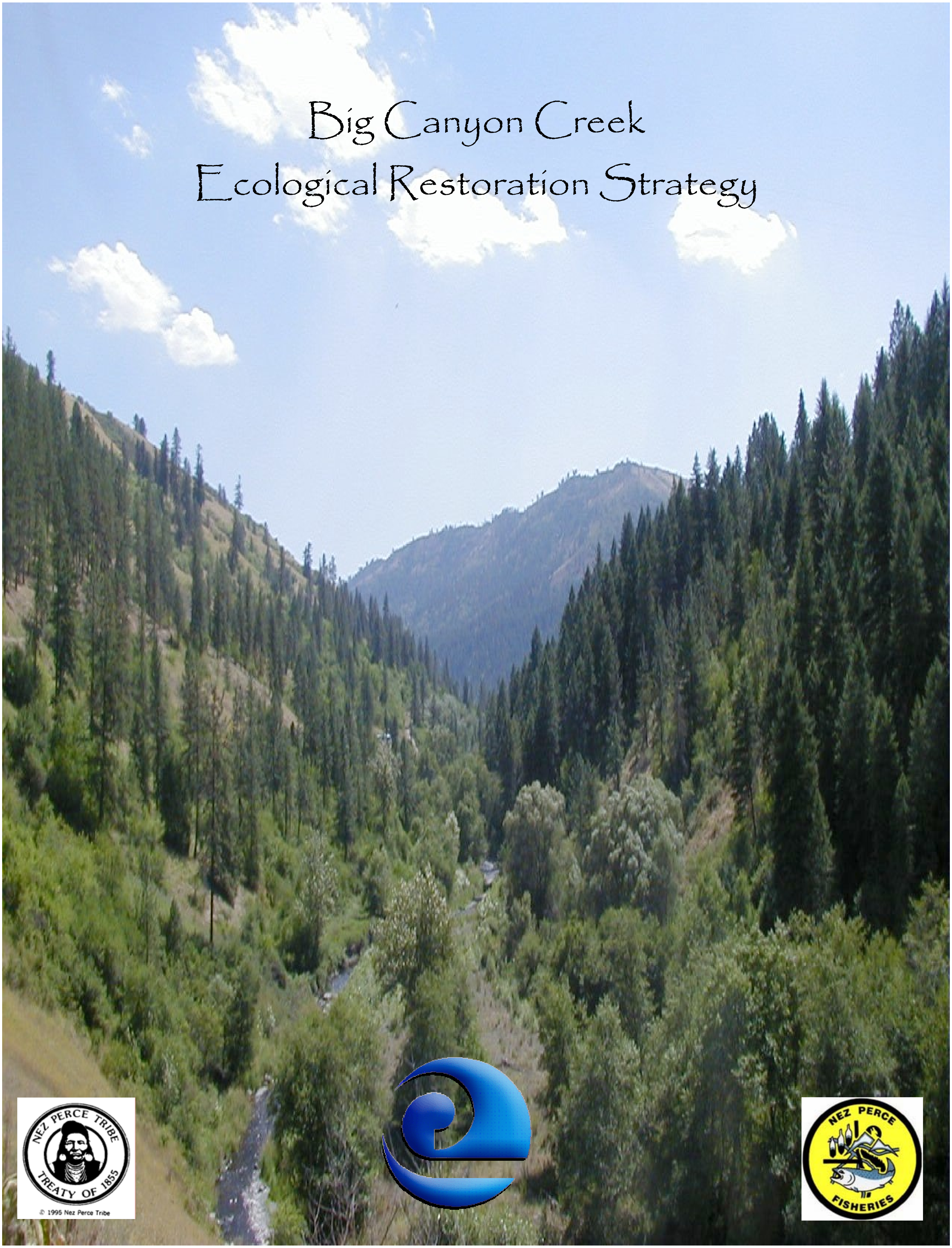
Big Canyon Creek
Ecological Restoration Strategy



Big Canyon Creek

Ecological Restoration Strategy

October 2007

prepared by:

Lynn Rasmussen, Project Manager
Nez Perce Soil and Water Conservation District
and
Shannon Richardson, Fisheries Biologist
Nez Perce Tribe – Department of Fisheries Resource Management – Watershed Division

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Executive Summary

Hé-yey, Nez Perce for steelhead or rainbow trout (*Oncorhynchus mykiss),* are a culturally and ecologically significant resource within the Big Canyon Creek watershed; they are also part of the federally listed Snake River Basin Steelhead DPS. The majority of the Big Canyon Creek drainage is considered critical habitat for that DPS as well as for the federally listed Snake River fall chinook (*Oncorhynchus tshawytscha*) ESU. The Nez Perce Soil and Water Conservation District (District) and the Nez Perce Tribe Department of Fisheries Resources Management- Watershed (Tribe), in an effort to support the continued existence of these and other aquatic species, have developed this document to direct funding toward priority restoration projects in priority areas for the Big Canyon Creek watershed. In order to achieve this, the District and the Tribe:

- Developed a working group and technical team composed of managers from a variety of stakeholders within the basin.
- Established geographically distinct sub-watershed areas called Assessment Units (AUs)
- Created a prioritization framework for the AUs and prioritized them.
- Developed treatment strategies to utilize within the prioritized AUs.

Assessment Units were delineated by significant shifts in sampled juvenile *O. mykiss* (steelhead/rainbow trout) densities, which were found to fall at fish passage barriers. The prioritization framework considered four aspects critical to determining the relative importance of performing restoration in a certain area: density of critical fish species, physical condition of the AU, water quantity, and water quality. It was established, through vigorous data analysis within these four areas, that the geographic priority areas for restoration within the Big Canyon Creek watershed are Big Canyon Creek from stream km 45.5 to the headwaters, Little Canyon from km 15 to 30, the mainstem corridors of Big Canyon (mouth to 7km) and Little Canyon (mouth to 7km).

The District and the Tribe then used data collected from the District's stream assessment and inventory, utilizing the Stream Visual Assessment Protocol (SVAP), to determine treatment necessary to bring 90% of reaches ranked Poor or Fair through the SVAP up to good or excellent. In 10 year's time, all reaches that were previously evaluated with SVAP will be reevaluated to determine progress and to adapt methods for continued success.

Over 400 miles of stream need treatment in order to meet identified restoration goals. Treatments include practices which result in riparian habitat improvements, nutrient reductions, channel condition improvements, fish habitat improvements, invasive species control, water withdrawal reductions, improved hydrologic alterations, upland sediment reductions, and passage barrier removal.

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Emmit Taylor, Acting Deputy Director
Nez Perce Tribe, Dept. of Fisheries Resources Management (DFRM)- Watershed

Clint Chandler, Fisheries Biologist II
Nez Perce Tribe, DFRM-Watershed

Kent Werlin, Biologist II
Nez Perce Tribe, DFRM-Watershed

Chet Hagen, Database Coordinator
Nez Perce Tribe, DFRM-Watershed

Justin Peterson, Fisheries Biologist I
Nez Perce Tribe, DFRM-Watershed

Dash Derringer, Field Technician
Nez Perce Soil and Water Conservation District

Janet Hohle, Clearwater Focus Program Coordinator
Idaho Soil Conservation Commission

Bob Ries, Fisheries Biologist
NOAA Fisheries

Ed Schriever, Regional Fishery Manager
Idaho Department of Fish and Game, Clearwater Region

Bill Reynolds, GIS Coordinator
Nez Perce County

Susan Beattie, Water Quality Specialist
Nez Perce Tribe

Kyle Wilson, Board Member, local landowner, economist
Nez Perce Soil and Water Conservation District

Todd Wittman, Board Member and local landowner
Nez Perce Soil and Water Conservation District

John Hermann, Chair
Nez Perce Soil and Water Conservation District

Jennifer Boie, Biologist II
Nez Perce Tribe, DFRM-Watershed

Rob Sampson, State Engineer
USDA- Natural Resources Conservation Service

Shawn Stubbers, Engineer and GIS Coordinator
Nez Perce Soil and Water Conservation District

Amanda Schwartz, Field Technician
Nez Perce Soil and Water Conservation District

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Acronyms

Organizations	
BPA	Bonneville Power Administration
District	Nez Perce Soil and Water Conservation District
FWP	Columbia River Fish and Wildlife Program
IDFG	Idaho Department of Fish and Game
IDWR	Idaho Department of Water Resources
ISCC	Idaho Soil Conservation Commission
ISDA	Idaho State Department of Agriculture
LSCD	Lewis Soil Conservation District
NFH	National Fish Hatchery
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPT	Nez Perce Tribe
NPTEC	Nez Perce Tribe Executive Council
NWPPC	North West Power Planning Council
Tribe	Nez Perce Tribe
Watershed-NPT	Nez Perce Tribe- Department of Fisheries Resource Management-Watershed Division
WR- NPT	Water Resources Division of the Nez Perce Tribe
WSU	Washington State University

Terms	
AU	Assessment Unit
BIOP	Biological Opinion
BMP	Best Management Practice
CBWMA	Clearwater Basin Weed Management Area
CFS	Cubic Feet per Second
CWMA	Cooperative Weed Management Areas
DPS	Distinct Population Segment
ESU	Evolutionary Significant Unit
FLIR	Forward Looking Infrared
GIS	Geographic Information System
GPS	Global Position System
MSL	Mean Sea Level
PMU	Priority Management Areas
PSA	Public Service Announcement
RPA	Reasonable and Prudent Alternatives
SRBA	Snake River Basin Adjudication
SRS	Salmon Recovery Strategy
TIR	Thermal Infrared
TMDL	Total Maximum Daily Load

CHAPTER 1

Background

The Nez Perce Soil and Water Conservation District (District) and the Nez Perce Tribe Department of Fisheries Resource Management Watershed Division (Tribe) developed this document to guide restoration activities within the Big Canyon Creek watershed for the period of 2008-2018.

This plan was created to demonstrate the ongoing need and potential for anadromous fish habitat restoration within the watershed and to ensure continued implementation of restoration actions and activities. It was developed not only to guide the District and the Tribe, but also to encourage cooperation among all stakeholders, including landowners, government agencies, private organizations, tribal governments, and elected officials. Through sharing information, skills, and resources in an active, cooperative relationships, all concerned parties will have the opportunity to join together to strengthen and maintain a sustainable natural resource base for present and future generations within the watershed.

Goals

The primary goal of the strategy is to address aquatic habitat restoration needs on a watershed level for resident and anadromous fish species, promoting quality habitat within a self-sustaining watershed. Seven objectives have been developed to support this goal:

- Identify factors limiting quality and quantity of steelhead spawning and rearing habitat
- Identify targets for optimal conditions within the basin
- Identify treatments to address limiting factors and goals for optimal conditions
- Prioritize location of restoration activities
- Identify information and data gaps
- Identify future monitoring strategy to support adaptive management
- Identify opportunities for collaboration with stakeholders

A Living Document

This document is a result of a collaborative planning effort by multiple stakeholders spanning several years. The document is intended to provide a framework for prioritization and coordination of restoration efforts and will be updated as necessary to include additional data and improved scientific methods. These updates will be used to reprioritize activities, and allow successful implementation of the plan through adaptive management. Approval and adoption of this document and any revisions shall follow the administrative procedures for the respective entity or sponsor.

Document Sponsors

Nez Perce Tribe

The Nez Perce Tribe, Department of Fisheries Resources Management – Watershed Division is an organizational division within in the Nez Perce Tribe. Tribal affairs are governed by an elected body called the Nez Perce Tribal Executive Committee. The chairman presides over the Executive Committee.

The vision of the Watershed Division is focused on protecting, restoring, and enhancing watersheds and all treaty resources throughout Nez Perce Territory, as described under the Treaty of 1855. These activities are accomplished using a holistic approach, which encompasses entire watersheds, ridge-top to ridge-top, emphasizing all cultural aspects. To achieve this goal, the Tribe employs strategies that rely on natural fish production and healthy river ecosystems.

Nez Perce Soil and Water Conservation District

The Nez Perce Soil and Water Conservation District (District) is a subdivision of Idaho State government organized on a county level. District affairs are governed by a county-wide elected board of seven members. Board members are land owners or land managers. The District provides leadership, coordination, and implementation of programs to protect and enhance the natural resources within the District.

The District implements conservation programs with private landowners, branches of government, and agricultural operators through formal agreements that link landowner conservation objectives with federal, state, and local program objectives. As a result of current and past efforts the District has an excellent working relationship with local landowners and elected officials.

Partnerships

The Big Canyon Creek watershed is a mixture of mostly private and tribal lands. To achieve success, restoration needs to occur on both ownerships. Since 2002, a strong relationship has been built between the Tribe and District resulting in the joint sponsorship of this document. This restoration strategy provides a vision as well as a framework to best direct future efforts synergistically.

Natural resource management in the basin has the potential to be volatile given the widely varied political, social, economic and environmental interests represented by various stakeholders and this group of partners realizes that there are unexplored opportunities to bring these diverse voices to the table. Listed below are the partners who assisted in developing this strategy. This list does not represent the entire scope of collaborative effort, as public input, focus groups, and landowner advisory groups, other agencies, and special interest groups were utilized at various stages of this document's development.

The organizations that directly contributed to the development of the Big Canyon Creek Ecological Restoration Strategy include:

- Nez Perce Soil and Water Conservation District (District)
- Nez Perce Tribe Department of Fisheries Resources Management, Watershed Division (Watershed- NPT)
- Nez Perce Tribe Department of Natural Resources, Water Resources Program (WR- NPT)

- Nez Perce Tribe Department of Natural Resources, Land Services Program
- Idaho Department of Fish and Game (IDFG)
- NOAA Fisheries
- Nez Perce County
- Lewis Soil Conservation District
- Idaho Soil Conservation Commission
- United States Department of Agriculture- Natural Resources Conservation Service (NRCS)

Public participation in the watershed planning and implementation process has included newsletters, direct mail to watershed landowners, and public meetings conducted through the District's public meeting process. The public meetings were held in December of 2004, 2005, and 2006. During these meetings public input was taken on the District and Tribe's inventory, assessment and BPA proposals. In addition, watershed advisory groups were used to review and identify natural resource improvement projects and strategies.

Document Organization

Two groups were assembled to produce this document. The first was the Working Group, consisting of District and Tribe staff members. This group was responsible for organizational support, including data compilation, writing and editing. The second was the Technical Team, which was comprised of representatives from a broad spectrum of management agencies. This group was responsible for the data analysis throughout this process. Several members of the Working Group were also members of the Technical Team.

This document is organized by Chapters. Throughout the document, Nimipuutimt, or Nez Perce language, is used for fish names where suitable, with English or the scientific name in parentheses.

Chapters

Chapter one describes the structure of the document and provides background information on the development of the restoration strategy. This chapter covers the scope of the project, including why it was initiated, who was involved, and the intentions behind the effort. Additionally, this section helps put the restoration strategy in context with regards to other efforts, past and present, occurring in the basin.

Chapter two offers justification for working within this basin, beginning with the focal species for the area. An examination of the current and historical significance of the focal species and the aquatic and terrestrial habitat follows. The chapter concludes with a discussion of the restoration potential within the area as well as what contribution toward the future any restoration actions will provide.

Chapter three establishes a geographic and historic context for directing future investments in aquatic habitat restoration actions in the basin. It describes attributes of the area that result in unique challenges in aquatic habitat restoration, outlining the importance of present and future actions.

Chapter four presents the framework to establish high priority areas in the basin within which to focus restoration efforts. Specifically, this section summarizes the restoration philosophy as developed by a diverse group of stakeholders, and lays out a tool for prioritization to maximize restoration investments. Sub-watershed areas, referred to as Assessment Units (AUs), are identified in this chapter, and the methods used to collect data for this analysis are described.

Chapter five categorizes the treatment needed to provide the level of restoration within the Big Canyon Creek basin that will help support continued and potentially enhanced salmonid productivity. Treatment groups are identified in this chapter and specific strategies to address those factors that limit salmonid productivity are outlined.

Chapter six focuses on strategies to support future restoration actions in the basin. Existing gaps in data are identified and the critical aspects of policy and community support are addressed by examining outreach and education potential. A plan for monitoring and evaluating progress is also summarized.

Purpose and Need

Many institutions that provide funding for aquatic habitat restoration activities require an overall basin-wide strategy that is closely linked to a comprehensive assessment of watershed conditions, water quality impairments, priority fish populations and geographic focus areas that identifies necessary high priority restoration actions. These institutions also require partnering, cost-leveraging, and demonstrable on-the-ground results. Some of the primary institutions that commonly fund watershed and aquatic habitat restoration efforts throughout the Pacific Northwest are developing broad state-wide or regional strategies to focus financial investments where there is a demonstrated need, articulated priorities, and clear restoration benefit. As funding becomes scarce and competition in the region expands, a greater emphasis will be given to funding high priority restoration actions in priority watersheds. This is largely being brought about for two reasons:

1. To demonstrate accountability and show completion of high priority restoration actions for whole watersheds, and

2. To focus or concentrate available funding to specific areas in order to achieve tangible, comprehensive restoration benefits at the watershed-scale as opposed to a “shotgun approach” where many different restoration actions are implemented over a broad landscape making it difficult to detect a restoration benefit.

While this effort was spearheaded by the Nez Perce Tribe and the Nez Perce Soil and Water Conservation District, it is intended to provide utility to all stakeholders in the Big Canyon watershed who are interested in aquatic habitat restoration and to foster a unified approach to future management.

Purpose Statement

The basin-wide aquatic habitat restoration strategy provides a common framework for restoration within a specific geographic region in order to best direct future resources, including funding and staff efforts, for maximum effect on high priority areas. Specifically, this strategy:

- Identifies priority stream reaches in the basin that provide the cornerstone for addressing freshwater habitat restoration needs of resident and anadromous fish
- Describes limiting factors affecting aquatic habitat and fish productivity
- Identifies optimal levels of watershed function needed to support fish productivity for each limiting factor
- Establishes the sequence in which actions should be pursued in order to achieve the maximum benefit

- Provides a rough estimate of the restoration needs by activity type for each of the identified priority reaches within the basin.

The strategy also displays a suite of restoration tools to accomplish identified opportunities; lays out a framework for developing a basin-specific technical assistance, outreach, and education plan; and highlights important information gaps from which to guide the development of future inventory and monitoring activities.

Ties to Other Efforts

An extended network of management, protection, and restoration efforts as well as fish and wildlife programs exist for the Big Canyon Creek watershed on a local, state, and federal level. Several ongoing and historic efforts within the Big Canyon Creek watershed are listed within this section with a summary of the previous effort and, the specific ties to this restoration plan are described for each effort.

Clearwater Subbasin Management Plan

Summary of previous effort:

The Clearwater Subbasin Management Plan was adopted in early 2005 by the Northwest Power and Conservation Council (NWPPC) into their Columbia River Basin Fish and Wildlife Program. Subbasin plans were developed for each subbasin in the Columbia River Basin in order to identify project priorities to achieve restoration and recovery goals in each respective subbasin. The Clearwater Subbasin Management Plan presents problem statements, objectives and strategies for habitat treatments within the Clearwater Subbasin.

Specific Tie(s) to this strategy:

Five high priority factors primarily limit aquatic and terrestrial species and habitats in the Clearwater subbasin: instream temperatures, sedimentation, loss or disturbance of riparian habitats, changes in vegetative structure, and alteration of environmental processes. (p.82) Three Potential Management Units describe the Big Canyon Creek watershed. Individual PMU designations identify six field HUCs with similar attributes that were used to characterize the entire Clearwater subbasin and further assisted in identifying priority restoration issues. The PMU concept was created for use in the Clearwater Subbasin Assessment process. The PMUs that describe the Big Canyon Creek watershed are PR-6, PR-7, and PR-8. Priority restoration issues for Big Canyon Creek are listed in the Clearwater Subbasin Management Plan.

Table 1 is derived from the *Clearwater Subbasin Plan* and shows restoration issues and priorities = by PMU. Priority is indicated by H=high, M=Moderate, and L = Low.

Table 1. Restoration Issues and Priority

Restoration Issue	PMU-6	PMU-7	PMU-8
Surface Erosion	H	H	H
Water Temperature	H	H	H
Prairie Grasses	H	H	H
Grazing Impacts	M	L	L
In-stream Work	L	L	L
Ponderosa Pine	H-M	-	H-M

The Big Canyon Creek Ecological Restoration Plan identified sedimentation, temperature, and habitat diversity as primary limiting factors for restoration. The restoration issues identified within the Clearwater Subbasin Management Plan are directly addressed through this restoration strategy.

NPPC 2000 Columbia River Basin Fish and Wildlife Program

Summary of previous effort:

The program is habitat based, focusing on rebuilding healthy, naturally producing fish and wildlife populations by protecting, mitigating, and restoring habitats and the biological systems within them.

The vision of the Clearwater Subbasin as outlined in the Clearwater Subbasin Management Plan is of "…a healthy ecosystem with abundant, productive, and diverse aquatic and terrestrial species, which will support sustainable resource-based activities (2005)". This vision is contained within the NWPPC's Columbia River Basin Fish and Wildlife Program.

Specific Tie(s) to this strategy:

The Big Canyon Creek Strategy works towards accomplishing the vision and objectives of the subbasin plan and, by extension, the program. By conducting restoration actions within the watershed, this Strategy strives to protect and restore the ecological functions and habitats of the Big Canyon Creek basin, thus aiding in the recovery of the Snake River Basin Steelhead Distinct Population Segment (DPS).

NOAA Fisheries Salmon Recovery Plans

Summary of previous effort:

The overall goal for this recovery plan is to achieve conditions for each Evolutionarily Significant Unit (ESU) and Distinct Population Segment (DPS) such that they no longer need protection under the ESA because either the danger of extinction or the likelihood of endangerment within the foreseeable future has been eliminated. A delisting decision will include consideration of the current extinction risk of the listed species and whether factors for the decline that lead to the listing have been addressed so they no longer limit the viability. The Interior Columbia Technical Recovery Team (ICTRT 2005) recommends that all Major Population Groups (MPG) in an ESU or DPS be viable before being considered at low risk of extinction and a candidate for delisting.

The ICTRT made determinations for the Snake River salmon and steelhead DPS and their respective MPGs recognizing desired future status and the current status. The desired future status is a description of the recovery plan objective for the MPG that meets the minimum viability requirements based on the ICTRT (2005) viability criteria. The minimum viability requirements are the minimum combination of populations within the MPG that must be at viable status for the MPG to satisfy the ICTRT criteria. There are multiple combinations of populations within a MPG that could meet minimum viability requirements. The populations included in each MPG recovery plan objective were selected based on unique sets of characteristics, such as run timing, importance as core production areas, management opportunities, and feasibility to monitor status. The recommended objectives or desired future status that NOAA presents in the draft recovery plans represent the shortest routes to MPG viability. The Idaho Partnership intends to use objectives from the draft Recovery Plans to target priority populations and the associated watersheds for restoration work.

Populations within a MPG that have been identified as necessary to achieve the desired future status for that MPG will be prioritized higher for habitat restoration than one that is not. The recovery plans caution that although not all population in an MPG need to be viable under the initial recovery planning objective, it would be highly risky to allow the status of any population to degrade.

Specific Tie(s) to this strategy:

The Salmon Recovery Plan (Draft, 2007)[1] names Big Canyon Creek one of the 5 Major Spawning Aggregation (MaSA) areas within the Lower Clearwater Basin (Figure 1.) and identifies six restoration objectives designed to improve habitat condition and bolster salmonid productivity:

The Salmon Recovery Plan identifies six restoration objectives designed to improve habitat condition and bolster salmonid productivity:

- Address localized areas where riparian function is most limited, including those segments of stream where roadbeds have been constructed adjacent to or within the immediate flood plain
- Restore riparian area composition, structure, and function in localized areas of the Lower Clearwater by improving riparian vegetation and hydrologic function through decommissioning or obliterating of roads within riparian areas and returning road surfaces, cuts and fills to productivity.
- Fine sediments in the Lower Clearwater mainstem are currently high due to the geologically unstable nature of the watershed and legacy effects from land management. Promote landscape management activities that minimize the threat of chronic sediment inputs.
- Improve water quality and geomorphic integrity by implementing watershed restoration and reducing accelerated sediment impacts in localized areas of the Lower Clearwater mainstem.
- Contribute to de-listing Lower Clearwater mainstem stream segments from the 303(d) list of water quality limited water bodies by applying appropriate and active watershed restoration to reduce sediment (identified as the pollutant of concern.
- Inventory existing roads (classified and unclassified) within the Lower Clearwater mainstem to identify watershed improvement activities, particularly in relation to fish passage.

The treatments outlined in the Big Canyon Creek Watershed Ecological Restoration Strategy address these objectives in all aspects.

[1]Draft can be found at the following website: http://www.idahosalmonrecovery.net/pdfs/PVA7_2_6_1ClearwaterLowerMainstem-stlhd.pdf

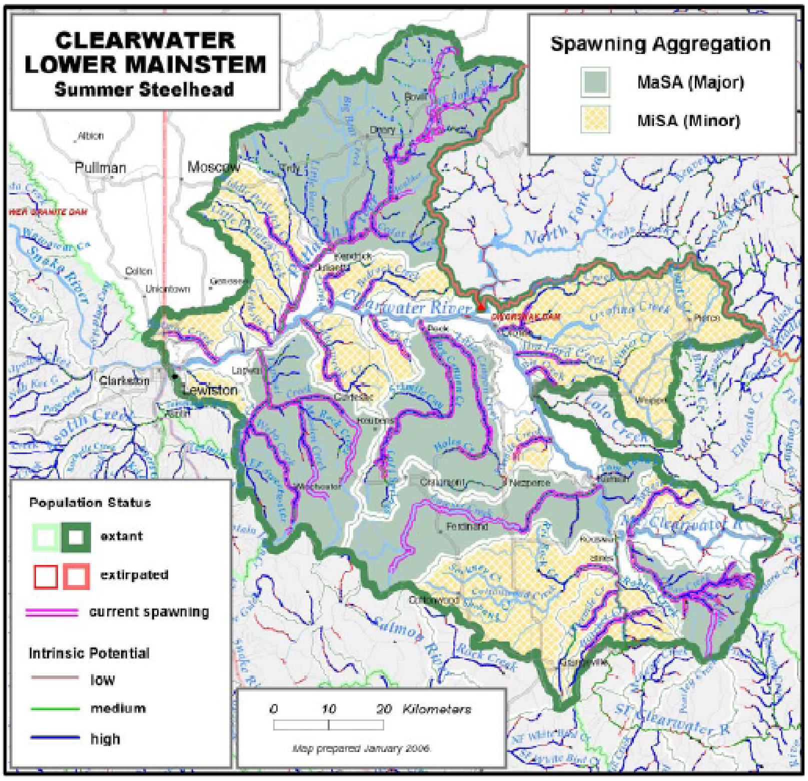

Figure 1. MaSA for Lower Mainstem Clearwater Basin.

Note that Big Canyon Creek is one of five MaSAs in the basin.

Lower Clearwater River Tributaries TMDL

Summary of Previous Effort:

The Lower Clearwater River Total Maximum Daily Load (TMDL) allocation is scheduled for completion in 2007. The TMDL effort is lead by the Nez Perce Tribe- Water Resources Department in cooperation with the Environmental Protection Agency (EPA).

The TMDL for the Lower Clearwater River is in publication and includes all sub-basins on the reservation. Data collected provides information for additional resource management applications and can be used to identify source water protection zones, areas especially sensitive to development or specific land use, and to monitor trends and responses to climate change or population density changes. Figure 2 illustrates water quality monitoring site location. As TMDL plans are implemented monitoring will be incorporated to assess effectiveness and determine trends in surface water quantity and quality on the reservation.

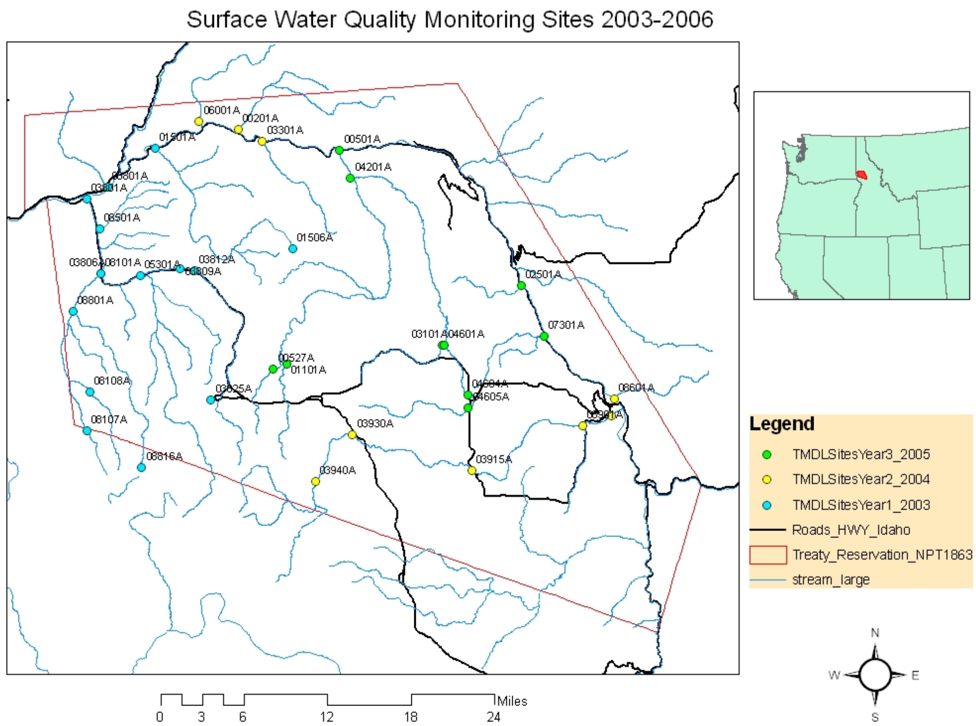

Figure 2. Water quality monitoring site locations.

Specific Tie(s) to this strategy:

Water Quality data from the TMDL was used to process the geographic prioritization outlined in Chapter 4. In addition, treatments identified in this strategy will assist in meeting TMDL goals.

Clearwater Basin Weed Management Area

Summary of previous effort:

A Cooperative Weed Management Area (CWMA) is a distinguishable hydrologic, vegetative, or geographic zone based upon geography, weed infestations, climatic or human-use patterns (ISDA, 2007). CWMAs are formed when the landowners and land managers of a given area come together and agree to work cooperatively to control weeds. Idaho has 40 CWMA's (see Appendix B – Watershed Profile for location map).

The Clearwater Basin Weed Management Area (CBWMA) was formed in 1995. The cooperative was created to bring together those responsible for weed management within the Clearwater River Basin, to develop common management objectives, facilitate effective treatment, integrate weed programs and coordinate efforts along logical geographic boundaries with similar lands, use patterns and problem weeds.

Big Canyon Creek is located within the mainstem Clearwater subbasin. A basin-wide Steering Committee coordinates sub-basin activities, maintains the CBWMA Long Range Strategy and consolidates information. The District is a member of the Steering Committee.

Cooperators in the CBWMA include private landowners, county government, tribal government, university, state and federal land management agencies, as well as interested individuals and organizations.

The major weeds of importance in the area include Dalmatian toadflax, diffuse knapweed, yellow toadflax, rush skeletonweed, spotted knapweed, orange hawkweed, meadow hawkweed, scotch thistle, and yellow starthistle. Major efforts are being made to control these weeds each year.

The Idaho State Department of Agriculture (ISDA) monitors weed infestations throughout the State of Idaho. Locations of weed infestations are mapped by many county, state, federal, and private landowners throughout the CBWMA. ISDA compiles the weed data into a statewide database for monitoring weed infestations, setting priorities and developing treatment strategies.

Specific Tie(s) to this strategy:

Weed treatments and strategies implemented through this plan are adopted directly from the CBWMA. In addition, weed inventory data collected through this plan is supplied to the CBWMA who houses weed infestation and treatment data for the Clearwater Basin. This Plan will monitor weed control success and infestations levels by using the established CBWMA protocols and database.

Fish Passage Assessment: Big Canyon Creek Watershed

Summary of previous effort:

In 2004, the Tribe completed a fish passage assessment as a component of the Protect and Restore the Big Canyon Creek Watershed project (BPA project number 1999-016-00). The goal of the passage assessment was to identify and prioritize all barrier crossings within the watershed. The project addressed a major information gap identified in the Clearwater Subbasin Plan.

Specific Tie(s) to this strategy:

Information provided in the passage assessment was used directly in this plan in the prioritization of assessment units and the identification of restoration strategies and priorities. The barrier prioritization protocol developed in the passage assessment was adopted for this strategy. Appendix B – Watershed Profile summarizes barrier information contained in the passage assessment.

Big Canyon Creek Environmental Assessment (EA)

Summary of previous effort:

The EA included a water quality resource assessment for the Big Canyon Creek watershed. The EA was completed in 1995 through a collaborative planning process. The Nez Perce Soil and Water Conservation District (District) partnered with the Idaho Soil Conservation Commission (ISCC), Lewis Soil Conservation District (LSD), Bureau of Land Management (BLM), Idaho Department of Environmental Quality (DEQ), University of Idaho (UI), USDA-Natural Resources Conservation Service (NRCS) and the Nez Perce Tribe (TRIBE) to complete the EA.
The EA assessed the status of the water quality beneficial uses, identified major water quality pollution sources, and developed watershed treatment strategies to address identified problems. The EA did not include Little Canyon Creek. However, the EA divided Big Canon Creek into

three treatment areas based on water quality data. These treatment areas correspond very closely to the Big Canyon Assessment Units (AUs) identified in this plan.

Specific Tie(s) to this strategy:

The EA was the basis of the District's BPA project installation from year's 1999 to 2006. The BPA proposal (1999-015-00) implemented projects in the geographic areas and resource concern areas identified as a high priority in the EA.

Through collection of additional resource information and through the implementation of projects from 1999-2006, the geographic priority location has changed in this plan compared to the original EA. Priority resources concerns are similar. The EA was used as the basis for inventory, background, and treatment strategies in this document.

Nez Perce County Transportation Master Plan

Summary of previous effort:

The Nez Perce County Transportation Master Plan (Master Plan) identifies transportation deficiencies throughout Nez Perce County and identifies and prioritizes projects that improve transportation access and safety. The Master Plan includes a growth analysis and short, medium, and long range projects to be completed over a 20-year timeframe.

The major projects identified as short term within the Big Canyon Creek watershed are the paving of gravel roads. A long range project is identified as the replacement of Bear Creek Bridge near Peck.

Specific Tie(s) to this strategy:

The Master Plan was used for economic and transportation data in this plan. In addition, the Master Plan project list was used to identify potential projects within the Big Canyon Creek watershed. Implementation of strategies in this plan will assist Nez Perce County in meeting the objectives outlined in the Master Plan. The Master Plan will be used as a tool to implement identified County road projects which are impacting fisheries resources.

Protect and Restore Anadromous Fish Habitat in the Big Canyon Creek Watershed (BPA project number 1999-016-00)

Summary of previous effort:

The Protect and Restore Anadromous Fish Habitat in the Big Canyon Creek Watershed is a project funded through the Bonneville Power Administration and sponsored by the Watershed-NPT. The project funds watershed restoration efforts in Big Canyon Creek for listed A-run steelhead.

The original project began in 1999 and has continued through 2007. Accomplishments through the years include fish habitat monitoring, the completion of a watershed assessment, a fish passage assessment, road inventory and resource inventories on TRIBE properties. The project also completed 4.1 miles of riparian treatments, 308 acres of wetland treatments, 8 upland treatment acres, and 10.5 riparian acres.

The Big Canyon Creek watershed is a mixture of mainly private and tribal land. To achieve success, restoration has to occur on both ownerships. A strong relationship has been built with the Nez Perce Water and Soil Conservation District since 2002. BPA project number 1999-016-00 focuses on Tribal lands while BPA project number 1999-015-00 (administrated by the District) focuses on private lands.

Work on this project from 1999-2007 has laid a solid foundation for stream/watershed restoration work to include: fish presence, absence, abundance data collected on the mainstem of Big and Little Canyon Creeks; comprehensive baseline habitat monitoring data collected at the watershed scale; fish passage assessment; road erosion assessment and transportation planning; and the development of a Natural Resources Assessment Protocol to assess and make stream restoration project recommendations on individual tribal properties (13 completed in 2005 and 10 in 2006). In addition, many on-the-ground projects were implemented such as fencing, riparian plantings, and weed control.

Specific tie(s) to strategy:

BPA project number 1999-016-00 identifies the fish habitat limiting factors for Big Canyon Creek. According to these guiding documents, the greatest factors limiting fish production in Big Canyon Creek are summer low flows and high temperatures, sedimentation, riparian degradation, channel/bank instability, and passage of aquatic life. The fish distribution and abundance monitoring data was used as the basis for the prioritization and delineation of assessment units for this plan.

Restoring Anadromous Fish Habitat in the Big Canyon Creek Watershed (BPA project number 1999-015-00)

Summary of previous effort:

The District developed BPA project number 1999-015-00 to enhance steelhead trout natural production in the Big Canyon watershed by improving salmonid spawning and rearing habitat. The District seeks to assist private, tribal, county, and state landowners in implementing Best Management Practices (BMPs) to reduce nonpoint pollutants, repair poorly functioning riparian zones, and increase water retention in the watershed. The project funds coordination, planning, technical assistance, BMP design and installation, monitoring, and educational outreach to identify and correct problems associated with agricultural and livestock activities impacting water quality and salmonid survival. The project accelerates implementation of the Idaho agricultural water quality management program. It also addresses specific needs identified in the Clearwater Subbasin Summary 2001 Draft and the 2000 Columbia River Basin Fish and Wildlife Program documents. Implementation activities began in 2000.

The Big Canyon Creek watershed is a mixture of mainly private and tribal land. To achieve success, restoration needs to occur on both ownerships. A strong relationship has been built between the District and the Tribe since 2002. BPA project number 1999-016-00 focuses on Tribal lands while BPA project number 1999-015-00 (administrated by the District) focuses on private lands.

Specific tie(s) to strategy:

BPA project number 1999-015-00 collected and identified information gaps to be used in the identification of geographic priorities and treatment strategy. In addition the project identified outreach and education needs to ensure private landowner participation and project implementation.

Clearwater Focus Program, Idaho SCC (BPA project number 1996-086-00)

Summary of previous effort:

The Clearwater Focus Program is co-coordinated by the Tribe and Idaho Soil Conservation Commission (ISCC). BPA project number 19960086-00 is the ISCC component of the program. The Clearwater Focus Program coordinates projects and interagency efforts to enhance and restore aquatic and terrestrial habitats in the Clearwater River subbasin to meet the goals of the NWPPC's 2000 Columbia River Basin Fish and Wildlife Program (FWP). The Focus Program convened the Clearwater Policy Advisory Committee (PAC) to provide guidance in the development of a Clearwater subbasin assessment and management plan. PAC membership includes the regional managers of state and federal agencies with natural resource responsibilities in the subbasin, the Nez Perce Tribe, local governments, and a private timberland owner representative. The Focus Program provides staff for the PAC and maintains their records. The PAC will provide guidance during future provincial reviews for project funding in the subbasin and NOAA Fisheries salmon recovery planning is also coordinated through the Focus Program and PAC. Functions of both the Clearwater Focus Program and the PAC have been formally adopted into the FWP with the adoption of the Clearwater Subbasin Management Plan.

This contract provides technical and management assistance to private landowners and land users, conservation districts, and local governments.

Specific Tie(s) to this strategy:

Technical and management assistance is provided by the Focus Program co-coordinator as requested by the District. Examples of assistance provided to the Big Canyon Creek project in the past have included: grant writing, document review and editing, review of project proposals, assistance with construction contract preparation, and assistance with development of the District's policy manual.

Big Canyon Aquatic Assessment

Summary of previous effort:

This assessment, completed in 2001, was conducted by WSU. At the time that the assessment was written, the Big Canyon Creek drainage lacked the robust data set that it currently has. Consequently, the document was primarily a literature survey that defined where more data was needed and made recommendations for addressing those data gaps. The Tribe and the District have gathered much of the recommended data and are now able to complete this prioritization using that data.

Specific Tie(s) to this strategy:

The majority of the watershed inventory and background information included in this document was obtained from the AA.

Little Canyon Planning Project Final Report

Summary of previous effort:

The Little Canyon Planning Project Final Report was completed by the Lewis Soil Conservation District and the Clearwater Soil and Water Conservation District in 1988. The LCPP includes the geographic boundaries of Little Canyon Creek. The LCPP includes a resource inventory, water quality problem identification, and treatment strategies.

Specific Tie(s) to this strategy:

Soils information and resource data were used in this strategy.

Big Canyon Creek Habitat Marketing Plan

Summary of previous effort:

The District developed a habitat marketing plan as part of its BPA project number 1999-015-00. The plan's purpose is to increase landowner awareness and adoption of fish habitat improvement projects and management practices. Marketing efforts from 1999-2004 focused on increasing landowner awareness of fish habitat needs and installation of erosion control measures in the Nichols Canyon and Central Grade portion of the watershed. Previous efforts include newsletters, public service announcements, fair displays, meeting displays, fact sheet development and educational workshops. The project has been very successful in obtaining participation from private landowners.

The purpose of the marketing plan is to assist in the adoption of fish habitat improvement practices which will result in increased populations of steelhead trout. A series of public meetings was held throughout the watershed in 2005, 2006, and 2007 in order to obtain public input on the plan.

A public survey was completed in March 2006 to identify education needs and obtain landowner input into the project implementation. The survey included landowners, units of government, and special interest groups within the watershed.

The survey identified the top ten resource issues that stakeholders thought were important in Big Canyon Creek. These issues included wildlife and fisheries, flooding, water availability, pesticide management, wetlands, wastewater and nutrients.

Specific tie(s) to this strategy:

The marketing plan will be used to obtain landowner buy-in to strategies and projects listed in this proposal. The marketing plan will be used to implement needed outreach activities within the watershed.

CHAPTER 2

Justification

Hé-yey have historically been, and remain to be, a culturally significant and highly valued resource in this area; their current and future importance cannot be underestimated. This chapter outlines the unique aspects of the Big Canyon Watershed that make it a high priority for restoration and protection.

The Big Canyon Creek Watershed is a high priority for restoration and protection due to:

- The significant densities of juvenile ESA listed steelhead present within the watershed
- The recent occurrence of coho salmon spawning and rearing activity within the watershed
- The completion of passage barrier and watershed resource assessments for the watershed
- The high amounts of watershed restoration effort provided by stakeholders
- The current degree of landowner involvement
- The importance in reducing water temperatures and sediment delivery to the Clearwater River for improvement of ESA listed fall chinook salmon spawning and rearing habitat
- The identification of the watershed by the NOAA BIOP as having high steelhead spawning and rearing potential in Clearwater River Subbasin

Focal Species

The Big Canyon Creek watershed provides habitat for a variety of resident and anadromous fish species. The anadromous stocks include wild A-run Hé-yey (steelhead/rainbow trout/ or *Oncorhynchus mykiss*) and naturally reproducing K'állay (coho salmon or *Oncorhynchus kisutch*). Juvenile Nacó'x (chinook salmon or *Oncorhynchus tshawytscha*) have been observed within Big Canyon Creek through electrofishing surveys conducted in 2003 and 2005. The Snake River Basin Steelhead DPS is a December 2005 continuance of the August 1997 62 FR 43937 ESU listed as threatened under the Endangered Species Act while Snake River fall chinook , listed as threatened in 1993 (58 FR 68543), spawn within the Clearwater River immediately below the confluence of Big Canyon Creek.

Oral histories maintained by members of the Nez Perce Tribe refer to the region's once significant salmon runs. Like many anadromous streams in the Columbia River Basin, populations of anadromous fish species have declined significantly from historic levels. Fish species identified through 2003-2006 electrofishing surveys of the Big Canyon creek watershed are listed in Table 2. Additionally, the tribe has begun a recovery effort for lamprey (*Lampreta tridentata*), referred to by the Nimiipu as eels or Heesu; a species of previous significance within this drainage according to oral tradition.

Table 2. Big Canyon Creek Fish Species

Nimipuutimt	Common Name	Genus species	Origin
Hé-yey	Steelhead/Rainbow Trout	*Oncorhynchus mykiss*	Native
Nacó'x	Chinook Salmon	*Oncorhynchus tshawytscha*	Native/ Reintroduced
K'állay	Coho Salmon	*Oncorhynchus kisutch*	Native/ Reintroduced
Not available	Paiute Sculpin	*Cottus beldingi*	Native
Not available	Mottled Sculpin	*Cottus bairdi*	Native
Not available	Torrent Sculpin	*Cottus rhotheus*	Native
Not available	Unidentified Sculpin Fry	*Cottus spp.*	Native
Not available	Speckled Dace	*Rhinichthys osculus*	Native
Not available	Longnose Dace	*Rhinichthys cataractae*	Native
Not available	Unidentified Dace Fry	*Rhinichthys spp.*	Native
Muq'uc	Bridgelip Sucker	*Catostomus columbianus*	Native
Tite'wxc	Chiselmouth	*Acrocheilus alutaceus*	Native
Qiyex	Northern Pike Minnow	*Ptychocheilus oregonensis*	Native
Not available	Redside Shiner	*Richardsonius balteatus*	Native
Lixli•ks	Smallmouth Bass	*Micropterus dolomieu*	Exotic/Introduced

Status and Importance of Hé-yey

There are numerous references and anecdotes referring to the historical abundance of Hé-yey (steelhead (*Oncorhynchus mykiss*)) within the Big Canyon Creek drainage. Comparisons of electrofishing data sets for the Big Canyon Creek and Potlatch River basins reveal that juvenile steelhead capture densities observed within the Big Canyon Creek watershed in 2003 and 2004 were as high or higher than those noted within concurrent electrofishing surveys of the productive Potlatch River basin. The Technical Recovery Team for this area recognizes that within the Snake River Basin, the Lower Clearwater River and its tributaries are among the few areas with predominantly wild steelhead production and limited hatchery influence (2006 NOAA LOID/BOR BiOp). Significantly, wild Hé-yey of the Lower Clearwater basin have seemingly adapted to survive abnormally warm water temperatures. Juvenile Hé-yey densities have been captured within Big Canyon Creek monitoring sites in which summer water temperatures of 28.4º C (83º F) were recorded. In light of current global climate forecasts, a robust population of steelhead possessing the ability to survive such adverse water temperatures would ostensibly be of great importance to the region.

Habitat Condition

Historically, vegetation within the Big Canyon watershed may have been dominated by grass communities with mixed shrubs. Cooler north-facing slopes possibly consisted of ponderosa pine with a shrubby under story. Wetland areas are thought to have been grass and forb-dominated with large communities of camas, a culturally significant plant to the Nimiipu. The riparian areas were likely composed of quaking aspen, black cottonwood, black hawthorn and red alder. Remnants of these types of vegetative patterns remain, but conditions prior to contact are largely speculative, relying heavily on local knowledge and backwards reconstruction from current conditions and impairments. Logging, grazing, irrigation and dryland agriculture have all contributed to an altered hydrological regime within this system, potentially altering the habitat dramatically; thus, the cumulative effects may be greater than currently understood.

Because of the significant cool water inputs and sections of intact riparian vegetation remaining throughout the stream system, it is possible to see the potential of this resource and reasonable to suspect that, with restoration and protection efforts, this drainage could fully return to its regional role as a vital part of sustaining anadromous and resident fish populations. Comparisons of electrofishing data sets for the Big Canyon Creek and Potlatch River basins reveals that juvenile steelhead capture densities observed within the Big Canyon Creek watershed in 2003 and 2004 were as high or higher than those noted within the productive Potlatch River basin during that time. Both the Clearwater Subbasin Management Plan and Assessment model (2003) state that Big Canyon Creek has moderate to high potential productivity, while the Salmon and Steelhead Recovery Plan for the lower mainstem Clearwater river shows that the majority of reaches in the Big Canyon watershed have moderate to high intrinsic spawning and rearing potential. The Clearwater Subbasin Inventory lists Big Canyon Creek as having fair A-run steelhead habitat conditions and identifies limiting factors to include: temperature, flow, sediment, watershed disturbances and habitat degradation.

Restoration Potential

It will be a long-term investment to rehabilitate the Big Canyon Creek watershed to the point of significantly increasing anadromous and resident fish species populations. To this end, the Tribe and the District have made significant scientific and social advances in fostering an atmosphere where there is both the technical expertise and community support for restoration activities.

A number of physical, and social, aspects of the Big Canyon Creek watershed allow for a great deal of potential in rehabilitating significant quantities of salmonid spawning and rearing habitat. As the watershed is characterized by relatively inaccessible streams flowing through deep and steeply sloped canyons; floodplain structure, levee, and road building development is limited to short lengths of valley along the lower stream reaches. As such, a very high degree of floodplain connectivity exists throughout the length of these streams. Fragments of fair to very good channel complexity and riparian corridor condition, along with numerous springs and micro-wetlands, exist along the major streams of the watershed. This, in combination with cooperative attitudes expressed by several key landowners, provides a strong foundation for achieving functional, self-healing watershed conditions.

Contribution Toward the Future

A meaningful investment in the rehabilitation of these waterways will promote the continued existence of resident and anadromous fish species. The sub-population of Hé-yey (*O. mykiss)* that utilize the Big Canyon Creek watershed requires the same conditions that other salmonids throughout this area require: cool, clean water without excessive levels of fine sediment and ,stream discharge quantity adequate for migration, spawning and rearing activities. The restoration activities specified in this strategy may help in the following ways:

- Address sediment sources: reduces the amount of sediment delivered into the stream, increasing quality and quantity of steelhead spawning habitat , juvenile steelhead cover and macroinvertebrate production

- Riparian corridor plantings: reduces stream temperature by increasing riparian canopy cover, filters sediment, livestock waste, herbicides, pesticides and road surface runoff, offers potential source of woody debris/cover and adds nutrients and food sources to stream system

- Riparian corridor fencing and development of off-site watering: reduces cattle access to streams, reducing soil compaction, trampling and removal of riparian area vegetation, helping to decrease sedimentation and improve water quality

- Stream crossings: addresses fish-passage issues and restores connectivity to streams, increasing access to spawning and rearing habitat

- Increase channel stability: increases habitat complexity, reduces width-depth ratios, increases riparian corridor stability/longevity and increases rheic to hyporheic flow ratios.

- Hé-yey (*O. mykiss)* in the Lower Clearwater River Basin, including the Big Canyon Creek system, are seemingly adapted to natural environmental conditions which include frequent droughts and relatively high summer temperatures. In the face of climate change, steelhead of the Big Canyon Creek watershed could potentially harbor genetic traits essential for survival of steelhead in a warmer, drier climate.

CHAPTER

3

Geographic and Historic Context

This section offers an overview of historic and present conditions within the Big Canyon Creek drainage. It outlines some of the challenges present in the valley that stem from historic uses and management as well as some of the unique features that make it an excellent candidate for rehabilitation.

Location

Big Canyon Creek, a fourth order tributary, joins the Clearwater River approximately two miles north of Peck, Idaho at river mile 35.3 (Figure 3). Located entirely within the Nez Perce Indian Reservation, and encompassing portions of Lewis, Nez Perce, and Clearwater Counties, the watershed drains approximately 227 square miles. Primary tributaries include Little Canyon, Six Mile, Cold Springs, Nichols, and Posthole Creeks. Little Canyon Creek is the most substantial tributary to Big Canyon Creek, and is formed by the confluence of Long Hollow and Holes Creeks.

The Big Canyon Creek watershed encompasses 141,999 acres. Clearwater, Lewis, and Nez Perce counties account for approximately 5.2%, 73.2%, and 21.6% of this area, respectively. Eighty-eight percent of the basin is privately owned, eight percent is tribally owned, and four percent is public land.

Additional information and maps are included in appendix B – Watershed Profile.

Demographics

Ancestors of the Nimiipu (Nez Perce Tribe) were the first inhabitants of the Palouse region, including the Camas Prairie (Black etal. 1997). Archaeologists theorize these people arrived in the area 20,000-30,000 years ago; Nez Perce legends describe species that became extinct during the last ice age (Slickpoo and Walker 1973). European settlement in the area followed discoveries of gold and other minerals in the 1860s.

Due to its low population density (approximately 6.4 – 8.4 people per square mile based on data for Lewis County, Idaho), the Big Canyon Creek watershed is classified as rural (U.S. Census Bureau 2000). The principal population centers within the watershed are the towns of Nez Perce (population 542) and Craigmont (population 453). Other towns located within the watershed include Peck and Mohler with populations of approximately 160 and 20, respectively. No town within the watershed is classified as urban (population greater than 1,000). The school systems of Craigmont, Nezperce and Orofino include grades K-12. Education for grades 1-6 is available in Peck, with 7-12 located in Orofino.

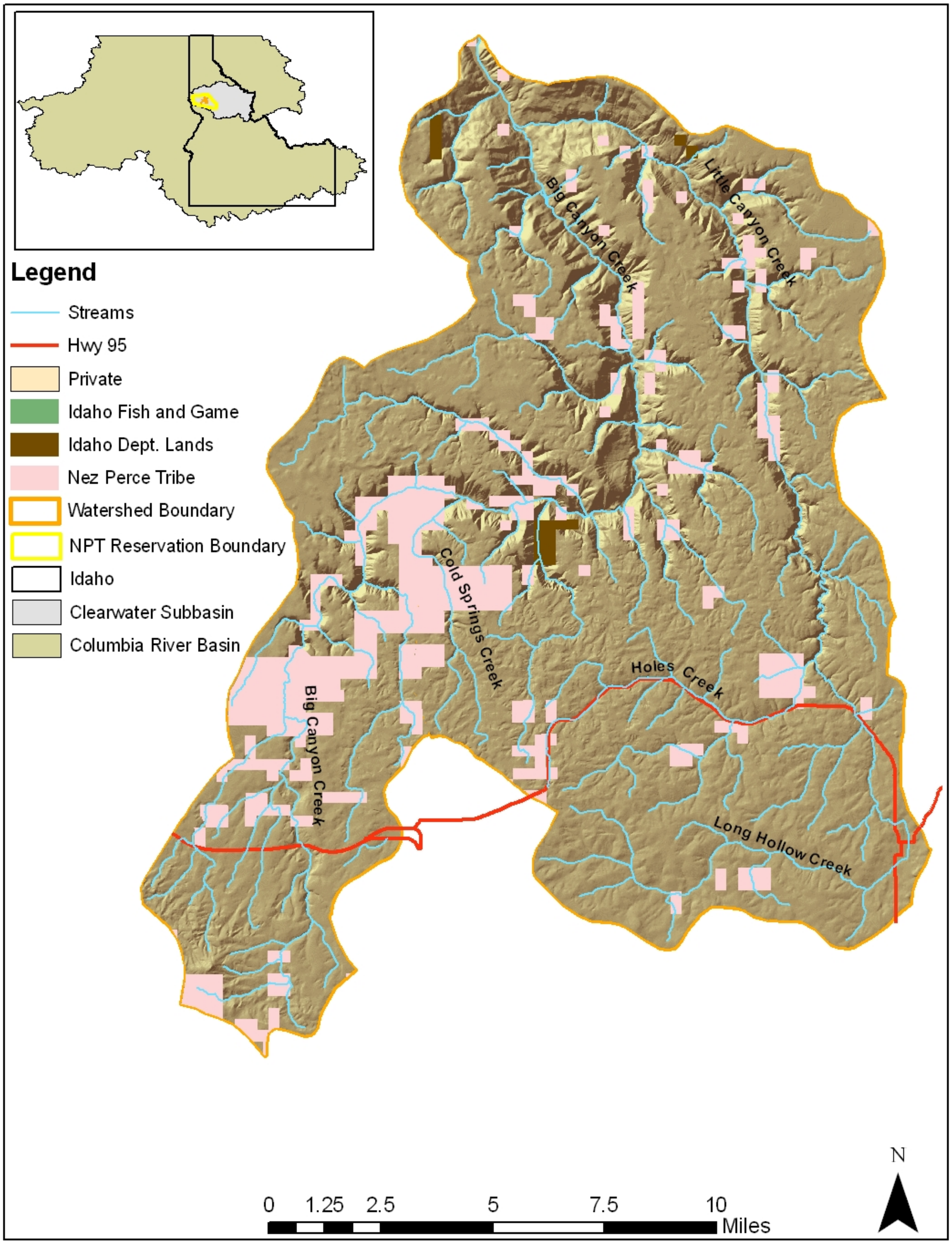

Figure 3. Big Canyon Creek location map.

Ownership

The majority of the land within the watershed is privately owned (88 %). Table 3 identifies the extent of ownership while Figure 3 illustrates ownership locations.

Table 3: Big Canyon Creek watershed ownership.

Ownership	Acres	Percentage (%)
Private	124,959	88
Nez Perce Tribe	11,360	8
Federal	5,112	3.6
State Lands	568	0.4
Total	141,999	100

Climate

The Big Canyon Creek watershed has a maritime climate pattern characterized by cool moist winters and warm dry summers. This climate is typical for much of the Pacific Northwest and Columbia Basin, and results from air masses and storm systems moving inland from the Pacific Ocean. Average annual precipitation generally increases with elevation, ranging from approximately 18 inches in the lower and central portions of the watershed to about 27 inches in the higher elevation areas. Such an elevation gradient in precipitation is also typical of the region. Climate data stations located at Nezperce, Idaho and Dworshak National Fish Hatchery (NFH) near Ahsahka, Idaho best represent the climatic conditions in the upper and lower Big Canyon Creek watershed, respectively.

Climate in the watershed is characterized by cool most winters and warm, dry summers. Summer high temperatures above 90° Fahrenheit (F) are common in the valleys while temperatures in the highs 70°s are common in the uplands. January low temperatures average 24° F in the valleys and 18° F at higher elevations.

Table 4. Summary of climatic conditions recorded at Nezperce, Idaho and Dworshak NFH (Natural Resources Conservation Service 2000).

Climatic Conditions	Nezperce, Idaho[1]	Dworshak NFH[2]
Avg. Annual Temperature (°F)	45.6	51.8
Avg. Temperature – January (°F)	27.7	31.8
Avg. Temperature – July (°F)	64.5	72.6
Avg. Total Annual Snowfall (inches)	51.3	14.0
Growing Season (# days)[3]	96	159

[1]Period of record is 1965-1990
[2]Period of record is 1967-1990
[3]Based on 80% probability of temperatures 32°F or greater

Topography

Elevations within the Big Canyon Creek watershed range from 994 feet above mean sea level (MSL) near the stream mouth to 4,245 feet above MSL at Mason Butte.

The topography of the Big Canyon watershed is characteristic of other watersheds occurring in the lower Clearwater region. Its features are typical of the rolling dissected basalt plateau occurring downriver from Orofino, Idaho. Steeply walled basaltic and granitic canyons border moderate to low gradient streams, giving way to gently sloping uplands at the higher elevations.

Geology and Lithology

The watershed is within the Columbia Plateau Geomorphic Province. Bedrock consists of Tertiary age Columbia River Basalt. The lower two miles of the canyon near the Clearwater River confluence are associated with Idaho Batholith, Precambrian age metamorphic rocks of the Wallace Formation and Jurassic age metamorphic meta-diabase. This highest point in the watershed, Mason Butte, formed in Cretaceous Age disintegrating granitic rock of the Idaho Batholith. The upper plateau area is mantled by Quaternary age Palouse loess. Soils are cut over forest and prairie soils derived primarily from wind blown silt loess with alluvium and colluvium.

Water Resources, Use and Hydrology

Water Quality

Beneficial use designations for Big Canyon Creek include primary and secondary contact recreation, domestic and agricultural water supply, coldwater biota, and salmonid spawning. The creek was identified as a first priority stream segment through the Idaho Agriculture Pollution Abatement process, suggesting significant water quality impacts from agricultural practices.

Water Quantity

No information is available on actual rather than permitted/potential water use within Idaho. Data regarding potential water use was derived from Idaho Department of Water Resources (IDWR) records on both water rights and adjudication claims filed under the Snake River Basin Adjudication (SRBA) process.

The amount of water available under a water right may be limited by either the rate (cubic feet per second - cfs) at which water may be drawn under the right, the volume (acre foot per year - AFY) allowed to be taken, or both.

Groundwater and surface water use in the Big Canyon Creek watershed is minimal. Only 17 land sections within the watershed are impacted by legal water use. One land section at the mouth of Big Canyon Creek is impacted by both surface and groundwater use. Seven and nine additional land sections are impacted solely by groundwater or surface water use, respectively.

Water Resources

Surface Water

Surface water flows are typically largest in March or April, decreasing significantly in the summer months. Sections of the watersheds two largest streams, Big Canyon Creek and Little Canyon Creek, have been noted to flow subsurface during summer baseflow periods. Approximately nine miles of Big Canyon Creek is dewatered annually while a much smaller segment of Little Canyon Creek (~ ½ mile) has been noted to be dewatered under low flow conditions. Within the middle reach of Big Canyon Creek (assessment unit #2), summer rheic streamflows typically cease two and one half miles upstream of Posthole Canyon and resume three miles below Sixmile Canyon.

Ground Water

The Big Canyon Creek Watershed overlies the Clearwater Plateau ground water system. The aquifer is recharged by the area's streams where permeable basalts are exposed to stream channels and by precipitation percolating through fractured bedrock in upland areas.

The quality of ground water within the Clearwater Plateau flow system is reported as suitable for domestic use, though levels of dissolved cadmium and lead occasionally exceed primary drinking water standards. Also, concentrations of dissolved manganese sometimes exceed the recommended level (NPSWCD, 1995)

This ground water system is susceptible to contamination for the following potential agricultural sources (listed in order of priority):

- feedlots
- hazardous material handling
- pesticide handling and use
- surface runoff
- fertilizer application
- septic tank systems
- domestic wells
- silvicultural activities

Hydrology

Hydrologically, less than 4% of the Big Canyon Creek watershed is dominated by spring snowmelt runoff patterns, with the remaining 96% subject to rain-on-snow events during the winter and spring (WSU, 2001). Spring snowmelt patterns are only evident in upper Big Canyon and Coldsprings areas of the watershed.

Limited discharge data (< 20 observations since 1965) is available from gauging stages located at the mouth of Big Canyon Creek (13341140 and 13341141). Mean annual discharge for Big Canyon Creek is estimated at 96 cfs. A flow of 8,360 cfs was recorded near the mouth of Big Canyon Creek during a catastrophic rain-on-snow driven flood event in January 1965 (Inter-fluve, Inc. 1994). Approximately 3,400 cfs was discharged from Little Canyon Creek during the same event (Lewis Soil Conservation District and Clearwater Soil and Water Conservation District, 1988). The report stated that twenty-nine years after this event, the 1994 Inter-fluve, evidence of the 1965 flood event could still be seen in the form of:

- A valley floor generally devoid of fine sediment
- Absence of a single defined channel with vegetated banks
- Absence of a distinct floodplain surface

- Channel pools and bars larger than would be likely from the current hydrologic regime
- Large-scale relic depositional bars in locations away from the current channel

Major drainages in the watershed include Little Canyon, Cold Springs Creek, Posthole Canyon, Sixmile Canyon and Nichols Canyon. Little Canyon Creek enters Big Canyon Creek approximately two miles upstream of the Clearwater River confluence. Big Canyon Creek enters the Clearwater River as the river flows westerly towards its confluence with the Snake River at Lewiston, Idaho.

Typical peak runoff events occur in March or April from a combination of snowmelt and rain (NPSWCD, 1995). Stream flow measurements recorded two miles upstream of Peck, Idaho ranged from 459 cfs in March 1993 to 3 cfs in August 1993. The magnitude of peak flows within Big Canyon Creek results in substantial bedload movement of cobble and boulder-sized particles.

The hydrological regime of a watershed is the foundation for all stream function. Significant land cover alterations throughout the drainage have resulted in dramatic changes to watershed runoff and peak discharge following storm events. The USDA NRCS TR-20 computer model was utilized to recreate historic watershed conditions for the Big Canyon Creek drainage. Based on historic data the peak discharge for a 5 year, 24 hour storm was calculated at 850 cfs for a total discharge volume of 1,265 acre feet. The same storm under present conditions has a calculated peak of 2,980 cfs, delivering a total volume of 3,720 acre feet of water. Figure 4 represents the estimated difference in discharge between historic and present conditions in Big Canyon Creek during a 5 year storm event (NPSWCD, 1995).

Current stream conditions reflect the dramatic changes in hydrological response illustrated in figure 4. The dramatically increased quantities of runoff delivered over decreased intervals of time decrease stream channel and riparian corridor stability. Such diminishment may be considered self-perpetuating in that dissipation of flood-water energy is reduced as channel stability and riparian vegetative density decreases, leading to further degradation of stream channel and riparian corridor conditions. Diminished riparian vegetation density decreases the ability to absorb surface and groundwater runoff, further increasing flood-water energy. A diminished riparian buffer also impacts the ability to filter the increased quantities of fine sediment carried by intense run-off events as well as reducing surface and groundwater absorption. The reduced run-off absorption rate attenuates spring-flow intensity while diminishing the quantity of groundwater stored for summer recharge. The subsequently diminished summer baseflow conditions are exacerbated through increased substrate column permeability provided by active aggregations of coarse bedload particles deposited through severe flow events. Thermal impacts upon the low volumes of rheic flows remaining are exacerbated through diminished levels of canopy cover provided by the disturbed riparian corridor.

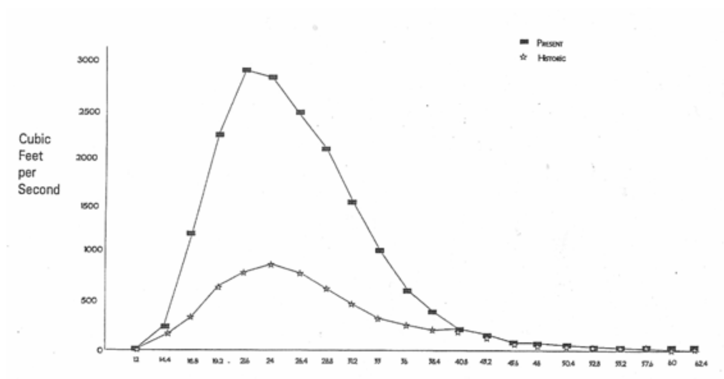

Figure 4. Hydrograph.

Wildlife Species

The varied topography and diverse vegetation with an abundance of edge habitat throughout the basin result in ample use by a variety of wildlife species.

Birds

Upland game bird species residing in this area include chukar, ring-necked pheasant, ruffed grouse, dusky grouse, gray partridge, mourning dove, wild turkey, and California quail. A variety of non-game species also utilize this area including: lazuli bunting, Bullock's oriel, lark sparrow, redwing blackbird, spotted sandpiper, red-eyed vireo, willow flycatcher, yellow-breasted chat and many other passerines; bald eagle, osprey, and many other raptors.

The upland game bird population is limited by the amount of available nesting cover in the watershed. Best Management Practices (BMPs) which increase available undisturbed herbaceous cover would enhance upland bird populations. Forest grouse and turkey would benefit from improved riparian management. BMPs, including grazing management, channel vegetation, and fencing would have the greatest impacts on improving these bird species and their habitat.

Mammals

Big game species found in this area include both white-tailed and mule deer, elk, black bear and mountain lion. Non-game species utilizing the basin include cottontail rabbit, raccoon, beaver, muskrat, mink, red fox, coyote and bobcat.

Sensitive Species

Lewis, Nez Perce, and Clearwater counties have a significant list of sensitive species, including plants, mammals, birds, amphibians, reptiles, and invertebrates. Most significant to the scope of the restoration strategy are the fish species, including: Hé-yey (*Oncorhynchus mykiss* (Steelhead)), Nacó'x (*Oncorhynchus tshawytscha* (Chinook Salmon)), Wawá·tam *(Oncorhynchus clarki lewisi* (Westslope Cutthroat Trout)), and the recently naturalized K'állay (*Oncorhynchus kisutch* (Coho Salmon)). For a complete listing of species, please see Appendix B. Eight "sensitive" plant species are identified in the Idaho Conservation Data Center (ICDC) as occurring within the watershed, and one additional plant species within one mile of the watershed boundaries. Steelhead (*Oncorhynchus mykiss*) are the only ESA listed fish species commonly found within the watershed and are found throughout most of the major tributaries. Chinook salmon (*Oncorhynchus tshawytscha*) and bull trout (*Salvelinus confluentus*) have been observed near the mouth of Big Canyon Creek (Bureau of Land Management 2000) but probably only use the area occasionally during migrations through the Clearwater River.

Cultural Resources

Big Canyon Creek was extensively used by prehistoric and historic cultures (NPSWCD, 1995). Few known cultural resource sites exist in the watershed area. However, a thorough archaeological survey and analysis has not been completed. A potential for encountering unknown cultural resource sites during planning and practice construction exists. Practices involving ground-disturbing activities (i.e. structural erosion control practices) have the greatest potential to impact cultural resources.

As plans are developed and locations of practices considered ground disturbing are identified, the Tribal and State Historic Preservation Officers will be contacted for locations of known cultural resources.

Land Cover

Land cover within the watershed, as displayed in Table 5, is divided into twelve categories according to the land cover GIS data provided by the Nez Perce Tribe – Land Services. Small grains is the largest land cover type at 87,775 acres (76 % of the watershed).

Table 5. Big Canyon Creek land cover extent.

Cover Type	Acres	%
Bare Rock	1,533	0.5
Bare Soil	6,630	3.8
Brush	16,947	6.5
Deciduous Forest	6,617	1.4
Evergreen Forest	7,180	1.1
Grassland	11,072	6.8
Mixed Forest	4,736	2.1
Pasture/Hay/Alfalfa	669	0.4
Small Grains	87,775	76.1
Urban	455	0.5
Water	51.9	<0.1
Wetlands	1,313	0.8

Black et al. (1997) describe the historic distribution of vegetation throughout the Camas Prairie as likely composed of forest communities on higher elevation mountains and ridges, and grasslands in the canyons and lower elevation plateaus. This general pattern is still seen today, although much of the former grassland areas have been converted to agricultural use.

The probable historic land cover according to Black et al. (1990) and corroborated by US Forest Service ICBEMP data was comprised of Idaho fescue (*Festuca idahoensis*) / bluebunch wheatgrass (*Pseudoregnevia spicata*) communities throughout the uplands. On the northern slopes, snowberry (*Symphori-carpos* spp.), black hawthorn (*Crataegus douglasii*) and rose (*Rosa* spp.) could be found. The wetland areas were dominated by camas (*Camassia quamash*), forbs and grasses and the riparian areas featured plains cottonwood (*Populus deltoids*), quaking aspen (*Populus tremuloides*) and red alder (*alnus rubra*). Forested areas were composed of ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*) with an understory of oceanspray (*Holodiscus discolor*), ninebark (*Physoocarpus malvaceus*), and serviceberry (*Amelanchier alnifolia*).

Riparian Areas

A riparian zone is the area immediately adjacent to a lake, stream, river or other body of water. Riparian vegetation is that which is located within the riparian zone, whose success is dependent upon their roots reaching the water table at some point in the year.

The magnitude, duration and frequency of stream flow are one of the most important factors influencing the riparian area. Riparian systems are dynamic, and condition of vegetation on a site is only one attribute of riparian health. Riparian health should be evaluated in terms of physical and biological function in relation to the entire watershed (Gephardt, 1992).

It is unlikely that soil and water conditions at many riparian sites will remain stable. Erosion resistance is characterized by vegetation condition as it relates to soil and substrate stability and texture. Vulnerability of the area or susceptibility to change may be influenced by external activities. The riparian area has been subject to extreme hydraulic events as well as intensive grazing and forest harvesting activities. Grazing activities contribute to removal of streamside vegetation, stock trails resulting in bare soil, and streambank instability (NPSWCD, 1995).

Wetlands

Wetlands in the Big Canyon Creek drainage are typically associated with Aquolls, Riverwash and Aquents, Bridgewater-Joseph, Wilkins silt loam, and Westlake-Latahco complex soil types. These soils share similar features; they are hydric because of saturation, naturally supportive of woody vegetation, and are seasonally ponded or flooded.

Wetlands within the Big Canyon Creek watershed have been degraded through grazing, roads, timber harvest, and draining. There is very limited knowledge about wetlands within the watershed. Some important functions of wetlands in a watershed may include, but are not limited to: water quality improvement, flood attenuation and desynchronization, groundwater recharge and discharge, and fish and wildlife habitat.

Water Quality Improvement: Big Canyon Creek is listed as water quality impaired on the State of Idaho's 303(d) list. As agriculture is the predominant land use, the location and assessment of wetlands for restoration and protection is essential for the filtration of non-point source pollution before it enters the tributaries to Big Canyon Creek.

Flood Attenuation and Desynchronization: Land management practice for agricultural and timber purposes have significantly reduced flood retention in the headwaters of Big Canyon Creek watershed, resulting in flash floods. Wetland location in the watershed may significantly affect water storage and, subsequently, flooding. For example, wetlands in the upper watershed may alleviate downstream flooding by intercepting, storing, and delaying surface runoff, and reducing peak flows. Subsequently, the lower flow rate improves the biogeophysical characteristics of adjacent streams. Wetlands in the lower reaches of the watershed, such as the floodplain wetlands along Big Canyon Creek, provide storage for water overtopping the banks, and are therefore effective at reducing flood episodes. Mid-elevation wetlands may be most effective at desynchronization, since these wetlands are far enough upstream to create delay, yet low enough in the watershed to collect significant amounts of water.

Groundwater Recharge and Discharge: Land use management practices and wetland drainage have had negative impacts on water storage in the upper reaches of the Big Canyon Creek watershed, which has reduced the seasonal duration of streamflow in tributaries to Big Canyon Creek. Groundwater recharge functions of headwater and floodplain wetlands augment late summer stream flows, which are vital to spawning fish.

Fish and Wildlife Habitat: A-Run steelhead spawning and rearing activity occurs within all perennial tributaries to Big Canyon Creek. Wetlands connected to streams containing these ESA listed fish may provide winter rearing habitat. In addition to directly providing habitat, wetlands can indirectly support steelhead and other fish species through the functions explained above.

Roads

Of concern within the Big Canyon drainage are the impacts of increased sedimentation and stream channel modifications on salmonid spawning and rearing habitat as a result of roads and road construction. Road density of the Big Canyon Creek drainage averages 1.1 miles road/square mile (Figure 5). Moderate to high road densities can contribute to slope failure and mass wasting events, surface erosion, altered channel morphology and changes to runoff characteristics while improperly designed road crossings can impede salmonid migration.

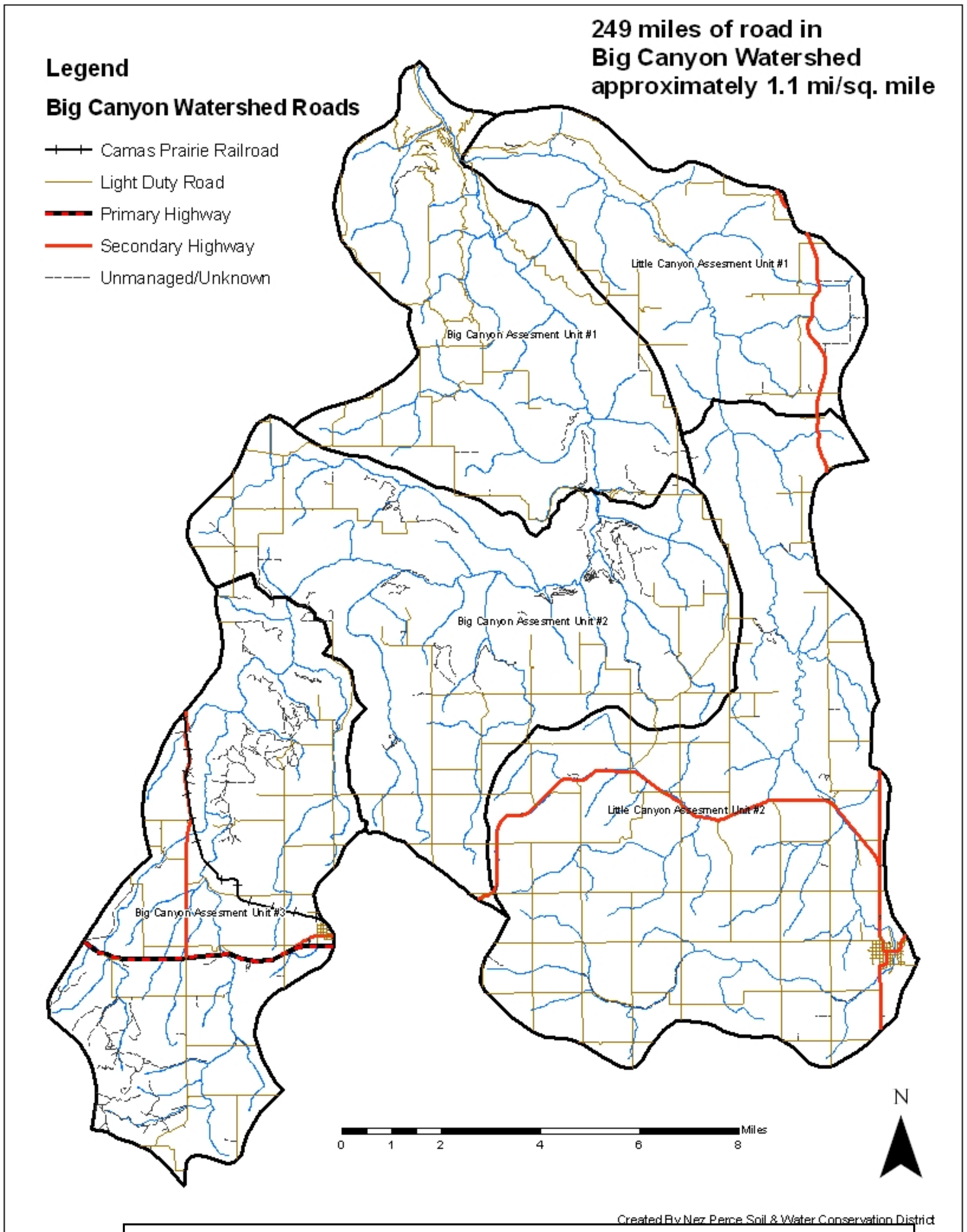

Figure 5. Road density in the Big Canyon Creek Watershed.

Regardless of origin, excessive sedimentation can affect salmonids at virtually all stages of life, reducing quality of and access to spawning habitat, reducing available oxygen to incubating eggs and rearing juveniles and contributing to elevated water temperatures (Furniss, et al., 1991).

Proper road placement is critical to minimizing damage of salmonid habitat. Placing roads to fit the landscape may help to avoid sensitive areas; roads located on ridgetops generally having the lowest impact on stream function. Should a road be placed near a stream it is crucial to keep stream crossings to a minimum while avoiding low areas, areas requiring cut-and-fill operations, and areas where side cast materials may enter the stream. Construction must be scheduled during times identified as non-critical to salmonid migration or spawning in order to minimize impacts.

Forestland

Forestlands occupy the higher elevations along the headwaters as well as shaded aspects of the canyon slopes. Dramatic topographical changes occur between the upper watershed on Mason Butte and the City of Peck near the mouth of Big Canyon Creek. Rolling tracts of crop and timberland are present along the headwaters while the mid-drainage topography is comprised of gently rolling to moderately steep uplands along with very steep canyon breaks which continue into the lower watershed. Moderate to heavy livestock grazing occurs in the upper and middle portions of the watershed, respectively.

Predominant forestland vegetative communities include ponderosa pine/snowberry, Douglas-fir/snowberry, and Douglas-fir/ninebark with a minor amount of the grand fir/twinflower habitat type in the upper portion on northeast aspects of Mason Butte. The forestland condition and level of management varies with ownership. Most of the ownership in the upper and middle portions is split between the Nez Perce Tribe and private non-industrial. The lower portion is primarily private non-industrial ownership. Nez Perce Tribe forestland is actively managed for timber production. Private non-industrial lands are unmanaged other than occasional logging, which is typically done without professional forestry assistance. Intensive livestock grazing occurs under both ownerships.

The economies of Lewis and Nez Perce Counties have long been driven by natural resource extraction, especially following the advent of mining by Anglo settlers in the mid-1800’s (Black, et al. 1998) and, almost inevitably, resource extraction involves local water bodies. Timber harvest has occurred with varying degrees of severity within headwater reaches of the Big Canyon Creek drainage; certain forest management actions imparting greater degrees of impact than others with regards to stream processes.

Rangeland

In leaving the uplands, regional streams generally descend into U-shaped canyons with steep walls. Many of these canyon areas are classified as rangelands. Big Canyon’s rangeland areas, including it’s relatively inaccessible canyon floor, are moderately to heavily grazed.

Gwin, Kettenbach, Meland, and Riggins, the major rangeland soils, are well drained and contain large amounts of rock fragments which limit their cropland and grazing land use. Lack of grazing management during the wet periods can result in compaction and downslope soil movement on steep slopes.

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Livestock grazing, especially of cattle, has altered or eradicated native vegetation on much of our rangeland areas previously grazed and browsed by wildlife (Platts, 1991), particularly within water-rich riparian areas. Erosion and soil compaction arise in areas where livestock are confined, affecting terrestrial and aquatic productivity, while increased levels of in-stream fine sediment affects spawning and rearing habitat of salmonids and other fishes. Rotation schedules, off-site watering, riparian area and fencing are a few tools available to help dissipate the effects of grazing near salmon-bearing streams.

The majority of rangeland acres occur on steep canyon walls adjacent to Big Canyon Creek and its tributaries on south facing aspects of 40 to 90 percent slopes. The rangeland is in fair to poor condition due to livestock grazing pressure over many decades. A deteriorated range condition has resulted in predominantly annual grass cover as well as other exotic weed species. The potential carrying capacity of rangeland in its natural condition varies between 1.5 acres per animal unit month (AUM) on loamy soils, to 5 acres per AUM on shallow soils. The current carrying capacity of the rangeland is only 25% of potential production, or between 0.4 to 1.25 AUMs.

Livestock grazing occurs predominantly in the spring and summer months. Some rangeland units are grazed for a twelve month period. Range improvement practices such as fencing and water developments are often limited by the stony soils and steep slopes.

Noxious weed invasion onto rangeland has drastically reduced forage production. Aggressive weeds of concern include yellow star thistle and cheatgrass brome. Invading weeds have had a devastating effect on rangeland production because of the inability to control them with conventional practices such as herbicides, range seeding, fencing and planned grazing systems.

The severe soil limitations and low production potential of rangeland cause costly range improvement practices to provide a very small return on the investment. Erosion concerns on rangeland are primarily ephemeral gully and streambank erosion. Streambank erosion may be a problem where livestock have direct access to streams for drinking water and crossings.

Cropland

Slopes utilized for cropland in the watershed range from 3-25%. Cropland soils on the upland areas include Nez Perce, Uhlorn, and Powwahkee, which were formed under prairie conditions, and Taney, Setters, and Southwick loams, which were originally forested but cleared of timber to allow for cultivation. The prairie soils are moderately well drained, however, the subsoil clay reduces permeability which results in springtime saturated soils and subsequent increases in soil erosion.

Cut-over soils, specifically the Taney soils, also have a fragipan subsoil characteristic which restricts water and root movement into the subsoil. Setters subsoils have a high clay content which also results in low water permeability. During wet periods, perched water tables in these soils move water laterally down slope, thereby producing sidehill seeps. Often, the naturally low pH of the cut-over soils is further depressed by the application of acidifying nitrogen fertilizers. For pH below 5.5, soil aggregation may also be decreased, leading to increased soil losses and sediment delivery.

The majority of cropland occurs on gentle to moderately steep slopes of loess covered basalt plateaus. The average annual precipitation varies across the watershed, ranging from 21 inches per year at Craigmont, to 25 inches per year at Orofino. Crops produced are primarily winter wheat, spring wheat, spring barley, spring peas, and lentils. Other crops produced include grass for seed production, canola, oats, garbonzo beans, and hay. The typical rotation includes a three year sequence of winter wheat, spring barley, and spring peas or set-aside.

Much of the cropland occurs on soils with fragipan characteristics. The resultant saturated moisture profile occurs during the December – March critical erosion period. Sediment loss from sheet, rill, and ephemeral gully erosion is accelerated under these conditions. Water permeability through the fragipan is very slow, delaying planting of spring crops. With extended wet soil conditions, compaction from spring farming practices occur, resulting in poor root penetration and slow infiltration and accelerating erosion potential.

About 48,874 acres (95% of the total cropland acres) are considered highly erodible (HEL) under the 1985 Food Security Act (FSA).

Pastureland

Pastureland within the Big Canyon Creek watershed includes approximately 3,500 acres of non-irrigated bottomland and upland soils adjacent to Cold Springs Creek, Posthole Canyon Creek, and other tributaries to upper Big Canyon Creek. Approximately 12% of the pastureland occurs on gently sloping bottomland soils susceptible to annual flooding.

Livestock operations in the watershed are typically moderately sized cattle operations, with a few horses, pigs, and sheep. Pasture fields are typically less than 20 acres and are usually grazed continuously during the year.

Forage vegetation is composed primarily of bluegrass, orchard grass, timothy, and smooth brome. These pasturelands are in fair to poor condition due to heavy grazing pressure, poor fertility management, and the subsequent invasion of weeds.

Pasturelands are generally located in close proximity to perennial streams and intermittent drainages. Riparian areas adjacent to excessively grazed pastures have experienced degradation through loss of protective woody and perennial grass cover. Excessive concentrations of livestock in riparian zones have resulted in the formation of stock trails and watering access points, exposing large areas of bare mineral soil. These streambank degradations result in the deposition of large quantities of soil into the stream channel while lack of protective vegetation along the channels results in increased channel erosion during runoff events. This diminishment of riparian vegetation also minimizes the interception and filtration of livestock waste concentrated within the pastures and adjoining streambanks.

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CHAPTER 4

Restoration Framework: Prioritization

This chapter presents a restoration philosophy followed by a detailed prioritization framework for ranking geographic areas within the watershed. The framework considers several aspects of watershed health including watershed processes and fish populations present, arriving at a prioritized ranking for restoration locations within the Big Canyon Creek watershed. Data collection methods are discussed in this chapter as well.

Restoration Philosophy

The restoration philosophy used for this report is a combination of those of the District and the Tribe. The District's restoration philosophy is to work in conjunction with local entities and land managers to enhance natural resources and their related ecosystems. The District supports a non-regulatory, voluntary approach to achieve restoration goals while promoting the wise use of natural resources within the watershed; the primary objective is implementation.

The Mission Statement for the Nez Perce Tribe Department of Fisheries Management states an overarching goal to "protect and restore aquatic resources and their habitats."

The working group supports these philosophies and expands on them by establishing a prioritized list of restoration activities in geographically specific areas.

When considering commitments to active restoration, the following situations should have priority:

- watersheds with higher fish densities should be considered to have priority over those with lower fish densities
- high-quality fish habitat that is disconnected from other habitat where fish are present should be reconnected

This approach ensures maximum benefit for effort expended. One fundamental point should be considered for management decisions, however:

- There will always be high priority restoration needs in lower priority areas

Regardless of an overall restoration strategy, the potential exists for restoration opportunities to present themselves in lower priority areas. Specific landowners or groups ready to take action or unique funding opportunities should always be considered by land managers as viable options, regardless of where they occur in order to safeguard crucial partnerships and relationships or to maintain momentum and support within the basin.

Assessment Units

While working toward establishing prioritized reaches for restoration, the working group considered several options for breaking the watershed into more easily-assessed geographical units, including the standardized 5th field Hydrologic Unit Codes (HUCs). In reviewing the data sets and prioritization objectives, the working group decided to define geographic management areas by using significant shifts in Hé-yey (*O. mykiss*) density (figure 7). These geographic management areas or assessment units (AUs) are listed in Table 6 and illustrated in figure 6. Appendix C provides descriptions of each AU.

Big Canyon and Little Canyon Creeks both contain dewatered stream segments, where subterranean flow occurs during the summer months due to seasonal water flow variability (Craig Johnson, personal communication, 2001).

Historical data suggests that Big Canyon Creek is a top producing A-run steelhead trout (*Oncorhynchus mykiss*) spawning area. The timing of steelhead migration, spawning, as well as smolt out migration from Big Canyon Creek occurs earlier in the season (November – May), and does not overlap with the low flow period of July – September (Johnson, 2001). Due to this spatial variability, the subterranean flow section of Big Canyon Creek presents no barrier to steelhead passage. The BLM contracted Interfluv Corporation to assess the ground water situation as well as any construction possibilities in the area in question. Their recommendation was that any effort spent on Big Canyon would be better directed toward other instream concerns rather that on the area where the subsurface flow occur (Johnson, 2001).

A 17 km dewatered stretch falls within the second Asessment Unit in Big Canyon Creek. Because of the lack of instream flow during the survey season, no data was collected to support three of the four ranking parameters within the prioritization framework described in the following pages. Therefore BC2 was not ranked, receiving a score of N/A, or Not Applicable; this achieves the Interfluv recommendation to direct restoration efforts toward areas with surface flow.

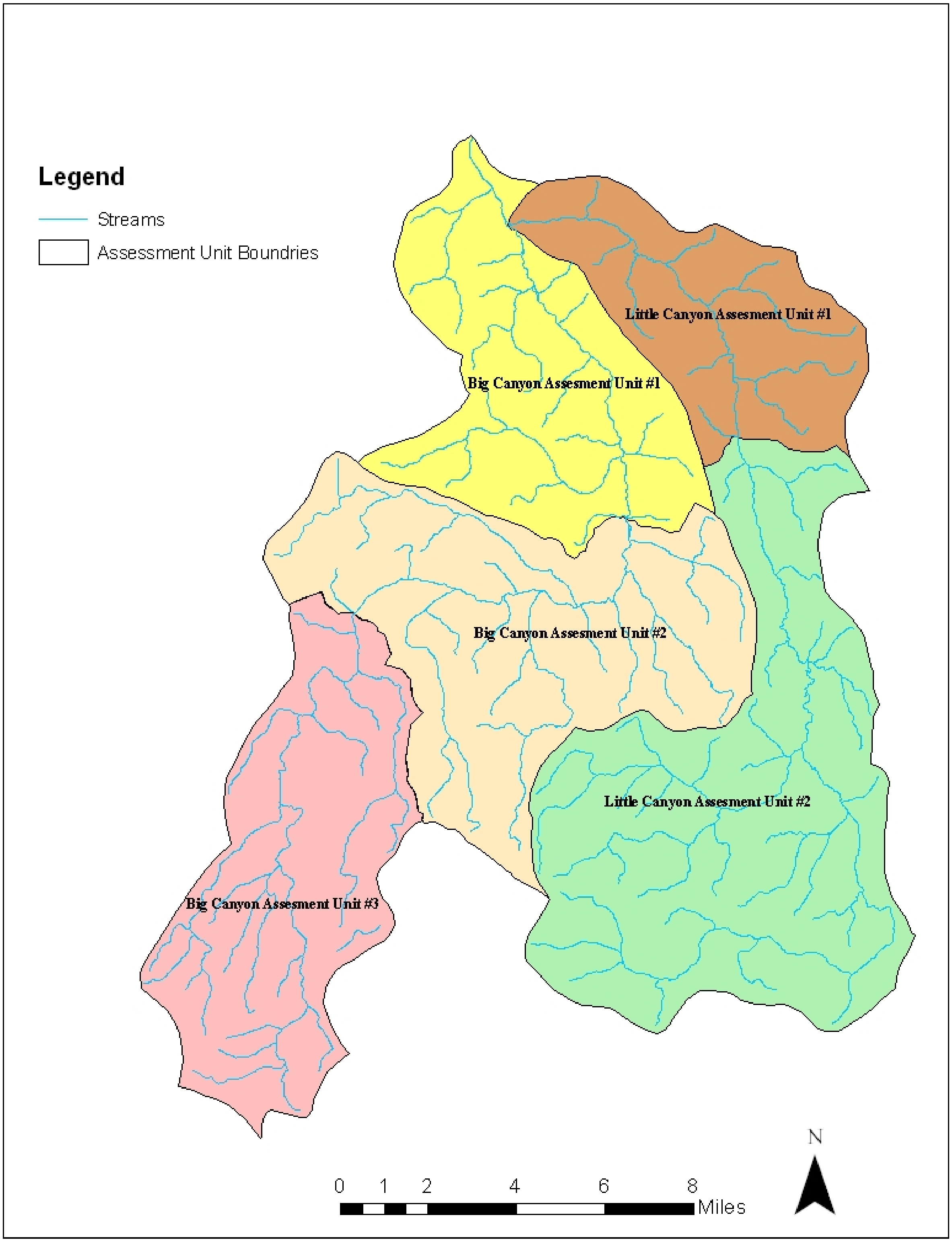

Figure 6. Big Canyon Creek Assessment Units.

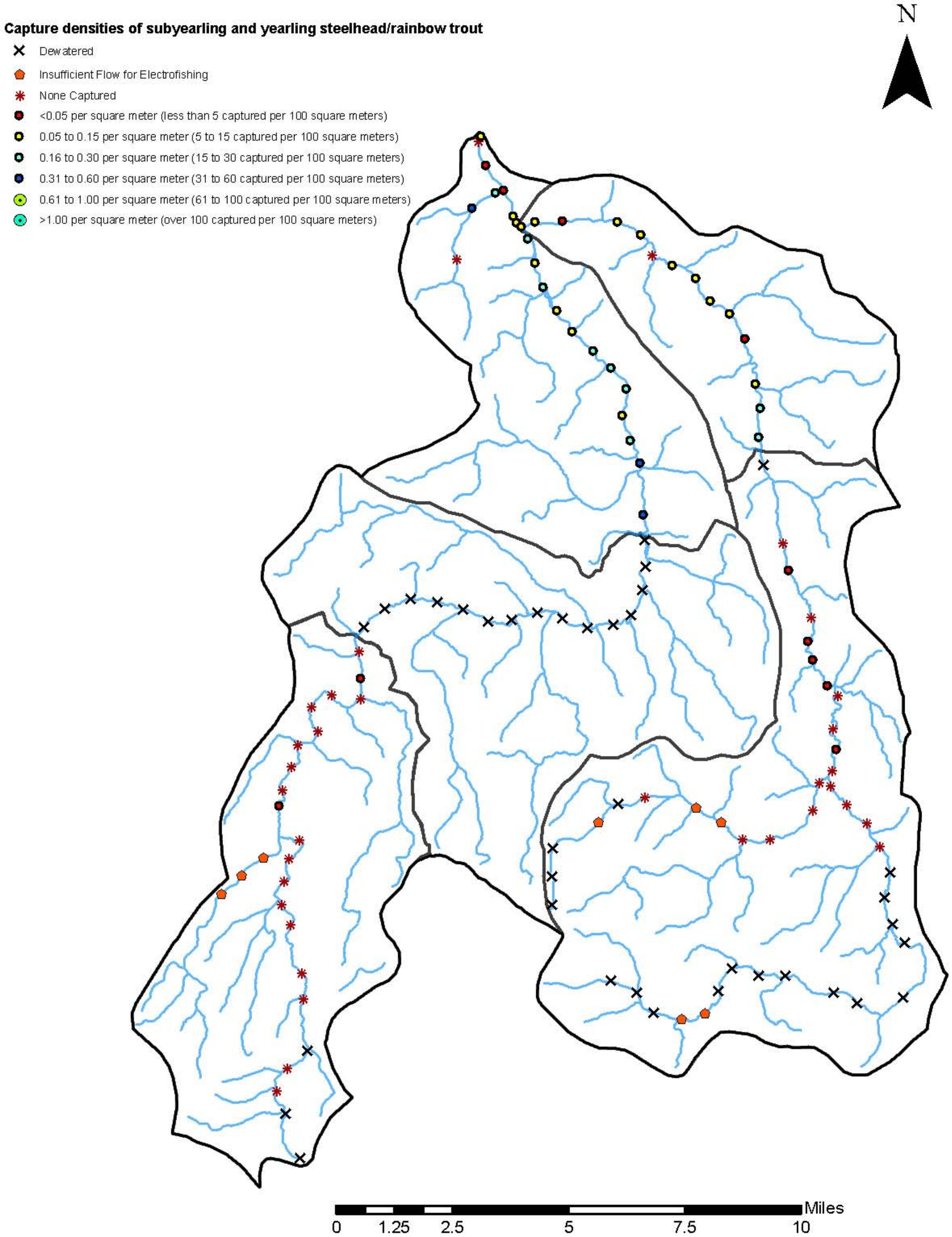

Figure 7. *O.mykiss* density distribution.

Table 6. Big Canyon Creek Assessment Unit descriptions.

Assessment Unit Name	Assessment Unit Code	Location	Description
Big Canyon Creek Assessment Unit 1	BC1	Km 0.0 to km 16.5	Below 15 km dewatered segment. Has high juvenile *O. mykiss* densities.
Big Canyon Creek Assessment Unit 2	BC2	Km 16.5 to km 45.5	Includes significant dewatered segment. Unconfined, unstable channel.
Big Canyon Creek Assessment Unit 3	BC3	Km 45.5 to headwaters	Diminished flow, increased turbidity. Fragmented, low-density *O. mykiss* with resident age-class structure.
Little Canyon Assessment Unit 1	LI1	Km 0.0 to km 15	Below short dewatered segment. High juvenile *O. mykiss* densities.
Little Canyon Assessment Unit 2	LI2	Km 15 to km 30	Includes significant dewatered segment. Diminished flow, increased turbidity. Diminished densities and resident *O. mykiss* age-class structures.

Methods

The primary data sets compiled for use in this strategy are listed in Table 7; a description of the methods employed follows the table. With a broad base of data sources, a variety of data collection methods were utilized. In several cases, similar parameters were undertaken using different protocols. These are described in the complete spreadsheet of data sets with short methods description, found in Appendix E. While there is an abundance of data for the Big Canyon Creek watershed, a significant portion of it is either geographically limited or qualitative in nature. The qualitative data collected is particularly valuable for establishing relative conditions within the same basin, while sufficient quantitative data exists to support a prioritization framework for restoration, enabling strong management recommendations.

Table 7. Primary data sets used for strategy development.

Data Set	Agency/Organization	Qualitative or Quantitative	Timespan of Data Collection
Baseflow	NPT- Watershed	Quantitative	2004-2006
Diatoms	NPT- Watershed	Quantitative	2003-2005
Electrofishing Surveys	NPT- Watershed	Quantitative	2003, 2004
Geomorphology	NPT- Watershed	Quantitative	2003, 2006
K- factor	NPSWCD	Quantitative	2003-2007
Macroinvertebrates	NPT- Watershed	Quantitative	2003-2005
SAM/SVAP	NPSWCD	Both	2003-2007
Stream Temperature	NPT- Watershed NPSWCD	Quantitative	2003-2007
Water Quality	NPT- Watershed	Quantitative	2003-2006

Methods:

Electrofishing Surveys (Watershed-NPT): One survey reach was located within every stream kilometer potentially accessible to anadromous salmonids through systematic site selection utilizing a random number generator and ESRI ArcView 8.1 (kilometer designations begin at stream mouth as zero). Surveys were initiated at the channel geomorphic division nearest the derived site coordinates (as determined via handheld GPS), ending at the first channel geomorphic division encountered after sampling fifty thalweg meters. Fifty-meter long surveys were also conducted within eight aquatic habitat monitoring sites located throughout the watershed. Six of these monitoring sites were located through systematic stratified random site selection while two were non-randomly located at stream mouths.

Electrofishing surveys were conducted with Smith-Root LR-24 24 volt backpack electrofishers programmed to output pulsed DC current with frequency, duty cycle, and voltage settings adjusted relative to site conductivity and temperature. While the monitoring sites were subjected to multiple-pass depletion surveys, all data reflects fish captured through a single, initial pass. Electrofishing crews consisted of one operator and two netters. In accordance with ESA Section 10 Scientific Research permits, electrofishing activities were aborted when stream temperatures reached 19º C to minimize potential stress to salmonids.

All species captured were anesthetized with a solution of tricaine methanesulfonate (MS-222) buffered with sodium bicarbonate. All salmonids were identified, measured (fork length to nearest mm), and weighed (to tenth of gram using calibrated Ohaus Scout-Pro electric balance). Scale samples and DNA tissue samples were collected from salmonid subsamples. Non-salmonid species were identified and counted with weight and length data being collected from subsamples of individual species. All fish were held to recovery in electrically aerated tanks before being released throughout the length of the survey site.

Hé-yey were divided into subyearling, 1, 2, and 2+ year age classes. Subyearling and yearling age to length relationships were established through visual analysis of length-frequency histograms. Scale sample analysis was utilized to establish minimum length-age classifications for two year and two year plus *O. mykiss* as efficacy of length-frequency histograms were compromised by the relatively small data sets available for these larger fish.

SAM/SVAP: The District-developed Stream Assessment Monitoring (SAM) protocol was used to evaluate many of the stream physical habitat parameters that are crucial to supporting aquatic life. SAM incorporates the USDA Stream Visual Assessment Protocol (SVAP), a Stream Erosion Condition Inventory (SEC) and techniques from Rosgen Stream Channel Classification. The 14-parameter SVAP protocol was the primary aspect used for the physical habitat portion of the prioritization, although not all 14 parameters were included; the parameters used were: Channel Condition, Hydrologic Alteration, Riparian Zone, Bank Stability, Water Appearance, Nutrient Enrichment, Fish Barriers, In-stream Fish Cover, Canopy Cover, Pool Habitat, Insect Habitat and Manure Presence. The SEC Inventory was used to determine the percentage of highly erosive soils present within each AU.

Stream Temperature (District and NPT-Watershed): Submersible temperature loggers (Optic Stowaways) programmed to record hourly water temperatures were deployed in mixing zones within each site following Idaho Division of Environmental Quality protocol (Zaroban 2000). Thermal data was analyzed for a number of metrics including diurnal deviation, instantaneous minimum and maximum temperature and 7 day average daily minimum, maximum, and average mean temperature.

Water Quality: A Hydrolab MiniSonde 4a, calibrated weekly, was utilized to measure dissolved oxygen, percentage dissolved oxygen saturation, pH, specific conductivity, total dissolved solids, salinity and sample temperature. Grab samples collected in sterile HDPE bottles were analyzed for the following parameters: *Escherichia coli* (*E. coli*), Total Suspended Solids, Ortho Phosphorus, Total Phosphorus, Nitrogen-Ammonia, Nitrate-N + Nitrite-N, and Kjeldahl Nitrogen.

Flow: Base-flow stream discharge measurements were collected between 2004 and 2006 at each of 8 monitoring sites located throughout the Big Canyon Basin. Stream discharge data was collected in accordance to USGS protocol (Nolan, et al., 2001) by use of a USGS vertical axis pymgy meter with top setting rod and AquaCalc 2000 sectional discharge recorder. Twenty to thirty discharge measurements were taken per transect and averaged for total flow.

Diatoms: Diatom collection followed 2002 EMAP-SW draft protocols (Hill 2002). A substrate particle less than 15 cm in diameter was randomly chosen at each sample point and placed within a clean 19 liter polyethylene bucket. A circular rubber area delineator was then placed upon the upper substrate surface to define a 12 cm^2 area. This delineated area was scrubbed with a stiff-bristled brush for 30 seconds; rock, delineator and brush were rinsed within the bucket by a minimal amount of stream water upon completion of timed scrub. The composite volume of the eleven sample rinses was recorded with a 50 mL subsample being removed, preserved with Lugol's solution, and identified to 800 valves per sample by EcoAnalysts, Inc., Moscow, ID.

Diatom metric values obtained from analysis were applied to an adaptation of the 2002 Idaho Department of Environmental Quality River Diatom Index (Grafe 2002). A relative index score was assigned to the following diatom metric values: % pollution sensitive, % pollution very tolerant, % polysaprobic, % requiring high oxygen, % highly motile, % nitrogen heterotrophs, eutrophic species richness and alkaliphilic species richness. These index scores were summed to provide a multimetric index score of impairment relative to unimpaired stream values established by Idaho DEQ.

Geomorphology: Representative riffle cross-section surveys were conducted within each of 8 monitoring sites within the Big Canyon Creek watershed through use of rotary laser and laser-receiver-equipped survey rod. Surveyed from left bank to right (as facing downstream), a fiberglass tape was stretched between monument pins and a relative elevation of 100 ft. established at the top of the left pin (U.S. customary units were utilized for discharge, cross section and longitudinal profile surveys to facilitate use of non-metric hydrological software; all other data was recorded in SI (metric) units). Distance and elevation was recorded for all deviations of pin to pin elevation with special care to note slope and terrace breaks, bankfull indicators, wetted perimeter points and maximum thalweg depth. From these surveys, calculations were made to determine the cross-sectional riffle area extant between the streambed and bankfull (high-water) plane.

K-Factor: K factor is soil erodibility factor which represents both susceptibility of soil to erosion and the rate of runoff, as measured under the standard unit plot condition. Soils high in clay have low K values, about 0.05 to 0.15, because they are resistant to detachment. Coarse textured soils, such as sandy soils, have low K values, about 0.05 to 0.2, because of low runoff even though these soils are easily detached. Medium textured soils, such as the silt loam soils, have a moderate K values, about 0.25 to 0.4, because they are moderately susceptible to detachment and they produce moderate runoff. Soils having a high silt content are most erodible of all soils. They are easily detached; tend to crust and produce high rates of runoff. Values of K for these soils tend to be greater than 0.4.

The majority of soils in the Big Canyon Creek watershed are silt loams. K factors for each soil type within the watershed were obtained from the USDA-NRCS Nez Perce/Lewis Soil Survey. Soils with a K factor greater than 0.37 were geospatially selected using GIS. Table 8 lists the K factor ranking per assessment unit. With 1 being the AU with the highest percentage of High K factor soils, indicating a higher potential for soil particle detachment in bare soil conditions.

Table 8. K Factor ratings for the Big Canyon Creek basin.

AU	Ranking	% of soils with K factor >.37	Acres of soils with K factor >.37	Total Acres in AU
BC1	4	10.7%	2,555	23,904
BC2	3	38.6%	13,129	34,027
BC3	2	50.4%	13,538	26,888
LI1	5	8.3%	1,426	17,133
LI2	1	65.2%	28,055	43,039

Macroinvertebrates: Benthic macroinvertebrate sampling followed 2002 EMAP-SW targeted riffle draft protocol (Klemm et al., 2002) with the exception of utilizing $0.09 m^2$, 500µm surber samplers as opposed to EMAP implementation of kick nets. Eight points were sampled within riffle macrohabitat units, the number of riffle units being identified prior to survey in facilitating even sample distribution. Sampled riffle units were visually divided into nine quadrants with random number generation determining quadrant to be sampled. Substrate within the surber larger than five cm in diameter was scrubbed with a nylon brush to dislodge clinging macroinvertebrates and removed from the sample frame, remaining substrate then being vigorously stirred for 30 seconds with a nylon rod. Predominant substrate type within the sample delineation was noted and sample site flagged to avoid impacting subsequent pebble count and surface fines surveys. Samples were preserved in ethanol (75-90% concentration) and analyzed at the BLM / USU National Aquatic Monitoring Center in Logan, UT. Subsamples of 500 specimens per site were identified to taxonomic resolution variable between specific orders, families and species.

Prioritization Framework

The working group developed a prioritization framework based on the conceptual model for restoration priorities found in the Hood River Basin Aquatic Restoration Strategy. The essential function of the framework is to identify high priority areas in need of active restoration or other activities with an emphasis on supporting actions in the most productive areas first to achieve maximum benefit, followed by actions in areas showing the highest potential productivity. One critical caveat applies: extenuating circumstances will present restoration opportunities in lower-priority areas and those opportunities should always be pursued or at least investigated.

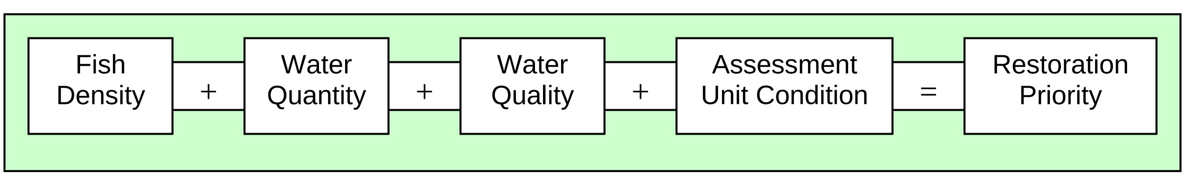

Figure 8. Conceptual framework for prioritizing aquatic habitat restoration activities in the Big Canyon Creek watershed.

While there are several species of interest in the Big Canyon Creek drainage, including resident and anadromous species, the *Fish Density* parameter identifies important stream reaches only for Hé-yey (*Oncorhynchus mykiss* (Steelhead / Rainbow Trout)) by examining sub-yearling and yearling densities within each reach. *Water Quantity* addresses flow-limited areas of concern, while *Water Quality* identifies areas with chemical, thermal and/or biological impaired areas.

Assessment Unit Condition addresses the relative condition of an area with regards to anthropogenic or natural perturbation; areas with higher levels of degradation received higher prioritization.

Each component in the Prioritization Framework was weighted equally (25% of overall score), although Fish Density was internally ranked inversely to the other components. This provides a mechanism to place emphasis on protecting areas where fish are present, regardless of the condition of the habitat. Thus, an assessment unit with high fish but relatively low habitat quality would receive a higher priority ranking than an area containing relatively high quality habitat but devoid of fish.

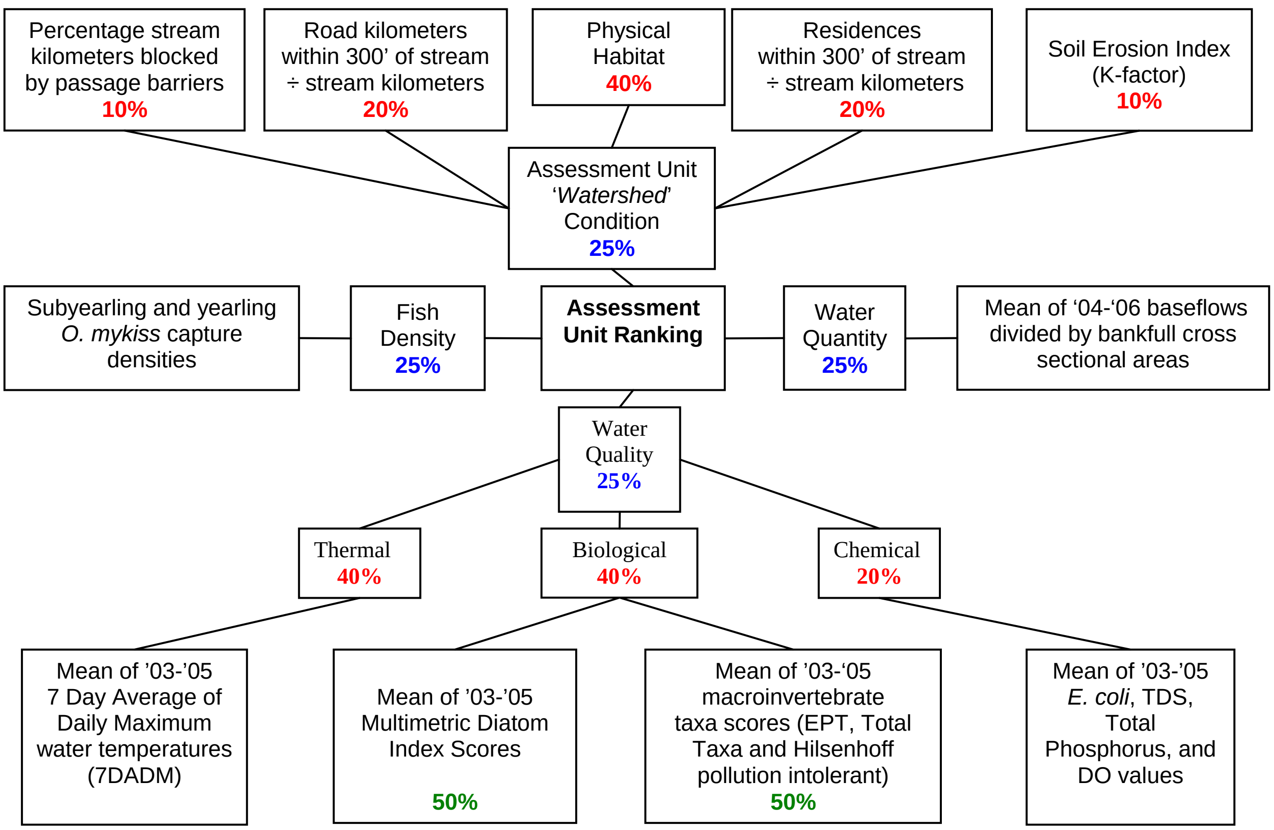

Figure 9. Assessment Unit Ranking Flow Chart

Fish Density

The Fish Density parameter strives to identify aquatic habitat restoration needs in the Big Canyon Creek basin essential to all anadromous and resident salmonid species. It is reasonable to assume that, considering salmonids' fairly specific habitat requirements, optimal salmonid habitat will provide high-quality habitat for non-salmonid resident fishes of the region. Although there are several species of salmonids in the Big Canyon Creek basin, Hé-yey (*Oncorhynchus mykiss* (Rainbow Trout / Steelhead)) were chosen as the primary species of interest due to their relative abundance, legal status and cultural importance.

Hé-yey densities were taken from two years of data collection across 47 sites; Little Canyon Creek was sampled in 2004 and Big Canyon was sampled in 2003 as described in the Methods section above. Density data was calculated for each of 50m passes, resulting in a density estimate for each km of stream potentially accessible to anadromous salmonid passage. Additionally, densities for the first pass of three 50m passes from the 8 monitoring sites within the Big Canyon basin were calculated. The total average density of subyearling and yearling Hé-yey was then calculated for the reaches found within each Assessment Unit and these averages were used for prioritization.

AUs containing high densities of Hé-yey were ranked higher than reaches with lower densities or no Hé-yey present. Fish species rankings were assigned on a scale of 1-5; reaches containing high densities of juvenile Hé-yey received higher ranking scores than reaches with lower densities. This parameter is scored inversely to the others, indicating the panel's intent to prioritize restoration actions in areas with core juvenile steelhead populations first, followed by actions in areas with the potential to support higher fish densities. Results of the prioritization are found in Table 9.

Table 9. Assessment unit rankings for fish priority parameter.

Assessment Unit	Subyearling and yearling steelhead/rainbow trout captured per m^2 surveyed	(#/100m^2)	Ranking
BC1	0.152	15.2	4
BC2	N/A	N/A	5
BC3	0.005	0.5	1
LI1	0.085	8.5	3
LI2	0.008	0.8	2

Water Quantity

Low in-stream flows have been long identified as a potential limiting factor in this basin. Availability of flow is identified by Bjornn and Reiser (1991) as a key habitat component for salmonids. Additionally, a wide variety of water rights exist throughout the basin which, if each were exercised to its full extent, would have the potential to dewater significant portions of the Big Canyon drainage. Finally, unpermitted withdrawal activity occurs throughout the basin, making assessments of actual water withdrawal with regards to permitted water withdrawal challenging

The three year base-flow mean for each site was divided by the derived bankfull cross-section[2] to establish monitoring site base-flow to high-flow ratios. Water Quantity rankings of 1-5 were assigned to each assessment unit on the basis of these ratio values. Assessment Units with low ratios, reflecting low base-flow relative to high spring flow events, received high scores (Figure 10) while AUs demonstrating less variability between high and low flow levels received low scores (Figure 11). A score of 1 indicates optimal water quantity relative within all 5 AUs and a score of 5 indicates relatively impaired water quantity conditions. This ranking paradigm reflects an intent to prioritize restoration within those areas with diminished levels of summer flow relative to total flow available.

[2] Methods for derivation of the base flow and bankfull measurements are described in the Methods section above.

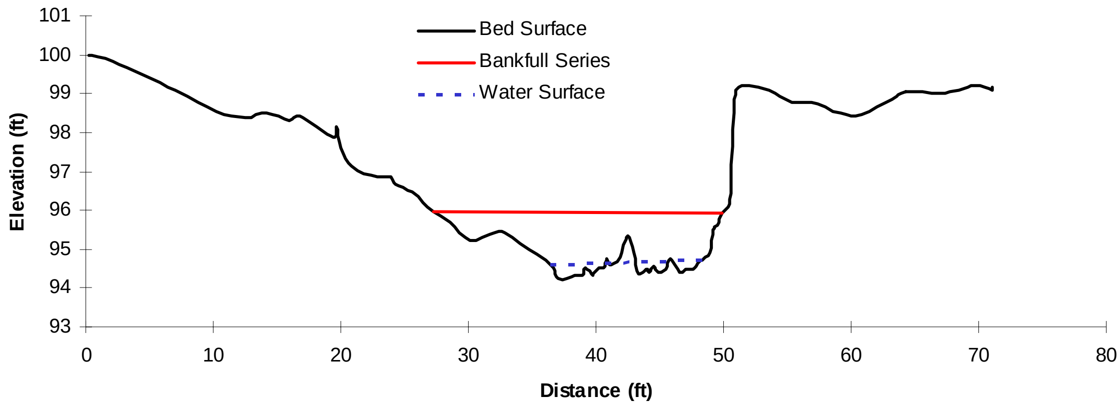

Figure 10. Low baseflow to bankfull ratio resulting in poor ranking.

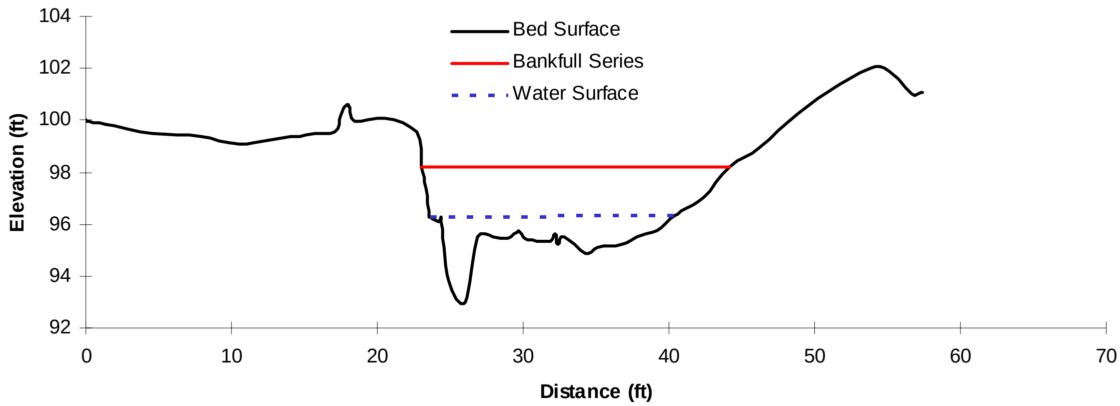

Figure 11. Higher baseflow to bankfull ratio resulting in better ranking.

Table 10. Assessment unit rankings for water quantity parameter.

Assessment Unit	Baseflow:Bankfull ratio	Ranking
BC1	0.17	1
BC2	N/A	5
BC3	0.03	4
LI1	0.07	2
LI2	0.05	3

Water Quality

Members of the technical group reviewed all available data and information relevant to identifying reaches for water quality concern, examining a suite of parameters including water temperature, chemical pollutants, biological contaminants, physical impairments and sedimentation. The water quality data obtained from several different sources was found to be spatially and temporally diverse

The water quality rankings were assigned on a scale of 1-5; with higher scores assigned to those assessment units displaying lower levels of water quality; thus biasing prioritization of restoration activities to those sites with greater degrees of water quality impairment Water quality scores were a composite of three components:

Thermal: Mean of 2003-2005 seven day average of daily maximum water temperatures. Please see Appendix F for U.S. EPA thermal guidelines for salmonids.

Chemical Parameters: Mean of 2003-2005 rankings for *E. coli*, total phosphorus, dissolved oxygen, total dissolved solids (TDS).

Biological Indicators: Mean of 2003-2005 pollution and sedimentation sensitive diatom data (multimetric diatom index) and pollution sensitive macroinvertebrate data (mean of Ephemeroptera, Plecoptera and Trichoptera richness (EPT), total taxa richness and Hilsenhoff pollution intolerant metrics).

Values for the three water quality components were normalized (each AU value divided by the watershed mean value for that component) prior to being combined in such a manner that 40% of the final water quality value was derived from Thermal values, 40% from Biological, and 20% from Chemical. A number of factors were considered in deriving this weighting scheme, not the least of which being temporal diversity of thermal and biological data relative to chemical.

Table 11. Assessment Unit Rankings for Water Quality Parameter.

Assessment Unit	Composite Ranking Score	Ranking
BC1	0.96	2
BC2	N/A	5
BC3	1.09	4
LI1	0.93	1
LI2	1.05	3

Assessment Unit Condition

Assessment Unit condition refers to a given watershed area's history, including management decisions; natural function; perturbation, resilience and resistance; specific land uses; anthropogenic influence and extractive resource use; current physical condition and stochastic events such as natural disasters. In short, a watershed is constantly changing and categorization, particularly with the intent to compare and prioritize condition for restoration, is a challenging task.

To address this complex question, the working group assembled a technical team of professionals with extensive experience working within the Big Canyon Creek drainage. The backgrounds of these professionals include: soils, fish biology, aquatic habitat restoration, hydrology and aquatic ecology. Four components went into establishing a ranked order of assessment units for the Big Canyon Creek watershed:

Percentage of stream kilometers blocked by fish passage barriers*:* In 2004, the Tribe submitted a report to the BPA documenting barriers to fish passage within the Big Canyon watershed. The barriers in that report that were identified to completely block adult anadromous passage were overlaid on the assessment unit layers and the percentage of stream kilometers blocked was calculated as a simple ratio. This aspect of Assessment Unit Condition is also directly reflected by densities of juvenile Hé-yey (*O. mykiss*) found in the Fish Priority Species parameter.

Road density, within 300' of the stream, per assessment unit: Within the assessment unit layer, the stream was buffered to 300' on either bank. A road density layer was overlaid on the assessment layer with kilometers of road within that 300' buffer calculated and divided by total kilometers of stream present to provide a relative riparian corridor road density per AU. This parameter reflects potential stream impacts resulting from road surface runoff, sediment, and contaminant delivery, diminished ground water connectivity due to roadbed compaction, diminished riparian vegetative density, diminished floodplain connectivity and diminished channel sinuosity.

Number of residences within 300' of the stream: A GIS layer of the county's residential structure coverage was overlaid on the assessment unit layer to determine the structural densities within 300' of the stream on both sides; this was used as a surrogate for residences within the 300' stream buffer. This value was then divided by total kilometers of stream per AU to provide riparian corridor residential development per AU. Increased residential development of riparian corridors has the potential to significantly impact stream function and habitat quality through numerous and varied impacts, commonly including such impairments as diminishment of riparian vegetative density, disruption of groundwater exchange patterns, introduction of impervious surfaces, introduction of lawn and garden herbicide and pesticide runoff and introduction of livestock waste.

Soil erosion index (K factor): K factor represents the susceptibility of soil to erosion and the rate of runoff. Soil structure and permeability both affect this parameter, because of their effects on runoff. Poor land management activities can increase the erodibility of soil and increase runoff rates, introducing greater yields of sediment delivery to the stream while increasing the magnitude of spring run-off events and decreasing quantities groundwater retained to augment stream flow throughout the summer months.

Physical Habitat: Portions of the SAM protocol were used to determine a score for the following aspects of physical habitat: Portions of data obtained through the District's SAM/SVAP protocol[3] were used to determine a score for the following aspects of physical habitat: Channel Condition, Riparian Zone, Bank Stability, Instream Fish Cover, Manure Presence, and Macroinvertebrate Presence.

Table 12. Assessment unit rankings for assessment unit condition parameter.

Assessment Unit	Composite Ranking Score	Ranking
BC1	0.753	1
BC2	1.236	5
BC3	0.851	3
LI1	0.838	2
LI2	1.533	4

[3] The SVAP protocol can be found in the District's Big Canyon Creek Stream Assessment Report (draft 2007), or at http://www.water.rutgers.edu/SVAP/SVAP.htm

Synthesis and Results

Each component of the prioritization framework; Fish Density, Water Quantity, Water Quality and Assessment Unit Condition, were integrated to develop an overall Aquatic Habitat Restoration Score for each reach. Higher composite scores reflect a higher basin-wide restoration priority, emphasizing protection and restoration of those AUs with high juvenile steelhead densities and impaired habitat conditions over regions which may have higher quality habitat but lower densities of fish. Assessment Units were ranked 1-5, with the highest scoring AU ranked 1, indicating the highest restoration priority. Two sets of AUs (BC3/LI2 and LI1/BC1) had identical composite scores; of these the AU with the higher fish density was ranked as a higher priority. The results are found in Table 13.

Table 13. Normalized results for Assessment Unit Rankings

Assessment Unit	Ranked Priority	Fish Density	Water Quantity	Water Quality	AU Condition	Overall Ranking
Big Canyon 1	3	4	1	2	1	2.00
Big Canyon 2	5	n/a	n/a	n/a	n/a	n/a
Big Canyon 3	2	1	4	4	3	3.00
Little Canyon 1	4	3	2	1	2	2.00
Little Canyon 2	1	2	3	3	4	3.00

CHAPTER 5

Restoration Framework: Treatment Strategies

This chapter identifies treatment strategies and needs within the geographically prioritized areas identified in Chapter 4. The prioritization framework in Chapter 4 primarily utilized quantitative data to determine an order for treating sub-optimal conditions within the Big Canyon Creek basin. This process helped to identify some of the factors affecting Hé-yey (O. mykiss) productivity. Developing treatments for identified deficiencies is the next, crucial aspect of pursuing restoration actions in the Big Canyon Creek basin.

To achieve this, the working group used the District's SAM/SVAP data. This data set, collected throughout the basin, is the most geographically thorough examination available within the basin. Using this data set, the working group developed an optimistic but attainable goal for the watershed within the 10-year period for which this strategy is intended: To treat three Assessment Units to the extent that 90% of those reaches within the AUs identified by SAM/SVAP as currently having Poor or Fair conditions could be reclassified as having Good or Excellent condition. This number of AUs was chosen with the recognition that some projects will be immediately achievable, while others might take up to several years of preparation, permitting and planning. This document outlines the geographic priority areas for work and is intended to act as a reference for prioritizing potential projects at annual inter-agency planning meetings.

Working within multiple AUs gives managers the flexibility to:

- Be proactive in pursuing projects in the top-priority Assessment Unit
- Focus limited funding toward priority projects in priority areas
- Implement projects within priority areas while planning for projects in other AUs
- Investigate high priority projects in lower priority areas

Methods

Stream Assessment

During the summers of 2006 and 2007, the Nez Perce Soil and Water Conservation District (District) conducted a stream inventory and assessment in the Big Canyon Creek watershed. The assessment was completed using the District's Stream Assessment Methodology (SAM) protocol (Rasmussen, 2007). This protocol combines techniques from Rosgen Stream Channel Classification, the USDA Stream Visual Assessment Protocol (SVAP) and a Stream Erosion Condition Inventory (SEC). Although the SAM protocol consists of several components, the working group determined that the most useful parameters for comparison within basins and between basins were the SVAP and the SEC inventory. Data in this section results from analysis done for the Big Canyon Creek Stream Assessment Report (draft 2007).

The Big Canyon watershed was divided into over 400 reaches. Reach designations were made based on geographic location, stream type, slope, soil type, and land cover. Teams consisting of two to four people specializing in soils, fisheries, range, botany, engineering, and water quality completed each inventory. 225 miles of stream inventory occurred and the District coordinated with 150 landowners prior to field data collection.

SVAP Component

SVAP consists of fourteen parameters[4]. Each criterion is given a numerical rating on a scale of 1 to 10, where the highest number represents the best condition. An index is created by totaling the values of all criteria evaluated and dividing by the number of criteria evaluated (USDA, 2004). This index is then divided into a four component ranking system consisting of Poor, Fair, Good, and Excellent categories.

Within each assessment unit, the linear feet of each SVAP function category (Poor, Fair, Good or Excellent) was recorded. Next, average values for each of the 14 SVAP condition parameters were calculated within each assessment unit and an index value for each category was determined. The index value was calculated by totaling the values of all criteria evaluated and dividing by the number of criteria evaluated (USDA, 2004). Thus, the lower-scoring parameters influenced the overall index value and could be identified as limiting factors within the assessment unit.

The SVAP parameters fell into 4 broad headings. Groups of parameters that fell under these headings tended to be scored similarly, creating a streamlined way to identify which factors contributed most significantly to the SVAP index ranking. Additionally, treatments for these grouped parameters tended to be similar or complementary. Combined ranking groups were created for Riparian Health, Fish Habitat, Nutrients and Channel Function. Two parameters, Passage Barriers and Hydrologic Alteration, did not specifically fall under these headings and were evaluated separately. Descriptions of each ranking group may be found in the Results section.

Within the three prioritized assessment units, reaches within areas of perennial flow that received a rating of Poor or Fair were considered priorities for restoration actions by treatment group. For example, a reach with perennial flow within Big Canyon Creek Assessment Unit 1 that was designated as poor for treatment group A - Riparian Habitat would be a priority project area. Treatments are recommended by the type of impairment within the Riparian Habitat heading.

Stream Erosion Condition Inventory (SEC)

A stream erosion condition inventory was completed as part of the SAM protocol. The criteria for the SEC portion included: evidence of bank erosion, bank stability condition, bank cover/vegetation, lateral channel stability, channel bottom stability and in-channel deposition. The criteria were examined for each stream reach and two erosion rating worksheets were completed per reach; one worksheet was for the actively eroding banks (banks that should be treated in the opinion of the evaluators) and the other for the remaining banks in the reach. A value between 0 and 3 was assigned for each of the evaluation criteria. Each actively eroding bank was measured (height and length) and photographed.

The values assigned were used to create an erosion index for each reach. The erosion index was determined by calculating a weighted average of the ratings of the actively eroding and remaining banks within each reach. The erosion index incorporates erosion from all banks in a reach whether they were actively eroding or not. A higher index value indicates a higher potential for bank erosion.

[4] The SVAP protocol can be found in the District's Big Canyon Creek Stream Assessment Report (draft 2007), or at http://www.water.rutgers.edu/SVAP/SVAP.htm

Treatment Groups

Based on the SVAP and SEC inventories, reaches were categorized into groups for treatment (table 14). Groups were determined based on their similarities and the treatments recommended for each reach. Some reaches may be included in more than one group.

Table 14. Treatment Groups.

Group	Treatment Unit Name
A	Riparian Habitat
B	Channel Function
C	Fisheries Habitat
D	Nutrients
E	Barriers
F	Water Withdrawal
G	Hydrologic Modification
H	Legacy
I	Upland Sediment
J	Invasive Species

A: Riparian Habitat

Reaches within this group were determined by a combined ranking of riparian cover and canopy cover. Impairment within this group was evident throughout the watershed. Impairment is defined as those reaches with less than 50% canopy cover, less than one active channel width of natural vegetation, a lack of vegetative regeneration, and/or moderately compromised filtering function. Impaired areas typically have invasive weeds, a lack of vegetative density, either grazing or agricultural tillage operations adjacent to channel; and minimal to no vegetative buffer.

B: Channel Function

Stream reaches with impaired channel function were ranked through a combination of scores for channel condition, hydrologic alteration and bank stability. Reaches receiving a poor ranking are typically confined, often by a road or railroad, have little to no floodplain access, are actively downcutting or widening, and >50% of the reach is channelized or riprapped. In addition, the channel may be deeply incised or have water withdrawals, minimal flooding, and unstable banks. Reaches receiving a fair rating have <50% of the channel altered by riprap or channelization; may include braided channels or excess aggradation; dikes or levees may restrict floodplain; channel is incised; banks are moderately unstable; and flooding occurs every 6 to 10 years. Reaches receiving a good rating may include evidence of past channel alteration but with significant recovery of the channel, set back dikes/levees which provide access to floodplain, moderately stable banks and limited channel incision.

Disconnection from floodplains and resultant straightening of the channel in these reaches usually indicates a high risk for channel degradation and bank erosion. Some reaches with risk of impairment due to road presence may be stabilized with mature cottonwood and willow stands, protecting the channel from erosion. Additionally, riprap may be present; although riprap provides a measure of bank stability, it is often detrimental to riparian zone conditions.

C: Fisheries Habitat

Poor Fisheries Habitat is defined by the combination of rankings for canopy cover, invertebrate habitat, macroinvertebrate presence, in-stream fish cover, pool presence and bank stability. Reaches found to be impaired for this category are found throughout the Big Canyon Creek basin and may be comprised of a variety of components identified through the SVAP parameters, depending on where in the watershed a reach is located. In the uplands, streams are often subject to agricultural pressures including cropping or grazing within or adjacent to the stream bank. This may greatly reduce or remove riparian vegetation, leading to bank instability, reduced canopy cover, reduced large woody debris recruitment and reduced habitat for macroinvertebrates. Streams subject to livestock grazing or feeding operations may have reduced bank stability and riparian vegetation, increased sedimentation, diminished water quality, and compacted soils. Finally, in the valley bottoms, stream channels may be confined by roads or railways, causing channelization and reducing in-stream fish cover, macroinvertebrate cover, riparian or canopy cover and habitat complexity.

D: Excessive Nutrients

The combined Nutrients ratings include the nutrient enrichment, water appearance and manure presence SVAP parameters. Reaches in this group were found throughout the watershed and were considered to have excessive nutrients from organic and inorganic sources if the combined rating was either poor or fair. The sources of excessive nutrients include animal feeding operations, agricultural fertilizers, sewage treatment facilities, and individual septic systems. Nutrients of concern include nitrate, bacteria, and phosphorus.

E: Barriers

The Tribe and the District have located passage barriers throughout the Big Canyon Creek watershed. These barriers may block passage seasonally or perennially for different life stages of anadromous fish. Barriers located in one reach are recognized to have an effect on upstream and downstream conditions.

F: Water Withdrawal

Reaches that are affected by water withdrawals often show highly variable seasonal flow, low flow in the summer months, increased water temperature and potentially reduced water quality. Water withdrawals may be the result of diversion structures, pumps canals, pipelines or a combination thereof. Withdrawals may be for domestic livestock or irrigational purposes. Water withdrawals were identified through the District's SAM inventory and from Idaho Department of Water Resources water permit records.

G: Hydrologic Alteration

Treatments suggested for Hydrologic Alteration will address those reaches with high peak flows and low summer flows (so-called "flashy" areas) and reaches with impaired water retention. These treatments will occur primarily within upland areas of the watershed, in areas of poor surface roughness, poor soil quality, high compaction and low water infiltration. Springs and wetlands are important to this process and will require treatment. Information on historic wetland areas is sparse; areas identified through the District's Resource Inventory and Planning Protocol

(RIPP) and the Tribe's Natural Resource Assessment and Management Plan (NRAMP) or areas with hydric soils may be further investigated for treatment.

Hydrologic soil groups and land cover are two parameters used to estimate rainfall runoff. Runoff estimates are used in determining hydrologic problems in watershed protection plans (Jarrell, 2002). In general, soils with high runoff potential and minimal land surface cover are at a greater risk for increased runoff. The working group identified areas with high potential for runoff by using the Nez Perce/Lewis Soil Survey and the Tribe's land cover GIS database. Geographic areas with a soil hydrologic group of C or D were identified. Soils are assigned a hydrological soil group from A to D based on runoff potential and infiltration characteristics. An individual soil hydrologic group consists of soils that have similar runoff potentials under similar storm and cover conditions (USDA, 2007). C soils have a slow infiltration rate and a restrictive layer that prohibits downward water movement. D soils have very slow infiltration rates and high swelling potentials due to clay content. Treatments will focus in geographic areas with poor land cover type and with C or D hydrologic group soils.

H: Legacy Reaches

Treatment Group H is a watershed wide treatment group and is not prioritized by Assessment Unit. Legacy reaches are those that received an overall SVAP index rating of excellent. It is essential that Legacy reaches be protected and that conditions upstream of these reaches are addressed in a timely manner. Protection of these areas might include land use management plans, weed control, fencing, and land acquisition, either through easements or purchase.

I: Upland Sediment

The upland sediment treatment group addresses sheet, rill, and gully erosion from upland areas. Treatment of streambank erosion is addressed in Group A – Riparian Habitat and Group C – Channel Condition. Geographic areas for this treatment group were identified by using the USDA-Natural Resources Conservation Service Soil Survey of Nez Perce and Lewis Counties. The erodibility factor or K factor for each soil type within the watershed was identified and soils with a K factor greater than or equal to 0.37 were identified as having a high potential for erosion when disturbed.

The goal of treatments in this group is to reduce and/or prevent erosion from the identified critical areas. The management of upland sediment sources can improve water quality and temperature within the streams of the Lapwai Creek basin. Areas requiring upland sediment management generally have a high soil k factor, indicating a high potential for erosion when disturbed. As the majority of lands within the Lapwai basin are croplands, disturbance potential is intrinsically high, making sediment retention of great concern. In addition to croplands; roaded areas, canyonlands and forested areas are also identified as treatment areas.

J: Invasive Species

Treatment Group J is a watershed wide treatment group and is not prioritized by Assessment Unit. Invasive species are of great concern throughout the Big Canyon Creek basin in both terrestrial and aquatic settings. Reaches and areas that are impaired due to Invasive Species encroachment may suffer from reduced riparian function; reduced filtration resulting in poor water quality and temperature; reduced cover, habitat and food sources for fisheries and wildlife species; reduced habitat complexity; and reduced bank stability. Some aquatic invasive species, such as the New Zealand Mud Snail or *Myxobolus cerebralis* (the parasite that causes Whirling disease), have the potential to severely impact entire populations of a number of species, predominately ESA listed steelhead and salmon. While the status of aquatic invasive species within the watershed is unknown, both the New Zealand Mud Snail and Whirling disease have been documented in the nearby Lapwai Creek watershed.

The potential for invasive species to spread within the Big Canyon basin is extreme due to the proximity of humans to the stream corridors. According to the Aquatic Nuisance Species (ANS) Taskforce, humans are the number one vector for transmission of invasive species (2007). In 2003, Idaho recognized the invasive species problem with House Bill 212, the Invasive Species Act, which recommended "prevention, early detection, rapid response and eradication" as the "most effective and least costly strategies against invasive species.

Treatment Strategies

This section outlines treatments for the priority Assessment Units identified in Chapter 4. These AUs in order of priority are Big Canyon Creek Assessment Unit 3 and Little Canyon Creek Assessment Unit 2, followed by Big Canyon Creek Assessment Unit Number 1, Little Canyon Assessment Unit Number 1, and Big Canyon Assessment Unit Number 2. The treatment groups are formatted to include general recommendations followed by specific AU recommendations. Group H-Legacy and Group J-Invasive Species are considered to be watershed-wide issues and do not have Assessment Unit-specific treatments.

Throughout this section of the strategy, units are identified for treatment (i.e., 3000 linear feet of streambank needing erosion control). These units are estimates based on survey information available at this time. However, watersheds are dynamic systems and conditions may change from the time of survey to the time of implementation. The working group intends these units to be a guide for restoration but expect the watershed to be treated with the goal of restoring 90% of the watershed to good or excellent condition.

Big Canyon Creek overall SVAP condition rankings include poor (368 miles – 81%), fair (66 miles – 4%), good (22 miles – 5%) and excellent (1.2 miles – 0.3%).

The goal of treatments is to improve over 400 miles of stream to a good or excellent SVAP overall condition rating. This will be accomplished through treatments outlined in Groups A through J.

Treatment implementation will be focused as follows:

- Projects will be focused in the highest priority AUs, unless otherwise specified in the Treatment Group description. As opportunities present themselves, work may occur simultaneously within the prioritized AUs.
- Proactive restoration efforts will initially be focused in the top priority AU; managers will actively seek to develop projects within this AU. Once high priority projects have been addressed in this AU, proactive efforts will be refocused toward the second and then third highest priority areas.
- Work will occur within areas of perennial flow first with the primary focus on mainstem channels and major tributaries first, later moving to areas with intermittent tributaries.
- Ranked priority of AUs will be used to direct limited funding. In the event that multiple restoration opportunities arise, projects will be developed for the higher ranking AU first.
- Projects will be coordinated with other management agencies at annual meetings.

Group A – Riparian Habitat

Big Canyon Creek combined SVAP ratings for Riparian Habitat includes poor (292 miles – 61%), fair (111 miles – 23%), good (64 miles – 14%), and excellent (9 miles – 2%). Figure 12 illustrates the locations of each ranking group. The assessment units with the highest percentage of degraded Riparian Habitat include LI1 (35%), BC2 (27%), and BC3 (26%).

General Recommendations

Riparian plantings consisting of forb, tree, and shrub components are recommended for all areas where adequate riparian zones do not exist. In areas where a partial riparian zone exists, interplantings of trees/shrubs are recommended. Riparian plantings may have the following benefits: bank stability, filtration, canopy cover, large woody debris input and food sources for macroinvertebrates. Conservation easements should be used where feasible.

In areas impacted by recreational vehicles, exclusion fencing, access gates, improved trails, road signs, and recreational planning are recommended.

In areas where livestock grazing occurs, recommendations include improved grazing management, riparian fencing, and off-stream water developments.

Forestland recommendations include the designation of critical waterways in cooperation with the Idaho Department of Lands and Nez Perce Tribe – Forestry Division. In addition, it would be beneficial to increase the amount of riparian vegetation left in place following timber harvest activities. This can be accomplished through harvest management plans, landowner education, and improvements to the Idaho Forest Practices Act.

In cropland areas where tillage occurs adjacent to the stream channels, vegetative buffers are needed, including both filter strips and riparian plantings. Riparian areas near croplands are affected by herbicide drift from aerial and ground applications, which causes reduced riparian density and canopy cover and may negatively impact mature trees. Manual weed control, fencing, grazing management, spray buffers, and riparian plantings are recommended to address this issue.

Road decommissioning should be considered where roads are located within the riparian area and are causing reduced riparian function. Areas threatened by noxious and invasive weeds should be treated in accordance and cooperation with the Clearwater Basin Weed Management Area.

Treatments types and extent are estimated for each Assessment Unit within the watershed. AUs are listed in order of priority.

Assessment Unit Recommendations

Big Canyon Creek Assessment Unit 3

BC3 has the third highest percentage of degraded riparian habitat within the watershed (22%). Approximately 100 linear miles of riparian corridor are in need of significant treatment with an additional 22 miles needing minor improvements.

Little Canyon Creek Assessment Unit 2

LI2 has the highest percentage of degraded riparian habitat within the watershed (28%). Approximately 130 linear miles of riparian corridor are in need of significant improvement while an additional 1 mile needs minor improvements.

Big Canyon Creek Assessment Unit 1

BC1 includes the fourth highest percentage of degraded riparian habitat in the watershed (11%). Over 50 miles need significant improvement and an additional 22 miles need minor improvement.

Little Canyon Creek Assessment Unit 1

LI1 has the least amount of degraded riparian habitat (4%). Approximately 18 miles of degraded riparian corridor habitat needing significant improvement, 14 additional miles require minor improvement and 5 miles need protection.

Big Canyon Creek Assessment Unit 2

BC2 contains 103 miles of degraded riparian corridor habitat needing significant improvement. 28 additional miles require minor improvement and 2 miles need protection.

Group A Recommendations		
Riparian Habitat		
Practice	Units	Extent
BC3		
Riparian Corridor Fencing	Miles	50
Water Developments	Each	18
Grazing Management	Acre	4,500
Weed Control	Acre	2,700
Vegetative Plantings	Acre	1,800
Road Improvements	Miles	54
LI2		
Riparian Corridor Fencing	Miles	66
Water Developments	Each	15
Grazing Management	Acre	5,900
Weed Control	Acre	3,500
Vegetative Plantings	Acre	2,600
Road Improvements	Miles	18
BC1		
Riparian Corridor Fencing	Miles	25
Water Developments	Each	11
Grazing Management	Acres	2,200
Weed Control	Acres	1,600
Vegetative Plantings	Acres	1,100
Road Improvements	Miles	10
LI1		
Riparian Corridor Fencing	Miles	52
Water Developments	Each	22
Grazing Management	Acre	4,600
Weed Control	Acre	3,000
Vegetative Plantings	Acre	2,100
Road Improvements	Miles	38
BC2		
Riparian Corridor Fencing	Miles	9
Water Developments	Each	8
Grazing Management	Acre	2,600
Weed Control	Acre	350
Vegetative Plantings	Acre	360
Road Improvements	Miles	4

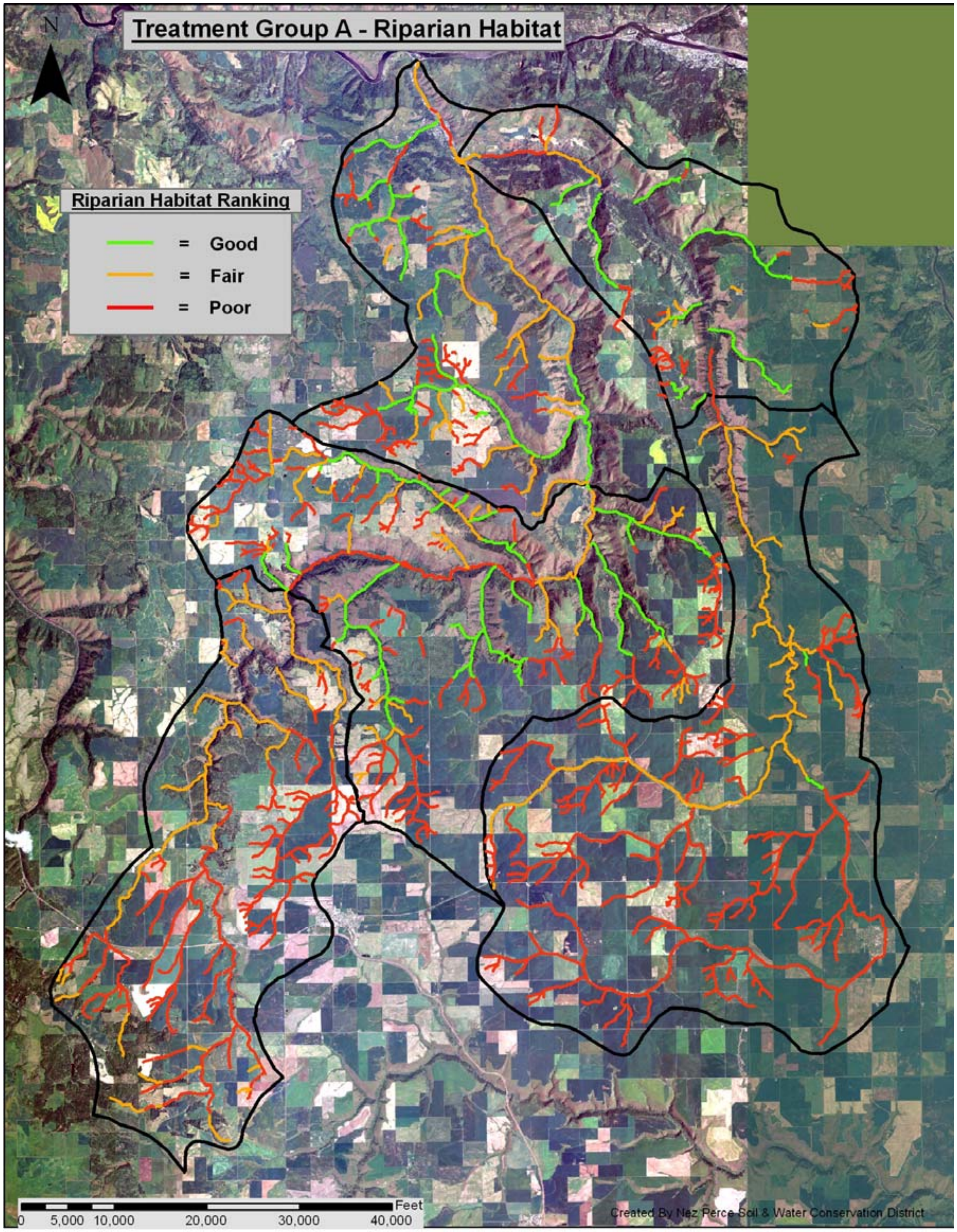

Figure 12. SVAP ratings for Riparian Habitat.

Group B - Channel Condition

Big Canyon Creek combined SVAP ratings for Channel Condition includes poor (65 miles – 14%), fair (282 miles – 59%), good (122 miles – 26%), and excellent (5 miles – 1%). Figure 13 illustrates the locations of each ranking group. The assessment units with the highest percentage of degraded Channel Condition are LI2 (23%), BC2 (19%), and BC3 (16%).

General Recommendations

In areas where excessive channel erosion is occurring, streambank stabilization measures, including bioengineering practices, are needed. Removing cattle from areas adjacent to the stream will also help to reduce erosion, avoid soil compaction, and promote healthy bank and riparian function.

Dikes and berms tend to limit floodplain access, potentially leading to incision, channelization and straightening and should be removed, or modified. This removal could include off-set dikes, removal of fill material, relief culverts, and other options as may be feasible based on individual sites within this group.

In areas where heavy incision and confinement is occurring, or where roads have limited use or utility, recommendations include road relocation, decommissioning and/or obliteration.

Stream-side plantings, riparian fencing, bioengineering solutions, and other measures identified in group A may help with stability, hydrologic function and overall channel function improvement.

Recommendations by AU are listed in order of priority. On-site analysis is needed to determine the feasibility and type of treatment needed.

Assessment Unit Recommendations

Big Canyon Creek Assessment Unit 3

According to SVAP data collected for BC3, there is 1 mile of reaches rated in excellent condition, 26 miles of Good condition, 70 miles of Fair condition reaches and 4 miles in Poor condition. Additionally, there were approximately 20 miles of roads within a 300’ stream buffer in this AU. SEC data indicates areas with actively eroding bank needing treatment. 34 miles of stream bank were observed to be either bare or nearly bare, indicating an increased risk for erosion. Restoration actions may include all of the General Recommendations above.

Little Canyon Creek Assessment Unit 2

According to SVAP data collected for LI2, there are 22 miles of reaches rated to be in Good condition, 62 miles of Fair condition reaches and 48 miles in Poor condition. None of the reaches within LI2 received an Excellent rating for channel condition. Additionally, there were approximately 30 miles of roads within a 300’ stream buffer in this AU. SEC data indicates areas with actively eroding bank needing treatment. 106 miles of stream bank were observed to be either bare or nearly bare, indicating an increased risk for erosion. Restoration actions may include all of the General Recommendations above.

Big Canyon Creek Assessment Unit 1

Based on the SVAP data collected for BC1, there is 1 mile of Excellent-rated reaches, 27 miles of Good-rated reaches, 38 miles of Fair-rated reaches and 6 miles of stream channel rated to have Poor condition. SEC data indicates areas of actively eroding bank needing treatment within this

AU. Additionally, 11 miles of stream bank were observed to be either bare or nearly bare, indicating an increased risk for erosion. 12 miles of roads within a 300' stream buffer are located in this AU. Restoration actions may include all of the General Recommendations above.

Little Canyon Creek Assessment Unit 1

Based on the SVAP data collected for LI1, there is 1 mile of Excellent-rated reaches, 10 miles of Good-rated reaches, 25 miles of Fair-rated reaches and 1 mile of stream channel rated to have Poor condition. SEC data indicates minimal areas of actively eroding bank needing treatment within this AU. Additionally, 7 miles of stream bank were observed to be either bare or nearly bare, indicating an increased risk for erosion. 9 miles of roads within a 300' stream buffer are located in this AU. Restoration actions may include all of the General Recommendations above.

Big Canyon Creek Assessment Unit 2

Based on the SVAP data collected for BC2, there is 1 mile of Excellent-rated reaches, 39 miles of Good-rated reaches, 87 miles of Fair-rated reaches and 6 miles of stream channel rated to have Poor condition. SEC data indicates areas of actively eroding bank needing treatment within this AU. Additionally, 38 miles of stream bank were observed to be either bare or nearly bare, indicating an increased risk for erosion. 16 miles of roads within a 300' stream buffer are located in this AU. Restoration actions may include all of the General Recommendations above.

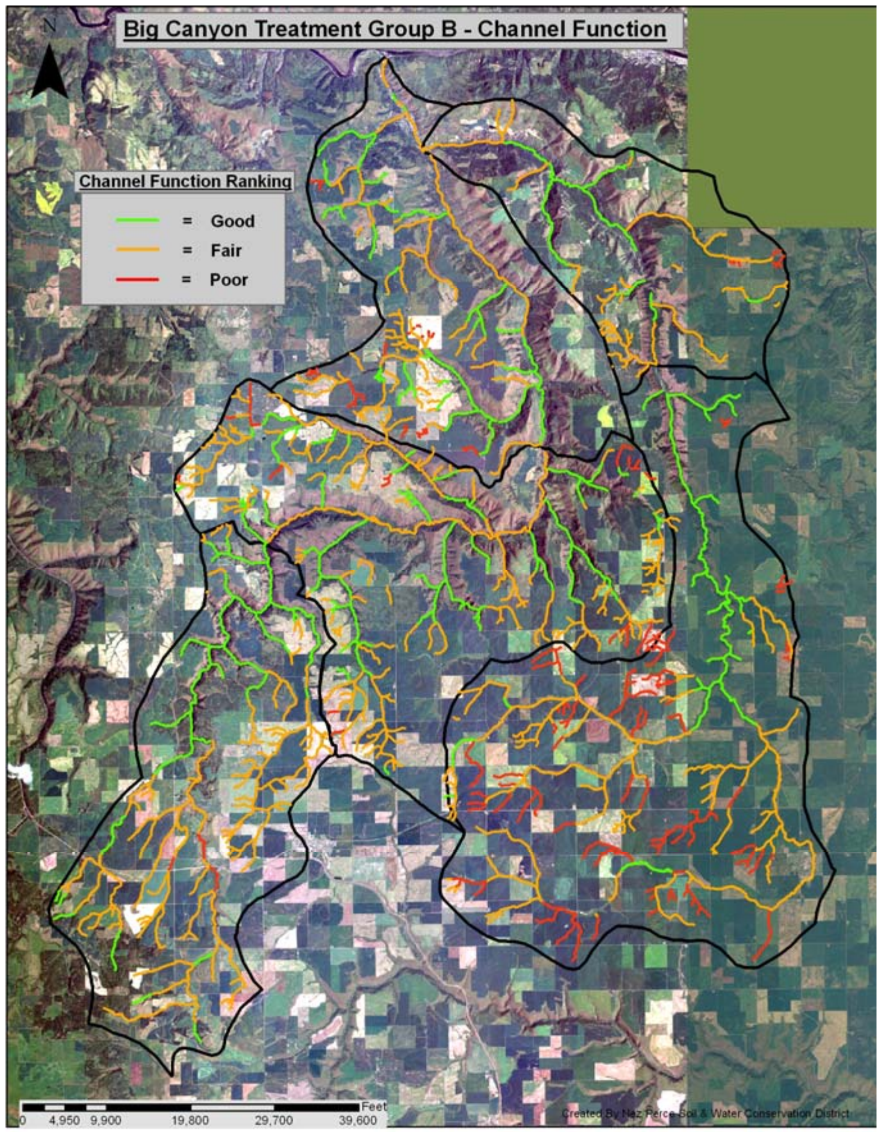

Figure 13. SVAP ratings for Channel Function.

Group C – Fish Habitat

Big Canyon Creek combined SVAP ratings for Fish Habitat includes poor (305 miles – 64%), fair (165 miles – 35%), good (6 miles – 1%). No reaches received and excellent rating. Figure XX illustrates the locations of each ranking group. The assessment units with the highest percentage of degraded Channel Condition are LI2 (28%), BC2 (28%), and BC3 (21%).

General Recommendations

Because impaired Fish Habitat is essentially the result of other stream conditions identified by the SVAP parameters, treatments addressing those conditions will have a great effect on improving Fish Habitat. The main limiting factors include poor macroinvertebrate diversity and numbers, lack of insect/invertebrate habitat, shallow pools, excessive fine sediment, high water temperature, and lack of instream fish cover.

Engineering, or hard restoration actions may be ill-suited for this region due to the extreme fluctuation inherent to this system but will be considered, should a beneficial action be identified. Mechanical input of large woody debris may be appropriate in certain areas but optimally, riparian zone vegetation should be enhanced to provide a long term source for large woody debris.

Other actions to be pursued include: removal of livestock from within riparian zone, riparian fencing and planting, off-site water development, and road decommissioning.

In addition to the recommendations derived from other sections, we recommend performing several high profile restoration projects in lower mainstem and upper mainstem Big Canyon and Little Canyon Creeks, including riparian planting and fencing, noxious weed removal and interpretive sign displays advising visitors of the importance of this stream to salmonids. This work is critical to improving anadromous fish habitat and has the added benefit of incorporating stakeholder support given its proximity to the communities of Peck, Craigmont, and Nezperce. These areas are highly visible from major transportation corridors such activities would be well situated to promote further restoration efforts throughout the watershed.

Assessment Unit Recommendations

Table 15 illustrates the miles receiving a good, fair, or poor combined Fish Habitat rating. No specific AU recommendations are provided as treatments identified through other groups will address fish habitat improvements.

Table 15. Fish Habitat Combined Ratings by AU.

AU	Poor (miles)	Fair (miles)	Good (miles)
BC1	33	34	5
BC2	79	53	1
BC3	72	29	0
LI1	14	23	0
LI2	107	26	0

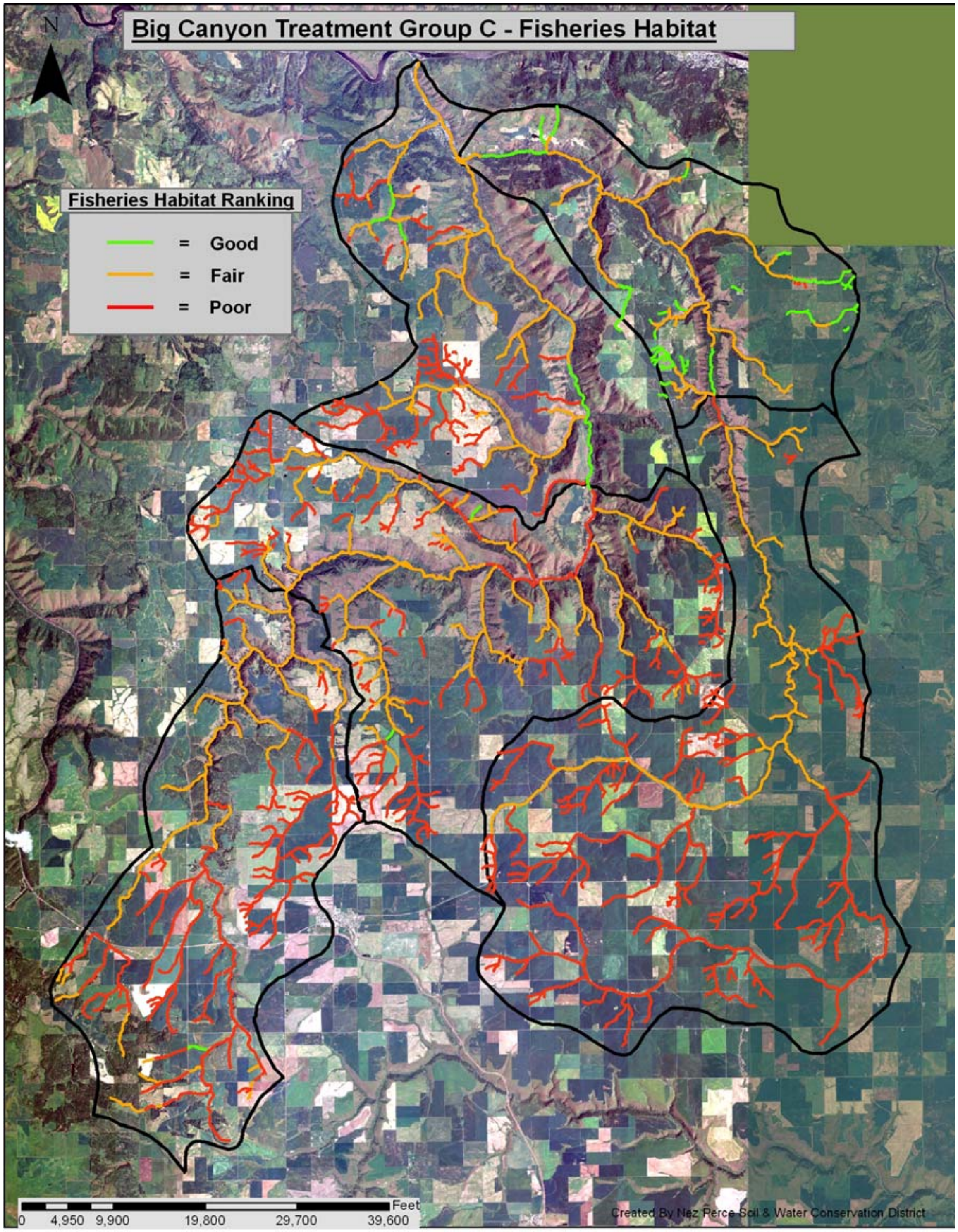

Figure 14. SVAP ratings for Poor and Fair Fish Habitat.

Group D –Nutrients

Big Canyon Creek combined SVAP ratings for Nutrients includes poor (117 miles – 24%), fair (287 miles – 60%), good (69 miles – 15%) and excellent (4 miles – 1%). Figure 15 illustrates the locations of each ranking group. The assessment units with the highest percentage of degraded Channel Condition are LI2 (25%), BC2 (22%), and BC3 (20%). Both BC3 and LI2 are within the 5th highest ranked nitrate priority area in the State of Idaho (Appendix B). Treatment will be focused in these two AUs.

General Recommendations

To address the reaches that classify as Poor or Good for this treatment group, practices targeting agricultural fertilizers, livestock waste, and septic waste are needed. Assessment Unit recommendations are listed in order of priority.

Livestock Sources:

Approximately 60 livestock operations are located within the watershed. One-third of these livestock operations have direct access to water in the stream. These operations not only contribute to excessive nutrient input, but also greatly diminish riparian cover, fish habitat, and channel function. The typical livestock operation will need a combination of practices to address the problems including: relocation of livestock, fencing, alternative water source developments, waste management systems, vegetative plantings, and streambank erosion control.

Feedlots located either within the 100-year flood zone, the valley bottom where cobble-dominated substrate occurs, or in other areas with direct access to streams, should be relocated and a waste management system installed. Waste management systems include practices which prevent runoff from the feedlot area from being delivered to the stream. This includes but is not limited to roof gutter systems, corral berms, filter strips, waste storage facilities, fencing, and alternative livestock watering systems.

Human Sources:

Many of the septic systems in the watershed were installed prior to the 1970s. These older systems may be failing or may not be installed to current water quality standards. In those areas where septic output poses a risk for increased nutrients (those located within 300 LF of the stream and the communities of Peck and Nezperce), upgrades or removals of septic systems are recommended. The city of Nezperce has a treatment facility located within the floodplain. This facilities should be evaluated to determine the extent of nutrient source and options for improvement. Vegetative plantings downstream of the facilities will assist in nutrient uptake.

Agricultural Sources:

Cropland is the major land use within the Big Canyon Creek Watershed. Fertilization practices within the watershed include fall and spring applications of nitrate nitrogen on cereal grain crops. Developing longer crop rotations and managing the amount, timing and application method of fertilizers can all reduce the potential for nutrient delivery to the stream. Recommendations for cropland management include the development of nutrient management plans and vegetative buffers along drainage corridors. The nutrient management plans include soil testing on a high frequency basis to assist agricultural producers in managing their fertilizer inputs. In addition, the establishment of vegetative filters will assist in nutrient utilization. The vegetative filters and the cropland management practices are addressed under Group I. However, the nutrient management plans are addressed in this section.

Assessment Unit Recommendations

Big Canyon Creek Assessment Unit 3

BC3 contains approximately 94 miles of streams impacted by excessive nutrients. Restoration actions may include all of the General Recommendations above and the specific treatments listed in the adjacent table.

Little Canyon Creek Assessment Unit 2

LI2 contains approximately 119 miles of streams impacted by excessive nutrients. Restoration actions may include all of the General Recommendations above and the specific treatments listed in the adjacent table.

Big Canyon Creek Assessment Unit 1

BC1 contains approximately 56 miles of stream impacted by excessive levels of nutrient enrichment. Restoration actions may include all of the General Recommendations above and the specific treatments listed in the adjacent table.

Little Canyon Creek Assessment Unit 1

LI1 contains approximately 32 miles of streams impacted by excessive nutrients. Restoration actions may include all of the General Recommendations above and the specific treatments listed in the adjacent table.

Big Canyon Creek Assessment Unit 2

BC2 contains 104 miles of streams impacted by excessive nutrients. Restoration actions may include all of the General Recommendations and the specific treatments identified in the adjacent table.

Group D Recommendations		
Nutrients		
Practice	Units	Extent
BC3		
Nutrient Management Plans	Acres	14, 500
Riparian Corridor Fencing	Miles	15
Water Developments	Each	4
Livestock Waste Systems	Each	5
Septic Upgrades	Each	45
LI2		
Nutrient Management Plans	Acres	25,000
Riparian Corridor Fencing	Miles	35
Water Developments	Each	9
Livestock Waste Systems	Each	8
Septic Upgrades	Each	68
BC1		
Nutrient Management Plans	Acres	7,900
Riparian Corridor Fencing	Miles	15
Water Developments	Each	5
Livestock Waste Systems	Each	8
Septic Upgrades	Each	50
LI1		
Nutrient Management Plans	Acres	6,000
Riparian Corridor Fencing	Miles	18
Water Developments	Each	11
Livestock Waste Systems	Each	5
Septic Upgrades	Each	6
BC2		
Nutrient Management Plans	Acres	14,500
Riparian Corridor Fencing	Miles	9
Water Developments	Each	8
Livestock Waste Systems	Each	5
Septic Upgrades	Each	17

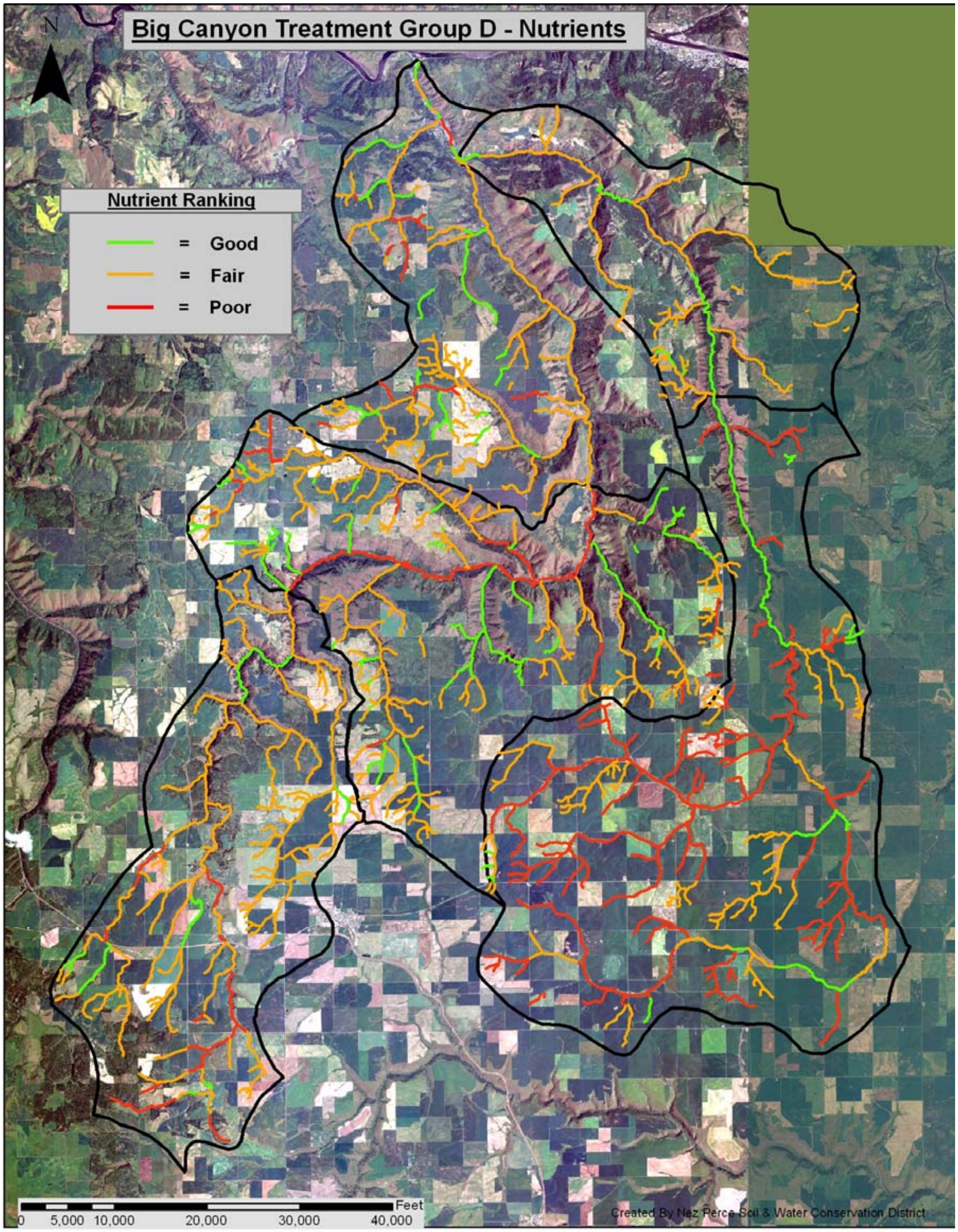

Figure 15. SVAP ratings for Poor and Fair Nutrient Condition.

Group E - Barriers

Over 61 habitat miles are blocked for fish passage within the watershed (Figure 16). The majority of blocked passage is located in the Little Canyon Assessment Unit 2.

General Recommendations

Treatment for reaches impacted by fish passage barriers includes the removal of known barriers, such as bridges, culverts, diversions, or stream crossings. Barriers replaced with suitably-designed bridges or other acceptable alternatives, such as bottomless archway culverts. New passages should be contoured appropriately to avoid further damage to the stream channel and should be rehabilitated through plantings and stabilization as necessary.

Through the District's SVAP protocol and the Tribe's Fish Passage Assessment, multiple barriers were identified. Complete barriers to fish passage should be removed first, followed by barriers that allow access to the highest quality habitat or the greatest amount of habitat. Barriers due to diversions and water withdrawals are addressed by remedies outlined for treatment groups F and G, Water Withdrawal and Hydrologic Alteration.

Within the SVAP scoring scheme, a stream segment with in reach barriers receives a poor rating, while stream reach having barriers within 3 km receive a fair rating. Addressing passage barriers will reflect strongly in SVAP scoring and will provide clear benefits to the resource by providing anadromous and resident fish species with many miles of previously unavailable habitat.

Assessment Unit Recommendations

<u>Big Canyon Creek Assessment Unit 1</u>

BC1 contains 43 identified barriers. Including 16 culverts, 8 road crossings, and 19 other barriers such as diversion structures, dams and headcuts. 8.4 km are blocked to anadromous fish passage.

<u>Big Canyon Creek Assessment Unit 2</u>

BC2 contains 50 identified barriers. These consisted of 30 culverts, 7 road crossings, and 13 other barriers, including diversion structures, dams and headcuts. 13.9 km are blocked to anadromous fish passage.

<u>Big Canyon Creek Assessment Unit 3</u>

BC3 contains 19 identified barriers. These consisted of 13 culverts, 2 road crossings, and 4 other barriers, including diversion structures, dams and headcuts. 4.9 km are blocked to anadromous fish passage.

<u>Little Canyon Creek Assessment Unit 1</u>

LI1 contains 11 identified barriers. These consisted of 6 culverts, 4 road crossings, and 1 other barriers. 3.6 km are blocked to anadromous fish passage.

<u>Little Canyon Creek Assessment Unit 2</u>

LI2 contains 45 identified barriers. These consisted of 30 culverts, 9 road crossings, and 6 other barriers, including diversion structures and dams. 31 km are blocked to anadromous fish passage.

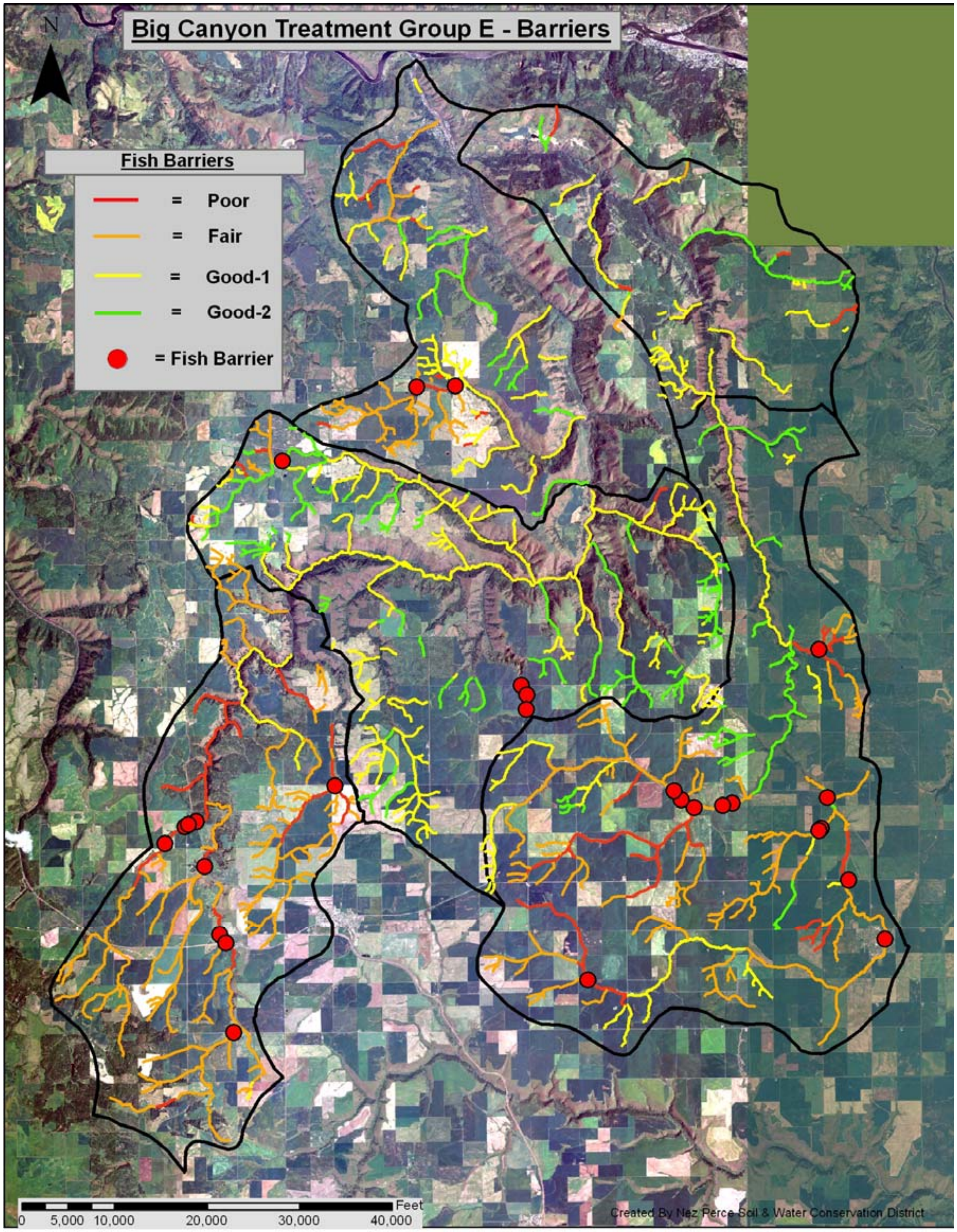

Figure 16. SVAP ratings Fish Passage Barrier locations.

Group F - Water Withdrawal

General Recommendations

Quantity of stream flow is inexorably linked to all aspects of water and aquatic habitat quality. A variety of minimal stream flow levels are required throughout the life stages of anadromous salmonids to facilitate any degree of success in migration, spawning, juvenile rearing and over-wintering. As surface flow diminishes, passage to critical refugia becomes problematic; many previously passable structures become barriers while potential for intermittent channel dewatering increases. Riparian vegetation, dependent on access to rheic flow, greatly decreases in complexity and density as stream flows diminish, further excerbating water quality and aquatic habitat issues.

A number of water rights exist within the basin, the majority of which are not in use. Land owners who are exercising their water rights should be given the opportunity to upgrade their systems to optimize water use. Further recommendations to reduce diminishment of critical in-stream flow include purchasing water rights within the basin, educating land owners, updating irrigation systems, upgrading diversion points and installing irrigation management plans.

The working group selected the 0 to 7 KM section of AU BC1 and 0 to 5 KM section of LI1 as the highest priorities for treatment. This decision was based on the high number of active diversion observed during the Sam inventory, the high population density, and the type of diversions. Many of the diversion along these corridors are either push berms or non-screened intakes which pose a high risk to fish passage. AU's are listed in order of priority.

Assessment Unit Recommendations

Big Canyon Creek Assessment Unit 1

BC1 has 91 permitted in-stream diversions, the highest number diversions in the watershed. The total maximum potential diversion rate for this AU, excluding rights to springs, groundwater or ponds, is 7.74 cubic feet per second (cfs) or about 21.3 acre feet.

Little Canyon Creek Assessment Unit 1

LI1 has 45 permitted in-stream diversions, the third greatest number of permitted in-stream diversions. The total maximum potential diversion rate for this AU, excluding rights to springs, groundwater or ponds, is 1.8 cubic feet per second (cfs), or about 16 acre feet.

Big Canyon Creek Assessment Unit 2

BC2 has 80 permitted in-stream diversions, the second highest number of permitted in-stream diversions. The total maximum potential diversion rate for this AU, excluding rights to springs, groundwater or ponds, is 6.61cubic feet per second (cfs).

Big Canyon Creek Assessment Unit 3

BC3 has 35 permitted in-stream diversions; the second lowest total number permitted in-stream diversions.

Little Canyon Creek Assessment Unit 2

LI2 has 26 permitted in-stream diversions, the lowest number of permitted in-stream diversions per AU.

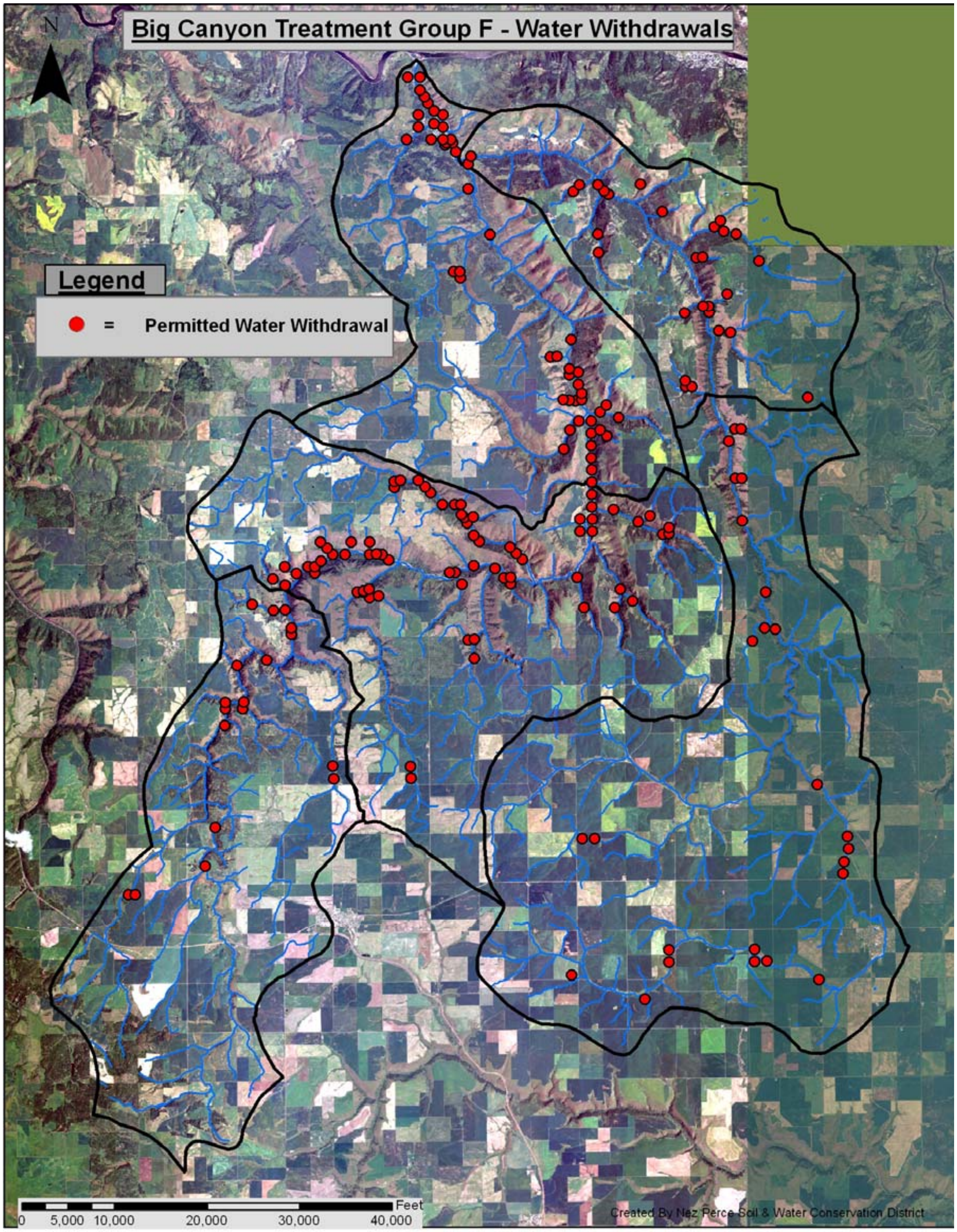

Figure 17. Water Withdrawal Locations

Group G - Hydrologic Alteration

Figure 18 illustrates the priority treatment areas within the assessment units. The highlighted areas indicate areas with the highest potential for runoff in a poor land cover condition. Hydrologic Alteration treatments are focused in the identified critical areas within the prioritized AUs. AUs are listed in order of priority. The AU priority reflects those AUs with the highest percentage of hydric soil groups C and D.

General Recommendations

Areas identified for treatment include those with a hydrologic group C or D soil rating but regardless of land type, crucial elements necessary to address alteration will include invasive weed control, land use planning and zoning as well as a complete and updated flood zone designation.

- Forested areas: reduce road density, perform tree plantings, and employ harvest management plans.
- Cropland areas: implement conservation management practices, conservation tillage systems, buffer strips, water retention structures, grass waterways, terraces, concentrated flow control structures, tree plantings, grass seedings, and reduce agricultural burning.
- Canyonlands: reduce road density, perform plantings and grass seedings and improve grazing rotation.
- Roaded areas: Create transportation plan, shape/grade, install relief culverts, culvert energy dissipaters.
- Wetland and Spring areas: Protect, enhance and rehabilitate wetlands and springs. Use fencing, weed control, water control and plantings. Re-water historically drained areas, remove water drainage structures.

Further recommendations include implementation of practices which promote water retention and land surface roughness. These include such practices as detention basins, road decommissioning, transportation planning, wetland enhancement/protection, restoration of drained lands, spring protection, vegetative plantings, and changing agricultural management practices.

Vegetative cover changes within the Big Canyon Creek watershed have resulted in dramatic changes to summer base flows (NPSWCD, 1995). The change in land cover from predominantly grass/herbaceous/tree cover to cropping systems may be responsible for profound alterations to the hydrological regime of the Big Canyon Creek watershed. The most significant hydrological change appears to be the increased magnitude and decreased duration of spring flow events. In addition to sedimentation and channel stability impacts, these ‘flashy’ spring flows reduce the quantities of soil moisture retained for recharge of groundwater flow, diminishing summer base-flow levels.

Assessment Unit Recommendations

Big Canyon Creek Assessment Unit 3

BC3 contains the highest acreage of hydric soils (1,695 acres) within the watershed. In addition, 30% of the AU contains hydric soil groups C or D. The Clearwater Subbasin plan identified the area near Reubens as critical for wetland restoration. Riparian zone vegetative density and corridor width is diminished in many areas while noxious, invasive weed species are abundant throughout the AU. Riparian plantings following noxious weed eradiation would thus be beneficial in increasing surface water retention and prolonging groundwater recharge. Treatments within this AU include those listed under general recommendations.

Big Canyon Creek Assessment Unit 1

BC1 is located at the lowest position within the watershed and thus is impacted by hydrologic alterations from within every other assessment unit. As the recipient of accumulated impacts, BC1 is characterized by extreme fluctuations in surface flow. Stream flows are greatest between January and April and lowest from July through September. During winter and spring high flow events, it is not unusual for discharge rates to increase several thousand-fold over summer base flows. The majority of BC1 includes hydric soil groups C and D. Treatments include those identified in general recommendations.

Big Canyon Creek Assessment Unit 2

BC2 is challenged by the inherently flashy nature of the Big Canyon Creek watershed. Riparian zone vegetative density and corridor width is diminished in many areas while noxious, invasive weed species are abundant throughout the AU. Riparian plantings following noxious weed eradiation would thus be beneficial in increasing surface water retention and prolonging groundwater recharge. As is true for the other two prioritized areas, conditions in the uplands are largely responsible for existing hydrologic regimes. Timberlands remaining within the AU headwaters should be protected, as should existing wetland areas. Springs, native vegetation and historic wetland areas should be restored, while potential development of new wetlands should be explored. Treatments identified in general recommendations should be implemented within this AU.

Little Canyon Creek Assessment Unit 2

LI1 has the lowest acreage of hydric soil groups C and D in the watershed. Riparian zone vegetative density and corridor width is diminished in many areas while noxious, invasive weed species are abundant throughout the AU. Riparian plantings following noxious weed eradiation would thus be beneficial in increasing surface water retention and prolonging groundwater recharge. Treatments within this AU include those listed under general recommendations.

Little Canyon Creek Assessment Unit 1

LI1 is located in a lower position in the watershed and is impacted by hydrologic alterations from LI2. As the recipient of accumulated impacts, LI1 is characterized by moderate to extreme fluctuations in surface flow. Stream flows are greatest between January and April and lowest from July through September. Treatments identified in general recommendations should be implemented in this AU.

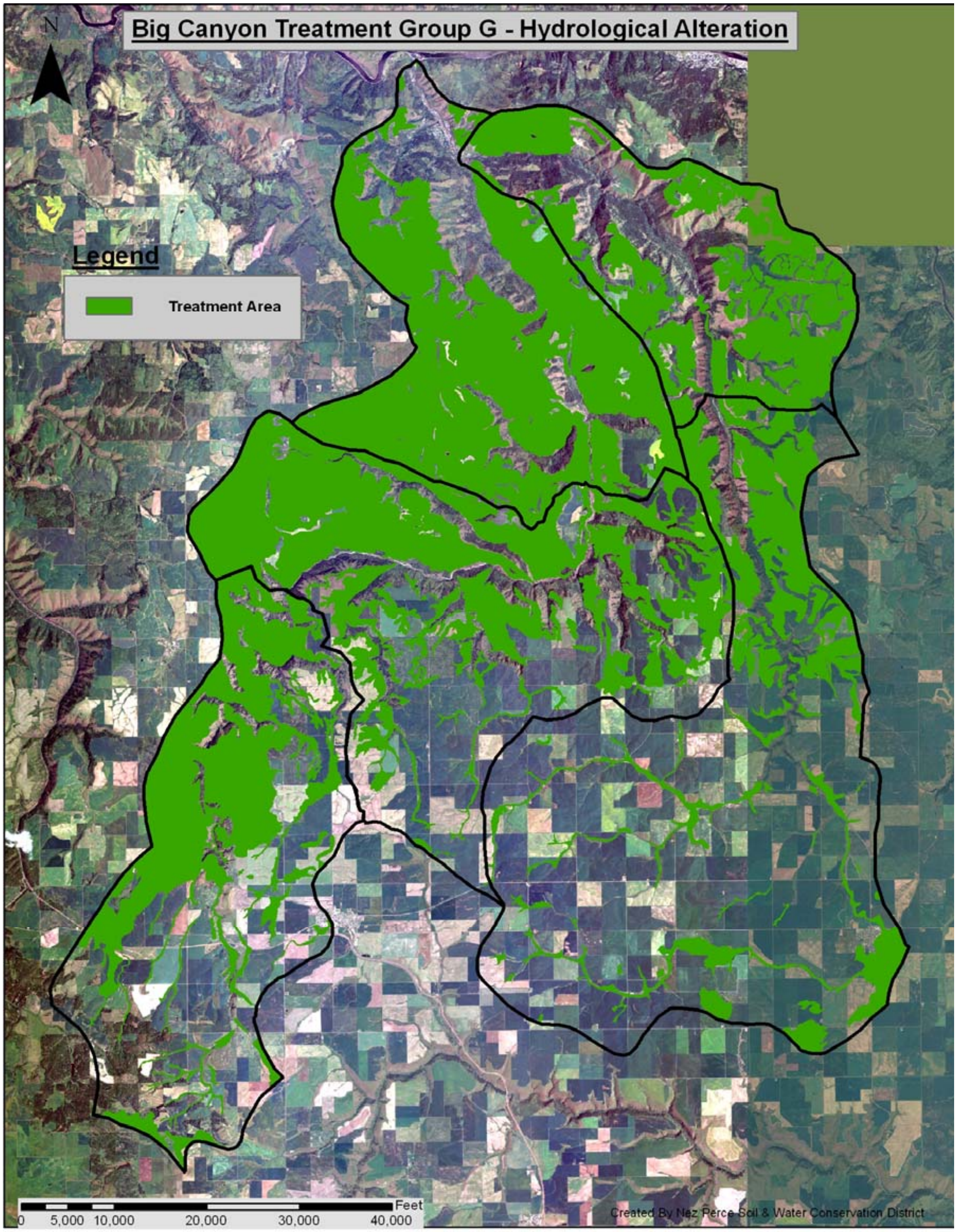

Figure 18. Hydrologic Alteration Treatment Areas.

Group H - Legacy

Treatment Group H is a watershed wide treatment group and is not prioritized by assessment unit. The Legacy treatment group consists of those reaches receiving an excellent SVAP overall condition rating.

Treatments needed for any stream segment receiving an excellent rating focus on protection of that reach. Treatments may include land use management plans specifying practices such as fencing, weed control, or conservation easements needed for protection. Site-specific treatment needs will be identified through an on-site inventory using the District's RIPP for private lands or NPT NRAMP protocol for Tribal lands. Conservation plans will be developed as necessary.

Through the SAM inventory process, two legacy group reaches (1.2 miles of stream) were identified within the watershed. Both are located in Little Canyon Assessment Unit 1 (figure 19). Additional Legacy reaches may be located within the watershed and not identified at the time of publication of this report. As these reaches are identified they will be added to the Legacy treatment group.

As treatments addressing limiting factors throughout the water are implemented the overall ranking of the treated reaches may be improved to excellent. As the status of a reach improves to excellent, it will be added to the Legacy treatment group.

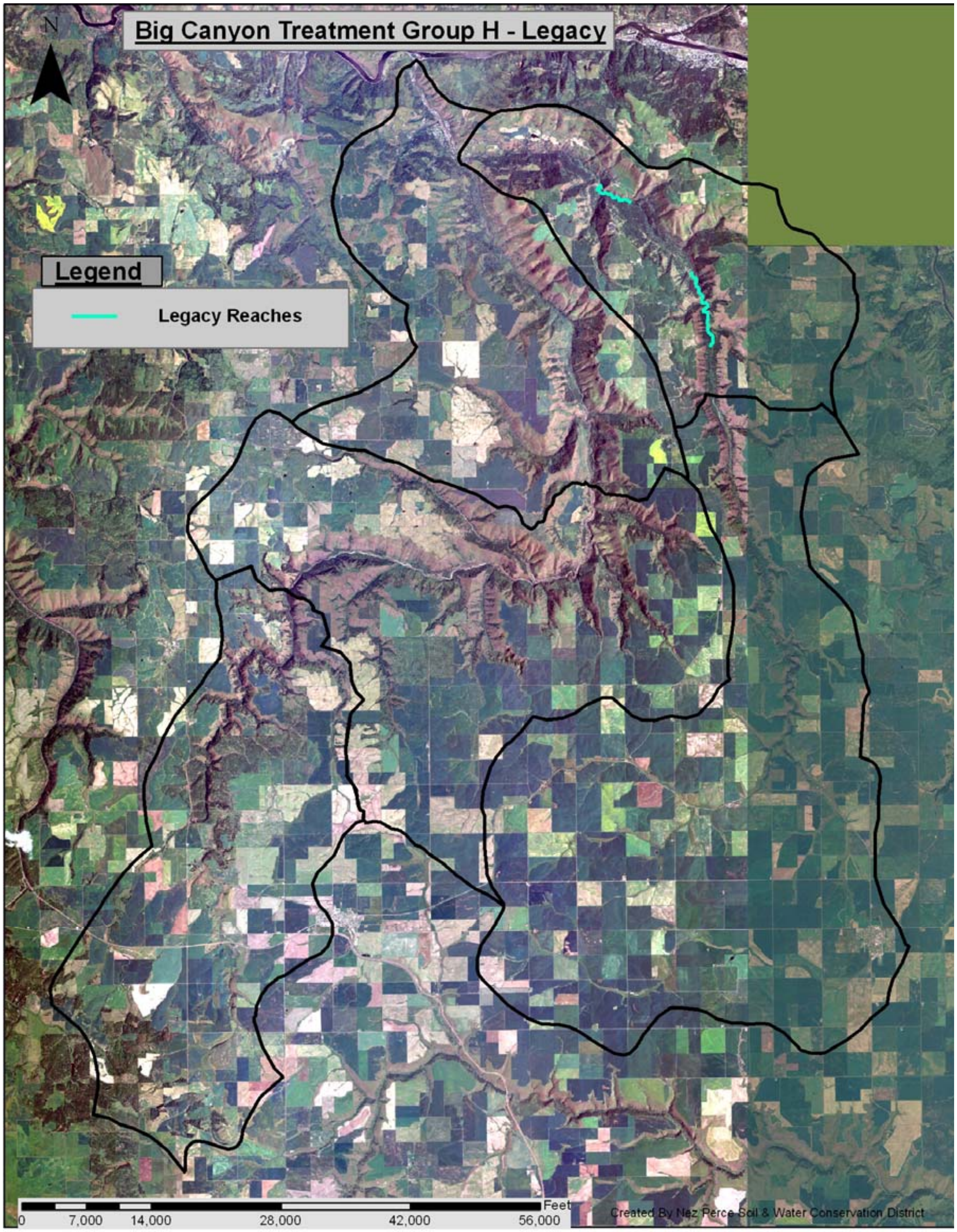

Figure 19. Legacy reach locations.

Group I - Upland Sediment

General Recommendations

Figure 22 illustrates the geographic locations for upland sediment treatments. Treatments to address upland sources of sediment may include longer and improved crop rotations, conservation tillage, improved soil quality, and contour farming. Factors including slope, soil type, precipitation, land use and soil depth all contribute to the types of management possible for upland sediment. Soils are one of the primary limiting factors for this treatment group as shallow, rocky soils do not have adequate soil depth to support many of the treatments. Areas with high concentrations of roads may need regular, appropriately timed maintenance, slope stabilization, shaping and water bars.

Figure 20. Current Condition.

Figure 21. Optimal Condition.

Figure 20 shows the current condition of the majority of cropland acres within the watershed and Figure 21 shows the desired condition. Note the land cover changes which have resulted in reduced erosion. The images used for both figures were taken from practices installed within the watershed. The field runoff was collected on the same day on adjacent fields. The cropland management practices are highly successful in reducing upland erosion. Additional benefits for hydrologic alteration are also obtained. These benefits are discussed in Group G.

Slopes exceeding 15% need careful evaluation before selecting practices. Cropland practices which decrease slope lengths should also be considered such as strip cropping, terraces, and water and sediment control structures. The majority of cropland lacks adequate buffers from drainageways and streams, increasing the potential for sediment delivery to the stream.

Many reaches within cropland fields were identified as having a high SEC index and will be treated for gully erosion. Sediment trapping practices such as sediment basins, vegetative filters, and terraces will decrease the amount of sediment transported to the stream.

Grazing lands located in canyon areas are impacted by winter grazing, invasive weeds, and lack of native vegetation. Treatments for these areas include invasive weed control, grazing management plans which identify the amount and timing of use, and establishment of native vegetation. Wildfires occur regularly within the watershed, providing an opportunity for canyon land restoration efforts. Fires remove the existing vegetation, leaving a bare soil surface which increases seed-to-soil contact for grass restoration. As fires occur, canyon lands will be treated with grass, shrub, and tree plantings. Weed control efforts will be prioritized based on the Clearwater Basin Weed Management Area protocols and priorities.

Assessment Unit Recommendations

Big Canyon Creek Assessment Unit 3

High k factor soils account for 65% of the surface area in BC3. Land uses within the high k factor areas include cropland (7,448 acres – 73%), forestlands (1,069 acres – 11 %), and canyonlands (1,430 acres – 14%). Sediment delivery rates are moderately high due to the proximity of disturbed surface areas to unbuffered streams. As such, an urgent need for cropland treatments exists.

Little Canyon Creek Assessment Unit 2

Land uses within high k factor soils include cropland (18, 369 acres – 87%), forestlands (123 acres – 1%), and canyonlands (2,242 acres – 11%). Sediment delivery is moderate to high due to flatter slopes within this AU. However, due to the large number of disturbed acres adjacent to unbuffered streams, an urgent need for cropland treatment exists.

Big Canyon Creek Assessment Unit 1

Land uses within high K factor soils include cropland (852 acres), forestland (360 acres), and canyonlands (590 acres). Areas requiring treatment within this AU are minimal. Focus should be on road treatments as they have the highest potential to deliver sediment to the stream.

Little Canyon Creek Assessment Unit 1

Land uses within high K factor soils include cropland (496 acres), forestland (196 acres), and canyonlands (421 acres). Areas requiring treatment within this AU are minimal. Focus should be on road treatments as they have the highest potential to deliver sediment to the stream.

Big Canyon Creek Assessment Unit 2

Land uses within high K factor soils include cropland (8,290 acres), forestland (269 acres), and canyonlands (1,156 acres).

Group I Recommendations		
Upland Sediment		
Practice	Units	Extent
BC3		
Cropland Management	Acres	7,500
Vegetated Buffers	Miles	20
Erosion Control Structures	Each	50
Sediment Basins	Each	10
Grazing Management	Each	1,500
Invasive Weed Control	Acres	600
Forest Management	Acres	1,000
Road Improvements	Miles	50
LI2		
Cropland Management	Acres	18,000
Vegetated Buffers	Miles	50
Erosion Control Structures	Each	100
Sediment Basins	Each	30
Grazing Management	Acres	2,200
Invasive Weed Control	Acres	2,000
Forest Management	Acres	100
Road Improvements	Miles	20
BC1		
Cropland Management	Acres	850
Vegetated Buffers	Miles	1
Erosion Control Structures	Each	5
Sediment Basins	Each	1
Grazing Management	Acres	600
Invasive Weed Control	Acres	40
Forest Management	Acres	400
Road Improvements	Miles	10
LI1		
Cropland Management	Acres	500
Vegetated Buffer	Miles	1
Erosion Control Structures	Each	3
Sediment Basins	Each	1
Grazing Management	Acres	400
Invasive Weed Control	Acres	40
Forest Management	Acres	200
Road Improvements	Miles	5
BC2		
Cropland Management	Acres	8,300
Vegetated Buffers	Acres	10
Erosion Control Structures	Each	50
Sediment Basins	Each	15
Grazing Management	Acres	1,400
Invasive Weed Control	Acres	300
Forest Management	Acres	300
Road Improvements	Miles	40

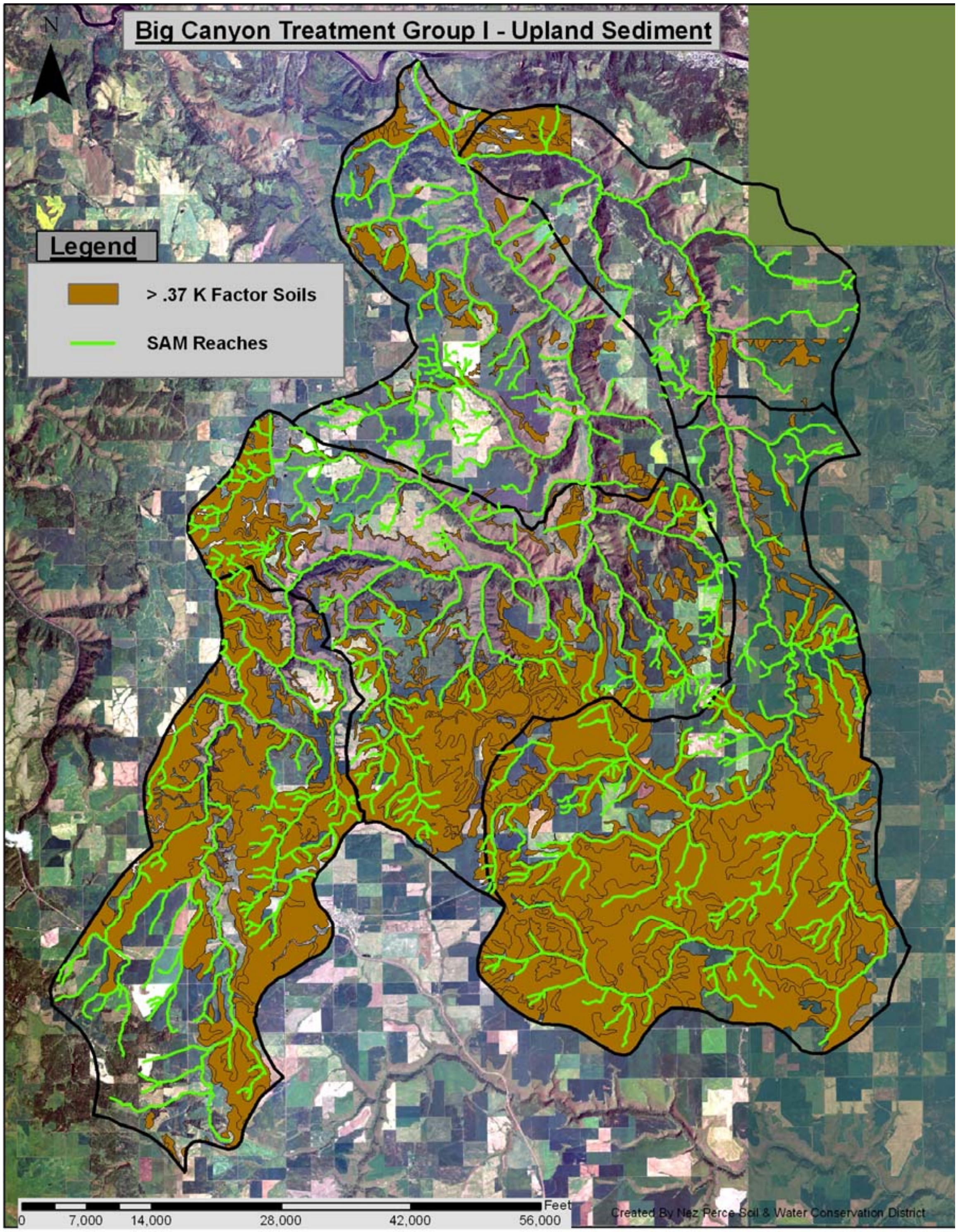

Figure 22. Upland Sediment Treatment Locations

Group J – Invasive Species

The presence of terrestrial and aquatic invasive species is of great concern within the Big Canyon basin. The potential for invasive species to spread is vast, due to the proximity of humans to the waterways. According to the Aquatic Nuisance Species (ANS) Taskforce, humans are the number one method of spread for invasive species (2007). In 2003, Idaho recognized the invasive species problem with House Bill 212, the Invasive Species Act, which recommended "prevention, early detection, rapid response and eradication" as the "most effective and least costly strategies against invasive species."

Further recommendations include developing a basin-wide general procedure to reduce the transport and introduction of invasive species. This may entail treating waders, nets and other equipment that comes in contact with stream water with saline, bleach, UV or other solution such as Bardac 22C50. Additionally, a protocol outlining disinfection of field equipment that has potentially come into contact with terrestrial invasive such as knotweed, knapweed or poison hemlock should be pursued for use by managers, land owners and restoration facilitators.

The Clearwater Basin Cooperative Weed Management Area identifies weedy invaders and categorizes them into three management control groups: control, eradicate, and contain. Invasive species control will follow the recommendations of the CBWMA.

This group is not prioritized within Assessment Units, as invasives are epidemic within the entire Basin. Recommendations include the creation of a field crew designated solely to perform noxious weed eradication throughout the Big Canyon basin.

For known major infestations within the Big Canyon Creek drainage, including *Conium maculatum* (poison hemlock), *Hieracium spp.* (hawkweed) and *Centaurea solstitialis* (yellow starthistle), all possible methods of eradication should be pursued.

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Chapter 6

Toward the Future

This chapter discusses some of the steps to take in order to sustain the momentum of active restoration within the Big Canyon Creek drainage. It addresses some of the gaps the working group identified throughout this process as well as the areas of support that are necessary to move forward in the basin.

Coordination

As we move from the planning stage of this document into the implementation stage, regular meetings should be held between agencies working in the Big Canyon Basin in order to coordinate on-the-ground projects from year to year. This type of coordination already exists annually between IDFG and the District, as well as between the District and the Tribe but a collaborative effort should be undertaken between all entities.

Data

A wealth of data exists for the Big Canyon creek drainage; throughout the process of organizing and analyzing the available data and creating GIS-ready layers of many components will be extremely valuable in the future. Not only does this provide a baseline set of data for monitoring, but it will help managers from the Tribe and the District to better organize future efforts, streamlining the data collection necessary to evaluate our efforts over the coming ten-year period. Being able to make comparisons between years is crucial in order to adapt our restoration methods to be as effective and efficient possible.

The working group is aware that several data sets relative to the Big Canyon Creek basin and our restoration actions there are currently being processed. Two data sets will support our restoration actions in the next ten years and will be used as we create action plans for the remaining AUs. The first, collected for the Big Canyon Creek TMDL, is currently being analyzed by an independent consulting firm and will be available within the coming year. The second is the FLIR thermal infrared data for the Big Canyon Creek basin, which is complete, but has yet to be geo-referenced. Upon completion, the FLIR data set will give us a more complete picture of the thermal regimes throughout the basin.

Funding

As mentioned early on in this report, many funding agencies are requiring some kind of management plan with a monitoring component; having a 10-year prioritized plan that serves as a blueprint for restoration activity for all agencies in the Big Canyon Creek basin answers that requirement. Beyond that, however, identifying specific, high-priority projects in the basin increases the potential for funding opportunities beyond the BPA. This increased funding potential will enable the Tribe and the District to develop more partnerships by reaching out to public groups, schools, individual landowners and other stakeholders. The synergistic effect of these partnerships and increased efforts can help us attain our goals within the basin, and possibly expand what we can achieve.

Policy

The Big Canyon Creek watershed is currently sustaining development pressure that often results in degraded terrestrial and aquatic habitat. Because the basin is a mixed ownership of private, tribal, state and federal lands, it falls under the regulatory authority of multiple agencies with regards to natural resources management. While these agencies have a number of ordinances and policies in place to protect the environment, many are outdated or inconsistent with current science and have the potential to critically undermine our restoration goals. A compilation and evaluation of state, local, federal and tribal ordinances, regulations and policies for environmental protection will be performed to provide guidance toward an ultimate goal of assisting all management entities to have strong natural resource management plans in place.

Education and Outreach

Undertaking restoration activity in any dynamic system requires an understanding of two principle ideas: that any action will have both upstream and downstream effects and that conditions affecting a watershed start in the uplands. Considering these two points, it is imperative that a considerable effort be made to involve all agencies working in the basin, private land owners, and other stakeholders in the planning process of any restoration action. With community support and a better understanding of how land practices can have a positive or negative effect on an area, restoration activities will be more likely to succeed (USEPA 2000).

Providing technical assistance and outreach through various programs to stakeholders in the basin is fundamental to adjusting practices and behaviors in such ways that promote more wise use of resources and afford them greater protection. The Tribe employs biologists, engineers and hydrologists with expertise, education and training in the watershed restoration and it is important to offer these services when they are needed. Examples may include increasing awareness and application of improved irrigation technologies that conserve water, assisting in the development and application of best management practices for small timberland operations to reduce sediment delivery to streams, or providing information to community citizens on the effects of lawn chemicals and fertilizers to aquatic resources. **All of the improvements brought about through active restoration actions can be easily be undermined or reversed if future generations are not provided the educational opportunities to learn about their connections to the watershed and their impacts on the land.**

Monitoring and Evaluation

From 2003 to 2006, the Tribe collected baseline data from 8 sites within Big Canyon basin using a rigorous, quantitative protocol developed by tribal biologists that was approved by the ISRP in preparation for the 2003 field season.[5] Additionally, the District has used the SAM protocols discussed in the methods section of Chapter 4 to collect both qualitative and quantitative data throughout both drainages. At the end of the 10-year time outlined in this document, all 8 sites in the Big Canyon basin will be assessed again, with the goal of collecting those data necessary to determine relative shifts in fish populations and aquatic habitat quality. Additionally, the reaches evaluated with the SAM protocol will be revisited to evaluate progress toward the watershed-wide goal of restoring 90% of reaches with a “poor,” “fair,” or “good” designation to “excellent” condition.

[5] Monitoring Plan to Evaluate Watershed Recovery is available from NPT DFRM.

References

Belt, George H., J. O'Laughhlin, and T. Merrill.Design of Forest Riparian Buffer Strips for the Protection of Water Quality: Analysis of Scientific Literature Idaho Forest, Wildlife and Range Policy Analysis Group, Report No. 8. June 1992.

Bjornn, T. C. and D.W. Reiser. 1991. Habitat Requirements of Salmonids in Streams. Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. American Fisheries Society Special Publication 19:83-138.

Black, A. E., E. Strand, C. Watson, R.G. Wright, J. M. Scott, P. Morgan. Land Use History of the Palouse Bioregion: Pre-European to Present. U.S. Geological Survey, 1998. Website: http://biology.usgs.gov/luhna/chap10.html. Accessed 13 June 2007.

Big Canyon Creek Aquatic Assessment. 2001. The Center for Environmental Education, Washington State University, Pullman, WA.

Clearwater Subbasin Assessment. Ecovista, Nez Perce Tribe Wildlife Division and Washington State University Center for Environmental Education. 2003. Accessed 30 September, 2007. www.nwcouncil.org/fw/subbasinplanning/clearwater/plan.

Chamberlin, T.W., R. D. Harr, F.H. Everest. 1991. Timber Harvesting, Silviculture, and Watershed Processes. Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. American Fisheries Society Special Publication 19:181-205.

Christian, Richard and Emmit E. Taylor. Fish Passage Assessment: Big Canyon Creek Watershed. 2004. Nez Perce Tribe.

Furniss, M.J., T. D. Roelofs, C.S. Yee. Road Construction and Maintenance. Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. American Fisheries Society Special Publication 19:297-323, 1991.

Idaho Conservation Data Center. Website: http://fishandgame.idaho.gov/cdc. Accessed 13 June 2007.

Idaho Department of Environmental Quality. 2007. Water Quality Standards. IDEQ 58.01.02. Boise, Idaho.

Idaho Department of Environmental Quality. 2007. Nitrate Priority Area Ranking. Boise, Idaho. Available at http://www.deq.state.id.us/water/data_reports/ground_water/nitrate/final_nitrate_priority area_ranking.pdf.

Idaho State Department of Agriculture Website.
http://www.agri.state.id.us/Categories/PlantsInsects/NoxiousWeeds Accessed August 2007.

Idaho Native Plant Society. 2007. Idaho Native Plant Society Rare Plant List – February 2007. Boise, Idaho. Available at http://www.idahonativeplants.org/rpc/RarePlantList.aspx

Jarrell, Wes and Larry Bundy. 2002. Discovery Farms Program. University of Wisconsin. Department of Soil Science. Available at http://wpindex.soils.wisc.edu/hydrologicsoilgroup.html.

J-U-B Engineers, Inc. 2004. Nez Perce County Transportation Master Plan. 2004-2024.

Koziol, D., L. Rasmussen, D. Dieringer. 2003. Big Canyon Creek Multi-layer Riparian Inventory. April 2003. Nez Perce Soil and Water Conservation District and USDA-Natural Resources Conservation Service. Lewiston, Idaho.

Lewis Soil Conservation District. 1988. Little Canyon Planning Project Final Report.

Nez Perce Tribe, Department of Fisheries Resources Management, Watershed Division. Protect and Restore Big Canyon Creek. Project Proposal for BPA. 2002.

Platts, W.S. Livestock Grazing. Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. American Fisheries Society Special Publication 19:297-323, 1991.

Protect and Restore Big Canyon Creek. Nez Perce Tribe, Department of Fisheries Resources Management, Watershed Division. Program Project Solicitation for FY 2007-2009.

Rasmussen, L.R, Zenner, C. and S. Thomas. Conservation Needs Assessment – Big Canyon Creek Watershed Survey Results. 2006. Nez Perce Soil and Water Conservation District.

Rasmussen, Lynn. Restoring Anadromous Fish in the Big canyon Creek Watershed: Habitat Improvement marketing Plan. 2006. Nez Perce Soil and Water Conservation District.

Rasmussen, Lynn. 2006. Restoring Anadromous Fish Habitat in the Big Canyon Creek Watershed. BPA project number 1999-015-00. Program Project Solicitation for FY 2007-2009.

Rosgen, D.L. 1994. Classification of Natural Rivers., Catena, Wildland Hydrology, Pagosa Springs, CO.

Shively, Dan. 2006. Hood River Basin Aquatic Habitat Restoration Strategy. USDA-Forest Service. Mt. Hood National Forest, Hood River Ranger District. Parkdale, Oregon.

Strategic Management Plan. Nez Perce Tribe Department of Fisheries Resources Management. Draft, 2007.

Taylor, Emmit; Mark Rainey; Kent Werlin. 2006. Protect and Restore Anadromous Fish Habitat in the Big Canyon Watershed. BPA project number 1999-016-00. Nez Perce Tribe. 2002 Project Proposal.

USEPA, 2003. EPA Region 10 Guidance for Pacific Northwest State and Tribal Temperature Water Quality Standards. EPA 910-B-03-002. Region 10 Office of Water, Seattle, WA.

USEPA, 2000. Principles for the Ecological Restoration of Aquatic Resources. EPA841-F-00-003. Office of Water (4501F), United States Environmental Protection Agency, Washington, DC. 4 pp.

United States Department of Agriculture – Natural Resources Conservation Service. Website: http://soils.usda.gov. Accessed August 2007.

United States Deparment of Agriculture, Natural Resources Conservation Service. 2002. National Soil Survey Handbook. Available at http://soils.usda.gov/procedures/handbook/main.htm.

USFWS and US Coast Guard. Aquatic Nuisance Species (ANS) Taskforce website. Homepage accessed 10/2/2007. http://www.protectyourwaters.net/

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Appendix A – Success Story

One of the challenges in the Lower Clearwater River system is to achieve restoration success on sites that have low precipitation, poor soils and heavy impacts from poor land management. Many of the restoration sites appear to be beyond repair in the minds of landowners and resource managers. However, the sponsors of this strategy have had numerous successes outside the proposed watersheds, leading to the belief that the restoration goals outlined in this strategy are feasible.

One project that illustrates the potential for successful restoration is located in the Hatwai Creek drainage. This drainage is located approximately 25 miles downstream of the mouth of Big Canyon Creek. The drainage has the same climate, soils and similar land use impacts as in Big Canyon Creek. The Hatwai Creek restoration project was installed in 1993 to improve chinook salmon (*Oncorhynchus tshawytscha*) habitat. The site had severe channelization, and other impacts stemming from its use as a gravel mine and livestock winter feeding operation. Additionally, the site had been a 1,000-head feedlot for 40 years.

Over many years of impacts, the stream area no longer supported salmonids. The District worked with the landowner to install restoration measures similar to those proposed in this strategy, including livestock fencing, alternative water developments, stream crossing improvements, tree plantings, and bioengineering streambank erosion control measures. Approximately 0.5 miles of stream was treated for about $40,000. As part of the project, IDFG collected fish distribution and abundance data within the project site. Figure XX illustrates the before and after treatment results.

BEFORE TREATMENT - 1992

AFTER TREATMENT - 2006

BEFORE TREATMENT - 1992

AFTER TREATMENT - 2006

Figure 23. Before and after treatment at the Hatwai Creek Restoration site.

Appendix B - Watershed Profile

The watershed profile section provides additional inventory information not included in the Background (Chapter 2) of this report.

The large volume of inventory data is summarized in Table 16. Data is presented for the entire Watershed as well as individual Assessment Units.

Table 16. Big Canyon Creek Inventory

Inventory Parameter	Watershed Wide	BC1	BC2	BC3	LI1	LI2
Ownership						
Federal (acres)	5,321	1,002	2,549	486	846	440
% Federal	3.7%	4.2%	7.5%	1.8%	4.9%	1.0%
Tribal (acres)	11,623	286	3,238	6,141	148	1,812
% Tribal	8.0%	1.2%	9.5%	22.8%	0.9%	4.2%
Private (acres)	12,7481	22,455	27,840	20,262	16,139	40,787
% Private	87.9%	93.9%	81.8%	75.4%	94.2%	94.8%
State (acres)	561	161	400			
% State	0.4%	0.7%	1.2%			
Acres						
Total Acres	144,991	23,904	34,027	26,888	17,133	43,039
% of Total		16.4%	23.4%	18.8%	11.8%	29.6%
Lewis County Acres	106,245	5,919	23,260	25,762	8,264	43,040
% Lewis County	73.3%	24.8%	68.4%	95.8%	48.2%	100%
Nez Perce County Acres	30,815	17,960	10,576	1,117	1,162	
% Nez Perce County	21.3%	75.1%	31.1%	4.2%	6.8%	
Clearwater County Acres	7644				7644	
% Clearwater County	5.3%				44.6%	
Stream Metrics						
Number of stream miles	766	120.2	191	156	70	228
% of within the Watershed		16%	25%	20%	9%	30%
Number of stream miles blocked by passage barriers	31	8	14	5	4	30
Vegetation						
Invasive Plants						
Number of road miles within 500 LF of stream with invasive weeds		129.8	123.7	127.9	ND[6]	ND
Number of road miles within 500 LF of stream with critical riparian establishment weeds		2.1	0	0	ND	ND
Multilayer Riparian Canopy						
Stream miles with No riparian cover		10.6	37.8	34.2	7.1	106.3
%		22%	51%	54%		
Stream miles with <15 feet of multilayer riparian vegetation		13.2	12.3	10.7	11.5	16.9
%		28%	17%	28 %		
Stream miles with >15 feet of multilayer riparian vegetation		24.0	23.8	17.9	24.9	10.1
%		50 %	32%	29%		

[6] No Data

Inventory Parameter	Watershed Wide	BC1	BC2	BC3	LI1	LI2
Roads						
Total Road Miles	382.8	63.7	93.3	54.1	32.8	138.9
Road Density (road miles/acre^2)	1.7	1.7	1.8	1.3	1.2	2.1
Number of Road Miles within 300 LF of stream	87.6	11.9	16.2	20.3	8.9	30.3
Road Category						
Light Duty Roads						
Total Miles	281.8	53.4	54.8	46.2	24.1	103.3
% of Total Miles		19%	19%	16%	9%	37%
Total Miles within 300 LF of stream	43.7	10.6	7.5	8.1	2.4	15.1
% within 300 LF of stream		24%	17%	19%	5%	35%
Primary Highway						
Total Miles	5.2			5.2		
% of Total Miles				100%		
Miles within 300 LF	1.1			1.1		
% of within 300 LF of stream				100%		
Secondary Highway						
Total Miles	28.5		0.4	6.0	4.3	17.8
% of Total Miles			1%	21%	15%	62%
Total within 300 LF of stream	10.9			1.9	0.2	8.8
% within 300 LF of stream				17%	2%	81%
Unimproved Roads						
Total Miles	124.7	10.3	38.2	54.1	4.3	17.8
% of Total Miles		8%	31%	43%	3%	14%
Total within 300 LF of stream	32.3	1.3	8.7	9.7	6.3	6.3
% within 300 LF of stream		4%	27%	30%	20%	20%
Rail Roads						
Total Miles	6.2			6.2		
% of Total Miles				100%		
Total within 300 LF of stream	0.5			0.5		
% within 300 LF of stream				100%		
Livestock						
Number of livestock operations	61	ND[7]	ND	ND	ND	ND
ND[8]	1270	ND	ND	ND	ND	ND
Number of operations with direct access to water	21	ND	ND	ND	ND	ND
Number of operations located	23	ND	ND	ND	ND	ND

[7] No Data

Inventory Parameter	Watershed Wide	BC1	BC2	BC3	LI1	LI2
within 300 lf of stream						
Residential Structures						
Total Structures	1737	405	196	393	182	561
Total Structures within 300 LF of stream	301	114	26	61	9	91
% of total	17.3%	28.2%	13.3%	15.5%	5.0%	16.2%
Soils						
Acres of hydric soils	6,863	841.5	1,695	1,959	1,017	1,351
% hydric soils in AU	4.7%	2.4%	2.1%	3.6%	6.5%	3.1%
Acres of K factor soils > .37	58,704	28,055	13,539	13,129	2,555	1,426
% of acres in AU with K factor > 0.37	40.5%	65.2%	50.4%	38.6%	10.7%	8.3%
Predominant Soil	Uhlorn	Southwick	Uhlorn	Taney	Southwick	Uhlorn
General Soil Groups Acres						
Broadax-Oliphant	1,504				1,504	
Chard	527				527	
Joel-Boles	9613	280	3011	5920	155	249
Kettenbach-Linville	17,203	6,092	6,351	1,532	2,293	936
Klickson-Hooverton	16,509	4,563	4,402	2,040	3,294	2,211
Southwick-Driscoll-Larkin	27,228	11,010	5,552		5,569	5,096
Taney-Setters	17,812	1,392	3,228	10,692	2,468	35
Uhlorn-Nez Perce	54,337	565	11,497	6,419	1,357	34,503
Land cover						
Bare Rock (Acres)	1,533.3	345	541.73	228.89	209.61	208.09
%	0.5	1.43	1.62	0.84	1.23	0.48
Bare Soil (Acres)	6,622.9	1,260.70	1,636.99	1,287.42	879.20	1,558.58
%	3.8	5.23	4.89	4.72	5.14	1558.60
Brush (Acres)	16,946.7	4,411.65	4,899.71	2,114.97	2,222.39	3,297.93
%	6.5	18.31	14.64	7.76	13.00	7.66
Deciduous Forest (Acres)	6,617.3	2,769.88	1,257.83	685.06	1,272.37	632.16
%	1.4	11.49	3.76	2.51	7.44	1.47
Evergreen Forest (Acres)	7,179.9	963.91	2,309.86	2,126.10	1,440.90	339.13
%	1.1					
Grassland (Acres)	11,071.7	2,477.02	2,516.32	1,889.21	1,704.82	2,484.32
%	6.8	10.28	7.52	6.93	9.97	5.77
Mixed Forest (Acres)	4,736.4	891.35	625.49	1,949.40	914.63	355.49
%	2.1	3.70	1.87	7.15	5.35	0.83
Pasture/Hay/Alfalfa (Acres)	669.4	18.65	85.82	74.72	53.82	436.39
%	0.4	0.08	0.26	0.27	0.31	1.01
Small Grains (Acres)	87,775.1	10638.48	19,322.42	16,361.83	8,129.13	33,323.27
%	76.1	44.14	57.74	60.01	47.56	77.35
Urban (Acres)	455.0	129.00	21.24	76.18	46.95	181.59
%	0.5	0.54	0.06	0.28	0.27	0.42
Water (Acres)	51.9	3.65	7.46	6.06	14.90	19.79
%	0.0	0.02	0.02	0.02	0.09	0.05
Wetlands (Acres)	1,312.6	190.61	237.50	436.90	203.56	244.00
%	0.8	0.79	0.71	1.70	1.19	0.57

Counties

The Big Canyon Creek watershed encompasses Clearwater (5.2%-7,539.5 acres), Lewis (73.2%-106,133.4 acres), and Nez Perce (21.6%-31,318.1 acres) Counties, Idaho.

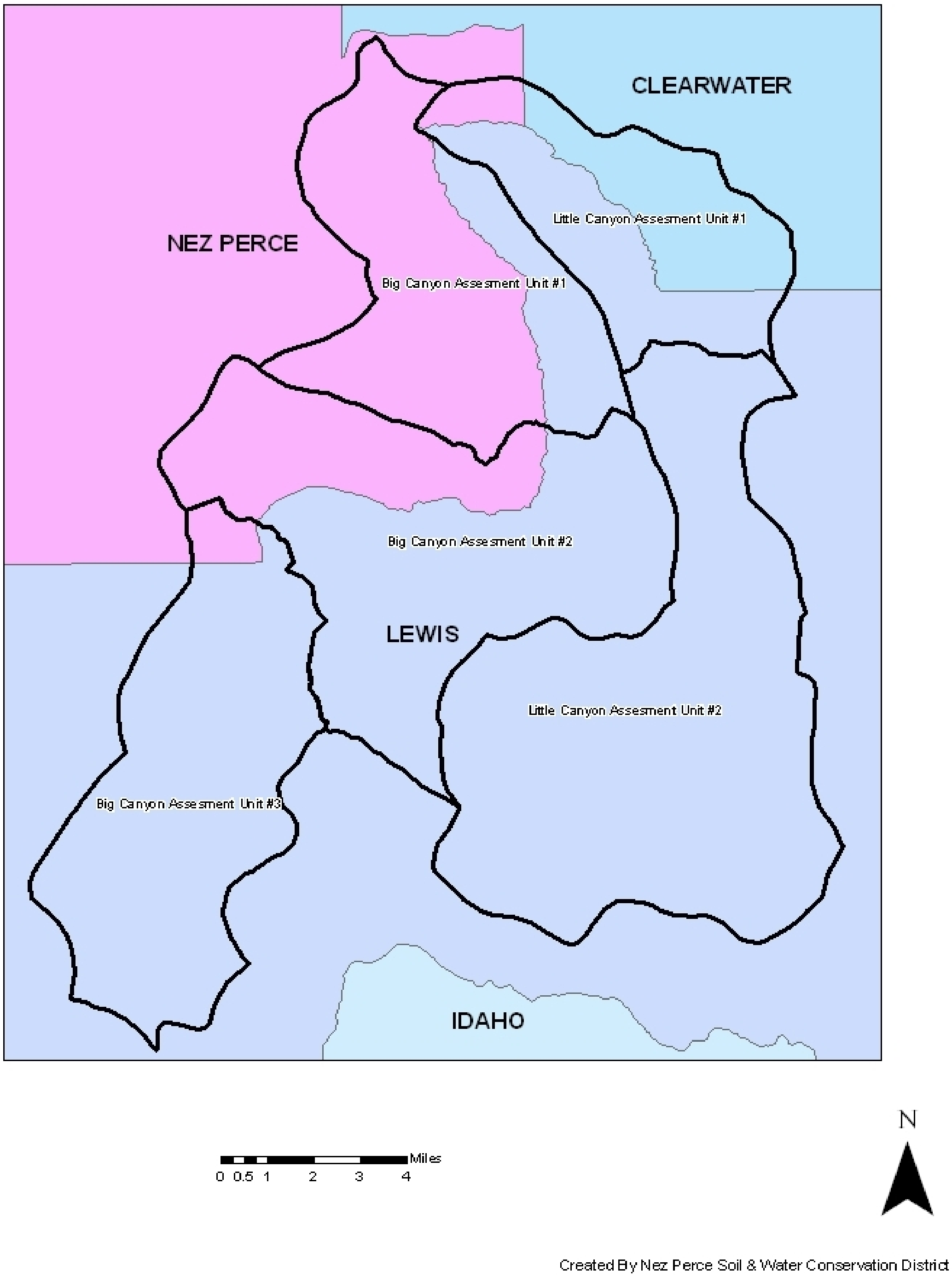


Figure 24. Counties.

Common Resource Area

A Common Resource Area (CRA) is defined as a geographical area where resource concerns, problems, or treatment needs are similar. It is considered a subdivision of an existing Major Land Resource Area (MLRA) map delineation or polygon. Landscape conditions, soil, climate, human considerations, and other natural resource information are used to determine the geographic boundaries of a Common Resource Area.

Common Resource Area Descriptions

9.11 Palouse and Nez Perce Prairies Nez Perce Prairie This unit is a loess covered plateau. It is higher, cooler, less hilly, and has shallower soils than the Palouse Hills CRA. Idaho fescue and bluebunch wheatgrass are native. Cropland is now extensive and grows wheat, barley, peas, and hay. The headwaters of many perennial streams are impacted by agricultural land use, negatively impacting the water quality of downstream canyon reaches.

43A.1 Northern Rocky Mountains Grassy Potlatch Ridges The Grassy Potlatch Ridges ecoregion is underlain by volcanics and mantled by loess and volcanic ash. Idaho fescue, bluebunch wheatgrass, bluegrass, snowberry, and, on cooler, moister sites, scattered ponderosa pine occur and contrast with the forests of the Northern Idaho Hills and the forests and savannas of the Lower Clearwater Canyons. Today, small grain farming, hay operations, and livestock grazing are extensive.

43A.3 Northern Rocky Mountains Lower Clearwater Canyons The deep, narrow Lower Clearwater Canyons are lower, drier, warmer, and have been more developed than the Lochsa, Selway, and Clearwater Canyons. Savanna, Douglas fir ponderosa pine forest, and, in riparian areas, western red cedar, western white pine, grand fir forest occur. Forests are more widespread on canyon bottoms than on slopes.

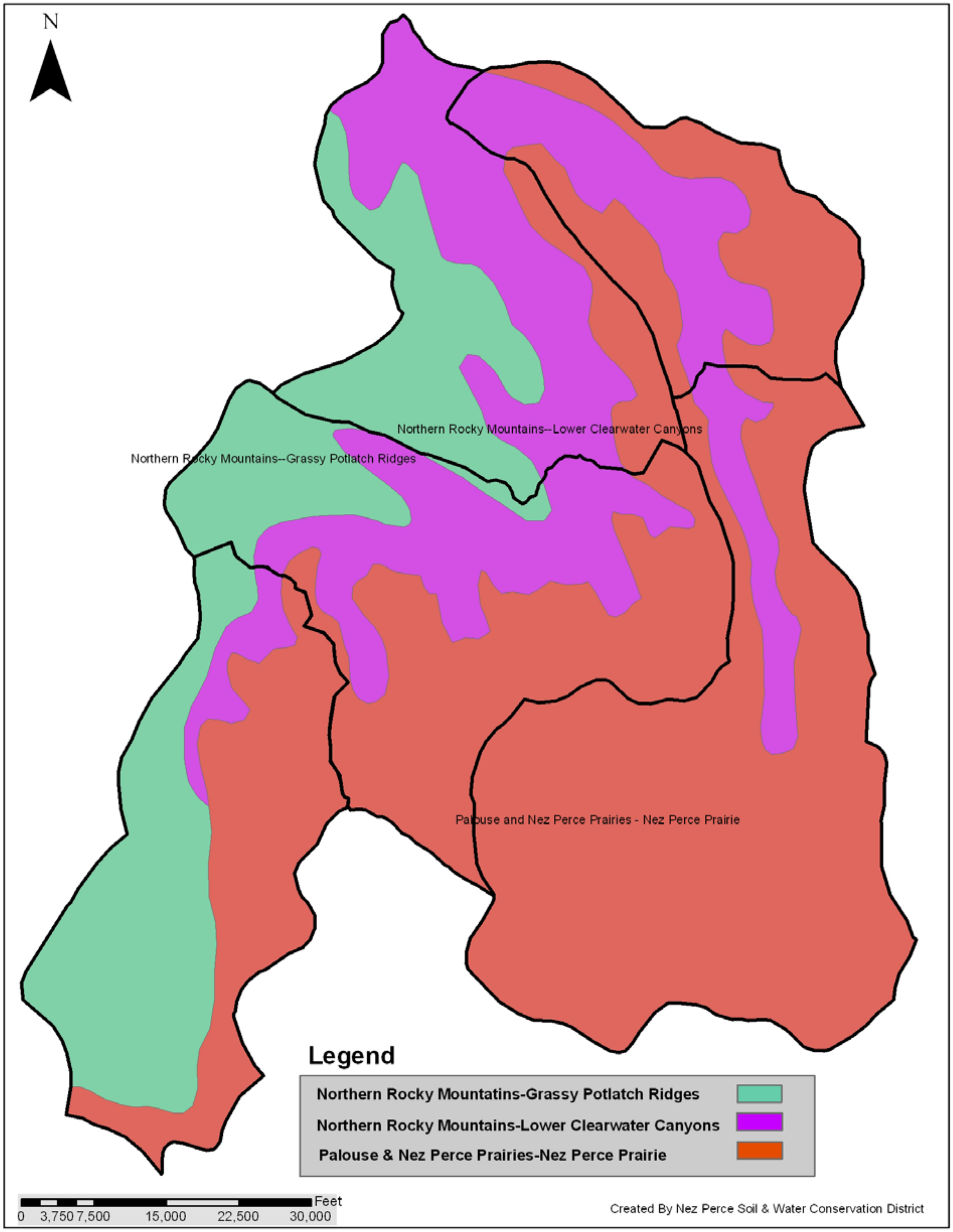


Figure 25. Common Resource Areas

Topography

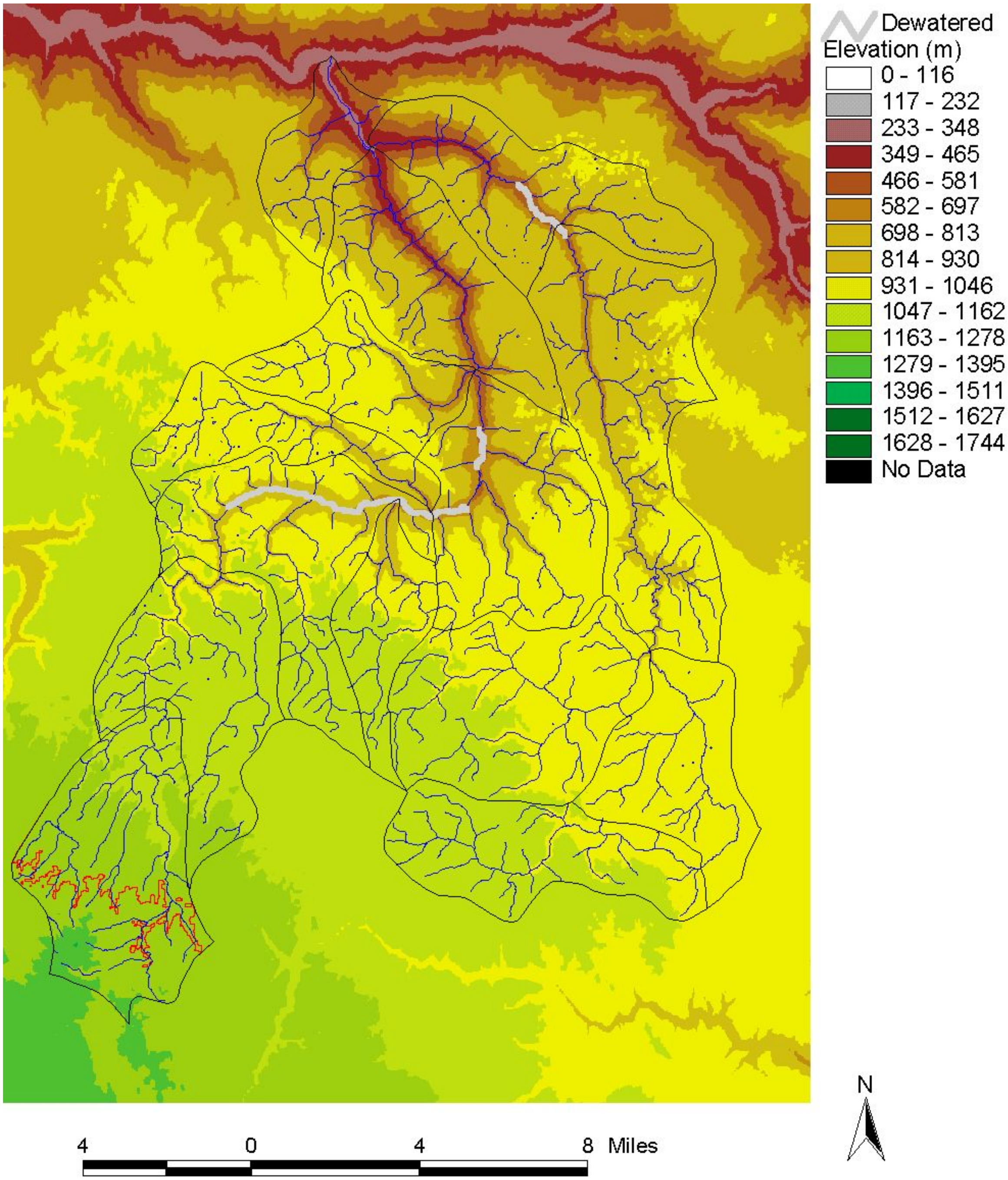


Figure 26. Big Canyon Creek watershed topography. Red line delineates the rain-on-snow elevation boundary (4,000') and stream reaches subject to seasonal dewatering.

Wetlands

The USDA Soil Survey for Lewis/Nez Perce Counties was used to determine the extent of hydric soils by assessment unit (Figure 27)

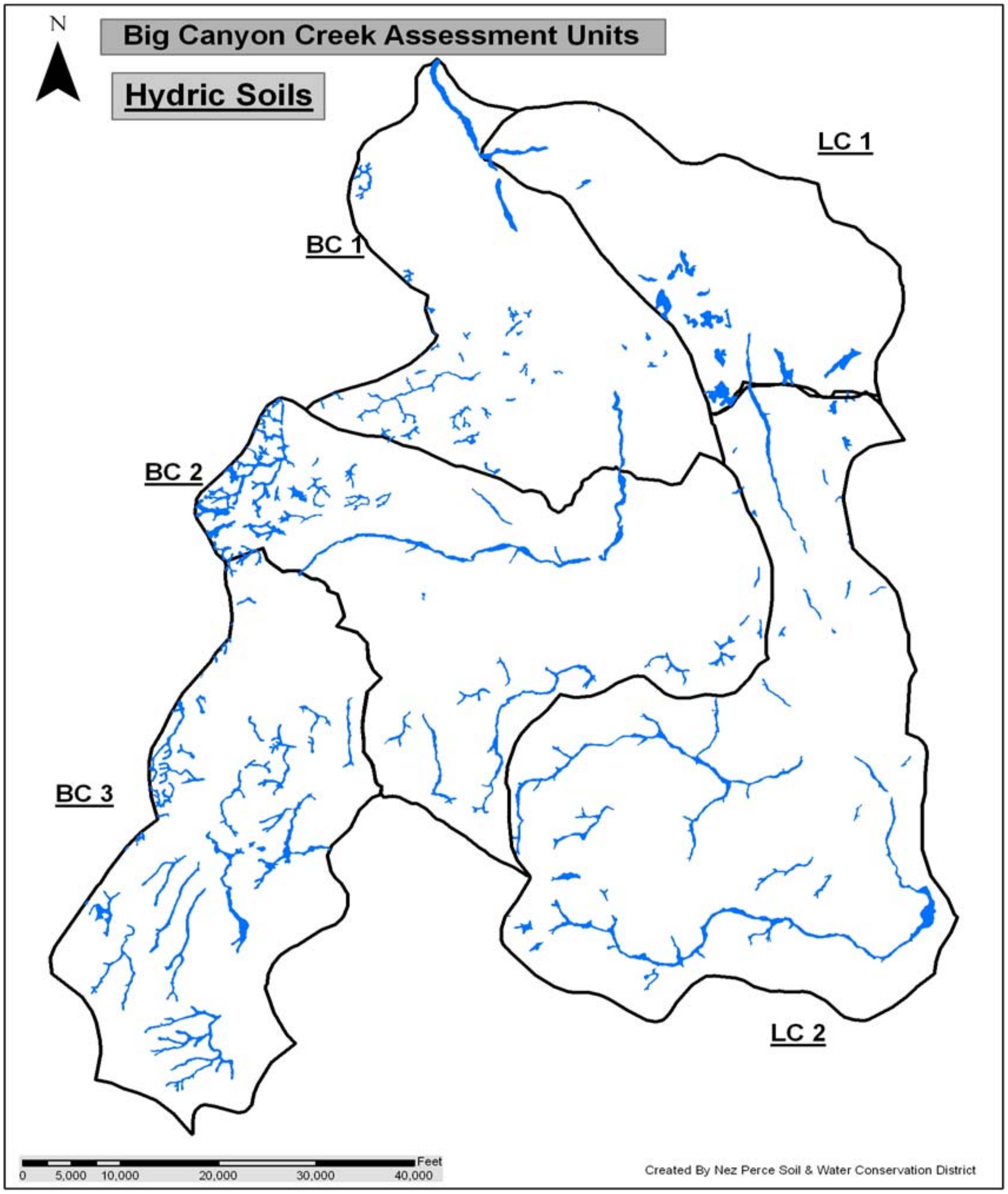


Figure 27. Hydric Soil location by Assessment Unit

Sensitive Species

Sensitive plant and animal species found in or near the Big Canyon Creek watershed are shown in Table 17.

Table 17. Sensitive Species List

Common Name	Scientific Name
Plant Species	
Douglas' Clover	*Trifolium douglasii*
Purple Thick-leaved Thelypody	*Thelypodium laciniatum var. streptanthoides*
Western Ladies Tresses	*Spiranthes porrifolia*
Wolf's Currant	*Ribes wolfii*
Simpson's Hedgehog Cactus	*Pediocactus simpsonii*
Jessica's Aster	*Aster jessicae*
Broad-fruit Mariposa	*Calochortus nitidus*
Constance's Bittercress	*Cardamine constancei*
Palouse Thistle	*Cirsium brevifolium*
Palouse Goldenweed	*Haplopappus liatriformis*
Hazel's Prickly Phlox	*Leptodactylon pungens ssp. Hazeliae*
Spacious Monkleyflower	*Mimulus ampliatus*
Bank Monkeyflower	*Mimulus clivicola*
	Tripterocladium leucocladulum
Piper's Milkvetch	*Astragalus riparius*
Green-band Mariposa Lily	*Calochortus macrocarpus var. maculosus*
Plumed Clover	*Trifolium plumosum var amplifolium*
Gold–back Fern	*Pentagramma triangularis ssp triangularis*
Spalding's Silene	*Silene spaldingii*
Dwarf Gray Rabbitbrush	*Chrysothamnus nauseosus ssp. Nanus*
Idaho Hawksbeard	*Crepis bakeri ssp. idahoensis*
Giant Heeleborine	*Epipactis gigantea*
Sticky Goldenweed	*Haplopappus hirtus var. sonchifolius*
Salmon-flower Desert-parsley	*Lomatium salmoniflorum*
Stalk-leaved Monkeyflower	*Mimulus patulus*
	Orthotrichum hallii
	Orthotrichum holzingeri
Fish Species	
Steelhead	*Oncorhynchus mykiss*
Chinook Salmon	*Oncorhynchus tshawytscha*
Bull Trout	*Salvelinus confluentus*
White Sturgeon	*Acipenser transmontanus*
Westslope Cutthroat Trout	*Oncorhynchus clarki lewisi*
Mammal Species	
Pallid Bat	*Antrozous pallidus*
Townsend's Big-eared Bat	*Corynorhinus townsendii*
Spotted Bat	*Euderma maculatum*
Long-eared Myotis	*Myotis evotis*
Fringed Myotis	*Myotis thysanodes*

Common Name	Scientific Name
Long-legged Myotis	*Myotis volans*
Yuma Myotis	*Myotis yumanensis*
Lynx	*Lynx Canadensis*
Western Pipistrelle	*Pipistrellus Hesperus*
Merriam's Shrew	*Sorex merriami*
Bird Species	
Black-billed Cuckoo	*Coccyzus erythropthalmus*
Bald Eagle	*Haliaeetus leucocephalus*
Mountain Quail	*Oreortyx pictus*
Great Gray Owl	*Strix nebulosa*
Flammulated Owl	*Otus flammeolus*
White-headed Woodpecker	*Picoides albolarvatus*
Peregrine Falcon	*Falco peregrinus anatum*
Northern Pygmy-owl	*Glaucidium gnoma*
Pygmy Nuthatch	*Sitta pygmaea*
Reptile & Amphibian Species	
Woodhouse's Toad	*Bufo woodhousii*
Ringneck Snake	*Diadophis punctatus*
Invertebrate Species	
Columbia Pebblesnail	*Fluminicola fuscus*
Shortface Lanx	*Fisherla nuttalli*
Columbia River Tiger Beetle	*Cicindela columbica*
Mission Creek Oregonian	*Cryptomastix magnidentata*

Nitrate Priority Areas

The 5th ranked nitrate priority area is located within the watershed. The Idaho Department of Environmental Quality (DEQ) designates 25 degraded groundwater areas within the state. Nitrate priority areas are ranked on the severity of the degradation. A rank of "1" indicates the most severely impacted area in the state.

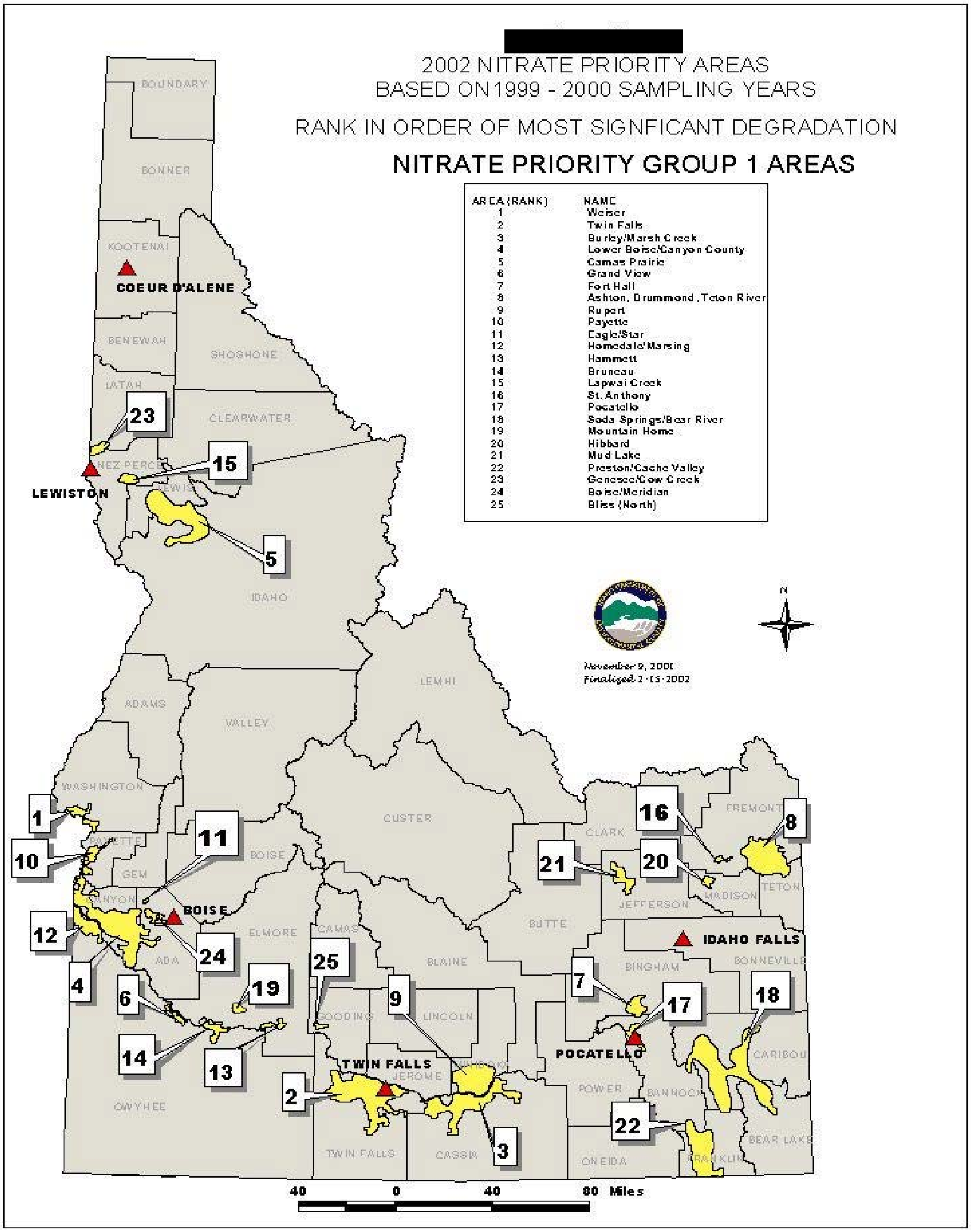


Figure 28. Nitrate Priority Areas

Coordinated Weed Management Areas

Over 40 Coordinated Weed Management Areas (WMA) have been established in Idaho. The Big Canyon watershed is located within the Clearwater Basin Coordinated Weed Management Area (CBWMA).

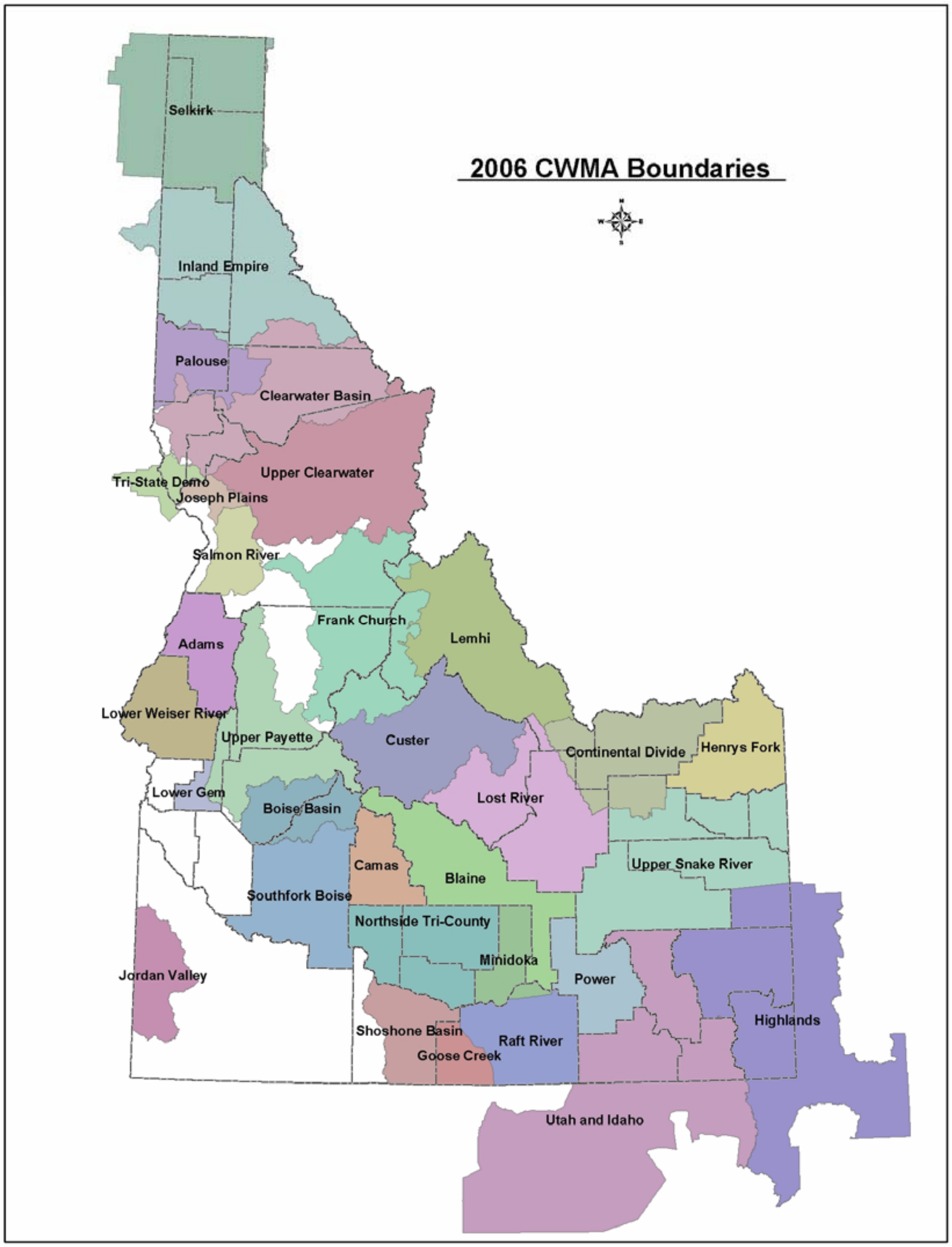


Figure 29. Idaho State Coordinated Weed Management Area locations.

Passage Barriers

Passage barriers were identified through two methods. The first was through the Big Canyon Fish passage barrier report and the second was the SAM Inventory. The first effort was completed by the NPT in 2004. The inventory was completed along stream and road crossings using a modified USDA-FS protocol.

Seventy-nine sites were surveyed in the Big Canyon watershed. Almost one-third of these crossings were located on the mainstem of Big Canyon, or its unnamed tributaries. Approximately one quarter sites were located on Long Hollow Creek, which is a tributary to Little Canyon Creek. The remaining sites were mixed amongst the other streams within the watershed.

Figure 31 shows where inventories were conducted within the Big Canyon watershed. This figure also contains the assessment of each site. The red dots indicate impassable sites, green dots indicate passable, and grey dots indicate unknown passages. The remaining sites are light blue, which stands for all structures that were assumed to pass fish (e.g. bridges, fords, and etc.). These surveys include only the sites that were quantitatively identified as barriers.

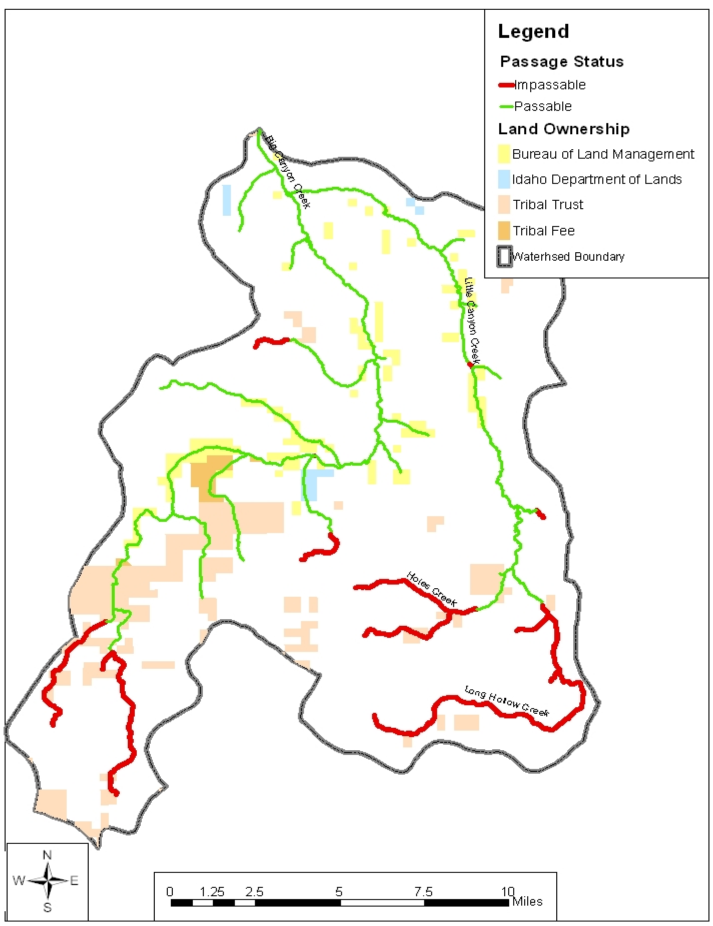
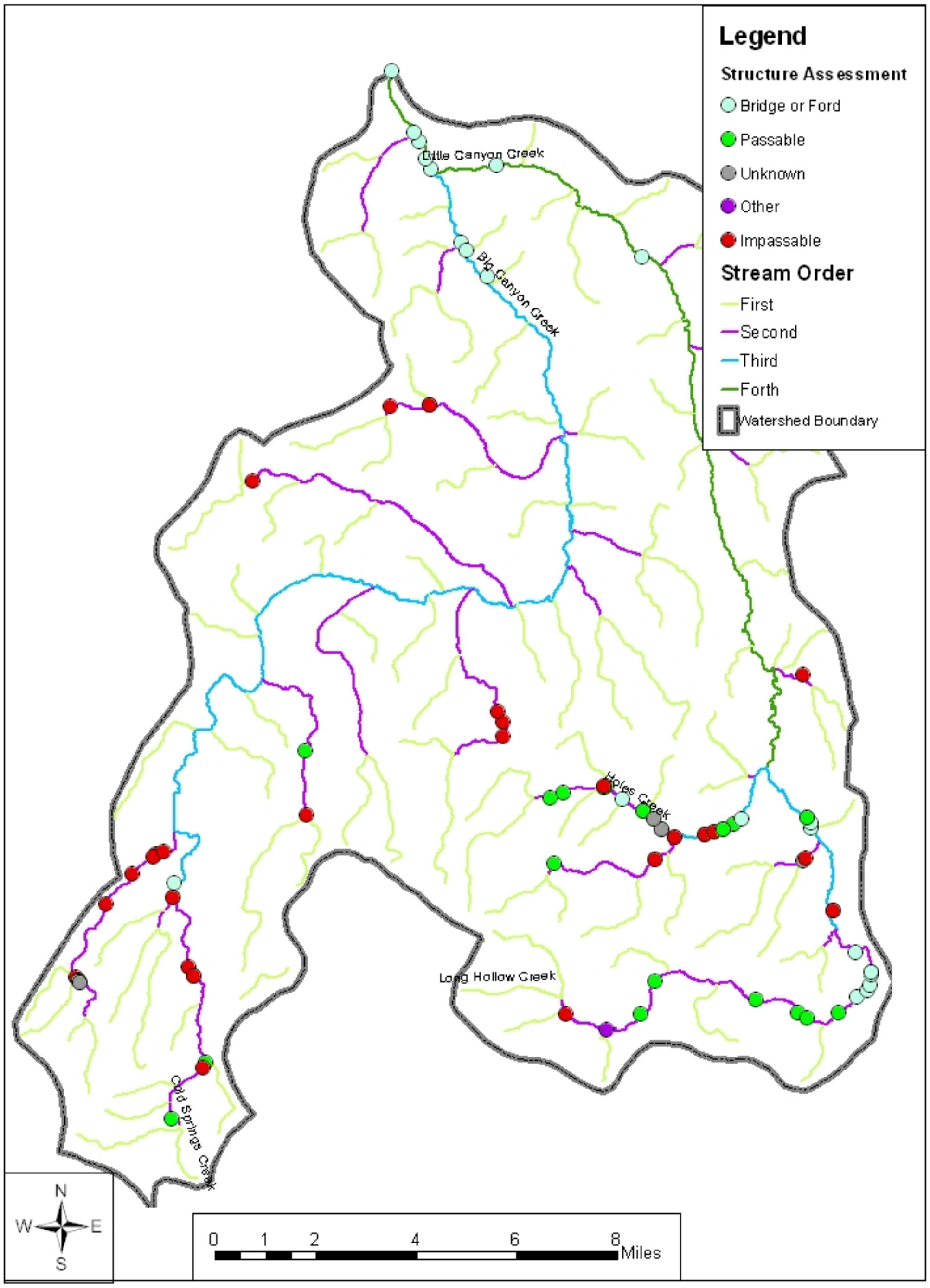


Figure 30. The passable and impassable stream sections within the Big Canyon



31. All Big Canyon watershed stream crossing surveys.

Riparian Inventory

A riparian inventory shows areas with no riparian canopy (shown as bare and bare-m in Figure 32), areas with <15 feet of riparian canopy and areas with > 15 feet of riparian canopy. .

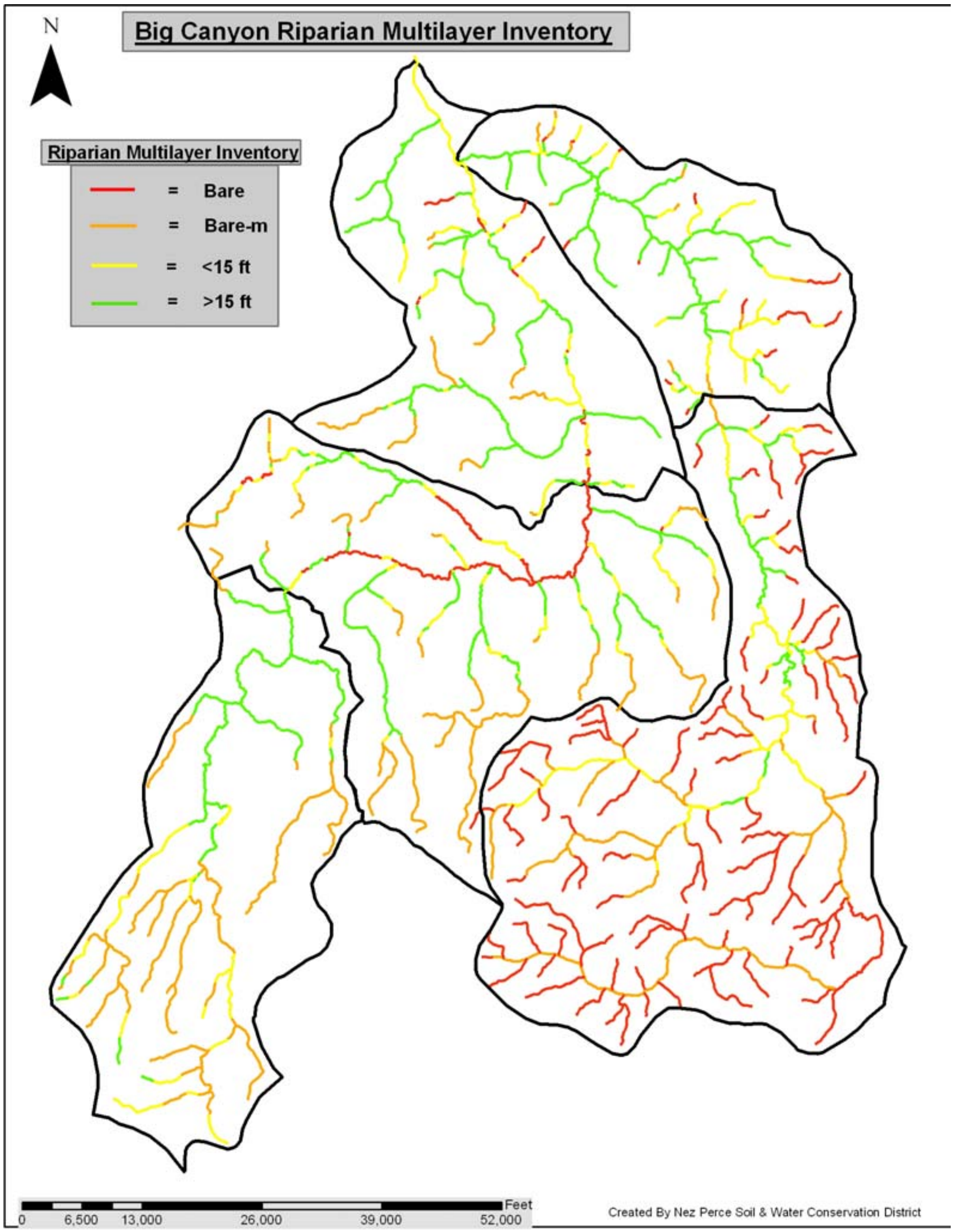
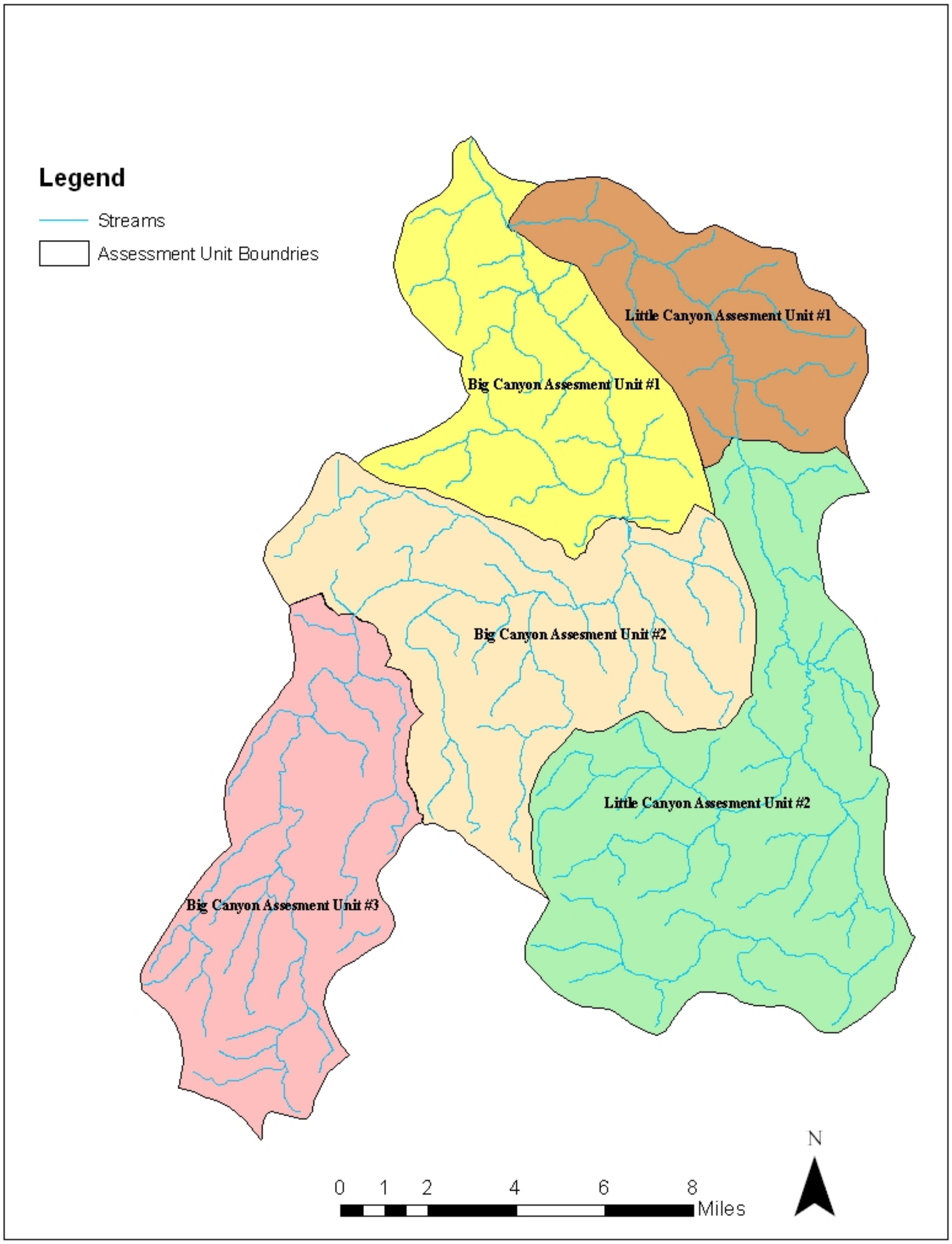
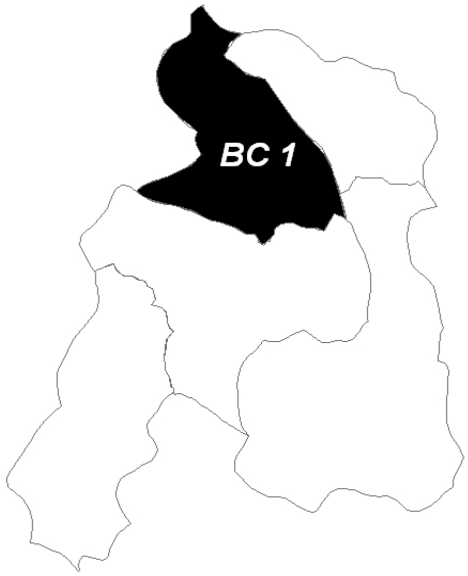


Figure 32. Riparian Inventory

Appendix C – Assessment Unit Profiles



Big Canyon Creek Assessment Unit 1



The Big Canyon Creek Assessment Unit 1 (BC1) encompasses 23,904 acres representing 16.4% of the watershed. BC1 is geographically located at the lowest elevation in the watershed and includes the confluence with the Clearwater River.

Resource Description

Urban areas include the City of Peck and developed area along Big Canyon Creek Road. Resource challenges include domestic water supply, sub-surface sewage disposal, sediment and nutrient loading from construction, road building, and road maintenance activities. The city's water supply is obtained from Big Canyon Creek. Also, the confluence of Big Canyon Creek and the Clearwater River is an important recreational site for fishing, boating, and wading activities. BC1 contains the 2nd highest number of residential structures in the watershed.

Pastureland includes both irrigated and non-irrigated acreages. Some pastureland acreage is irrigated with water obtained from Big Canyon Creek. Resource challenges include nutrient management, proper grazing management, and weed control.

Forestland occurs on steep canyon slopes. Scattered timber stands may be found on the canyon floor and interspersed throughout the cropland. Resource challenges include short-term erosion from forest harvesting activities, increased surface water runoff from reduced vegetative cover, long term erosion from road building activities, and the potential for fish spawning and rearing habitat degradation from in-stream road crossings.

Canyonlands in this assessment unit occurs on the canyon bottom and on the steep canyon walls. Starthistle is the most prevalent weedy species. Precipitation is limiting during summer months.

Cropland varies from 0 to 25% slopes. Most of the cropland occurs on gently rolling topography. Subsurface drainage was historically installed on an estimated 40% of the cropland acres. Resource challenges include gully erosion and nitrogen leaching.

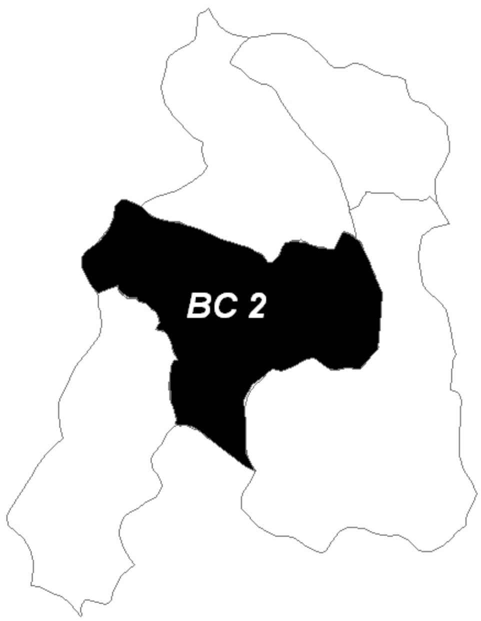
Limiting Factors

SVAP overall condition ratings for BC1 include poor (26 miles – 36%), fair (24 miles – 33%), and good (22 miles – 31%). There are no excellent reaches in this AU.

Fish Habitat is the most limiting factor to this AU with the majority of reaches (94%) receiving a fair/poor rating. Additional limiting factors are excessive nutrients (79%),riparian habitat (70%) and channel condition (61%).

In order to achieve the goal of 90% of fair/poor reaches improved to good/excellent, over 50 miles need treatment focusing on riparian habitat, channel condition and excessive nutrients.

Big Canyon Creek Assessment Unit 2



The Big Canyon Creek Assessment Unit 2 (BC2) encompasses 34,027 acres representing 23.4% of the watershed. BC2 was identified as the lowest priority AU for restoration efforts.

Resource Description

Land use within BC2 consists of cropland (62%), pastureland (2%), canyon lands (21%) and forestland (15%).

Urban areas are minimal within this AU.

Forestland occurs on very steep facing canyon slopes. Scattered timber stands may be found on the canyon floor and interspersed throughout the cropland. Resource challenges include short-term erosion from forest harvesting activities, increased surface water runoff from reduced vegetative cover, and long term erosion from road building activities.

Pastureland is non-irrigated and occurs mostly along stream corridors.

Canyonlands in this assessment unit occur on the canyon bottom and on the steep canyon walls. Starthistle is the most prevalent weedy species. Precipitation is limiting during summer months. The majority of canyonlands are grazed. However, extreme slopes limit grazing access.

Cropland varies from 0 to 25% slopes. Most of the cropland occurs on gently rolling topography. Subsurface drainage was historically installed on an estimated 50% of the cropland acres. Resource challenges include gully erosion and nitrogen leaching.

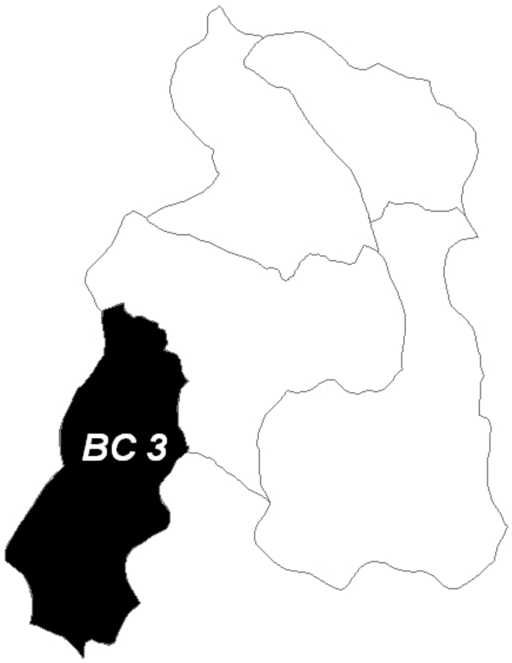
Limiting Factors

SVAP overall condition ratings for BC2 include poor (102 miles – 76%), fair (16 miles – 22%), and good (10 miles – 7%). There are no excellent reaches in this AU.

Riparian Habitat is the most limiting factor to this AU with the majority of reaches (85%) receiving a fair/poor rating. Additional limiting factors are fish habitat (75%), excessive nutrients (72%), and channel condition (69%).

In order to achieve the goal of 90% of fair/poor reaches improved to good/excellent, treatment over 102 miles need treatment focusing on riparian habitat and excessive nutrients.

Big Canyon Creek Assessment Unit 3



The Big Canyon Creek Assessment Unit 3 (BC3) encompasses 26,888 acres representing 18.8% of the watershed. BC3 is geographically located at the highest elevation in the watershed.

Resource Description

Land use includes cropland (73%), pastureland (11%), and forestland (15%).

Urban areas- no urban areas are located within this AU. 393 residential structures are located within the AU.

Pastureland is non-irrigated and is located adjacent to streams.

Forestland occurs on steep canyon slopes. Scattered timber stands may be found on the canyon floor and interspersed throughout the cropland. Mason Butte contains the highest density of forestland within the AU.

Canyonlands are minimal and occur at the confluence of Cold Springs and Big Canyon Creek.

Cropland varies from 0 to 25% slopes. Most of the cropland occurs on gently rolling topography. Resource challenges include gully erosion and nitrogen leaching.

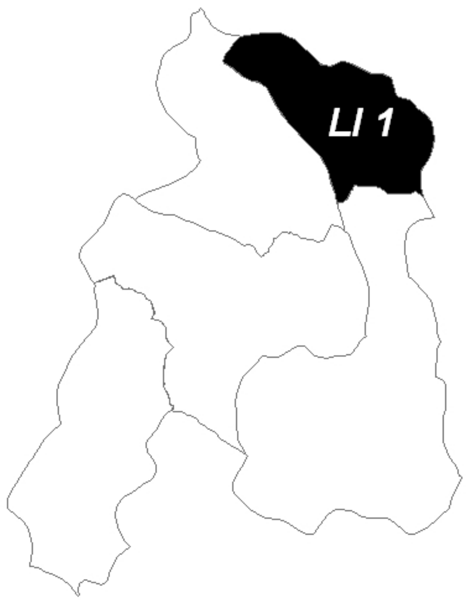
Limiting Factors

SVAP overall condition ratings for BC3 include poor (93 miles – 92%) and fair (8 miles – 8%). There are no good or excellent reaches in this AU.

Riparian Habitat is the most limiting factor to this AU with the majority of reaches (99%) receiving a fair/poor rating. Additional limiting factors are channel condition (73%), fish habitat (71%) and excessive nutrients (79%).

In order to achieve the goal of 90% of fair/poor reaches improved to good/excellent, over 93 miles need treatment focusing on riparian habitat, channel condition, and nutrients.

Little Canyon Creek Assessment Unit 1



The Little Canyon Creek Assessment Unit 1 (LI1) encompasses 17,133 acres representing 11.8% of the watershed. LI1 is a tributary to BC1.

Resource Description

Urban areas include developed areas along the stream corridor. Resource challenges include domestic water supply, sub-surface sewage disposal, sediment and nutrient loading from construction, road building, and road maintenance activities.

Pastureland includes both irrigated and non-irrigated acreages. Some pastureland acreage is irrigated with water obtained from Little Canyon Creek.

Forestland occurs on very steep canyon slopes. Scattered timber stands may be found on the canyon floor and interspersed throughout the cropland. A high density of roads is found within this AU.

Canyonlands in this assessment unit occurs on the canyon bottom and on the steep canyon walls. Starthistle is the most prevalent weedy species. Precipitation is limiting during summer months.

Cropland varies from 0 to 25% slopes. Most of the cropland occurs on gently rolling topography.

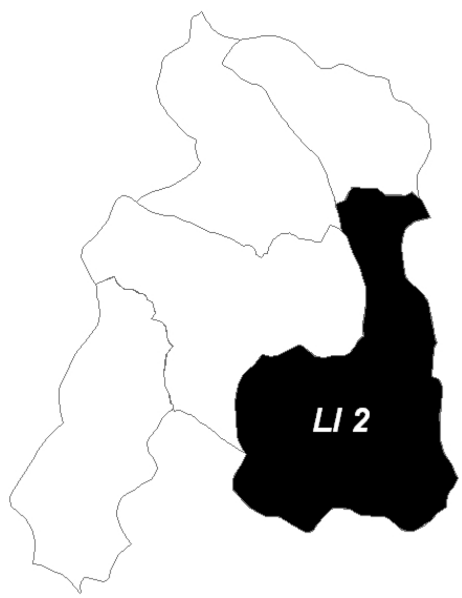
Limiting Factors

SVAP overall condition ratings for LI1 include poor (24 miles – 64%), fair (8 miles – 23%), and good (4 miles – 10%) and excellent (1.2 miles – 3 %). This is the only AU with excellent reaches.

Fisheries Habitat is the most limiting factor to this AU with the majority of reaches (81%) receiving a fair/poor rating. Additional limiting factors are nutrients (73%), riparian habitat (62%) and channel condition (69%).

In order to achieve the goal of 90% of fair/poor reaches improved to good/excellent, treatment over 32 miles need treatment focusing on riparian habitat, nutrients, and channel condition. In addition, treatment needs to include protection of those reaches with an excellent rating.

Little Canyon Creek Assessment Unit 2



The Little Canyon Creek Assessment Unit 2 (LI2) encompasses 43,039 acres representing 29.6% of the watershed. This AU ties for the highest geographical priority with BC3.

Resource Description

Urban areas include the City of Nezperce, Idaho. Resource challenges include domestic water supply, sub-surface sewage disposal, sediment and nutrient loading from construction, road building, and road maintenance activities.

Pastureland is non-irrigated and occurs near streams.

Canyonlands in this assessment unit occurs on the canyon bottom and on the steep canyon walls. Starthistle is the most prevalent weedy species. Precipitation is limiting during summer months.

Cropland occurs on gently rolling topography.

Forestland occurs on very steep canyon slopes.

Limiting Factors

SVAP overall condition ratings for LI2 include poor (117 miles – 82%), fair (21 miles – 15%), and good (5 miles – 3%). There are no excellent reaches in this AU.

Riparian Habitat is the most limiting factor to this AU with the majority of reaches (99%) receiving a fair/poor rating. Additional limiting factors are channel condition (83%) fish habitat (85%) and excessive nutrients (76%).

In order to achieve the goal of 90% of fair/poor reaches improved to good/excellent, over 130 miles need treatment focusing on riparian habitat, channel condition, and nutrients.

Appendix D – Thermal Guidelines

Recommended
The EPA recommends a 16°C maximum 7 Day Average Daily Maximum (7DADM) to:

- Protect juvenile salmon and trout from lethal temperatures
- Prevent sub-optimal growth conditions for juvenile salmonids as found under elevated water temperatures
- Avoid disadvantageous competition between juvenile salmonids and other fish species
- Limit increased disease susceptibility and transmission as facilitated by high water temperature

Lethal
The upper incipient lethal temperature (UILT) refers to the point at which fish, held constantly for one week's time, die at a rate of 50%. The UILT, which varies by age class, is a maximum of 26°C for juvenile salmonids present within the Lapwai Creek watershed (EPA, 2003).

Appendix E – Data Sets and Methods

This spreadsheet contains the collection of data sets determined by the Tribe and the District to be potentially beneficial in developing a prioritization for projects in the basin and/or recommending treatment strategies.

Data Set	Agency/ Organization	Brief Methods Description
Fish Distribution and Abundance	Watershed- NPT	**Quant.** Single-pass fishing of 50m unblocked reach with Smith-Root LR 24 backpack shocker. Short form habitat deliniation with substrate composition estimate.
Stream Temperature	NPSWCD	**Quant.** Thermographs installed as per DEQ and NPSWCD protocol
Roadside Weed inventory	NPSWCD	**Qual.** Road sides were inventoried and noxious weeds recorded. Locations are recorded by road segment. A summary report is available and all data is in GIS format. Includes strategies for treatment according to Clearwater Basin Weed Advisory Group recommendations.
SAM	NPSWCD	**Qual/Quant.** Stream Assessment Methodology (SAM) includes the Stream Visual Assessment Protocol (SVAP), plant inventory, Rosgen channel information, streambank erosion
Riparian multilayer canopy inventory	NPSWCD	**Qual.** Using air photos, determine width of existing riparian canopy. Ground truthed 20% of sites.
Wolman Pebble Count	NPSWCD	**Quant.** By reach, pebble count data was collected following the USFS protocol. Sample size varies by year as the SAM protocol was revised. Early samples are 30 counts, later samples are 100 counts.
SVAP-Channel Condition	NPSWCD	**Qual.** A value of 1 to 10 is given to each reach. The breakdown is 10 for natural channels with no downcutting, no dikes, and no lateral cutting. 7 is given to channels with evidence of past alterations. 3 is given to an altered channel with les s than 50% of the reach with riprap and/or channelization. Dikes or levees restrict floodplain. 1 is given to an actively downcutting channel, dikes/levees restrict access to floodplain.

SVAP-Hydrologic Alteration	NPSWCD	**Qual.** A value of 1 to 10 is given to each reach. Four categories are provided. The field technician can select a score between the ones provided. 10 is the best condition and indicates a channel that has no dams or water withdrawals or other structures limiting stream's access to floodplain. 7 is a channel that has limited incision, flooding occurs every 3 to 5 years, and withdrawals do not impact habitat. 3 is a channel that flooding occurs every 6 to 10 years, channel is deeply incised, and withdrawals significantly impact habitat. 1 is a channel where no flooding occurs, it is deeply incised, withdrawals have caused severe loss of low flow habitat.
SVAP- riparian Zone	NPSWCD	**Qual.** 5 categories are provided. Indicates the amount of natural vegetation present. For example a 10 rating is given to those reaches where the natural vegetation extends two active channel widths on each side of the channel
SVAP-Bank Stability	NPSWCD	**Qual.** 4 categories are provided. Indicates streambank stability.
SVAP-water appearance	NPSWCD	**Qual.** 4 categories are provided. Indicates turbidity, color and other visual characteristics. This is a visual indicator
SVAP - Nutrient Enrichment	NPSWCD	**Qual.** Four categories are provided. Indicates clarity of water, algae presence/absence.
SVAP-barriers to fish movement	NPSWCD	**Qual.** Five categories are present. Identifies barriers within reach, type of barrier, and barriers near reach.
SVAP-Instream Fish Cover	NPSWCD	**Qual.** Five categories are present. Identifies the type of instream fish cover found in the reach; large woody debris, deep pools, overhanging vegetation, boulders/cobble, riffles, undercut banks, thick root mats, dense macrophyte beds, isolated/backwater pools.
SVAP-Pools	NPSWCD	**Qual.** Four categories are used to identify the number and depth of pools. In addition, the number of pools and depth of each is recorded.
SVAP-Insect/invertebrate habitat	NPSWCD	**Qual.** Four categories which identify the type of habitat found in the reach. Identifies fine woody debris, submerged logs, leaf packs, undercut banks, cobble, boulders, coarse gravel.
SVAP - Canopy Cover	NPSWCD	**Qual.** Four categories. Indicates amount of shading in reach. This is an occular estimate.
SVAP- manure presence	NPSWCD	**Qual.** 3 categories indicating presence of livestock in riparian area.
SVAP-Riffle Embeddedness	NPSWCD	**Qual.** 5 categories are provided. Indicates level of embeddedness.
SVAP-Macroinvertebrates	NPSWCD	**Qual.** 4 categories are provided. Groups insects into 3 tolerance groups.
Macroinvertebrates observed	NPSWCD	**Qual.** 4 categories are provided. Groups insects into 3 tolerance groups.
SVAP-Ranking	NPSWCD	**Qual.** Gives a ranking. Adds up scores from other elements and divides by total number ranked.
Stream Channel Classification	NPSWCD	**Quant.** Bankfull width, mean depth, max depth, flood-prone width, gradient, channel xsection in representative area of each reach
Site Photos	NPSWCD	**Qual.** Photos of upstream and downstream of each reach start and end, cross sections, erosion areas, unique features.

Plants	NPSWCD	**Quant.** Presence/absence of noxious weeds, other weedy species, rare/sensitive species
Bank Erosion Measurements	NPSWCD	**Quant.** Measurements of bank height and length for each eroding section within the reach.
Stream Erosion Condition Index	NPSWCD	**Qual.** Collects information relating to bank erosion evidence, bank stability condition, bank cover/veg, lateral channel stabilization, channel bottom stability, in-channel deposition
Pebble Count	NPSWCD	**Quant.** Pebble count in riffle section - 1 per reach
RIPP	NPSWCD	
FLIR	Water Resources-NPT	**Quant.** Thermal infrared cameras mounted to the bottom of aircraft flown along trnasects throughout both drainages.
Water Quality	Water Resources-NPT	**Qual/Quant.** Protocol outlined in *Quality Assurance Project Plan for the Lower Clearwater River TMDL.* 120 pp. 2003. Nez Perce Tribe, WRD. Samples were sent to the EPA lab in Manchester, WA; EcoAnalysts in Moscow, ID; and the BOR PNRL in Boise, ID for analysis.
NRAMP	Watershed- NPT	**Qual/Quant.** Land use determined; current lease information updated; features of site GPS'd; esp. fences, culverts, springs, eroded features, actual stream channel, concentrations of weeds. Wetland eval, if appropriate; Ocular evaluation of stream features; dominant substrate; pool quantity, depth, type; canopy cover, riparian condition, density, veg. surveys; riparian and upland daubenmire frams surveys; bank stability; SVAP.
Fish Passage	Watershed- NPT	**Quant.** A comprehensive inventory and assessment of aquatic organism passage at all road/stream crossings within the watersheds using a modified USFS protocol. The barriers were then prioritized according to: 1.) the amount of habitat blocked at each site and 2.) the fish life history stages impacted by the barrier.
Stream Monitoring and Evaluation	Watershed- NPT	**Quant.** Wolman Pebble Count, riffle and pool x-sections, LP, embeddedness, fines, CGU classification, bank stability, discharge, thermal, chem, electrofishing, diatoms, macroinvertebrates, LWD, riparian zone data, canopy cover
Wolman Pebble Count	Watershed- NPT	**Quant.** At each of 11 transects in reach; 10 particles from bankfull to bankfull, every 1/10th m of distance. Also at cross sections (when evaluated); 100 particles minimum from each x-section, BF-BF, heel-toe distribution.
Geomorphic Survey	Watershed- NPT	**Quant.** Representative riffle and pool benchmarked and surveyed in 2003, 2006 with laser level and reciever to capture BF, thalweg, and all other major features of x-section. L->R looking upstream. LP beginning at bottom of reach, recorded thalweg, BF, lowbank, other features.

Cobble Embeddeddness	Watershed- NPT	**Quant.** 60 cm ring placed in pool tailout, with laminar flow, large enough to accommodate up to 3 ring placements to ensure at least 100 particles. Free matrix particles 45mm-300mm were removed first and measured along longest axis. Partially embedded particles of 45mm-300mm were then removed; depth of embeddedness and length perpendicular to the embedded axis were measured. Habitat restrictions disallowed paramter to be collected at all sites.
Surface fines	Watershed- NPT	**Quant.** Fines measurements were conducted by a composite method of grid and visual counts in pool tailouts and riffle of less than 4% gradient.
Channel Geomorphic Unit Classification	Watershed- NPT	**Quant.** Channel Geomorphic Units or habitat types were measured for the full extent of the reach, excepting 2004 and 2005, in which habitat was noted for only the fished section of the reach.
Bank Stability	Watershed- NPT	**Quant.** Meters of stable bank were recorded for upper and lower sections of right and left banks. A stable bank was defined having <65% slope, >50% cover and no signs of cracking or slumping.
Discharge	Watershed- NPT	**Quant.** Discharge was generally collected with a vertical axis pygmy meter in accordance to USGS protocol, with 20-30 discharge measurements being taken per transect. At several sites, flow was too low to measure with the pygmy meter and a timed flow capture method was employed.
Thermal	Watershed- NPT	**Quant.** Optic Stowaways programmed to record hourly temperatures were deployed in accordance to Idaho DEQ protocol.
Chemistry	Watershed- NPT	**Quant.** Hydrolab used to look at variety of water chem parameters. Grab samples also utilized and were analyzed by independent labs.
Electrofishing	Watershed- NPT	**Quant.** Triple-pass reduction within block-netted 50m reach. Fish anesthatized, weighed and measured. Fish released at conclusion of all three passes. Scale and DNA samples taken from salmonids.
Diatoms	Watershed- NPT	**Quant.** EMAP-SW protocol: rock selected randomly within protocol restrictions and is scrubbed for 30 seconds, washed and resultant sample is preserved with Lugol's. Samples analyzed at independent lab
Macros	Watershed- NPT	**Quant.** Surber sampler used at 8 points within riffle habitat. Substrate of greater than 5 cm scrubbed and removed. Remaining substrate stirred for 30 seconds. Samples analyzed by independent lab.
LWD	Watershed- NPT	**Quant.** LWD were counted as habitat deliniation was completed. LWD had diameter of >15cm, length of either 3 meters of exceeding 2/3 wetted width of stream. Submergence also recorded.
Riparian Zone data	Watershed- NPT	**Quant.** Veg type, tree maturity, density, width, canopy cover