are maintained and by attaching conditions to future permits.
 - 2.1.3 Encourage development of commercial sources of westslope cutthroat trout. Support development of approved and available sources of genetically diverse native westslope cutthroat trout for private pond stocking.
 - 2.2 Evaluate policies for preventing illegal transport and introduction of nonnative fishes.
 - 2.2.1 Optimize enforcement of laws and policies that prohibit unauthorized fish transplant and stocking. Strengthen enforcement of existing laws and continue to work to improve the legal and policy framework for preventing unauthorized fish transplant and stocking.

- 2.3 Inform the public about ecosystem concerns of illegal introductions of nonnative fishes.
 - 2.3.1 Discourage unauthorized fish introductions. Focus an intensive public education campaign on the Priest Lake basin to reduce the potential spread of illegally introduced nonnative fish species.
 - 2.3.2 Develop bull trout education program. Develop a public information program with a broad emphasis on bull trout ecology and life history requirements and a more specific focus on regionally or locally important recovery issues.
- 2.4 Evaluate biological, economic, and social effects of control of nonnative fishes.
 - 2.4.1 Develop protocols for suppressing nonnative fish. Conduct research and develop protocols to describe the most effective methods for suppressing or eradicating nonnative fish populations from waters where they negatively impact bull trout recovery, with emphasis on lake trout and brook trout in the Priest Lakes system.
 - 2.4.2 Evaluate site-specific conflicts with introduced sport fish. Determine the site-specific level of predation, competition, and hybridization of bull trout with introduced sport fish (especially lake trout and brook trout) and take management actions to minimize the effects of those interactions, while maintaining or restoring a viable bull trout population in Priest Lake that is sufficiently large to protect the genetic integrity of the local population(s).
- 2.5 Implement control of nonnative fishes where found to be feasible and appropriate.
 - 2.5.1 Experimentally remove established brook trout populations. Evaluate opportunities for experimental removal of brook trout

from selected streams. Priority watersheds include those in the Upper Priest Lake basin, particularly Rock and Ruby Creeks, and others identified as bull trout spawning and rearing streams.

- 2.5.2 Evaluate the potential for a barrier in the Thorofare to control the migration of nonnative fish. Investigations in Upper Priest Lake have indicated that aggressive netting could effectively control lake trout, but that rapid reinvasion by lake trout occurs from downstream Priest Lake. Risks to bull trout from the lake trout invasion currently exceed concerns over fragmentation from barriers. For this situation, consider installing a partial (perhaps seasonal or selective) fish barrier in the Thorofare between Upper Priest and Priest Lakes to protect Upper Priest Lake's vulnerable adfluvial bull trout populations.

2.6 *Develop tasks to reduce negative effects of nonnative taxa on bull trout.*

- 3 Establish fisheries management goals and objectives compatible with bull trout recovery and implement practices to achieve goals.

- 3.1 Develop and implement State and Tribal native fish management plans integrating adaptive research.

- 3.1.1 Implement adaptive management to address lake trout in Lake Pend Oreille and Priest Lake. Continue assessing predator-prey interactions in Lake Pend Oreille and Priest Lake, with emphasis on lake trout. Continue analysis of options for using commercial-type fishing gear to reduce lake trout numbers. In Priest Lake, implement actions to reduce lake trout numbers.

- 3.1.2 Aggressively protect remaining native species complexes. Maximize efforts to suppress and, if possible, eliminate lake trout from Upper Priest Lake. Consider all potential methods to negate lake trout immigration, including design and strategies for funding and installing a downstream fish barrier to prevent immigration.

Manage Upper Priest Lake to minimize nonnative fish populations by using aggressive protective regulations for native species, liberal limits on nonnatives, and information and education campaigns.

3.2 Evaluate and prevent overharvest and incidental angling mortality of bull trout.

3.2.1 Minimize unintentional bull trout mortality. The Idaho Department of Fish and Game and the Washington Department of Fish and Wildlife should continue to develop and implement sport angling regulations and fisheries management plans, guidelines, and policies that minimize incidental mortality of bull trout, particularly in the Priest Lakes and the Priest River.

3.2.2 Evaluate enforcement of angling regulations and oversee scientific research. Ensure compliance with angling regulations and scientific collection policies and target enforcement efforts at known bull trout spawning and staging areas.

3.2.3 Implement angler education efforts. Inform anglers about special regulations (*e.g.*, on Upper Priest Lake) and how to identify bull trout and reduce hooking mortality of bull trout caught incidentally in the Priest River system.

3.2.4 Solicit information from commercial guides. Develop a reporting system to collect information on bull trout that are caught and released from charter boats and by commercial fishing guides on Priest Lake.

3.3 Evaluate potential effects of introduced fishes and associated sport fisheries on bull trout recovery and implement tasks to minimize negative effects on bull trout.

3.3.1 Discourage illegally introduced sport fish populations. Adopt an aggressive approach to angling regulations and fisheries

management that actively avoids legitimizing fisheries for illegally established populations of nonnative fish in the future and that supports minimizing the presence of and/or removing illegally introduced fish.

3.4 Evaluate effects of existing and proposed sport fishing regulations on bull trout.

3.4.1 Encourage brook trout harvest. Develop and maintain regulations that prescribe liberal bag limits on brook trout throughout the Priest River watershed.

4 Characterize, conserve, and monitor genetic diversity and gene flow among local populations of bull trout.

4. Incorporate conservation of genetic and phenotypic attributes of bull trout into recovery and management plans.

4.1.1 Conduct genetic inventory. Conduct coordinated genetic inventory and protect genetic diversity throughout the recovery subunit, with emphasis on analyzing bull trout from the Upper Priest River watershed where hybridization with brook trout presents the most imminent threat.

4.2 *Maintain existing opportunities for gene flow among bull trout populations.*

4.3 Develop genetic management plans and guidelines for appropriate use of transplantation and artificial propagation.

4.3.1 Implement actions to develop a refugia for Priest Lakes. Develop plans for captive propagation or other methods of maintaining genetic viability of declining bull trout population in Priest Lakes.

- 5 Conduct research and monitoring to implement and evaluate bull trout recovery activities, consistent with an adaptive management approach using feedback from implemented, site-specific recovery tasks.
 - 5.1 Design and implement a standardized monitoring program to assess the effectiveness of recovery efforts affecting bull trout and their habitats.
 - 5.1.1 Develop standardized monitoring procedures. Develop standardized strategies for bull trout redd counts and juvenile monitoring to track bull trout populations in the Priest River watershed, including Gold Creek, Hughes Fork, Trapper Creek, and Upper Priest River. Apply these strategies throughout the Clark Fork Recovery Unit.
 - 5.1.2 Increase monitoring of adfluvial bull trout populations in Priest Lakes. Increase monitoring of adfluvial populations to determine population status, distribution, movement, and seasonality of use of different habitat types by adult and subadult bull trout in and between the lakes.
 - 5.1.3 Increase lake water quality monitoring. Support increased water quality monitoring efforts in Priest Lakes to protect existing high standards and to better understand potential linkages between water quality, lakeshore development, and bull trout requirements.
 - 5.2 Conduct research evaluating relationships among bull trout distribution and abundance, bull trout habitat, and recovery tasks.
 - 5.2.1 Identify suitable unoccupied habitat. Identify suitable unoccupied habitat, if any, in the Priest Lake watershed that might be reconnected or enhanced to increase recruitment of bull trout to the system. Within five years, complete a comprehensive list of all known passage barriers that prevent upstream-migrating bull trout from accessing suitable habitat. Consider establishing resident bull

trout populations upstream of natural barriers to provide a genetic reserve.

5.2.2 Map spawning habitat. Develop a comprehensive map of primary tributary reaches of bull trout spawning for focusing habitat protection and recovery efforts.

5.2.3 Evaluate core area classification status. The classification of the Priest Lakes and Priest River as a primary core area should be reviewed to determine whether recovery of bull trout abundance to a level consistent with primary core status (*i.e.*, 1,000 adult fish) is feasible.

5.3 *Conduct evaluations of the adequacy and effectiveness of current and past best management practices in maintaining or achieving habitat conditions conducive to bull trout recovery.*

5.4 *Evaluate effects of diseases and parasites on bull trout and develop and implement strategies to minimize negative effects.*

5.5 *Develop and conduct research and monitoring studies to improve information concerning the distribution and status of bull trout.*

5.6 Identify evaluations needed to improve understanding of relationships among genetic characteristics, phenotypic traits, and local populations of bull trout.

5.6.1 Investigate status of migratory and resident life history forms. Investigate potential existence of fluvial or resident bull trout populations in the Priest River tributaries where adfluvial migrants previously dominated.

5.6.2 Assess hybridization threat with brook trout in the Upper Priest River watershed. Assess significance of brook trout hybridization in the Upper Priest River watershed and establish benchmarks to

measure and/or prevent any further increase in the rate of hybridization.

- 6 Use all available conservation programs and regulations to protect and conserve bull trout and bull trout habitats.

- 6.1 Use partnerships and collaborative processes to protect, maintain, and restore functioning core areas for bull trout.

- 6.1.1 Support watershed group restoration efforts. Support collaborative efforts by local watershed groups (*e.g.*, Priest Lake Watershed Advisory Group) to accomplish site-specific protection/restoration activities throughout the basin, consistent with this recovery plan and with Cumulative Watershed Effects Assessments already completed in the Binarch, Indian, Kalispell, Lion, Quartz, Reeder, Trapper, and Two Mouth Creeks and in the Upper West Branch and Lower West Branch Priest River watersheds.

- 6.1.2 Protect habitat. Provide long-term habitat protection on State and private lands through habitat conservation plans, land exchanges, purchase, conservation easements, management plans, and other methods. Initial emphasis should be on identified bull trout spawning and rearing streams in the Upper Priest Lake watershed.

- 6.1.3 Support habitat protection and monitoring in the Priest Lake State Forest. Work collaboratively with the Idaho Department of Lands and other State agencies and nongovernmental entities to ensure that bull trout habitat is protected and enhanced in drainages on the east side of the Priest Lake watershed (where tributary habitat is generally more suitable for bull trout than on the west side due to underlying geology).

- 6.1.4 Develop Priest Lakes partnerships. Initiate a Citizens Advisory Group of anglers, homeowners, stakeholders, and other interested parties to assess potential solutions to the immigration of lake trout

into Upper Priest Lake. Work with local organizations and individuals to establish fisheries management objectives for Priest Lakes that accommodate the potential to reach bull trout recovery goals and minimize the migration of lake trout upstream through the Thorofare into the Upper Priest River watershed. Include discussion of potential options for lake trout reduction in Priest Lake.

- 6.2 Use existing Federal authorities to conserve and restore bull trout.
 - 6.2.1 Monitor compliance with the Biological Opinion for the Federal Columbia River Power System. Monitor compliance with Biological Opinion of the U.S. Fish and Wildlife Service (USFWS 2000) (Federal Columbia River Power System) related to operation of Albeni Falls Dam on the outlet of Lake Pend Oreille.
- 6.3 Evaluate enforcement of existing Federal and State habitat protection standards and regulations and evaluate their effectiveness for bull trout conservation.
 - 6.3.1 Fully implement existing State habitat protection laws. Fully implement the Idaho Forest Practices Act, Idaho Lake Protection Act, Idaho Stream Channel Protection Act, Washington Hydraulic Permit approval, Water Quality Standards for Surface Water of the State of Washington (WAC 173-201a), and Washington Forest and Fish program to maximize legal protection of bull trout habitat under State law. Evaluate the effectiveness of these laws and programs in conserving bull trout habitat.
 - 6.3.2 Encourage floodplain protection. Encourage local and State governments to develop, implement, and promote restrictive regulations to protect floodplains and lakeshores in Boundary and Bonner Counties in Idaho and Pend Oreille County in Washington to mitigate habitat loss and stream encroachment from rural residential development throughout the Priest River drainage.

These and other effects of development are of particular concern in watersheds that support bull trout spawning and rearing as they exacerbate temperature problems, increase nutrient loads, decrease bank stability, and alter instream and riparian habitat.

- 7 *Assess the implementation of bull trout recovery by recovery units and revise recovery unit plans based on evaluations.*

IMPLEMENTATION SCHEDULE

The Implementation Schedule that follows describes recovery task priorities, task numbers, task descriptions, duration of tasks, potential or participating responsible parties, total cost estimate, and estimates for the next five years, if available, as well as comments. These tasks, when accomplished, will lead to recovery of bull trout in the coterminous United States.

Parties with authority, responsibility, or expressed interest to implement a specific recovery task are identified in the Implementation Schedule. Listing a responsible party does not imply that prior approval has been given or require that party to participate or expend any funds. However, willing participants will benefit by demonstrating that their budget submission or funding request is for a recovery task identified in an approved recovery plan and is, therefore, part of a coordinated recovery effort to recover bull trout. In addition, section 7 (a)(1) of the Endangered Species Act directs all Federal agencies to use their authorities to further the purposes of the Act by implementing programs for the conservation of threatened or endangered species.

Following are definitions to column headings and keys to abbreviations and acronyms used in the Implementation Schedule:

Priority No.: All priority 1 tasks are listed first, followed by priority 2 and priority 3 tasks.

Priority 1: All actions that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future.

Priority 2: All actions that must be taken to prevent a significant decline in species population or habitat quality or to prevent some other significant negative impact short of extinction.

Priority 3: All other actions necessary to provide for full recovery (or reclassification) of the species.

Task Number and Task Description: Recovery tasks as numbered in the recovery outline. Refer to the action narrative for task descriptions.

Task Duration: Expected number of years to complete the corresponding task. Study designs can incorporate multiple tasks, which, when combined, may reduce the time needed for completion.

Responsible or Participating Party: Federal, State, Tribal, County, local, or Canadian government agencies, nongovernmental organizations, or universities with responsibility or capability to fund, authorize, or carry out the corresponding recovery task. The following is a list of acronyms used to identify these parties throughout the implementation schedule:

Canadian Government:

BCMWLAP British Columbia Ministry of Water, Land, and Air Protection

Federal Agencies:

BLM	Bureau of Land Management
BOR	U.S. Bureau of Reclamation
BPA	Bonneville Power Administration
COE	U.S. Army Corps of Engineers
FERC	Federal Energy Regulatory Commission
NMFS	National Marine Fisheries Service
NPS	National Park Service
NRCS	National Resources Conservation Service
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency

USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service

State Agencies:

IBODS	Idaho Bureau of Disaster Services
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
IDL	Idaho Department of Lands
IDPR	Idaho Department of Parks and Recreation
IDWR	Idaho Department of Water Resources
ITD	Idaho Transportation Department
IWRB	Idaho Water Resources Board
MDEQ	Montana Department of Environmental Quality
MDHES	Montana Department of Health and Environmental Sciences
MDNRC	Montana Department of Natural Resources and Conservation
MDOJ	Montana Department of Justice, Natural Resource Damages
MDOT	Montana Department of Transportation
MDSL	Montana Department of State Lands
MFWP	Montana Fish, Wildlife and Parks
WADNR	Washington Department of Natural Resources
WADOE	Washington Department of Ecology
WDFW	Washington Department of Fish and Wildlife

Others:

ARCO	Atlantic Richfield Corporation
BNSFR	Burlington Northern and Santa Fe Railway
CSKT	Confederated Salish and Kootenai Tribes
FAID	Flathead Agency Irrigation District
FBC	Flathead Basin Commission
FLBS	Flathead Lake Biological Station

IDWAG	Idaho Watershed Advisory Group
KT	Kalispel Tribe
LPOWAG	Lake Pend Oreille Watershed Advisory Group
MBTRT	Montana Bull Trout Restoration Team
MBTSG	Montana Bull Trout Scientific Group
MPC	Montana Power Company
PBTTAT	Panhandle Bull Trout Technical Advisory Team
PacifiC	PacifiCorp
PCTC	Plum Creek Timber Company
PPLMT	Pennsylvania Power and Light of Montana (formerly MPC)
TU	Trout Unlimited
UCFRBSC	Upper Clark Fork River Basin Steering Committee
WAGs	Idaho Watershed Advisory Groups

Boldface type indicates the agency or agencies that have the lead role for task implementation and coordination, though not necessarily sole responsibility.

Cost Estimates: Cost estimates are rough approximations and are only provided for general guidance. Total costs are estimated for the duration of the task, are itemized annually for the next five years, and includes estimates of expenditures by local, Tribal, State, and Federal governments and by private business and individuals.

An asterisk (*) in the total cost column indicates that these tasks are part of normal agency responsibilities under existing authorities.

Double asterisk (**) in the total cost column indicates that estimated costs for these tasks are not determinable at this time. Input is requested to help develop reasonable cost estimates for these tasks.

Triple asterisk (***) indicates costs are combined with or embedded within other related tasks.

Implementation Schedule for the bull trout recovery plan: Upper Clark Fork Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
1	1. 1. 1	Reduce general sediment sources	25	USFS, BLM, Counties, USEPA, MDNRC, MDOT, NRCS, PCTC, USDOT	*						Ongoing ²
1	1. 1. 3	Clean up mine waste	25	MDEQ, BLM, USEPA, MDNRC, PCTC, USFS	*						Ongoing administrative costs
1	1. 1. 4	Implement Atlantic Richfield Corporation mitigation	25	MDEQ, USEPA, MDNRC, MDOJ (NRD), MFWP	*						Ongoing
1	1. 1. 7	Assess and mitigate nonpoint thermal pollution	25	EPA, BLM, MDEQ, MDNRC, MFWP, NRCS, USFS	*						CWA required costs
1	1. 1. 9	Implement water quality regulations	25	MDEQ, Counties, USEPA, USFS, USFWS	*						CWA required costs

² Ongoing tasks are currently being implemented, as part of normal agency responsibilities that may benefit bull trout. Because these actions are not specifically being done to address bull trout conservation, they are not included in the cost estimates. Some of these efforts may be occurring at reduced levels and/or in only a small portion of the watershed.

Implementation Schedule for the bull trout recovery plan: Upper Clark Fork Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
1	1. 2. 1	Eliminate entrainment in diversions	15	MDNRC, MFWP , BLM, PCTC, NRCS, USFS, USFWS	1,500	100	100	100	100	100	Ongoing
1	1. 2. 2	Provide fish passage around diversions	15	MDNRC, MFWP , BLM, PCTC, NRCS, USFS, USFWS	750	50	50	50	50	50	Ongoing
1	1. 2. 3	Eliminate culvert barriers	25	USFS , BLM, Counties, MDNRC, MDOT, MFWP, PCTC, USDOT	1,250	50	50	50	50	50	Ongoing
1	1. 2. 5	Improve instream flows	25	MDNRC, MFWP , USFS, TU	*						Ongoing
1	1. 4. 3	Operate Milltown Dam to minimize impact on native fish	25	MPC , USEPA, MFWP	250	10	10	10	10	10	Ongoing
1	1. 5. 2	Monitor fire effects and mitigate effects where necessary	25	MDNRC, USFS	*						Ongoing administrative costs

Implementation Schedule for the bull trout recovery plan: Upper Clark Fork Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
1	3. 3. 1	Evaluate site-specific conflicts with introduced sport fish	25	MFWP,USFWS, USFS	*						Ongoing administrative costs
1	5. 2. 1	Identify suitable unoccupied habitat	5	MFWP, USFS, USFWS, MDNRC, PCTC	500	100	100	100	100	100	Ongoing
1	6. 2. 4	Implement Plum Creek Habitat Conservation Plan	30	USFWS, PCTC	900	30	30	30	30	30	Ongoing 30-year agreement
1	6. 3. 2	Encourage floodplain protection	25	Counties, MDEQ, MDNRC, MFWP	250	10	10	10	10	10	Ongoing
2	1. 1. 2	Upgrade problem roads	25	USFS, MDNRC, PCTC, BLM, Counties, MDOT, USDOT	*						Ongoing administrative costs
2	1. 1. 6	Restore fish passage at Milltown Dam	10	FERC, MDOJ, USEPA, MFWP, MPC, USFWS	1,000	100	100	100	100	100	FERC relicensing issue
2	1. 1. 8	Reduce nutrient input	25	MDEQ, USEPA, NRCS, PCTC, USFS	*						CWA required costs

Implementation Schedule for the bull trout recovery plan: Upper Clark Fork Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	1. 2. 4	Restore connectivity over other manmade barriers	5	MFWP, USFS	***						See related tasks 1.2.2 and 1.2.3
2	1. 3. 1	Conduct watershed problem assessments	25	MFWP, USFS, BLM, MDNRC, NRCS, PCTC,	***						See related tasks 1.1.7 and 1.1.9
2	1. 3. 2	Prioritize actions on waters with restoration potential	25	MFWP, USFS, USFWS	125	5	5	5	5	5	Ongoing
2	1. 3. 3	Revegetate denuded riparian areas	25	BLM, USFS, *MDNRC, NRCS, PCTC, MDOT, USEPA, MFWP, USDOT	625	25	25	25	25	25	Ongoing
2	1. 3. 4	Improve grazing practices	25	USFS, BLM, USEPA, MDNRC, MFWP, NRCS, PCTC	*						Ongoing administrative costs
2	1. 3. 5	Restore stream channels	25	USFS, BLM, MDNRC, MFWP, NRCS, PCTC	*						Ongoing
2	1. 3. 6	Improve instream habitat	25	USFS, BLM, MDNRC, MFWP, NRCS, PCTC	*						Ongoing

Implementation Schedule for the bull trout recovery plan: Upper Clark Fork Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	1. 3. 8	Manage beaver to function naturally in maintaining wetlands	25	MFWP, USFS, BLM, MDNRC, PCTC, NRCS	125	5	5	5	5	5	Ongoing
2	1. 3. 11	Mitigate for transportation corridor encroachment on streams	25	MDOT, USDOT, MFWP, USFS	*						Ongoing administrative costs
2	1. 4. 1	Reduce reservoir operational impacts	10	MDNRC, MFWP, USFS	250	25	25	25	25	25	Ongoing
2	1. 4. 2	Provide instream flow downstream of dams	10	MDNRC, MFWP, USFS	250	25	25	25	25	25	Ongoing
2	1. 4. 4	Evaluate fish passage at Painted Rocks Dam	5	MDNRC, MFWP	50	10	10	10	10	10	
2	1. 5. 1	Mitigate for legacy effects of mining-related timber management practices	25	USFS, BLM, MDNRC	*						Ongoing administrative costs
2	2. 1. 2	Regulate private fish ponds	25	MFWP	*						Ongoing fish management costs

Implementation Schedule for the bull trout recovery plan: Upper Clark Fork Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	2. 1. 3	Encourage development of commercial sources of westslope cutthroat trout	5	MFWP	25	5	5	5	5	5	
2	2. 3. 1	Discourage unauthorized fish introductions	25	MFWP, TU, USFS, USFWS	*						Ongoing administrative costs
2	2. 3. 2	Develop bull trout education program	15	MFWP, USFWS	150	10	10	10	10	10	Ongoing, costs part of statewide program
2	2. 5. 1	Experimentally remove established brook trout populations	25	MFWP, BLM, USFS, USFWS	625	25	25	25	25	25	Ongoing
2	2. 5. 2	Suppress northern pike in Clearwater Lakes chain	25	MFWP	250	10	10	10	10	10	Ongoing
2	2. 5. 3	Reduce brown trout numbers in portions of mainstem rivers	25	MFWP	250	10	10	10	10	10	Ongoing

Implementation Schedule for the bull trout recovery plan: Upper Clark Fork Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	2. 6. 1	Evaluate bull trout–brown trout interaction	10	MFWP , USFS, USFWS	***						See related task 2.5.3
2	3. 1. 1	Implement adaptive management of native fish management plans	25	MFWP , BLM, USEPA, FERC, MDEQ, MDNRC, MDOT, PCTC,, USDOT, USFS, USFWS	*						Ongoing administrative costs
2	3. 1. 2	Aggressively protect remaining native species complexes	25	MFWP , USFWS , BLM, PCTC, USFS	*						Ongoing
2	3. 2. 1	Minimize unintentional mortality of bull trout	25	MFWP , USFWS	***						See related tasks 3.1.1. and 3.2.1
2	3. 2. 2	Evaluate enforcement of angling regulations and oversee scientific research	25	MFWP , USFWS	***						See related tasks 3.2.3 and 3.4.1
2	3. 2. 3	Implement angler education efforts	25	MFWP , USFWS	***						See related task 3.2.2

Implementation Schedule for the bull trout recovery plan: Upper Clark Fork Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	3. 4. 1	Evaluate effects of existing and proposed angling regulations on bull trout in heavily fished waters	25	MFWP, USFWS	***						See related tasks 3.2.2 and 3.2.3
2	4. 1. 1	Conduct genetic inventory	10	MFWP, USFS, USFWS	***						See related task in Chapter 1 of Recovery Plan
2	5. 2. 2	Investigate bull trout movement and distribution	25	MFWP, BLM, PCTC, USFS, USFWS	2,500	100	100	100	100	100	Ongoing
2	5. 2. 4	Map spawning habitat	5	MFWP, USFS, USFWS	100	20	20	20	20	20	Ongoing
2	5. 2. 6	Evaluate water temperature as a limiting factor	10	MFWP, USEPA, MDEQ, MDNRC, USFS, USFWS	250	25	25	25	25	25	Ongoing
2	5. 3. 3	Expand monitoring of forestry best management practices	25	MDNRC, MDEQ, MFWP, PCTC, USFS	***						See related task 1.3.4

Implementation Schedule for the bull trout recovery plan: Upper Clark Fork Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	5. 3. 4	Protect groundwater inflow sources	25	MDEQ , MDNRC, MFWP, NRCS, PCTC, USFS	*						Ongoing administrative costs
2	5. 6. 2	Research origin of migratory bull trout at Milltown Dam	3	MPC , MFWP	150	50	50	50			3-year project
2	6. 1. 1	Support watershed group restoration efforts	25	MFWP , USFS , USFWS , BLM, USEPA, MDEQ, MDNRC, NRCS, PCTC, TU	*						See related tasks 1.3.1 and 1.3.2
2	6. 1. 2	Protect habitat	25	USFS , BLM, MDNRC, MFWP, NRCS, PCTC, USFWS, TU	*						Costs will be evaluated through task 6.1.1
2	6. 1. 3	Integrate watershed restoration efforts on public and private lands	25	USFS , USFWS , BLM, MDNRC, MFWP, NRCS, PCTC, TU	625	25	25	25	25	25	Ongoing
2	6. 1. 4	Develop strategy for implementation participation	5	USFWS , MFWP	125	25	25	25	25	25	

Implementation Schedule for the bull trout recovery plan: Upper Clark Fork Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	6. 2. 3	Complete Federal Energy Regulatory Commission licensing of Milltown Dam	6	FERC , MPC, USFWS	*						Ongoing administrative costs
2	6. 3. 1	Fully implement State habitat protection laws	25	MDNRC , MFWP, PCTC	*						Ongoing State administrative and regulatory costs
3	1. 1. 5	Monitor McDonald gold mine	10	MDEQ , MDNRC, MFWP	50	5	5	5	5	5	Ongoing
3	1. 1. 10	Minimize recreational development in bull trout spawning and rearing habitat	25	Counties , MFWP, MDNRC, USFS, USFWS	*						Costs associated with land use planning
3	1. 2. 6	Consider fish salvage, as needed	5	MFWP , USFS, USFWS	25	5	5	5	5	5	
3	1. 2. 7	Consider passage around natural barriers	10	MFWP , USFWS, USFS	***						See related task 1.2.4

Implementation Schedule for the bull trout recovery plan: Upper Clark Fork Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
3	1. 3. 7	Minimize potential stream channel degradation	25	Counties, MDNRC, MDOT, MFWP, USDOT, USFS, USFWS	*						Ongoing administrative costs
3	1. 3. 9	Reduce riparian firewood harvest	25	USFS	*						Ongoing administrative and planning costs
3	1. 3. 10	Reduce impacts from campsite use	25	USFS, BLM, MDNRC, PCTC	*						Ongoing administrative and planning costs
3	1. 3. 12	Reduce impacts to Foster Creek	5	DOL (Job Corps), MFWP, USFS, USFWS	50	10	10	10	10	10	
3	2. 1. 1	Review fish stocking programs	25	MFWP, USFS, USFWS	***						See related task 2.2.1
3	3. 2. 4	Solicit information from commercial guides	10	MFWP, USFS, USFWS	*						Routine administrative/ planning costs

Implementation Schedule for the bull trout recovery plan: Upper Clark Fork Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
3	5. 2. 3	Evaluate importance of contributing waters	25	MFWP , USFS, USFWS	250	10	10	10	10	10	
3	5. 2. 5	Coordinate monitoring of fish movement	25	MFWP , AVISTA, IDFG, USFWS	***						See related task 5.2.2
3	5. 3. 1	Develop and implement best management practices for managing water diversions	25	MDNRC , MFWP, NRCS, USFS, USFWS	*						Ongoing administrative costs
3	5. 3. 2	Implement best management practices for grazing in riparian zones	25	MDNRC , MFWP, PCTC, NRCS, USFS, USFWS	***						See related task 1.3.4
3	5. 4. 1	Monitor fish health in private hatcheries	25	MFWP , USFWS	*						Ongoing State fish health costs
3	5. 4. 2	Prevent spread of fish pathogens	25	MFWP , USFWS	*						See related task 2.2.1
3	5. 4. 3	Evaluate effects of whirling disease on bull trout	10	MFWP , USFWS	500	50	50	50	50	50	Ongoing

Implementation Schedule for the bull trout recovery plan: Upper Clark Fork Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
3	5. 6. 1	Investigate status of migratory and resident life history forms	10	MFWP, USFWS, USFS	***						See related task 5.2.2

Implementation Schedule for the bull trout recovery plan: Lower Clark Fork Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
1	1. 1. 1	Reduce general sediment sources	25	USFS, Counties, CSKT, FERC, IDEQ, IDFG, IDL, ITD, IDWAG, MDNRC, MDOT, MFWP, NRCS, USFWS, USDOT	*						Ongoing administrative costs
1	1. 1. 5	Implement ARCO mitigation on Flathead Indian Reservation	25	CSKT	*						Ongoing
1	1. 1. 8	Implement water quality regulations	25	IDEQ, MDEQ, Counties, USEPA, USFS, USFWS	*						CWA required costs
1	1. 2. 1	Eliminate entrainment in diversions	25	CSKT, IDFG, IDWR, MDNRC, MFWP, FERC, NRCS, USFWS	1,250	50	50	50	50	50	Ongoing
1	1. 2. 2	Provide fish passage around diversions	25	CSKT, IDFG, IDWR, MDNRC, MFWP, AVISTA, City of E. Hope, NRCS, USFWS	750	50	50	50	50	50	Ongoing
1	1. 2. 3	Eliminate culvert barriers	25	USFS, Counties, IDFG, IDL, ITD, MDNRC, MDOT, USDOT	250	10	10	10	10	10	Ongoing

Implementation Schedule for the bull trout recovery plan: Lower Clark Fork Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
1	1. 2. 5	Improve instream flows	25	CSKT, MDNRC, MFWP, IWRB, IDFG,	*						Ongoing
1	1. 4. 1	Evaluate and restore upstream fish passage at mainstem Clark Fork and Pend Oreille River dams	10	AVISTA, FERC, PPLMT, COE, CSKT, IDFG, MFWP, USFWS	9,500	950	950	950	950	950	Ongoing - 45 years through FERC license
1	1. 4. 2	Provide safe passage downstream through dams and reservoirs	45 ³	AVISTA, FERC, PPLMT, COE, CSKT, IDFG, MFWP, USFWS	***						Ongoing - included in task 1.4.1 above
1	1. 4. 3	Reduce reservoir operational impacts	45	AVISTA, FERC, PPLMT, COE, CSKT, IDEQ, IDFG, MDEQ, MFWP, USFWS	***						Ongoing - included in task 1.4.1 above

³The Avista Settlement Agreement for relicensing Noxon Rapids and Cabinet Gorge Dams will provide over \$1.25 million dollars per year for 45 years to restore and improve habitat and fish passage under Washington Water Power's Native Salmonid Restoration Plan (Washington Water Power Company 1998).

Implementation Schedule for the bull trout recovery plan: Lower Clark Fork Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
1	1. 4. 9	Avoid gas supersaturation	10	AVISTA, EPA, FERC, CSKT, IDEQ, IDFG, MDEQ, MFWP, MPC, USFWS	*						Ongoing - approx. \$10–20M permanent fix at Cabinet Gorge and Noxon Dams
1	3. 3. 1	Evaluate site-specific conflicts with introduced sport fish	5	CSKT, IDFG, MFWP, USFWS, AVISTA	1,000	200	200	200	200	200	Ongoing - 5 years through FERC license
1	5. 2. 1	Identify suitable unoccupied habitat	5	CSKT, IDFG, MFWP, USFS, USFWS, AVISTA	500	100	100	100	100	100	Ongoing
1	6. 1. 2	Protect habitat	25	AVISTA, CSKT, FERC, IDFG, IDL, IDWR, MFWP, COE, NRCS, USFS, USFWS	17,500	700	700	700	700	700	45 years through FERC license
1	6. 2. 1	Monitor compliance with Avista FERC Settlement Agreement	25	AVISTA, FERC, USFWS, IDFG, IDEQ, MDEQ, MFWP, TU, USFS	***						Ongoing - See related tasks

Implementation Schedule for the bull trout recovery plan: Lower Clark Fork Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
1	6. 2. 2	Evaluate existing FERC license conditions at Thompson Falls Dam	10	FERC, USFWS, IDEQ, IDFG, MDEQ, MFWP, PPLMT, TU, USFS	100	10	10	10	10	10	
1	6. 2. 3	Implement FERC license conditions for Kerr Dam	25	CSKT, FERC, *USFWS, MDEQ, MFWP, TU, USFS	***						Ongoing - See related tasks
1	6. 2. 4	Federal Columbia River Power System Biological Opinion	25	USFWS, IDEQ, IDFG, MDEQ, MFWP, TU, USFS	*						Ongoing administrative costs
1	6. 3. 1	Fully implement State and Tribal habitat protection laws	25	CSKT, IDL, MDNRC, MFWP, IDEQ, IDWR	*						Ongoing routine administrative costs
1	6. 3. 2	Encourage floodplain protection	25	Counties, COE, USEPA, IDFG, IDEQ, IDL, MDEQ, MDNRC, MFWP	250	10	10	10	10	10	Ongoing
2	1. 1. 2	Upgrade problem roads	25	USFS, MDNRC, PCTC, Counties, MDOT, USDOT	*						Ongoing administrative costs

Implementation Schedule for the bull trout recovery plan: Lower Clark Fork Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	1. 1. 3	Clean up mine waste	25	IDEQ, MDEQ, IDWAG, USEPA, USFS, Private Parties	*						Ongoing administrative costs
2	1. 1. 6	Assess and mitigate nonpoint thermal pollution	25	EPA, CSKT, IDEQ, MDEQ, NRCS	*						
2	1. 2. 4	Mitigate Trestle Creek flume impacts	5	IDFG, IDWR	50	10	10	10	10	10	
2	1. 3. 1	Conduct watershed problem assessments	10	CSKT, IDEQ, IDFG, MFWP, IDL, NRCS, USFS, USFWS	*						Ongoing management/ administrative costs
2	1. 3. 2	Revegetate denuded riparian areas	25	AVISTA, CSKT, FERC, USFS, IDFG, IDL, MFWP, NRCS, USFWS, TU	675	25	25	25	25	25	45 years through FERC license
2	1. 3. 3	Improve grazing practices	25	BLM, MDNRC, NRCS, PCTC, USFS, CSKT, MFWP	*						Ongoing administrative/ planning costs

Implementation Schedule for the bull trout recovery plan: Lower Clark Fork Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	1. 3. 4	Restore stream channels	25	IDFG, MFWP, USFS, AVISTA, CSKT, FERC, NRCS, TU, USFWS	***						See related task 1.1.3
2	1. 3. 5	Improve instream habitat	25	USFS, AVISTA, BPA, FERC, IDFG, IDL, MDNRC, MFWP, NRCS	***						Ongoing; see related task 1.1.3
2	1. 3. 6	Minimize potential stream channel degradation	25	Counties, IBODS, MDNRC, COE, CSKT, IDFG, IDWAG, IDWR, ITD, MDEQ, MDOT, MFWP	*						Ongoing/management /administrative costs
2	1. 4. 4	Research and recommend instream flows and minimum pools on the Flathead Agency Irrigation District	5	CSKT, BIA, USFWS	50	10	10	10	10	10	Section 7 consultation
2	1. 4. 5	Provide instream flow downstream of dams	10	AVISTA, COE, FERC, IWRB, PPLMT, IDEQ, IDFG, USFWS	*						45 years through FERC license

Implementation Schedule for the bull trout recovery plan: Lower Clark Fork Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	1. 4. 6	Research and recommend instream flow in lower Flathead River	5	CSKT, FERC	*						Ongoing/part of task 1.4.5
2	1. 4. 7	Maintain passage through alluvial fans in Lake Pend Oreille	25	AVISTA, COE, IDFG	250	10	10	10	10	10	Ongoing
2	1. 4. 8	Assess impact of Lake Pend Oreille water levels on kokanee salmon	10	IDFG, BPA, COE	500	50	50	50	50	50	Ongoing
2	1. 5. 1	Monitor fire effects and mitigate effects where necessary	25	IDL, MDNRC, USFS	*						Ongoing/ routine administrative costs
2	2. 1. 2	Regulate private fish ponds	25	CSKT, IDFG,MFWP	*						Ongoing/ routine administrative costs

Implementation Schedule for the bull trout recovery plan: Lower Clark Fork Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	2. 1. 3	Encourage development of commercial sources of westslope cutthroat trout	5	CSKT, IDFG, MFWP	*						Ongoing fish management costs
2	2. 2. 1	Optimize enforcement of laws and policies that prohibit unauthorized fish transplant and stocking	25	CSKT, IDFG, MFWP, USFWS, USFS	*						Ongoing fish management costs
2	2. 3. 1	Discourage unauthorized fish introductions	25	CSKT, IDFG, MFWP, AVISTA, MDNRC, TU, USFWS	*						Ongoing fish management costs
2	2. 3. 2	Develop bull trout education program	15	Avista, CSKT, IDFG, MFWP, TU, USFWS	150	10	10	10	10	10	Ongoing/part of statewide program
2	2. 5. 1	Experimentally remove established brook trout populations	25	CSKT, IDFG, MFWP, AVISTA, FERC, USFWS	625	25	25	25	25	25	Ongoing

Implementation Schedule for the bull trout recovery plan: Lower Clark Fork Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	2. 5. 2	Suppress lake trout in Lake Pend Oreille	10	IDFG, USFWS	500	50	50	50	50	50	
2	2. 5. 3	Suppress brown trout in Bull River	10	MFWP, AVISTA, FERC, USFWS	100	10	10	10	10	10	
2	3. 1. 1	Implement adaptive management of native fish management plans	25	CSKT, IDFG, MFWP, USFWS	*						Ongoing fish management costs
2	3. 1. 2	Implement Avista Native Salmonid Restoration Plan	25	AVISTA, IDFG, FERC, MFWP, USFWS	2,500	100	100	100	100	100	Ongoing
2	3. 2. 1	Minimize unintentional mortality of bull trout	25	CSKT, IDFG, MFWP	*						Ongoing routine fish management costs
2	3. 2. 2	Evaluate enforcement of angling regulations and oversee scientific research	25	CSKT, IDFG, MFWP, AVISTA, USFWS	2,500	100	100	100	100	100	45 years through FERC license

Implementation Schedule for the bull trout recovery plan: Lower Clark Fork Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	3. 2. 3	Implement angler education efforts	25	CSKT, IDFG, MFWP, AVISTA, TU, USFWS	***						Partially included in task 3.2.2 above
2	3. 3. 2	Regulate mainstem reservoirs to inhibit reproduction of nonnative fish	45	AVISTA, FERC, IDFG, MFWP, USFWS	*						Ongoing through FERC license
2	3. 4. 1	Evaluate opportunities for regulated bull trout fisheries	25	CSKT, MFWP, IDFG, USFWS	***						See related task 3.2.2
2	4. 1. 1	Conduct genetic inventory	10	CSKT, IDFG, MFWP, AVISTA, FERC, UM, USFWS	*						See related task in Chapter 1 of Recovery Plan
2	5. 2. 3	Investigate bull trout movement and distribution	25	CSKT, IDFG, MFWP, AVISTA, FERC, USFWS	1,250	50	50	50	50	50	Costs part of task 1.4.1

Implementation Schedule for the bull trout recovery plan: Lower Clark Fork Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	5. 2. 5	Research origin of bull trout that migrate to Cabinet Gorge Dam	5	IDFG, MFWP , AVISTA, FERC, USFWS	*						See related tasks 5.2.3 and 1.4.1.
2	5. 3. 1	Evaluate efficacy of trap/transport project	10	IDFG, MFWP , AVISTA, FERC, USFWS	*						See related task 1.4.1
2	5. 4. 2	Prevent spread of fish pathogens	25	IDFG, MFWP, USFWS , CSKT	*						Ongoing fish management costs
2	5. 5. 1	Evaluate Middle Fork East River	5	IDFG, IDL , USFWS	250	50	50	50	50	50	
2	6. 1. 1	Support watershed group restoration efforts	25	AVISTA, CSKT, IDFG, MFWP, USFS, USFWS , FERC, IDEQ, IDL, IDWAG, MDNRC, NRCS,	*						Meets CWA requirements
2	6. 2. 5	Expedite Flathead Agency Irrigation District Biological Opinion	5	BIA, USFWS , CSKT	*						Ongoing administration costs

Implementation Schedule for the bull trout recovery plan: Lower Clark Fork Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	6. 2. 6	Implement Plum Creek Habitat Conservation Plan	30	USFWS, PCTC	***						See task 6.2.4 for Upper Clark Fork Subunit
3	1. 1. 4	Evaluate and, if necessary, mitigate impacts from Rock Creek Mine	25	MDEQ, IDFG, MFWP, Sterling Mining Co. , USFS, USFWS	*						Ongoing, administrative costs
3	1. 1. 7	Reduce nutrient input	25	CSKT, IDEQ,MDEQ, USEPA, NRCS	*						Ongoing operations/ administrative costs
3	1. 1. 9	Minimize recreational development in bull trout spawning and rearing habitat	25	County, IDL, MDNRC, MFWP, USFS, IDFG, USFWS	*						Ongoing operations/ administrative costs
3	1. 2. 6	Consider fish salvage, as needed	5	Avista, MFWP, USFWS, USFS	25	5	5	5	5	5	

Implementation Schedule for the bull trout recovery plan: Lower Clark Fork Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
3	1. 3. 7	Manage beaver to function naturally in maintaining wetlands	25	CSKT, IDFG, MFWP, USFS	125	5	5	5	5	5	Ongoing
3	2. 1. 1	Review fish stocking programs	25	CSKT, IDFG, MFWP, USFS, USFWS	*						Ongoing fish management costs
3	2. 4. 1	Assess superimposition of kokanne salmon and brown trout redds on bull trout redds	5	IDFG, MFWP, CSKT	50	10	10	10	10	10	
3	2. 4. 2	Evaluate northern pike and smallmouth bass in lower Flathead River	10	CSKT, MFWP, USFWS	*						Ongoing fishery management program cost
3	3. 2. 4	Solicit information from commercial guides	10	IDFG, MFWP, USFS, USFWS	*						Routine administrative planning costs

Implementation Schedule for the bull trout recovery plan: Lower Clark Fork Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
3	5. 2. 2	Evaluate habitat suitability (<i>i.e.</i> , thermal conditions) in reservoirs	15	AVISTA, FERC, MFWP, USFWS	***						See related task 1.4.1
3	5. 2. 4	Coordinate monitoring of fish movement	25	AVISTA, CSKT, IDFG, MFWP, USFWS	***						See costs associated with task 1.4.1
3	5. 2. 6	Evaluate feasibility of maintaining fluvial/resident populations	15	AVISTA, CSKT, IDFG, MFWP, FERC, USFWS	***						See costs associated with task 1.4.1
3	5. 2. 7	Map spawning habitat	25	CSKT, IDFG, MFWP	***						Costs part of tasks 1.4.1 and 5.2.3
3	5. 4. 1	Monitor fish health in private hatcheries	25	IDFG, MFWP, USFWS	*						Ongoing fish management costs

Implementation Schedule for the bull trout recovery plan: Flathead Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
1	1. 1. 1	Reduce general sediment sources	25	USFS , BCMWLAP, BPA, Counties, CSKT, DOT, USEPA, FBC, GNP, MDEQ, MDNRC, MDOT, MFWP, NRCS, PCTC, USFWS	*	100	100	100	100	100	Ongoing administrative/ planning costs
1	1. 1. 2	Address forest road maintenance and hotspots	25	USFS , Counties, MDNRC, PCTC	***						Ongoing administrative costs; see task 6.2.7
1	1. 1. 8	Implement water quality regulations	25	MDEQ , Counties, USEPA, USFS, USFWS	*						Ongoing/ administrative planning costs
1	1. 2. 3	Eliminate culvert barriers	10	USFS , BCMWLAP, Counties, CSKT, DOT, GNP, MDOT, MDNRC, MFWP, PCTC, USFWS	100	10	10	10	10	10	Ongoing
1	2. 3. 1	Discourage unauthorized fish introductions	25	CSKT , MFWP , BCMWLAP, GNP, MDNRC, PCTC, USFS, USFWS	*						Ongoing fish management costs

Implementation Schedule for the bull trout recovery plan: Flathead Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
1	2. 5. 2	Suppress brown trout in Mill Creek	10	MFWP, USFWS	100	10	10	10	10	10	Ongoing
1	3. 1. 1	Implement adaptive management of native fishes in Flathead Lake and Flathead River	10	CSKT, MFWP	2,500	100	100	100	100	100	Ongoing, new 10-year plan
1	3. 1. 2	Develop and implement Swan Lake management strategy	5	MFWP	50	10	10	10	10	10	
1	3. 1. 3	Aggressively protect remaining native species complexes	25	CSKT, GNP, MFWP, USFWS	*						Ongoing fish management plans
1	3. 3. 1	Evaluate site-specific conflicts with introduced sport fish	10	CSKT, GNP, MFWP, USFWS	1,000	100	100	100	10	100	Ongoing
1	4. 1. 1	Conduct genetic inventory	10	MFWP, BCMWLAP, CSKT, GNP, MDNRC, PCTC, USFS, USFWS	***						See related task in Chapter 1 of Recovery Plan

Implementation Schedule for the bull trout recovery plan: Flathead Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
1	5. 1. 1	Develop standardized monitoring procedures	25	CSKT, MFWP, USFWS, GNP, USFS	1,250	50	50	50	50	50	Ongoing
1	5. 2. 1	Identify suitable unoccupied habitat	5	CSKT, GNP, MFWP, USFS, USFWS, MDNRC	***						Related to task 5.1.1
1	6. 1. 2	Protect habitat	25	USFWS, BCMWLAP, CSKT, GNP, MDNRC, MFWP, NRCS, PCTC, USFS	*						Ongoing
1	6. 2. 1	Monitor compliance with Kerr Dam FERC Order and Biological Opinion	35	CSKT, FERC, USFWS BIA, PPLMT,	*						Ongoing routine administrative costs
1	6. 2. 2	Minimize impacts of Bigford Dam through Federal Energy Regulatory Commission relicensing process	5	FERC, Pacific, USFWS, MDEQ, MFWP	50	10	10	10	10	10	

Implementation Schedule for the bull trout recovery plan: Flathead Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)					Comments	
					Total cost	Year 1	Year 2	Year 3	Year 4		Year 5
1	6. 2. 3	Monitor compliance with Federal Columbia River Power System Biological Opinion for Hungry Horse Dam	25	USFWS, BPA, BOR, FERC,	*						Ongoing administrative costs
1	6. 3. 2	Encourage floodplain protection	25	Counties, CSKT, USEPA, FBC, MFWP, MDEQ, MDNRC, USFWS	*						Ongoing, agency management and planning costs
2	1. 1. 3	Improve maintenance along transportation corridors	25	BNSFR, MDOT, USDOT, Counties, USFS	*						Ongoing/ maintenance costs
2	1. 1. 4	Modify problem reaches of trail system	25	GNP, USFS	*						Ongoing/ maintenance costs
2	1. 1. 5	Monitor existing and future coal mine development in British Columbia	25	BCMWLAP, USEPA, FBC, MDEQ	*						Ongoing monitoring costs

Implementation Schedule for the bull trout recovery plan: Flathead Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	1. 1. 7	Assess nutrient input and increase water quality monitoring and remediation	25	MDEQ, USEPA, FBC, FLBS	*						CWA required
2	1. 2. 1	Eliminate entrainment in diversions	25	CSKT, MDNRC, MFWP, GNP, NRCS, PCTC, USFS, USFWS	250	10	10	10	10	10	Ongoing
2	1. 2. 2	Provide fish passage around diversions	25	CSKT, MDNRC, MFWP, GNP, NRCS, PCTC, USFS, USFWS	250	10	10	10	10	10	Ongoing
2	1. 2. 4	Improve instream flows	25	CSKT, MDNRC, MFWP	250	10	10	10	10	10	Ongoing
2	1. 3. 1	Conduct watershed problem assessments	10	CSKT, MFWP, USFS, GNP, MDNRC, NRCS, PCTC, USFWS	*						Ongoing management costs
2	1. 3. 2	Revegetate denuded riparian areas	25	USFS, BCMWLAP, CSKT, GNP, MDNRC, MFWP, NRCS, PCTC, USFWS	250	10	10	10	10	10	Ongoing

Implementation Schedule for the bull trout recovery plan: Flathead Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	1. 4. 1	Reduce reservoir operational impacts	10	BOR, BPA , CSKT, USEPA, FBC, FERC, FLBS, GNP, MFWP, PPLMT, USFS, USFWS	200	20	20	20	20	20	Ongoing
2	1. 4. 2	Provide instream flow downstream of dams	10	BOR, BPA , CSKT, MFWP, USFWS	500	50	50	50	50	50	Ongoing
2	1. 4. 3	Evaluate selective withdrawal at Hungry Horse Dam	10	BOR, MFWP , CSKT, BPA, USFWS	***						Priority task 1.4.2
2	1. 4. 5	Evaluate impact of dam operations on bull trout predators	10	MFWP , BPA, BOR, CSKT	250	25	25	25	25	25	Ongoing
2	2. 1. 1	Upgrade fish hatchery practices	10	MFWP, USFWS , CSKT	*						Ongoing fish management costs
2	2. 1. 2	Regulate private fish ponds	25	MFWP	*						Ongoing fish management costs

Implementation Schedule for the bull trout recovery plan: Flathead Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	2. 1. 3	Encourage development of commercial sources of westslope cutthroat trout	5	MFWP	*						Ongoing fish management costs
2	2. 2. 1	Optimize enforcement of laws and policies that prohibit unauthorized fish transplant and stocking	25	CSKT, MFWP, USFWS, USFS	*						Ongoing fish management costs
2	2. 3. 2	Develop bull trout education program	25	CSKT, MFWP, USFWS	250	10	10	10	10	10	Part of statewide program
2	2. 4. 1	Develop protocols for suppressing nonnative fish	10	CSKT, MFWP, USFWS, USFS	***						See task 2.4.1 for Upper Clark Fork Recovery Subunit
2	2. 4. 2	Discourage illegally introduced sport fish populations	25	CSKT, MFWP	*						Ongoing fish management costs

Implementation Schedule for the bull trout recovery plan: Flathead Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	2. 5. 1	Experimentally remove established brook trout populations	25	CSKT, MFWP , GNP, MDNRC, PCTC, USFS, USFWS	625	25	25	25	25	25	
2	2. 6. 1	Reduce/minimize impacts of northern pike	25	CSKT, MFWP	625	25	25	25	25	25	
2	2. 6. 2	Consider installing barriers to hinder spread of nonnative fish	10	CSKT, GNP, MFWP , USFS, USFWS	250	25	25	25	25	25	Ongoing
2	3. 2. 1	Minimize unintentional bull trout mortality	25	CSKT, MFWP , BCMWLAP, GNP	*						Ongoing fish management costs
2	3. 2. 2	Evaluate enforcement of angling regulations and oversee scientific research	25	CSKT, GNP, MFWP , BCMWLAP, USFWS	***						See task 3.2.2 of Upper Clark Fork Recovery Subunit
2	3. 2. 3	Implement angler education efforts	25	CSKT, GNP, MFWP , USFWS	***						See related task 3.2.2

Implementation Schedule for the bull trout recovery plan: Flathead Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	3. 2. 4	Solicit information from commercial guides	10	MFWP	*						Routine management costs
2	3. 4. 1	Evaluate opportunities for regulated bull trout fisheries	25	CSKT, MFWP, USFWS	*						Ongoing fish management/ regulations costs
2	5. 4. 2	Prevent spread of fish pathogens	25	MFWP, USFWS, CSKT, GNP	*						Ongoing fish management and health costs
2	5. 5. 1	Increase monitoring of adfluvial bull trout populations in smaller lakes	10	CSKT, GNP, MFWP, USFWS	1,000	100	100	100	100	100	See task 3.1.3
2	5. 6. 2	Assess hybridization threat with brook trout in the Swan River drainage	5	MFWP, PCTC, UM, USFS, USFWS	50	10	10	10	10	10	

Implementation Schedule for the bull trout recovery plan: Flathead Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	6. 1. 1	Support watershed group restoration efforts	25	CSKT, MFWP, USFS, USFWS , BOR, BPA, Counties, DOT USEPA, FBC, FERC, FLBS, GNP, MDNRC, MDEQ, MDOT, NRCS, PCTC, PPLMT	*						Ongoing administrative costs, CWA costs
2	6. 1. 3	Support habitat protection and monitoring in British Columbia	25	BCMWLAP, MFWP, USFWS , BPA, USFS	*						Ongoing
2	6. 2. 4	Implement Plum Creek HCP	30	PCTC, USFWS	***						Ongoing; see related tasks for Upper and Lower Clark Fork Recovery Subunits
2	6. 3. 1	Fully implement State and Tribal habitat protection laws	25	CSKT, MDNRC , MDEQ, MFWP, PCTC, USFS	*						Ongoing/ administrative and monitoring costs

Implementation Schedule for the bull trout recovery plan: Flathead Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
3	1. 1. 6	Minimize recreational development in bull trout spawning and rearing habitat	25	Counties, CSKT, MFWP, MDNRC, NPS, USFS, USFWS	*						Routine land management planning costs
3	1. 3. 3	Improve grazing practices	25	USFS, CSKT, GNP, MDNRC, MFWP, NRCS, PCTC, USFWS	*						Ongoing administrative costs
3	1. 3. 4	Restore stream channels	25	USFS, BCMWLAP, CSKT, GNP, MDNRC, MFWP, NRCS, PCTC, USFWS	*						Ongoing
3	1. 3. 5	Improve instream habitat	25	USFS, BCMWLAP, CSKT, GNP, MDNRC, MFWP, NRCS, PCTC, USFWS	*						Ongoing
3	1. 3. 6	Minimize potential stream channel degradation	25	Counties, MDNRC, COE, CSKT, MDEQ, MDOT, MFWP	*						Administrative costs associated with land use planning
3	1. 4. 4	Avoid gas supersaturation from Hungry Horse Dam	25	BOR, BPA, CSKT, USEPA, MFWP, MDEQ, USFWS	250	10	10	10	10	10	Ongoing

Implementation Schedule for the bull trout recovery plan: Flathead Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
3	1. 5. 1	Monitor fire effects and mitigate effects where necessary	25	CSKT, MDNRC, USFS, GNP	*						Ongoing administrative and planning costs
3	3. 2. 5	Coordinate with British Columbia fisheries monitoring and management authorities	25	BCMWLAP, CSKT, MFWP, USFWS	125	5	5	5	5	5	Ongoing
3	5. 2. 2	Map spawning habitat	25	CSKT, MFWP, USFWS	***						See costs associated with tasks 5.1.1 and 5.5.1
3	5. 4. 1	Monitor fish health in private hatcheries	25	MFWP, CSKT, USFWS	*						Ongoing/ fish health costs
3	5. 5. 2	Evaluate bull trout population and habitat in Tally Lake watershed to determine potential core area status.	5	MFWP, USFS, USFWS	25	5	5	5	5	5	

Implementation Schedule for the bull trout recovery plan: Flathead Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
3	5. 6. 1	Investigate status of migratory and resident life history forms of bull trout	10	CSKT, MFWP, BCMWLAP, CSKT, GNP, USFS, USFWS	***						See costs associated with tasks 5.1.1 and 5.5.1

Implementation Schedule for the bull trout recovery plan: Priest Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
1	1. 1. 1	Reduce general sediment sources	25	IDL, USFS , County, BPA, COE, IDEQ, ITD, IDWAG, NRCS, USFWS	*						Ongoing/ administrative planning costs
1	1. 1. 2	Address forest road maintenance and hotspots	25	IDL, USFS , KT, USFWS, WDFW	*						Ongoing/ administrative forest planning costs
1	1. 1. 6	Implement water quality regulations	25	IDEQ, MDEQ , Counties, USEPA, USFS, USFWS	*						Ongoing cost; CWA required
1	1. 2. 1	Eliminate culvert barriers	25	IDL, USFS , County, ITD, IDFG, USFWS	625	25	25	25	25	25	Ongoing
1	1. 3. 1	Conduct watershed problem assessments	10	IDFG, KT, WDFW , IDL, IDEQ, NRCS, USFS, USFWS	*						Ongoing management costs
1	2. 3. 1	Discourage unauthorized fish introductions	25	IDFG, WDFW , USFS, USFWS	*						Ongoing fish management costs

Implementation Schedule for the bull trout recovery plan: Priest Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
1	2. 4. 2	Evaluate site-specific conflicts with introduced sport fish	10	IDFG, USFWS, WDFW	500	50	50	50	50	50	Ongoing
1	2. 5. 2	Evaluate the potential for a barrier in the Thorofare to control the migration of nonnative fish	5	IDFG, USFWS	250	50	50	50	50	50	Ongoing
1	3. 1. 1	Implement adaptive management to address lake trout in Lake Pend Oreille and Priest Lake	10	IDFG, WDFW	250	25	25	25	25	25	
1	3. 1. 2	Aggressive protection of remaining native species complexes	25	IDFG, WDFW, USFWS	*						Ongoing fish management costs
1	3. 2. 2	Evaluate enforcement of angling regulations and oversee scientific research	25	IDFG, USFWS, WDFW	500	20	20	20	20	20	Ongoing

Implementation Schedule for the bull trout recovery plan: Priest Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
1	3. 2. 3	Implement angler education efforts	25	IDFG, WDFW, KT, USFWS	***						Ongoing costs; part of task 3.2.2
1	5. 2. 1	Identify suitable unoccupied habitat	5	IDFG, KT, USFS, USFWS, WDFW	250	50	50	50	50	50	Ongoing
1	6. 1. 1	Support watershed group restoration efforts	25	IDFG, KT, USFS, USFWS, WDFW, BPA, COE, IDEQ, IDL, IDWAG, NRCS	*						Ongoing administrative costs/CWA required
1	6. 1. 2	Protect habitat	25	IDL, USFS, County, IDEQ, IDFG, IDWAG, KT, NRCS, USFWS, WDFW	*						Ongoing administrative costs
1	6. 1. 3	Support habitat protection and monitoring in the Priest Lake State Forest	25	IDL, IDFG, IDWAG, USFWS	250	10	10	10	10	10	

Implementation Schedule for the bull trout recovery plan: Priest Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
1	6. 3. 2	Encourage floodplain protection	25	County , COE, USEPA, IDFG, IDEQ, IDL	*						Ongoing/ land use planning and administrative costs
2	1. 1. 3	Improve maintenance along transportation corridors	25	ITD , USDOT , County, IDL, USFS	*						Ongoing maintenance costs
2	1. 1. 5	Assess and reduce nutrient input from forestry practices and lakeshore development	25	EPA , IDEQ , WADOE , KT, USFS, USFWS,	*						Ongoing, CWA required
2	1. 2. 2	Improve instream flows	25	IWRB , IDL, USFS	*						Ongoing
2	1. 3. 2	Revegetate denuded riparian areas	25	IDL , USFS , KT, NRCS	250	10	10	10	10	10	Ongoing
2	1. 3. 4	Restore stream channels	25	IDL , USFS , IDFG, KT, NRCS, USFWS	250	10	10	10	10	10	Ongoing
2	1. 4. 1	Minimize impacts of dam operations on bull trout in Priest Lake	5	Avista , IDFG , IDWR , COE , USFWS	125	25	25	25	25	25	

Implementation Schedule for the bull trout recovery plan: Priest Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	1. 4. 3	Provide upstream passage over barriers	10	Avista, COE, IDFG, IDL, IDWR, USFWS	1,000	100	100	100	100	100	
2	2. 2. 1	Optimize enforcement of laws and policies that prohibit unauthorized fish transplant and stocking	25	IDFG, USFWS, USFS	*						Ongoing fish management costs
2	2. 3. 2	Develop bull trout education program	25	IDFG, USFWS	*	10	10	10	10	10	Ongoing
2	2. 4. 1	Develop protocols for suppressing nonnative fish	10	IDFG, USFWS, USFS	***						Ongoing; see task 2.4.1 of Upper Clark Fork Recovery Subunit
2	2. 5. 1	Experimentally remove established brook trout populations	25	IDFG, USFS, USFWS	625	25	25	25	25	25	Ongoing
2	3. 2. 1	Minimize unintentional bull trout mortality	25	IDFG, WDFW, USFS, USFWS,	*						Ongoing fish management costs

Implementation Schedule for the bull trout recovery plan: Priest Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	3. 3. 1	Discourage illegally introduced sport fish populations	25	IDFG, WDFW	*						Ongoing fish management costs
2	3. 4. 1	Encourage brook trout harvest	25	IDFG, WDFW	*						Ongoing fish management costs
2	4. 1. 1	Conduct genetic inventory	10	IDFG, KT, USFS, USFWS, WDFW	250	25	25	25	25	25	Ongoing
2	4. 3. 1	Implement actions to develop a refugia for Priest Lakes.	5	USFWS, IDFG	500	100	100	100	100	100	
2	5. 1. 1	Develop standardized monitoring procedures	25	IDFG, KT, WDFW, USFS, USFWS	625	25	25	25	25	25	Ongoing
2	5. 1. 2	Increase monitoring of adfluvial bull trout populations in Priest lakes	25	IDFG, KT, USFS, USFWS	250	10	10	10	10	10	Ongoing
2	5. 2. 3	Evaluate core area classification status	5	IDFG, USFWS	***						See task 5.2.2

Implementation Schedule for the bull trout recovery plan: Priest Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	5. 6. 2	Assess hybridization threat with brook trout in the Upper Priest River watershed	3	IDFG , KT, USFWS	75	25	25	25	25	25	Ongoing
2	6. 1. 4	Develop Priest Lakes partnerships	5	IDFG , KT, WDFW, USFWS	250	50	50	50	50	50	
2	6. 2. 1	Monitor compliance with the Biological Opinion for the Federal Columbia River Power System	25	USFWS , COE	*						Ongoing administrative costs
2	6. 3. 1	Fully implement State habitat protection laws	25	IDEQ , IDL , WADNR , IDFG , IDWAG , IDWR	*						Ongoing administrative planning costs
3	1. 1. 4	Minimize recreational development in bull trout spawning and rearing habitat	25	County , IDL , USFS , IDFG , USFWS , WDFW	*						Administrative costs; regulatory oversight

Implementation Schedule for the bull trout recovery plan: Priest Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
3	1. 3. 3	Improve grazing practices	25	IDL, USFS, NRCS, USFWS	*						Ongoing routine planning/ administrative costs
3	1. 3. 5	Improve instream habitat	25	IDL, USFS, IDFG, KT, NRCS, USFWS	*						Ongoing
3	1. 3. 6	Minimize potential stream channel degradation	25	County, IBODS, COE, IDEQ	*						Costs part of land use planning process
3	1. 4. 2	Minimize impacts of Albeni Falls Dam on bull trout in the Priest River	5	COE, USFWS	250	50	50	50	50	50	
3	1. 5. 1	Monitor fire effects and mitigate effects where necessary	25	IDL, USFS, USFWS	*						Ongoing administrative regulatory costs

Implementation Schedule for the bull trout recovery plan: Priest Recovery Subunit											
Priority number	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates (\$1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
3	2. 1. 1	Review fish stocking programs	25	IDFG, USFWS	*						Ongoing fish management costs
3	2. 1. 2	Regulate private fish ponds	25	IDFG	*						Ongoing fish management costs
3	2. 1. 3	Encourage development of commercial sources of westslope cutthroat trout	25	IDFG	*						Ongoing fish management costs
3	3. 2. 4	Solicit information from commercial guides	10	IDFG	*						Ongoing fish management costs
3	5. 1. 3	Increase lake water quality monitoring	15	IDEQ, USEPA	15	10	10	10	10	10	15-year program
3	5. 2. 2	Map spawning habitat	5	IDFG, KT, USFS, USFWS, WDFW	25	5	5	5	5	5	Ongoing
3	5. 6. 1	Investigate fluvial and resident bull trout status	10	IDFG, KT, USFS, USFWS, WDFW	100	10	10	10	10	10	

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APPENDIX A: Common and Scientific Names of Fishes Found in the Clark Fork Recovery Unit.

northern pike, <i>Esox lucius</i>	Introduced
largescale sucker, <i>Catostomus macrocheilus</i>	Native
longnose sucker, <i>C. catostomus</i>	Native
northern pikeminnow, <i>Ptychocheilus oregonensis</i>	Native
peamouth, <i>Mylocheilus caurinus</i>	Native
redside shiner, <i>Richardsonius balteatus</i>	Native
longnose dace, <i>Rhinichthys cataractae</i>	Native
fathead minnow, <i>Pimephales promelas</i>	Introduced
central mudminnow, <i>Umbra limi</i>	Introduced
Chinook salmon, <i>Oncorhynchus tshawytscha</i>	Introduced
kokanee salmon, <i>O. nerka</i>	Introduced
rainbow, redband, or steelhead trout, <i>O. mykiss</i>	Introduced
westslope cutthroat trout, <i>O. clarki lewisi</i>	Native
Yellowstone cutthroat trout, <i>O. clarki bouvieri</i>	Introduced
golden trout, <i>O. aquabonita</i>	Introduced
brown trout, <i>Salmo trutta</i>	Introduced
brook trout, <i>Salvelinus fontinalis</i>	Introduced
bull trout, <i>S. confluentus</i>	Native
lake trout, <i>S. namaycush</i>	Introduced
Arctic grayling, <i>Thymallus arcticus</i>	Introduced
mountain whitefish, <i>Prosopium williamsoni</i>	Native
pygmy whitefish, <i>P. coulteri</i>	Native
lake whitefish, <i>Coregonus clupeaformis</i>	Introduced
black bullhead, <i>Ameiurus melas</i>	Introduced
yellow bullhead, <i>A. natalis</i>	Introduced
burbot, <i>Lota lota</i>	Introduced
brook stickleback, <i>Culaea inconstans</i>	Introduced
black crappie, <i>Pomoxis nigromaculatus</i>	Introduced
pumpkinseed, <i>Lepomis gibbosus</i>	Introduced
bluegill, <i>L. macrochirus</i>	Introduced

smallmouth bass, <i>Micropterus dolomieu</i>	Introduced
largemouth bass, <i>M. salmoides</i>	Introduced
shorthead sculpin, <i>Cottus confusus</i>	Native
slimy sculpin, <i>C. cognatus</i>	Native
yellow perch, <i>Perca flavescens</i>	Introduced
walleye, <i>Stizostedion vitreum</i>	Introduced

APPENDIX B: List of Chapters.

Chapter 1	Introductory
Chapter 2	Klamath River Recovery Unit, Oregon
Chapter 3	Clark Fork River Recovery Unit, Montana and Idaho
Chapter 4	Kootenai River Recovery Unit, Montana and Idaho
Chapter 5	Willamette River Recovery Unit, Oregon
Chapter 6	Hood River Recovery Unit, Oregon
Chapter 7	Deschutes River Recovery Unit, Oregon
Chapter 8	Odell Lake Recovery Unit, Oregon
Chapter 9	John Day River Recovery Unit, Oregon
Chapter 10	Umatilla–Walla Walla Rivers Recovery Unit, Oregon and Washington
Chapter 11	Grande Ronde River Recovery Unit, Oregon
Chapter 12	Imnaha–Snake Rivers Recovery Unit, Oregon
Chapter 13	Hells Canyon Complex Recovery Unit, Oregon and Idaho
Chapter 14	Malheur River Recovery Unit, Oregon
Chapter 15	Coeur d’Alene Lake Basin Recovery Unit, Idaho
Chapter 16	Clearwater River Recovery Unit, Idaho
Chapter 17	Salmon River Recovery Unit, Idaho
Chapter 18	Southwest Idaho Recovery Unit, Idaho
Chapter 19	Little Lost River Recovery Unit, Idaho
Chapter 20	Lower Columbia River Recovery Unit, Washington
Chapter 21	Middle Columbia River Recovery Unit, Washington
Chapter 22	Upper Columbia River Recovery Unit, Washington
Chapter 23	Northeast Washington Recovery Unit, Washington
Chapter 24	Snake River Washington Recovery Unit, Washington
Chapter 25	St. Mary–Belly Rivers Recovery Unit, Montana

APPENDIX E
BIRD SPECIES LIST

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BIRDS KNOWN TO OCCUR IN THE VICINITY OF DETACHMENT BAYVIEW

Great Blue Heron
Wood Duck
Harlequin Duck
Common Goldeneye
Barrow's Goldeneye
Bufflehead
Hooded Merganser
Common Merganser
Turkey Vulture
Bald Eagle
Sharp-shinned Hawk
Cooper's Hawk
Northern Goshawk
Red-tailed Hawk
Blue Grouse
Ruffed Grouse
Bonaparte's Gull
Flammulated Owl
Great-horned Owl
Northern Pygmy Owl (Forest edge)
Barred Owl
Northern Saw-Whet Owl
Vaux Swift
Calliope Hummingbird
Rufous Hummingbird
Lewis Woodpecker
Red-naped Sapsucker
Williamson's Sapsucker
Hairy Woodpecker
Three-toed Woodpecker
Black-backed Woodpecker
Northern Flicker
Pileated Woodpecker
Olive-sided Flycatcher
Western Wood Pewee
Hammond's Flycatcher
Gray Jay
Steller's Jay
Clark's Nutcracker
Black-billed Magpie
Common Raven
Mountain Chickadee
Chestnut-backed Chickadee
Red-breasted Nuthatch

White-breasted Nuthatch
Brown Creeper
Winter Wren
Golden-crowned Kinglet
Ruby-crowned Kinglet
Townsend's Solitaire
Swainson's Thrush
Varied Thrush
Cedar Waxwing
Solitary Vireo
Yellow-rumped Warbler
Townsend's Warbler
MacGillivray's Warbler
Western Tanager
Black-headed Grosbeak
White-throated Sparrow
White-crowned Sparrow
Dark-eyed Junco
Brown-headed Cowbird
Red Crossbill
White-winged Crossbill
Common Redpoll
Pine Siskin
Evening Grosbeak
House Sparrow

APPENDIX F

FOREST STAND INVENTORIES

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Detachment Bayview - Table 1 Stand Data

Type	Stand			Dec.	Site		#	Basal	Ave	Cubic Volume			Scribner Volume			
<u>Group</u>	<u>No.</u>	<u>Acres</u>	<u>Type</u>	<u>Origin</u>	<u>Index</u>	<u>Species</u>	<u>Trees</u>	<u>Area</u>	<u>DBH</u>	<u>Gross</u>	<u>p.a.i.</u>	<u>Net</u>	<u>Gross</u>	<u>p.a.i.</u>	<u>p.a.i.</u>	<u>Net</u>
								<u>s.f.</u>	<u>In.</u>	<u>C c.f.</u>	<u>C.c.f.</u>	<u>C. c.f.</u>	<u>M b.f.</u>	<u>M b.f.</u>	<u>%</u>	<u>M b.f.</u>
8	1	10.1	D3,3,wl	93	83	TOTAL	1,293	1,176	11.4	373	6	330	117	2	2.1%	104
						D	730		13.3	197		177	63			57
						H	0			0		0	0			0
						RC	16		13.0	3		2	0			0
						WP	0			0		0	0			0
						LP	24		17.0	10		9	3			3
						TF	100		14.2	53		43	18			15
						PP	24		17.0	6		5	2			2
						RA	0			0		0	0			0
						LARCH	397		11.4	104		94	30			27
						BC	0			0		0	0			0
0	2	0.3	D3,3,O	90	80											
0	3	1.3	D4,2,O	90	80											
0	4	1.6	0													
0	5	2.8	0													
0	6	8.5	0													

TOTALS - FOREST LAND

Stands 1 10.1

NON-FOREST LAND

Stands 5 14.6

GRAND TOTAL

Stands 6 24.7

Detachment Bayview - Table 2 - Stand Data by Decade of Origin

<u>Acres</u>	<u>Type</u>	<u>Dec.</u>	<u>Species</u>	# <u>Trees</u>	Basal Area	Ave DBH	<u>Cubic Volume</u>			<u>Scribner Volume</u>			Net
		<u>Origin</u>					Gross	p.a.i.	Net	Gross	p.a.i.	p.a.i.	
							<u>s.f.</u>	<u>In.</u>	<u>C c.f.</u>	<u>C.c.f.</u>	<u>M b.f.</u>	<u>%</u>	<u>M b.f.</u>
12.91		0											
1.6	90	housing											
10.1	93	83	TOTAL	1,293	1,176	11.4	373	6	330	117	2	2.1%	104
			D	730		13.3	197		177	63			57
			H	0			0		0	0			0
			RC	16		13.0	3		2	0			0
			WP	0			0		0	0			0
			LP	24		17.0	10		9	3			3
			TF	100		14.2	53		43	18			15
			PP	24		17.0	6		5	2			2
			RA	0			0		0	0			0
			LARCH	397		11.4	104		94	30			27
			BC	0		0.0	0		0	0			0
													0
TOTALS - FOREST LAND													
10.1				1,293	1,176	11.4	373	6	330	117	2	2.1%	104
NON-FOREST LAND													
14.51													
GRAND TOTAL													
24.7													

Detachment Bayview - Table 3 - Habitat Data By Cruised Stands

Type	Stand			Dec.	Vol/ac			Vol. Down	Ave Dia.	Ave.	#
<u>Group</u>	<u>No.</u>	<u>Acres</u>	<u>Type</u>	<u>Origin</u>	<u>M b.f.</u>	<u>Dominant</u> <u>Understory*</u>		<u>Woody</u>	<u>Down</u>	<u>Dia.</u>	<u>Snags</u>
8	1	10.1	D3,3,wl	93	9	V.M. /NB	60%	670	12.8	11.9	2.52
0	2	0.3	D3,3,O	90		Snowberry	70%				
0	3	1.3	D4,2,O	90		Lawn	100%				
0	4	1.6	0								
0	5	2.8	0								
0	6	8.5	0								
TOTALS - FOREST LAND		10.1						670	12.8	11.9	2.52
NON-FOREST LAND		14.5									
GRAND TOTAL		24.7									

VM/NB = Vine Maple and
Ninebark

<u>GROUP</u>	<u>CALL</u>	# Trees <u>per</u> <u>ac.</u>	Basal Area/ac <u>s.f.</u>	Ave DBH <u>In.</u>	Net VOLUME PER ACRE <u>b.f.</u>	Cu. Feet	<u>Compartment All Stands Combined</u>	# Plots <u>20</u>	SE <u>%</u> <u>9.0%</u>
8	D3,3,wl	TOTAL	115.2	116	8,525	2,744	20	9.0%	
		D	72	13.3	5,630	1,746			
		H							
		IC	1.6	13	42	22			
		WP							
		LP							
		TF							
		PP	2.4	17	162	51			
		RA							
		LARCH	39.2	11.4	2,691	925			
		BC							

