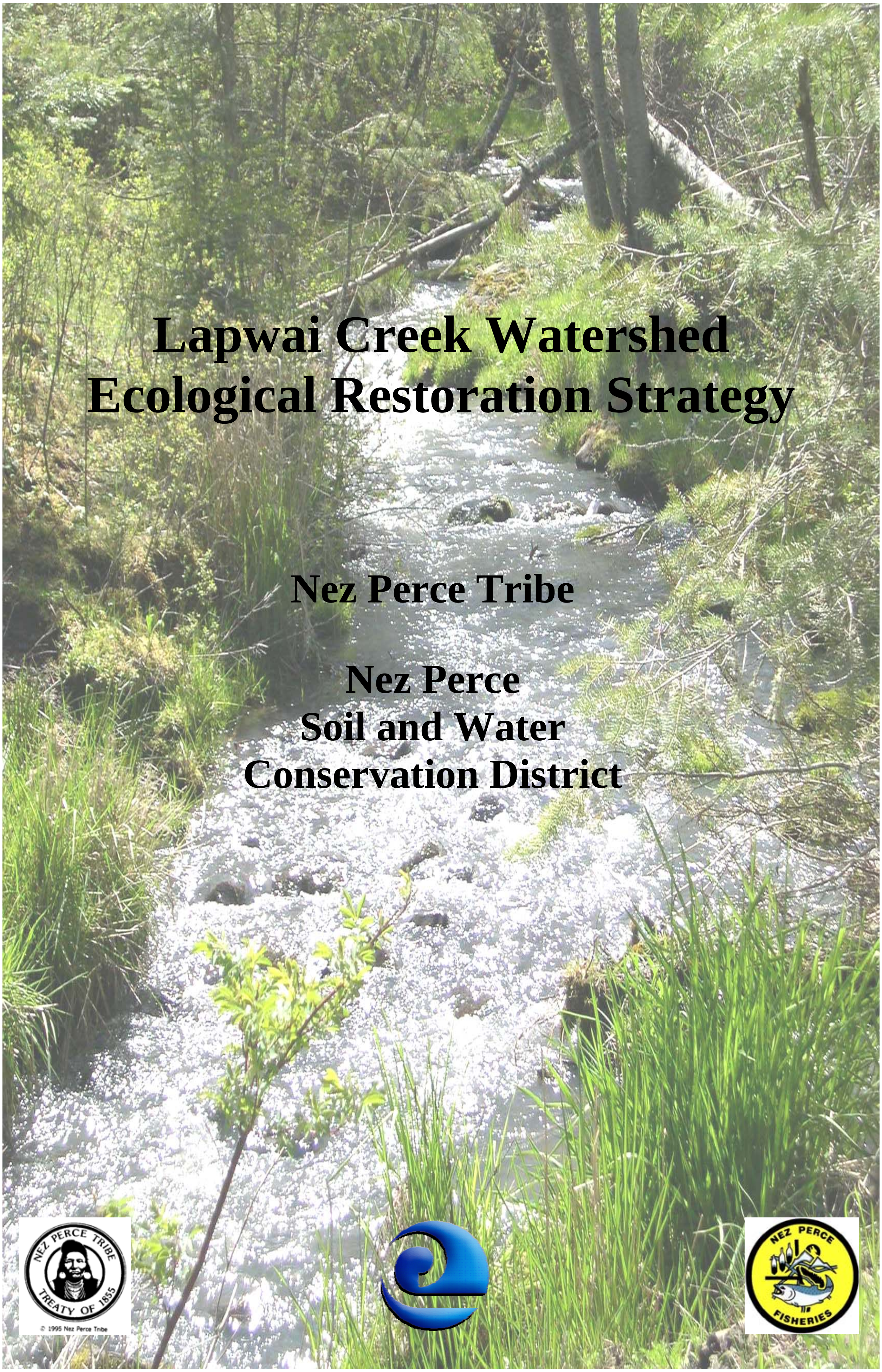
Lapwai Creek Watershed Ecological Restoration Strategy



Nez Perce Tribe

Nez Perce
Soil and Water
Conservation District

Strategy for the Restoration of Lapwai Creek Watershed

Spring 2009

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Funded by the Bonneville Power Administration

The cover photo is an example of high quality habitat conditions on West Fork Sweetwater Creek within the Lapwai Creek watershed.

This plan is written for all community members whose lives are intertwined with the landscape.

The health of our local watersheds, streams and fish is a reflection of how we treat the land. Many stories are told about the great runs of steelhead and salmon that once occurred in our local streams, and the profound disappointment over the lack of fish found there today is ever-present.

In recent years, agencies and individuals alike have participated in efforts to help restore local streams and watersheds through the implementation of best management practices (BMPs). These BMPs, applied to grazing, forestry, agriculture and development, have yielded benefits to fish, wildlife, landowners and community members. However, there is much more to be done.

Restoration of fish and their habitat-- within a thriving community landscape-- can only be accomplished by a holistic, ridgetop-to-ridgetop, watershed-based approach that includes all stakeholders. As a community, we are all connected by the water, air, soil and natural resources that we depend on in common. It is our hope to work with landowners—private, tribal, state and federal—to restore our natural resources in a manner that will benefit all people who live here today and in future generations.

Protection and restoration of our local watersheds can keep us from losing what we can never regain, but it will take the coordinated efforts of us all to achieve the goals outlined in this plan. Our actions today will help shape a path for our children, our grandchildren, and our grandchildren's children.

______________________________ Nez Perce Soil and Water Conservation District

______________________________ Nez Perce Tribe

Mission

Our mission is to work proactively within the watershed's diverse landscapes to restore and protect the ecological processes of the Lapwai Creek watershed to the greatest extent possible.
We will work to rehabilitate habitat that will support healthy, self-sustaining fish populations and provide clean water for the benefit of all. We will work within present challenges and opportunities toward achieving a balance whereby all communities can thrive for generations to come.

Abstract

Hé-yey, Nez Perce for steelhead or rainbow trout (*Oncorhynchus mykiss),* are a culturally and ecologically significant resource of the Lapwai Creek watershed and comprise a portion of the federally listed Snake River Basin Steelhead distinct population segment (DPS). The majority of the Lapwai Creek drainage is federally identified as critical habitat for this DPS while also providing habitat for the federally listed Snake River Nacó'x, or fall chinook (*Oncorhynchus tshawytscha*), evolutionarily significant unit (ESU). The Nez Perce Soil and Water Conservation District (District) and the Nez Perce Tribe Department of Fisheries Resources Management-Watershed (NPT DFRM-Watershed), in effort to support the continued existence of these and other aquatic species, have developed this document to direct efforts and resources toward the highest priority restoration projects and areas of the Lapwai Creek watershed. To achieve this, the District and the Tribe executed the following:

- Performed extensive surveys collecting data pertaining to fish habitat limiting factors and aquatic habitat health
- Established a working group and technical team composed of managers from stakeholders within the basin
- Established geographically distinct sub-watershed areas called Assessment Units (AUs) based on collected data
- Created and applied a prioritization framework for the AUs using data collected by the District and the Tribe
- Developed treatment strategies to use within the three highest priority AUs

Assessment Units were delineated by significant shifts in sampled juvenile Hé-yey *(O. mykiss* (steelhead/rainbow trout) densities, which corresponded with fish passage barriers. The prioritization framework considered four aspects to determine 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 top three areas to pursue restoration within the Lapwai Creek watershed are Lapwai Creek from stream km 17-34, Sweetwater Creek from the mouth to km 13, and from the mouth of Lapwai Creek to km 17.

Following prioritization, data collected by the District through use of the federal Stream Visual Assessment Protocol (SVAP) were used to determine treatment necessary to bring 90% of reaches ranked as Poor or Fair through the SVAP up to a Good or Excellent rating. Reaches that were evaluated with SVAP will be reevaluated in 10 years to determine progress and adapt restoration treatments as indicated.

Mouth of Lapwai Creek
Summer, 2003

Acknowledgements

The authors recognize and greatly appreciate the assistance of their colleagues in the production of this document with additional sincere thanks to others not listed here. The authors also recognize and express their gratitude to the field crew members and support staff that spent countless hours in the collection and development of the data used for this document.

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List of Acronyms

Organizations	
BPA or Bonneville	Bonneville Power Administration
DFRM	Department of Fisheries Resources Management
EPA	U.S. Environmental Protection Agency
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
IDL	Idaho Department of Lands
IDT	Idaho Department of Transportation
IDWR	Idaho Department of Water Resources
ISAB	Independent Scientific Advisory Board
LOID	Lewiston Orchards Irrigation District
LSCD	Lewis Soil Conservation District
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	National Marine Fisheries Service
NPSWCD or District	Nez Perce Soil and Water Conservation District
NPT or Tribe	Nez Perce Tribe
NPTEC	Nez Perce Tribal Executive Council
NRCS	Natural Resources Conservation Service
Council	Northwest Power and Conservation Council
USACE or Corps	U.S. Army Corps of Engineers
USBLM or BLM	U.S. Bureau of Land Management
USBR or BR	U.S. Bureau of Reclamation
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WSU	Washington State University

Terms	
AU	Assessment Unit
BiOp	Biological Opinion
CBWMA	Clearwater Basin Weed Management Area
CWMA	Cooperative Weed Management Area
DPS	Distinct Population Segment
ESU	Ecologically Significant Unit
FLIR	Forward Looking Infrared
GIS	Geographic Information System
ICBEMP	Interior Columbia Basin Ecosystem Management Project
LOP	Lewiston Orchards Project
PMU	Potential Management Unit
RIPP	Resource Inventory and Planning Protocol
SEC	Soil Erosion Condition
SRBA	Snake River Basin Adjudication
TIR	Thermal Infrared
TMDL	Total Maximum Daily Load

SECTION ONE: RESTORATION PLAN

Winter ice in the Lapwai Basin

Chapter One: Introduction

The Nez Perce Tribe Department of Fisheries Resources Management-Watershed Division (NPT DFRM-Watershed) and the Nez Perce Soil and Water Conservation District (District) developed this document to direct funding toward prioritized restoration activities within the Lapwai Creek watershed for the period of 2008-2018. The plan was revised in spring 2009 to reflect scientific review comments and incorporate additional data.

This plan was created to demonstrate the ongoing need and potential for anadromous fish and aquatic resources 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 NPT, but also to promote cooperation among all stakeholders, including landowners, government agencies, private organizations, tribal governments, and elected officials. Through sharing information, skills, and resources in 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.

Goal and Objectives

The primary goal of the strategy is to restore aquatic habitat for resident and anadromous fish species, promoting quality habitat within a self-sustaining watershed. Within this document, Hé-yey (*Oncorhynchus mykiss* (steelhead)) is used as an indicator species for aquatic life and habitat requirements within the Lapwai Creek watershed. Seven objectives have been developed to support this goal:

- Identify factors limiting quality and quantity of aquatic habitat
- Identify treatments to address limiting factors
- Prioritize locations of restoration activities
- Identify information and data gaps
- Identify future monitoring strategy to support adaptive management
- Identify opportunities for collaboration with stakeholders

Purpose and Need

Many institutions that provide funding for aquatic habitat restoration require a basin-wide strategy that is linked to a comprehensive assessment of watershed conditions, water quality impairments, priority fish populations, and geographic focus areas that identifies high priority restoration actions. These institutions also require partnering, cost-leveraging, and demonstrable on-the-ground results. Some of the primary institutions that fund watershed and aquatic habitat restoration throughout the Pacific Northwest are developing state-wide or regional strategies to focus financial investments where there is a demonstrated need, articulated priorities, and clear restoration benefit. As competition in the region expands, a greater emphasis will be given to funding 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 to achieve comprehensive restoration benefits at the watershed-scale as opposed to a "shotgun approach" when many 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 be useful to all stakeholders in the Lapwai Creek watershed who are interested in aquatic habitat restoration, and to foster a unified approach to future management.

Purpose Statement

The purpose of a basin-wide aquatic habitat restoration strategy is to provide 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.

Timeline

The priorities outlined in this plan draw upon the cumulative body of work that has been completed in the Lapwai Creek basin. It will be critical for managers, as they implement projects in the Lapwai Creek area, to reflect upon the efficacy of work completed within a time frame that allows them not only to identify successful methods, or Best Management Practices (BMPs), but also to adapt management approaches to improve success rates.

The working group determined that within this basin and current scope of work, the initial time frame for implementing aspects of this strategy will be 10 years. Many challenges to restoration, including mixed and changing ownership, level of landowner participation, land management practices, changes to funding levels, and shifts in climate will play out in this period. The ability to track these shifts—and adapt practices to address them—will help determine the long-term success of restoration within the Lapwai Creek basin. Monitoring conducted in years 8-10 (discussed further in Chapter 7), combined with lessons learned in this 10-year period, will help direct managers to create feasible goals for future work.

A Living Document

This document is a result of collaborative planning efforts by multiple stakeholders spanning several years. This document is intended to provide the necessary framework for prioritization and coordination of restoration efforts, and will be updated as necessary to include additional data, improved scientific methods or to reflect major shifts in land ownership. These updates will be used to reprioritize activities and ensure the 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.

This document has been reviewed by the NWPPCS Independent Scientific Review Panel (ISRP) as well as by representatives of several management agencies and stakeholders within the basin. Comments that added value to the plan were incorporated into this draft.

At the conclusion of the initial 10-year period for which this plan is intended, the document will be reviewed and modified to reflect both our progress and our adaptation to new information and challenges within the basin.

Document Sponsors

Nez Perce Tribe

The Nez Perce people have inhabited the Lapwai Creek Watershed since time immemorial, and the watershed is within the present boundaries of the Treaty of 1863 between the Tribe and United States Government. The Nez Perce Tribe has recognized a significant reduction of fisheries resources and watershed/aquatic ecosystem degradation that has occurred over the past 100 years. Because of this, the Tribe developed a Department of Fisheries Resources Management Program and Watershed Division in an effort to restore and protect these resources (DFRM). The DFRM and the Watershed Division is guided and directed by the Nez Perce Tribal Executive Committee (NPTEC).

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 landowners 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 Lapwai Creek watershed is a mixture of mostly private and tribal lands. To achieve meaningful restoration within this unique land ownership and legal jurisdiction, action must occur on all lands, regardless of ownerships. Interagency partnership is therefore crucial to the success of watershed restoration projects. 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 and promote the synergistic effect of restoration projects within the watershed, affecting change on tribal and private lands.

Natural resource management in the basin is extremely complex, given the widely varied political, social, economic and environmental interests represented by various stakeholders, and this group of partners realizes there are unexplored opportunities to bring other diverse voices to the table. Listed below are the organizations that contributed to the development of the Lapwai Creek Watershed Ecological Restoration Strategy:

- Nez Perce Soil and Water Conservation District (District)
- Nez Perce Tribe Department of Fisheries Resources Management, Watershed Division (NPT DFRM - Watershed)
- Nez Perce Tribe Department of Natural Resources, Water Resources Program (NPT - WR)
- 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 (LSCD)
- Idaho Soil Conservation Commission (ISCC)
- United States Department of Agriculture- Natural Resources Conservation Service (NRCS)

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. 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 December 2004-2006, and March 2009.

During these meetings, public input was taken on the District and Tribe's inventory, assessment, restoration proposals, and this document. In addition, watershed advisory groups were used to review and identify natural resource improvement projects and strategies.

Document Structure and Organization

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

This document is in three sections. The first section is organized by chapter and contains the restoration plan. The second section describes the methods and data sets used to develop this document. The final section contains appendices to the document. 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 1 describes the structure of the document and provides background information on the development of the restoration strategy. It covers the scope of the project, including why it was initiated, who was involved, and the intentions behind the effort.

Chapter 2 establishes a regional context for directing future investments in aquatic habitat restoration in the basin. It describes attributes of the area that result in unique challenges and opportunities for restoration.

Chapter 3 offers justification for working within this basin, beginning with the focal species for the area. An examination of the significance of the focal species and the aquatic and terrestrial habitat follows. Chapter 2 concludes with a discussion of the restoration potential within the area.

Chapter 4 examines the primary limiting factors identified within the Lapwai Creek watershed. Each limiting factor is defined and current conditions are provided based on surveys conducted by the Tribe and the District.

Chapter 5 outlines the framework to establish high priority areas in the basin within which to focus restoration efforts. Specifically, this section 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 6 categorizes the treatment needed to provide the level of restoration within the Lapwai Creek basin that will help support continued and potentially enhanced productivity for both anadromous and resident fish.

Chapter 7 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.

Tite'wxc
Acrocheilus alutaceus
Chiselmouth, a native minnow

Ties to Related Efforts

An extended network of management, protection and restoration efforts, as well as fish and wildlife programs, exist for the Lapwai Creek drainage on the local, tribal, state and federal level. The three regional efforts outlined below provide guidance for the basins within which the watershed falls; summaries of other efforts reviewed for this document may be found in Appendix A**.**

NWPCC 2005 Columbia River Basin Fish and Wildlife Program

The Columbia River Basin Fish and Wildlife Program (FWP) is based on rebuilding healthy naturally-producing fish and wildlife populations by protecting, mitigating, and restoring habitats and the biological systems within them. The FWP focuses on performance, emphasizing scientific review and accountability of both new and on-going actions.

The FWP draws on subbasin management plans to provide subbasin-level objectives to accomplish Columbia River basin goals. The vision for the Clearwater River 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)

Specific Tie(s) to this restoration plan:

Implementation of the Lapwai Creek Strategy works toward accomplishing the vision and objectives of the Clearwater Subbasin Management Plan and, by extension, the FWP. Implementation of the Lapwai Creek Strategy is consistent with the FWP focus on adaptive management.

Clearwater Subbasin Management Plan

The Clearwater Subbasin Management Plan was adopted in early 2005 by the Northwest Power and Conservation Council (NWPCC) 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, and objectives and strategies for habitat treatments within the Clearwater Subbasin.

The Subbasin plan identifies three management units within the Lapwai Creek watershed that share similar attributes. The subbasin plan identified priority restoration issues for each unit, with each issue prioritized by H=high, M=medium, L=low, or U=suspected but unknown need. Table 1, taken from the Clearwater Subbasin Management Plan, depicts the three units identified within the Lapwai Creek watershed (PR-4, PR-7, PR-8), along with level of priority ascribed to each restoration issue.

Table 1. Restoration Issues and Priorities

Restoration Issue	PR-4	PR-7	PR-8
Surface Erosion	H	H	H
Water Temperature	M	H	H
Grazing Impacts	H	L	L
Wetland/Riparian	M	U	U
In-stream Work	L	L	L

The text of the Clearwater Subbasin Plan indicates that localized impact, particularly in riparian areas, may be of critical importance.

Specific Tie(s) to this restoration plan:

The Clearwater Subbasin Management Plan lists five high priority factors as primarily limiting aquatic and terrestrial species and habitats in the Clearwater subbasin: high summer instream temperatures, excessive sedimentation, loss or disturbance of riparian habitats, changes in vegetative structure, and alteration of environmental processes. These issues are directly addressed through the Strategy for the Ecological Restoration of Lapwai Creek Watershed.

The NOAA Fisheries Salmon Recovery Plans

The overall goal for the recovery plan is to achieve conditions for each Evolutionarily Significant Unit (ESU) and Distinct Population Segment (DPS) so that they no longer need protection under the Endangered Species Act (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 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.

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 populations 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.

The plan and ecological restoration strategy encapsulates the actions utilized to address and restore Lapwai Creek.

Specific Tie(s) to this restoration plan:

The Salmon Recovery Plan (Draft, 2007)[1] names Lapwai Creek one of the five 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:

- 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 floodplain.
- 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 waterbodies 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.

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

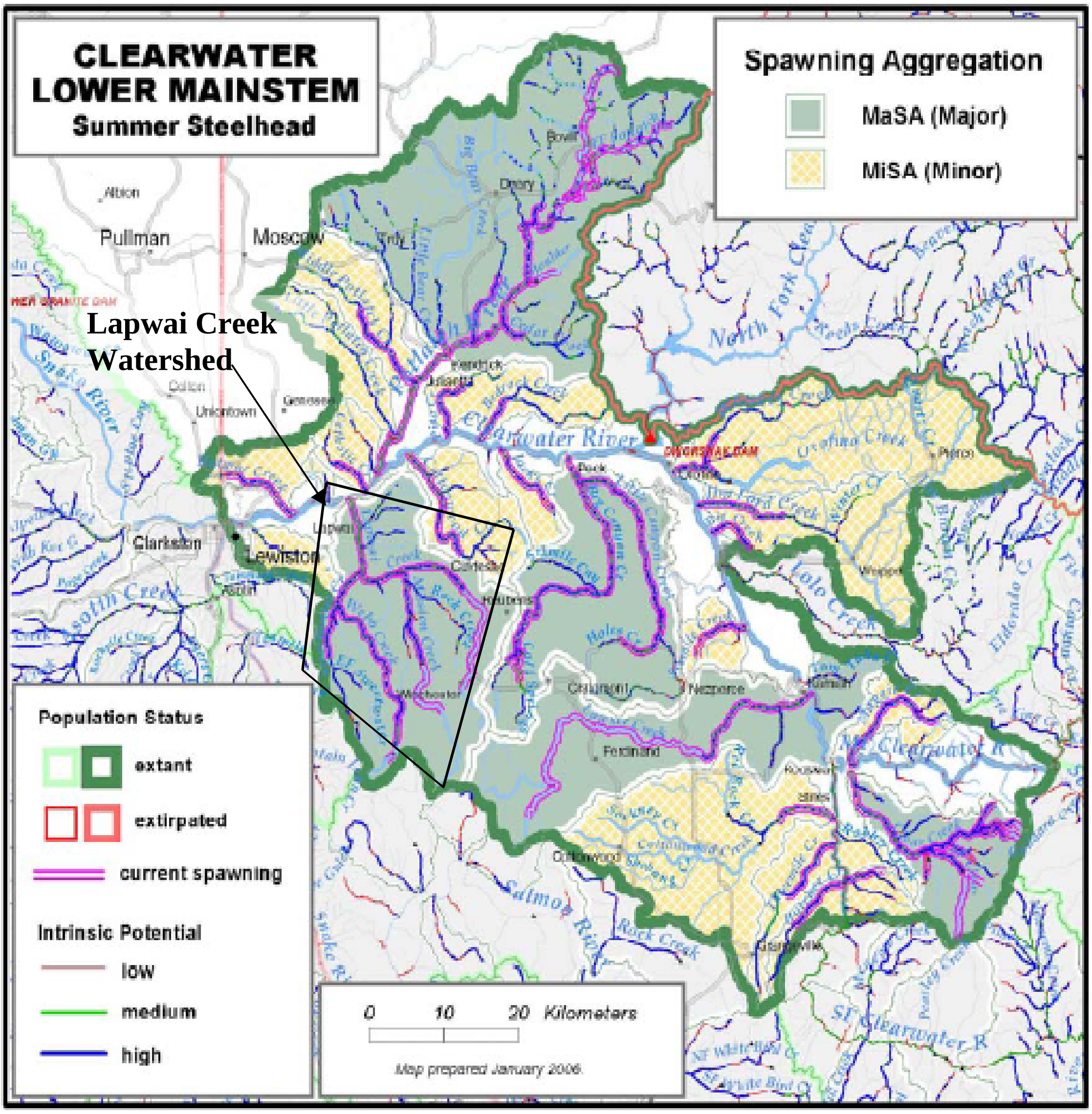


Figure 1. MaSA for Lower Mainstem Clearwater Basin

Chapter 2: Regional Context

This chapter provides an overview of historic and present conditions within the Lapwai 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. Figure 2 provides a general geographic overview of the watershed.

Location and General Description

Lapwai Creek, a 4th order stream, includes the tributaries of Mission, Sweetwater, Webb and Tom Beall Creeks. From its origin, Lapwai Creek flows 8.9 kilometers before discharging into Winchester Lake, near Winchester, Idaho. From the outflow of Winchester Lake, the creek continues its northward course for approximately 41 km and enters the Clearwater River 18 km east of Lewiston, Idaho. U.S. Highway 95 abuts the west bank of the creek from Winchester Lake to stream km 23. Lapwai Creek shows a high degree of channel confinement within this segment due to the combined effects of the highway location and steep, narrow valley. From stream km 23 to the mouth, the valley widens but confinement remains an issue due to a series of railroad prisms and dikes restricting access to the floodplain. The Lapwai Creek Watershed lies within Nez Perce and Lewis counties, as well as in Nez Perce and Lewis Districts. The watershed lies entirely within the Nez Perce 1863 Reservation boundary with several small communities, including Culdesac, Sweetwater, Lapwai and Spalding, located adjacent to main stem Lapwai Creek. Moderate grazing and irrigation activities were noted below stream km 23 with dryland agriculture prevalent throughout the headwaters (adapted from Chandler and Parot, 2003 and from WSU Assessment, 2001).

Table 2. Lapwai Creek Watershed Overview

Lapwai Creek Watershed	
Order	4th
Area (Acres)	174,600
Maximum Elevation (m)	1,463
Minimum Elevation (m)	239
Relief (m)	1,224
Main channel Length (mi)	45

Winchester Lake and all other sub-watersheds within the Lapwai Creek drainage have beneficial use designations from the U.S. EPA for primary and secondary contact recreation, agricultural water supply, cold-water biota and salmonid spawning. Additionally, Winchester Lake has domestic water supply (303(d) List) and special resource water designations (WSU Assessment, 2001).

Land Ownership and Use

Originally intended to be an intact parcel of land for the Nez Perce people, the reservation has legally been open for non-Indian settlement since the General Allotment Act of 1887, also known as the Dawes Act. Unique ownership patterns resulting from settlement in the Lapwai Creek basin lead to diverse land management strategies. Historically, state, federal and tribal lands throughout the reservation have been administered through different avenues, lacking a comprehensive management plan for the benefit of fisheries and wildlife resources, and have thus been unable to direct a unified approach on private land.

Table 3. Lapwai Creek Watershed Ownership (2007)

Ownership	Acres	Percentage (%)
Private	150,000	86
Nez Perce Tribe	22,670	13
State Lands	1,620	1
Water	310	0
Total	174,600	100

Land Cover and Use

The GIS coverage developed for evaluating land cover within the Lapwai Creek watershed (Figure 5) was obtained from the NPT- Land Services division and excludes two headwater reaches of Sweetwater and Webb Creeks. With the exception of those two sections, the watershed encompasses 158,622 acres. Of this, three land uses dominate 78% of that area. These three land uses— forestry, grazing and agriculture— are somewhat difficult to differentiate because of the transitional nature of the uses. The coverage was examined instead to show the potential for these activities within the basin. Additionally, other conditions such as the physical makeup of the land, historic uses of the land and the accuracy of the digital coverage were evaluated as well. Thus, these figures should be looked at as being relative in nature.

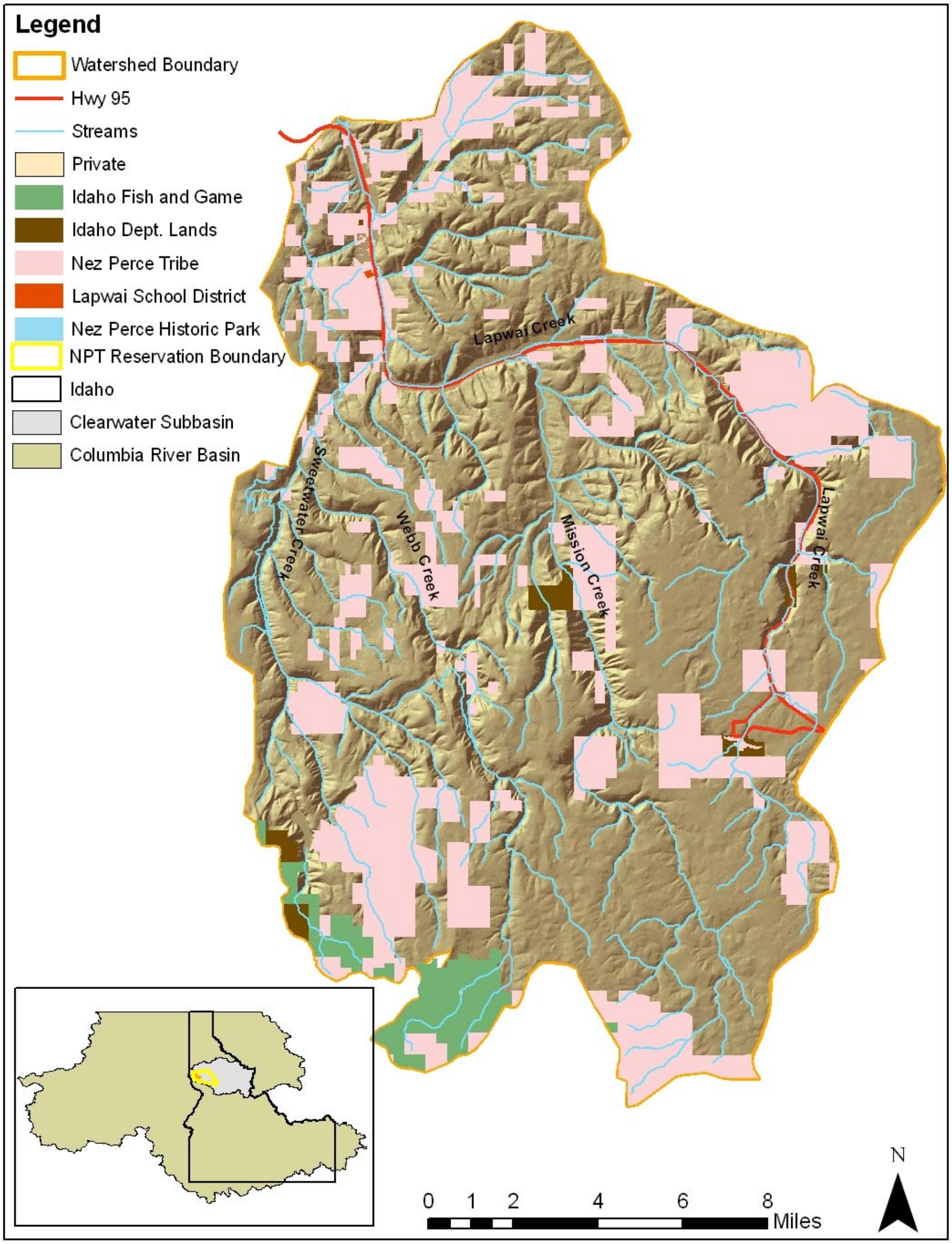


Figure 2. Lapwai Creek Watershed

In contrast to many areas with high agricultural use, where fertile river bottoms provide grazing and farming opportunities, the Lapwai Creek basin is dominated by wooded or forested creek bottoms with agriculture concentrated in the surrounding uplands. This provides a unique set of circumstances which, combined with road placement and forestry practices, contributes to highly degraded aquatic conditions throughout the watershed. In addition to the intrinsic value of the natural resources within this area, concerns with cultural resources, endangered species, and tribal traditions factor heavily into management decisions.

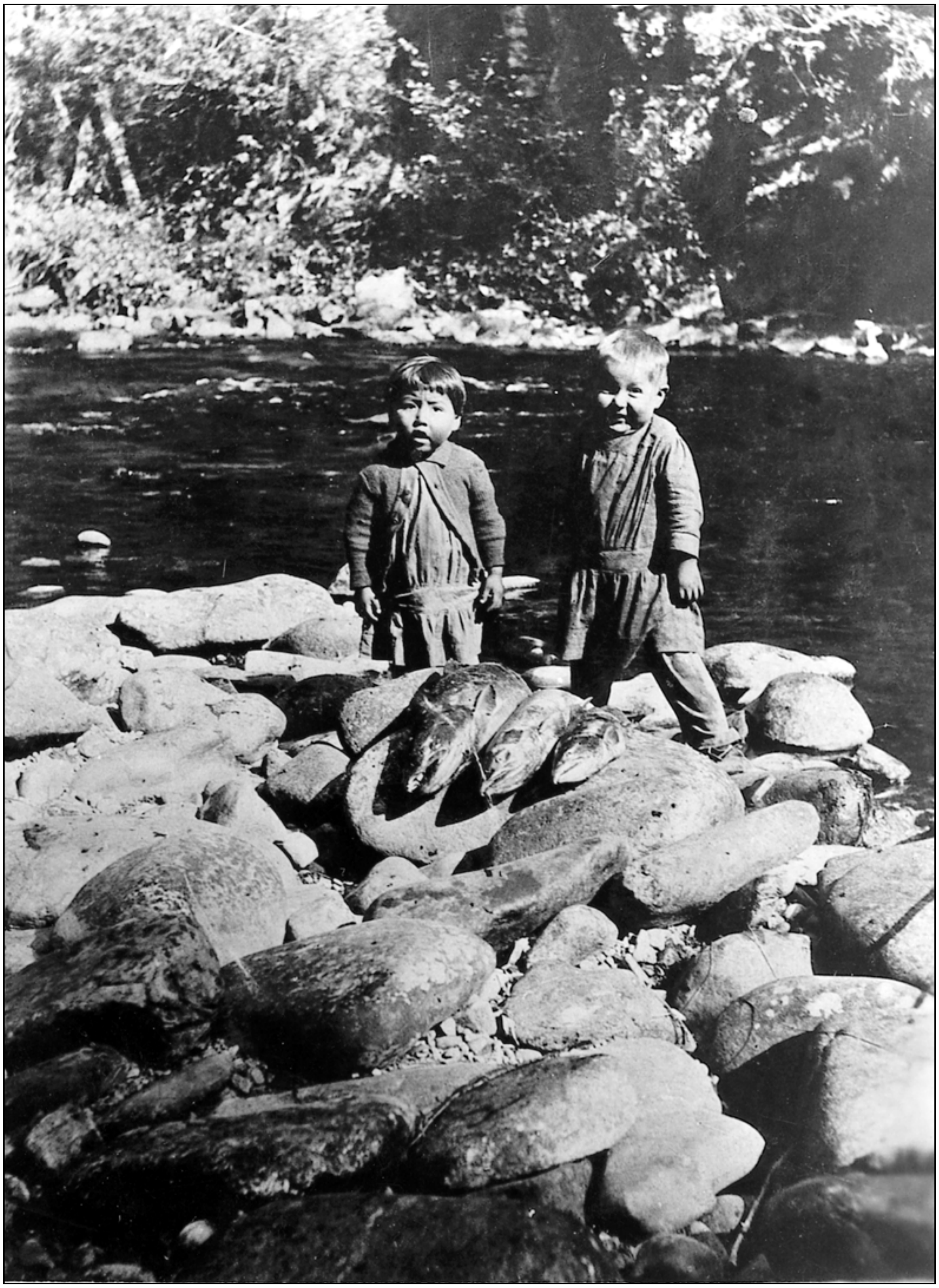
Streams within the Lapwai Creek watershed are severely impacted by numerous anthropogenic stressors over the past century. Non-irrigated cropland is present in the uplands surrounding the stream valleys, while grazing and logging activities are prevalent throughout the headwaters and canyons. Paved, gravel, and dirt roads constrict many miles of stream throughout the drainages, and create numerous fish passage barriers at those locations where stream channels are crossed. Streams within the watershed and their associated floodplains have been further restricted by levees constructed immediately adjacent to stream channels, and irrigation diversion structures located within the watershed divert all summer flows from significant reaches of several streams.

These activities have resulted in reduced retention of spring precipitation and summer groundwater recharge in many streams throughout the watershed; increased fine sediment input compounded by diminished riparian buffering capability; decreased stream shading; decreased large woody debris recruitment; discharge of livestock waste into streams; channel confinement with diminished habitat complexity, decreased stream bed stability and reduced dissipation of flood-water energy; reduced and/or eliminated stream flows, and multiple fish passage barriers. Many of these stream impacts are further exacerbated, given the geology and elevation of the watersheds, by highly erosive loess soils and frequent rain on snow events. As such, surveys performed from 1982 to 1983 by the Nez Perce Tribe Department of Fisheries Resource Management (DFRM) found streams within the Lapwai Creek watershed to exhibit extreme annual flow variations (mean summer baseflows frequently falling below 10% of mean annual discharge levels); high summer water temperatures; high levels of sedimentation, cobble embeddedness and bedload; high nutrient and fecal coliform input; and poor quality and quantity salmonid spawning, rearing and over-wintering habitat.

Demographics

Historically, ancestors of the Nimiipuu (people of the Nez Perce Tribe) were the first inhabitants of this area. While archeologists posit that humans arrived in the Palouse region more than 12,000 years ago (Black, et al., 1997), Nimiipuu oral tradition states that they have been here since time immemorial (NPT Strategic Management Plan, 2007). Intensive European settlement of this region followed the discovery of gold and other minerals in the mid 1800’s (Black, et al, 1997). Although the Lapwai Creek watershed falls almost completely within the boundaries of the Nez Perce Reservation, the majority of the land within the watershed is owned by non-Indians.

The Lapwai Creek watershed falls within both Lewis and Nez Perce counties. The population density of Nez Perce County is strongly influenced by Lewiston, Idaho, population of over 30,000, which lies outside of the watershed boundary. The population density of Lewis County is approximately 7.8 people per square mile according to US Census data, giving it a rural classification, which better represents the area within the watershed. Major centers of population within the watershed are Lapwai (population 1,134), Culdesac (population 378), and Winchester (population 308); additionally, the communities of Slickpoo, Sweetwater, Spalding, and Reubens are located within the watershed, each with a population of 150 or less as of 1990.



Boys with Salmon

Climate and Hydrology

The region's climate pattern is maritime-influenced with average annual temperature, precipitation and snowfall increasing with elevation. Climate stations located in Winchester, Idaho and Lewiston, Idaho best describe the range of conditions found throughout the Lapwai Creek watershed. Winchester, at a higher elevation, is generally cooler than Lewiston year-round, receiving nearly twice the precipitation and more than five times the snowfall.

Table 4. Summary of Climatic Conditions Recorded at Winchester, ID and Lewiston, ID (Western Region Climate Center, 2007)

Climatic Condition	Winchester, ID[2]	Lewiston, ID[3]
Average Annual Temperature (°F)	43.3	52.5
Average Daily Temperature- January (°F)	27.5	33.3
Average Daily Temperature- July (°F)	61.4	74.0
Total Average Precipitation (in)	24.1	12.7
Total Average Snowfall (in)	93.5	15.6

Stream flow patterns in the Lapwai Creek drainage are driven primarily by storm events in streams that drain mid and low elevation plateaus, and by the timing and volume of snow-melt from streams draining Craig Mountain. The snowpack on Craig Mountain is an important driver of the hydrology in the Lapwai Creek Basin. Significant amounts of snow accumulate on Craig Mountain in some winters, with peak snow-melt occurring in late winter or early spring. Rain-on-snow events occur in most years, and occasionally cause extreme floods. Droughts are common in years when there is little snow accumulation on Craig Mountain, or when snows melt rapidly in early spring. Historically, melt-water sustained streams flows throughout most of the summer. In recent decades, the entire basin appears to be shifting toward a rain-dominated hydrograph characterized by flashy peaks, and extremely low flows during the summer drought period. The hydrograph is significantly altered by agricultural runoff, water diversions, and manipulation by several reservoirs.

[2] Data set complete from 1965-2005
[3] Data set complete from 1948-2005

Hydrologic Alteration: In 1965, following an extremely high flow event during which Lapwai Creek reached flows of ~4,000 cfs, the US Army Corps of Engineers (USACE) completed a flood control project placing a series of levees along Lapwai Creek near the unincorporated town of Sweetwater, ID. Later that year, flood control structures were completed along Mission Creek as well. Flood control projects continued into the 1980's, including: channel straightening and enlargement; rip rapping banks; levee construction; and snagging and clearing (WSU Assessment, 2001). Alterations such as these disrupt natural flow regimes, often leading to increased peak flows and reduced low flows. This can impact sediment transport and deposition, channel stability, habitat complexity and quantity, water temperature, and aquatic biota production and diversity (WSU Assessment, 2001).

Historically, flows in this basin may have been variable but grow increasingly inconsistent. The SCS Engineering Computer Program for Project Formulation – Hydrology showed an estimated 267% increase in the 10-year, 24-hour storm peak discharge (Environmental Assessment for Mission-Lapwai Creek Watershed, 1994). For that 10-year 24-hour storm peak discharge rate, the model estimated an approximate presettlement discharge of 1,800 cfs and a discharge rate of 6,600 cfs under current land cover and use. Since 1975, the highest discharge recorded at the USGS gage at the mouth of Lapwai has been 5,010 cfs on February 9, 1996 (WSU Assessment, 2001).

Topography

Streams within the Lapwai Creek drainage generally originate in rolling uplands dominated by dryland agriculture and flow through steeply walled basaltic and granitic canyons as they descend from the uplands. The gradient decreases and the valleys widen in the lower reaches of the watershed (Figure 3.). The watershed is divided nearly in half by a northeast-trending escarpment, creating distinct upper and lower sections of the drainage. Within the Lapwai Creek drainage, the maximum elevation is 1,463m, while the mouth of Lapwai Creek is at an elevation of 239m (description adapted from WSU Assessment, 2001).

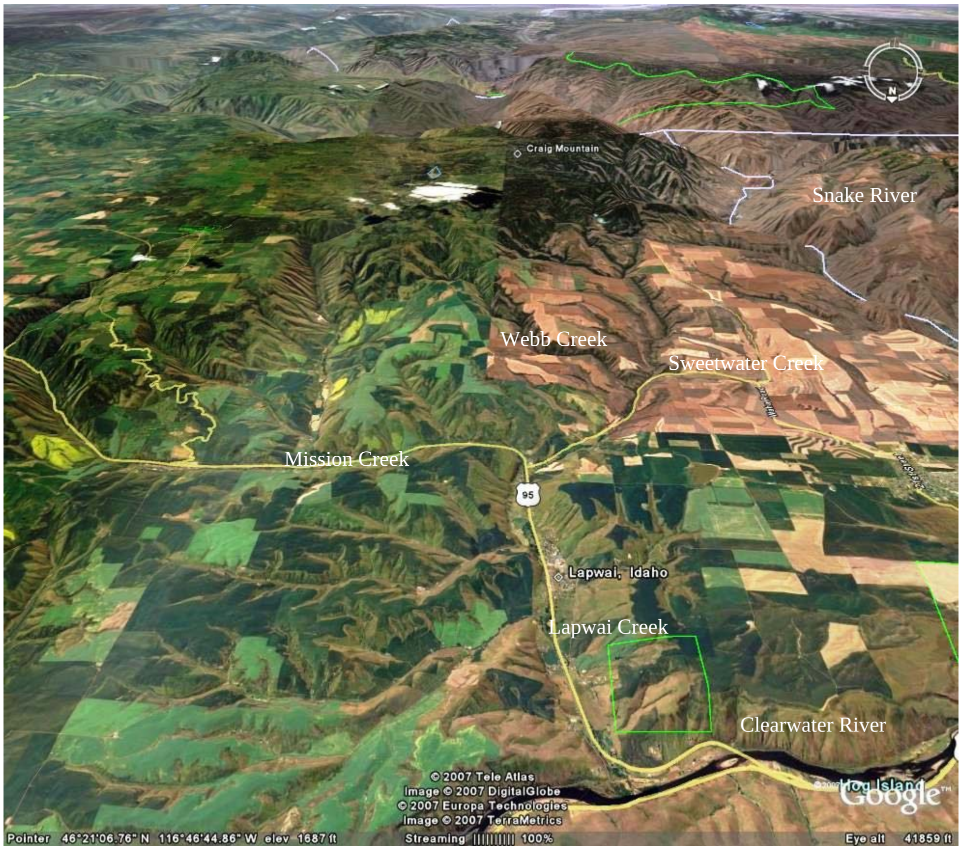


Figure 3. Topography of the Lapwai Creek Watershed

Geology and Lithology

The predominant rock type in the Lapwai Creek watershed is the Columbia River basalt group, consisting of a series of extrusive volcanic flows measuring 2,000 to 4,000 feet in thickness. As many as 17 different flows have been counted with each flow ranging from 25 to 150 feet in thickness. Loess deposits can blanket the basalt above the escarpment with steep valleys carved through the basalts below. A semi-circular band of granitics representative of the Idaho Batholith extends through the upper portions of the watershed. The granitics are centered around Winchester Lake and extend from the Lapwai Creek headwaters through central Mission Creek and southward along the divide between the headwaters of Sweetwater and Webb Creeks (description from WSU Assessment, 2001).

Lapwai-Bridgewater, 1-4% slopes: This unit is located primarily along stream terraces and flood plains along Lapwai and Sweetwater Creeks in the lower part of the watershed. These soils are formed in alluvium from mixed sources over gravelly alluvium from basalt. These soils are very deep and well-drained. The characteristic plant community consists of sedges, rushes, and woody species such as willow, redosier dogwood, and black hawthorn.

Naff-Palouse, 8-20% slopes: This unit is located on gently sloping to moderately steep hills on plateaus of the east side of the watershed. These soils developed in loess, and are very deep and well-drained. Historically the natural plant community would have consisted of bluebunch wheatgrass - Idaho fescue, but today is predominantly cultivated.

Cramont-Culdesac, 2-20% slopes: This unit is located in the southern part of the watershed at higher elevations on hills or plateaus. These soils developed from loess, volcanic ash, weathered basalt materials, and are very deep and well-drained. The potential plant community is forested with species such as Douglas fir, grand fir, and western larch.

Uhlorn-Nez Perce, 2-20% slopes: This unit is located on hills or plateaus on ridge tops in the central part of the watershed such as Webb and McCormick ridges. These soils developed in loess and are very deep, and moderately to well-drained. Native plant communities consisted of bluebunch wheatgrass and Idaho fescue but today these soils are predominantly cultivated.

Linville-Kettenbach, 25-75% slopes: This unit is located in the northern part of the watershed on steep and very steep south and west facing canyon slopes. The soils formed in loess and colluvium from basalt. These soils are well-drained and range in depth from moderate to very deep. The native plant community is bluebunch wheatgrass/ Idaho fescue/Sandberg bluegrass, much of which is now heavily infested with noxious weeds such as yellow starthistle.

Figure 4. Soil Types within the Lapwai Creek Watershed

Water Resources and Use

At the time of this writing, no information was available on actual versus permitted water use in the Lapwai Creek drainage. During the 2006 Snake River Basin Adjudication (SRBA), all water rights and claims to surface and ground water were inventoried. The combined permitted in-stream, pond, spring and groundwater water withdrawals have the potential to dewater several streams in the Lapwai Creek watershed (L. Rasmussen, NPSWCD, 2007); however, many of these water rights appear to have been exercised rarely, if ever.

The early 1900's marked an advent of water resource development in the Lapwai Creek watershed with two projects having particular significance.

Winchester Lake- In 1910, the Craig Mountain Lumber Company created Winchester Lake (or Lapwai Lake) by damming the headwaters of Lapwai Creek, forming a mill pond that was used until about 1966, when all of the marketable-sized timber had been extracted. The largest and most expensive mill of its kind in northern Idaho, Craig Mountain Lumber Company employed up to 270 men and provided electric power to the town of Winchester during its early years (Nielson, 1980). Currently, Winchester Lake has sedimentation and water quality issues, effecting Upper Lapwai Creek (TMDL, 1999).

Lewiston Orchards Project- The Lewiston Orchards Project (LOP) was constructed by private interests beginning in 1906, to bring irrigation water to the southern part of Lewiston. Comprised of four diversions on Sweetwater, Webb, West Fork Sweetwater and Captain John Creeks, as well as a number of canals, feeders and three reservoirs, the

LOP provides irrigation and/or domestic water to nearly half of the residents of Lewiston, primarily in the once-agricultural Orchards residential area. The LOP is owned by the Bureau of Reclamation (BOR) and is operated by the Lewiston Orchards Irrigation District (LOID).

Long term flow requirements for this system are under development in anticipation of the BiOp, slated to be in place by January 31, 2010. Interim flow requirements for the LOID project allow the removal of all but 2.5 cubic feet per second (cfs) in Sweetwater Creek at the diversion and all but 1 cfs in Webb Creek. Prior to operation of the numerous diversion structures throughout Sweetwater Creek and its tributaries, the Twenty One Ranch springs maintained summer flow at between 3 and 10 cfs, augmenting flows in both Sweetwater and Lapwai Creek (Morehead, 2004).

The Twenty One Ranch springs historically had a significant impact on the amount and temperature of summer flow into Sweetwater and Lapwai Creeks. The 2001 NOAA Fisheries BiOp indicated that Sweetwater Creek was “likely of very high biological value” as it provided refuge from summer drought due to the input from the springs. Data taken throughout the last century indicate that the springs output between 1.6 and 11.1 cfs ranging in temperature from 8.3°C-10.6°C with an average temperature of 10°C, well within the optimal thermal range for salmonids and other aquatic resources.

Wildlife Species

The varied topography, diverse vegetation and 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 the watershed 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, western meadowlark, redwing blackbird, spotted sandpiper, red-eyed vireo, willow flycatcher, yellow-breasted chat and many other passerines; bald eagle, osprey, and many other raptors.

Western Meadowlark

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

Sensitive Species: Lewis and Nez Perce 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 re-introduced K'állay (*Oncorhynchus kisutch* (Coho Salmon)). Additionally, in Nez Perce and Lewis counties combined, the Idaho Conservation Data Center (ICDC) has identified 25 plant species of concern, four invertebrate species of concern, eight bird species and 10 mammal species. For a complete listing of species, please see Appendix B.

Vegetation

The probable historic land cover according to Black et al. (1990) and corroborated by USFS Interior Columbia Basin Ecosystem Management (ICBEMP) data was comprised of Idaho fescue (*Festuca idahoensis*) / bluebunch wheatgrass (*Pseudoregnevia spicata*) communities throughout the uplands and canyon lands. 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*), forbes and grasses and the riparian areas featured black cottonwood (*Populus trichocarpa*), 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*).

Although the remnants of these communities are still visible in certain areas, massive land conversion has occurred since 1900. Within the entire Palouse bioregion, which contains the Lapwai Creek watershed, 94% of the native grasslands and 97% of wetlands have been converted to either crop, hay or pasture lands; 21% of forested land has been converted to urban or agricultural use; and 61% of riparian zones that existed as late as 1940 were gone by 1989 (Black, et al., 1990). As native vegetation has been removed and agriculture has shaped the landscape, at least 30 species of noxious weeds have begun colonizing the area. See Appendix C for a list of known noxious weeds in Lewis and Nez Perce counties.

Table 5. Vegetation Cover Types within the Lapwai Creek Watershed

Land Type	Total Acres	Percentage of Drainage
Evergreen Forest	17,156	11%
Mixed Forest	25,313	16%
Grassland/Brush	17,665	11%
Small Grains	64,231	40%

Riparian Areas

A riparian zone is the area immediately adjacent to a lake, stream, river or other body of water. Riparian vegetation is comprised of both wetland and upland species that are dependent upon their roots reaching the water table and include a variety of native grass, shrub, and tree species, as well as wetland plants like sedges, rushes, and bulrushes. Riparian vegetation currently covers less than 1% of the western United States. The diversity of native wetland and woody plant species, especially when connected to intact upland plant communities, provides outstanding food sources and nesting, hiding, and thermal cover for many fish and wildlife species.

Historically, riparian area vegetation in the Lapwai Creek drainage contained cottonwood (Populus spp.); willow (Salix spp.); birch (Betula spp.); alder (Alnus spp.); red-osier dogwood (*Cornus sericea*); black hawthorn (Cretaegus douglasii); and mock orange (Philadelphus lewisii). Currently, these species have been displaced by non-native species to varying degrees. Native species tend to dominant at higher elevations, north-facing slopes, and in the more confined canyons. Non-native species become more predominant on drier, south-facing slopes, and in the wider valley bottoms. Native riparian plant communities are generally more diverse than areas dominated by exotic vegetation. Compared to exotic plant species, native riparian species such as sedges, rushes, and willows do a better job of filtering sediments and nutrients. Due to their generally deeper and more extensive root systems, they also provide greater infiltration, higher water tables, and increased streambank stability (K. Werlin, personal correspondence, 2007).

Changing land use in riparian zones has increased the abundance and diversity of noxious weeds in the watershed, which include such species as: yellow starthistle (*Centaurea solstitialis*), poison hemlock (*Conium maculatum*), scotch thistle (*Onopordum acanthium*), perennial pepperweed (*Lepidium latifolium*), spotted knapweed (*Centaurea maculosa*), and knotweed species (*Polygonum ssp*). Idaho has over a hundred weed species present, and non-native, invasive plant species have especially become a major threat to riparian communities (Prather, et al., 2006). A list of the known noxious weeds in Lewis and Nez Perce Counties can be found in Appendix C.

Wetlands

Wetlands, often referred to as "nature's kidneys," provide many benefits, including: flood water storage, fish and wildlife habitat, nutrient uptake, ground water recharge and discharge, erosion control, and water quality improvement. Wetlands historically provided many traditional foods (e.g., camas) for the Nimiipuu. There is limited knowledge about the historical extent of wetlands within the watershed, but hydric soils data suggest that a significant percentage of the landscape in the upper watershed was historically wet meadow and other wetland habitat types. Today, wetlands within the Lapwai Creek watershed have been degraded through anthropogenic impacts such as: grazing, road development, timber harvest, farming, and draining. Collection of baseline information to obtain an understanding of how wetlands currently function in the Lapwai Creek watershed has been undertaken by the NPT Water Resources Department. Wetlands can provide support to the Lapwai Creek drainage in many ways including:

Water Quality Improvement: Agriculture is the predominant land use in the Lapwai Creek watershed, and Lapwai Creek is listed as water quality impaired on the State of Idaho's 303(d) list for nutrients and sediment. Therefore, locating and assessing wetlands for restoration, enhancement, and protection in the watershed is essential to prevent and/or buffer non-point source pollution from entering the tributaries to Lapwai Creek.

Flood Attenuation and Desynchronization: Timber harvest and wetland drainage for agricultural purposes have significantly reduced flood retention in the headwaters of Lapwai Creek watershed, resulting in flash floods that damage salmonid habitat (Cichosz et al. 2001 *in review*). Wetland location in the watershed may significantly affect water storage and 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 Lapwai 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 (i.e., they attenuate discharge into groundwater and streams allowing a steady baseflow to be released throughout the growing season), 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: Timber harvest and wetland drainage have had negative impacts on water storage in the upper reaches of the Lapwai Creek watershed, which has reduced the seasonal duration of streamflow in tributaries to Lapwai Creek. Groundwater recharge functions of headwater and floodplain wetlands augment late summer stream flows, which are vital to spawning fish.

Fish and Wildlife Habitat: Many wildlife species including birds, mammals, reptiles and amphibians inhabit the Lapwai Creek watershed. Almost all of these wildlife species use riparian and/or wetland areas at some stage in their life cycle. Salmonid spawning and rearing occur within all major tributaries to Lapwai Creek. Of the anadromous salmonids, Hé-yey (*O. mykiss*) are best suited to the Lapwai Creek system, and have been recorded in all major tributaries to Lapwai Creek. Wetlands connected to streams containing anadromous fish may provide winter salmonid rearing habitat. In addition to directly providing habitat, wetlands can indirectly support fish through many of the functions explained above.

Evergreen and Mixed Forest: Timber and wood products form a significant portion of the region's economy (Nez Perce County online brochure, 2007). It is difficult to discern the exact amount of timber harvest or logging that occurs because of the mix of ownership throughout the basin. Much of the timber in the area is located in the uplands, making harvest problematic, or is mixed in with deciduous forest, making selection challenging. The GIS coverage in Figure 5 indicates that approximately 27% of the watershed is comprised of timber that has the potential to be pursued as harvestable.

Grassland and Brush: While grazing can occur on a variety of land types, grassland and brush best typify grazing areas in the Lapwai area (L. Ames, correspondence, 2007). The combined acres of grassland and brush make up 11% of the watershed; as with forestry, however, many other conditions influence where animals are actually grazed, including slope, aspect, time of year and weather. Additionally, feeding operations in the Lapwai drainage often occur within a 300' riparian buffer[4] along streams, creating an additional impact.

Agriculture: By far the greatest land use in the Lapwai basin, and the land use with the greatest associated certainty, is agriculture. Small Grains, combined with Pasture/Hay/Alfalfa, comprise 40% of the Lapwai Basin. The primary consideration in determining how much of that 40% is cropped depends on the time of year and whether it is in rotation. Cropping may also occur in other land types, such as historic wetlands or within a 300' riparian buffer.

[4] The 300' riparian buffer is the professional standard outlined in the Nez Perce Tribe DFRM-Watershed Strategic Management Plan (Draft, 2007).

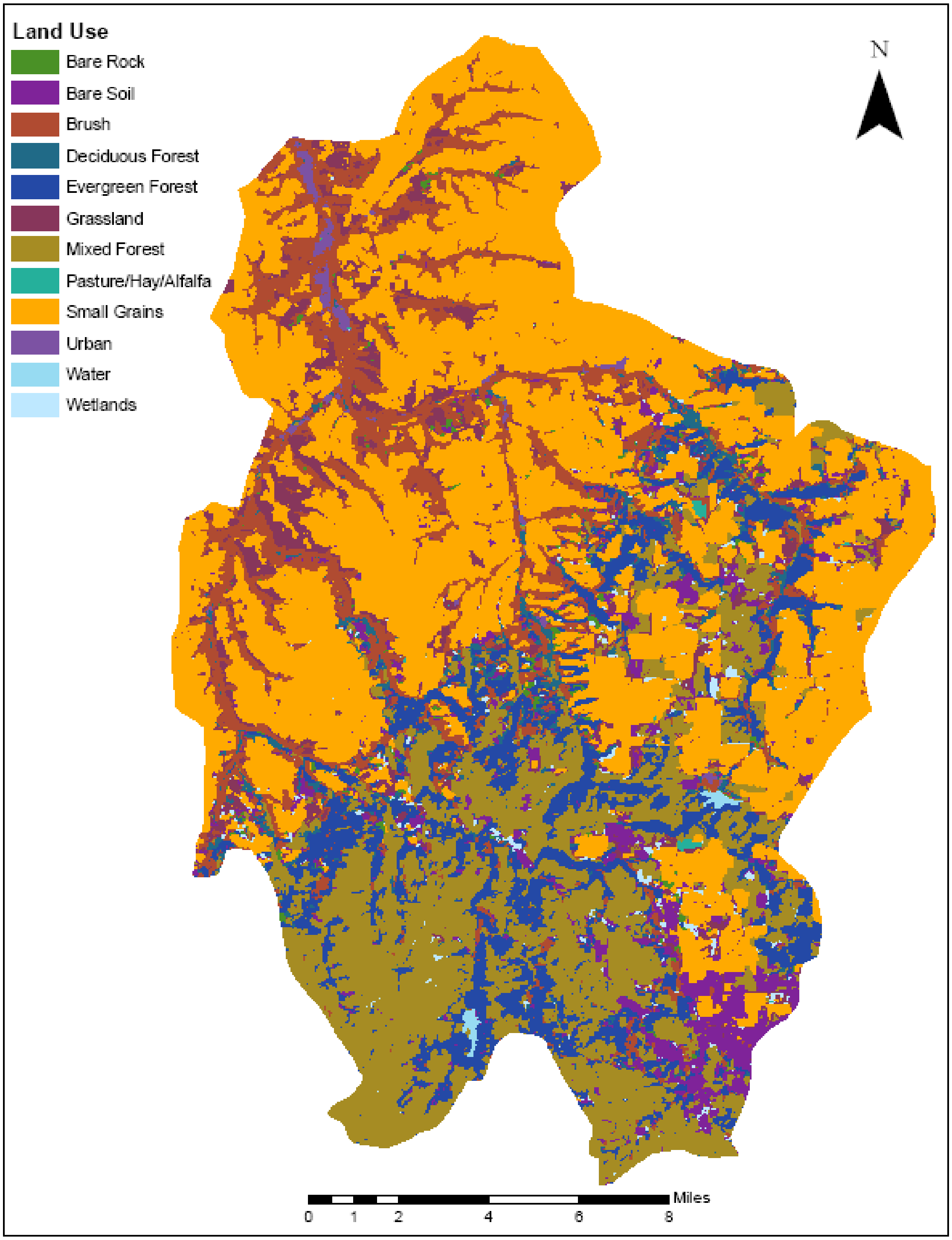


Figure 5. Land Cover in the Lapwai Creek Watershed

Forestry and Timber Harvest

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 affects local water bodies. Currently, timber and wood products are recognized as major economic drivers in the Lapwai Creek watershed.

Forest tracts in the headwater reaches of the Lapwai Creek drainage consist of varied ownership, size, and management strategies. Consequently, timber harvest has occurred with varying degrees of severity. The majority of forest lands are located in steep areas of the drainage that may be unsuitable for residential development. Some parcels are managed for silviculture, while others are left unmanaged or are managed without regard for future forest production. Further management strategies have included logging for fuel reduction and removal of trees damaged by insects or fire.

Certain forest management actions have greater impact than others with regards to stream processes. In general, harvest and forestry practices have improved, but it remains true that regardless of what planning documents specify, the *care* with which a logging operation is conducted can have much more to do with maintaining quality fish habitat (Chamberlin, et al., 1991, emphasis added). While timber management activities do not generally alter the amount or timing of precipitation entering a watershed, they may affect the quantity, quality, and timing of runoff and associated stream flow.

Snow Accumulation and Melt: Harvest affects the way a forest canopy collects and redistributes snowfall, shades the snowpack and lowers wind velocities. The loss or creation of shade patches may hasten or slow snowmelt, affecting when runoff reaches streams. Loss of canopy cover can result in increased wind velocities, quickening melting events. Additionally, decreased canopy cover increases rain on snow events, resulting in torrential runoff resembling a flood.

Evapotranspiration: Reducing the biomass or number of stems, leaves and roots that would either intercept or take up precipitation and groundwater may lead to an increase in the level of runoff following timber harvest. Generally, differences in runoff can be seen most prominently during the growing season, which coincides with the beginning of the rainy season. Runoff may raise the risk of mass wasting events (Chamberlin, et al. 1991).

Soil Structure: Disturbed soil absorbs less water than undisturbed soil, and absorbs it more slowly, resulting in higher levels of runoff. Virtually all water falling on undisturbed soil reaches the stream, and substantial runoff only occurs when the ground is saturated, as during the spring rainy season. Forest management practices that disturb the soil include road building, yarding, burning and scarification. These, in turn, affect when and how water reaches streambeds, either increasing or decreasing peak streamflow and potentially increasing sediment transport (Chamberlin, et al 1991).

Water Quality: The primary variables affected by timber harvest are temperature, suspended sediment, and dissolved oxygen. The importance of these with regards to salmon-bearing streams is discussed in Chapter 5.

- Temperature: Harvesting can cause increases in mean daily, monthly and annual maxima, mostly due to increased amounts of sunlight reaching the stream surface.

- Suspended sediment: Forest practices that change the timing, duration or amount of sediment input to a stream may be partially mitigated by maintaining the integrity of a riparian zone, but increased sedimentation is almost always detrimental.

- Dissolved oxygen: Increased sediment and water temperature lead to lower levels of dissolved oxygen; this is generally the result of inappropriately located logging activities, such as in, across, or nearby small streams.

Agriculture and Grazing

Livestock grazing, particularly by cattle, has altered or eradicated native vegetation on much of the rangeland area 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 and promoting weed infestations; increased fine sediment affects spawning and rearing habitat of salmonids and other fishes. The presence of cattle in riparian or streambed areas can lead to increased *E. coli* levels, which are of concern to aquatic systems and humans alike.

The results of such alterations to the watershed may include an increased delivery rate of runoff to streams, with increased sediment and nutrient loads. A higher rate of delivery changes the overall timing and duration of water returned to the stream. Rapid runoff may reduce the amount of available groundwater, which lowers the water table. The combination of altered inflow and altered groundwater may result in decreased summer baseflows (Carter, 2001).

Sedimentation

Sediment covers and fills instream substrate crucial to fish for food availability, cover, and spawning. Excessive sedimentation can result from watershed inputs (from upland grazing); instream trampling, disturbance and erosion due to banks denuded of vegetation; reduced sediment entrapment by riparian vegetation; reduced bank stability; and increased peak flows due to compaction.

Streamflow

Compaction and loss of ground cover due to grazing decreases infiltration, which leads to increased overland flow. This changes summer base flows; the timing and duration of recharge to streams; timing, duration and volume of peak flow events, and increases erosion and potential for flooding. Changes may be significant enough that perennial streams flow ephemerally and ephemeral streams dry up.

Temperature

The loss of riparian vegetation can lead to greatly increased stream temperature due to increased surface exposure to radiant heat. This increase, combined with increases due to widened stream channels, low summer flow and loss of undercut banks due to streamside grazing, can result in lethal temperatures for fish.

Nutrients

Reduced riparian vegetation and increased compaction can result in faster delivery of runoff to streams. Nutrients may not filter out as efficiently as in a properly functioning riparian area, resulting in increased nutrient loads from livestock urine and manure in and around the stream. Reduced summer flows can further concentrate nutrients.

Grazing occurs in the Lapwai Basin year-round. Typically, cattle graze in the canyons in spring, mountains in the summer and fall and are moved to feedlots during the winter. Within Nez Perce County, 41% of those feedlot operators allow access to streams while only 16% provide off-site watering opportunities (District, 1998). Impacts from these operations include accumulation of animal waste in a confined area, leaching of animal waste, stream-side degradation, and impaired water quality. According to the District's Confined Animal Feeding Operation Inventory and Analysis (1998), Lapwai Creek is considered to be at high risk for water quality impairment. Sweetwater and Mission Creeks are considered to be at moderate risk, and Webb Creek is considered to be at low risk. Rotation schedules, grazing animals better-suited for the area (including sheep), development of off-site watering systems, and riparian area fencing, with the exclusion of agriculture waste systems, etc., are a few tools available to help dissipate the effects of grazing near salmonid streams.

Impacts from grazing in the headwaters of Mission Creek

Rolling plateaus of non-irrigated cropland with slopes of 3-25% typify the watershed's upland areas; agricultural land comprises more than 60% of the watershed total surface area. Winter wheat is the top crop produced in the area, followed by spring barley and legumes. Most watershed agricultural producers use a three year crop rotation and apply an average of 100 lbs/acre of anhydrous nitrogen as fertilizer (NPSWCD, 1995). Overall, only 43% of those surveyed reported soil testing to determine their specific fertilizer requirements (District, 1995). The majority of those who performed soil tests did so on a three year sampling frequency (District, 1995). Because of the slopes, land uses and soil types, this area is susceptible to erosion-related failures in the lowlands, while the uplands are relatively stable. Culverts in agricultural areas such as these may have an increased likelihood of plugging, causing super-saturated soil conditions and culvert failures.

Roads

Activities associated with road building and road presence that may impact fish populations in the Lapwai drainage include increased sedimentation, stream and floodplain constriction, and in-channel changes due to roads and road construction. The legacy of extractive industry in Lewis and Nez Perce counties has resulted in a moderately high overall road density ranging from four to eight miles of road per square mile. This has contributed to slope failure and mass wasting events, surface erosion, altered channel morphology, changes to runoff characteristics and improperly designed stream crossings with the potential to impede salmonid migration.

Many of the roads in this system are paved or graveled. The more significant sediment problems resulting from the road system are largely concentrated in a few areas, including Tom Beall Creek and the headwaters of Sweetwater Creek on Craig Mountain. The estimated total sediment delivery rate is estimated to be 3620.73 tons, or approximately 3.12 tons per mile across 1160 miles of roads. Sedimentation is harmful to salmonids and resident fish alike and can affect salmonids at virtually all stages of life by reducing quality of and access to spawning habitat and juvenile cover; reducing available oxygen to incubating eggs and rearing juveniles; and contributing to elevated water temperatures (Furniss, et al., 1991).

Roads are present along the valley floor along mainstem Sweetwater Creek, Lapwai Creek, Mission Creek, and Tom Beall Creeks, often modifying stream function. Channels have been relocated to accommodate the roads, and in places, the roads take up most of the valley bottom. Throughout the basin, pullouts on roads are often located on the streamside, causing degraded channel condition and contributing to sedimentation and reduced stability. In 2005, the Tribe conducted a road erosion survey on tribally-held lands within the Lapwai Creek drainage and found that the Sweetwater Block of roads (roads within the upper area of the Sweetwater Creek drainage) alone contributed 259.720 tons of sediment into streams annually. To address this issue throughout the watershed, transportation plans are recommended to reduce overall road density and thus reduce impact to streams.

Approximately 123 miles of stream within the Lapwai Creek watershed were inventoried for barriers in 2003-2004. It was determined that nearly 60% of these total inventoried stream miles are currently blocked by barrier structures, representing 72.6 miles of habitat currently unavailable for anadromous salmonids within the watershed. A total of 208 crossings were inventoried, 78 of which were complete passage barriers to all life stages. Nearly one-half of the crossings were culverts, the most common type of structural passage barrier (NPT Lapwai Stream Crossing Report, 2004). A single, adequately-sized, bottomless archway is the most desirable type of culvert, as it most closely mimics natural stream conditions for passage, although a bridge is generally preferable (Furniss, et al., 1991). Only two bottomless archway-type culverts were identified within the basin. See Appendix E for a map of barrier locations in the Lapwai Creek basin.

Of primary concern in the Lapwai Creek basin, particularly in the lower section, is the presence of U.S. Highway 95 and a railroad prism running along, and occasionally immediately adjacent to the creek. The presence of those two structures restricts Lapwai Creek from accessing its natural floodplain in several areas and maintenance activities can be detrimental to stream function. Specifically, methods of erosion control, including riprapping or other hard stabilization efforts, can lead to incision and straightening of the creek. Uncontrolled erosion contributes to sedimentation, bank instability and reduced riparian function. Winter road maintenance and spraying to control weeds can introduce potentially harmful substances into the water table and directly to the stream. Developing methods to address these issues in conjunction with the Idaho Transportation Department will be crucial in restoring the streams within the Lapwai Creek watershed.

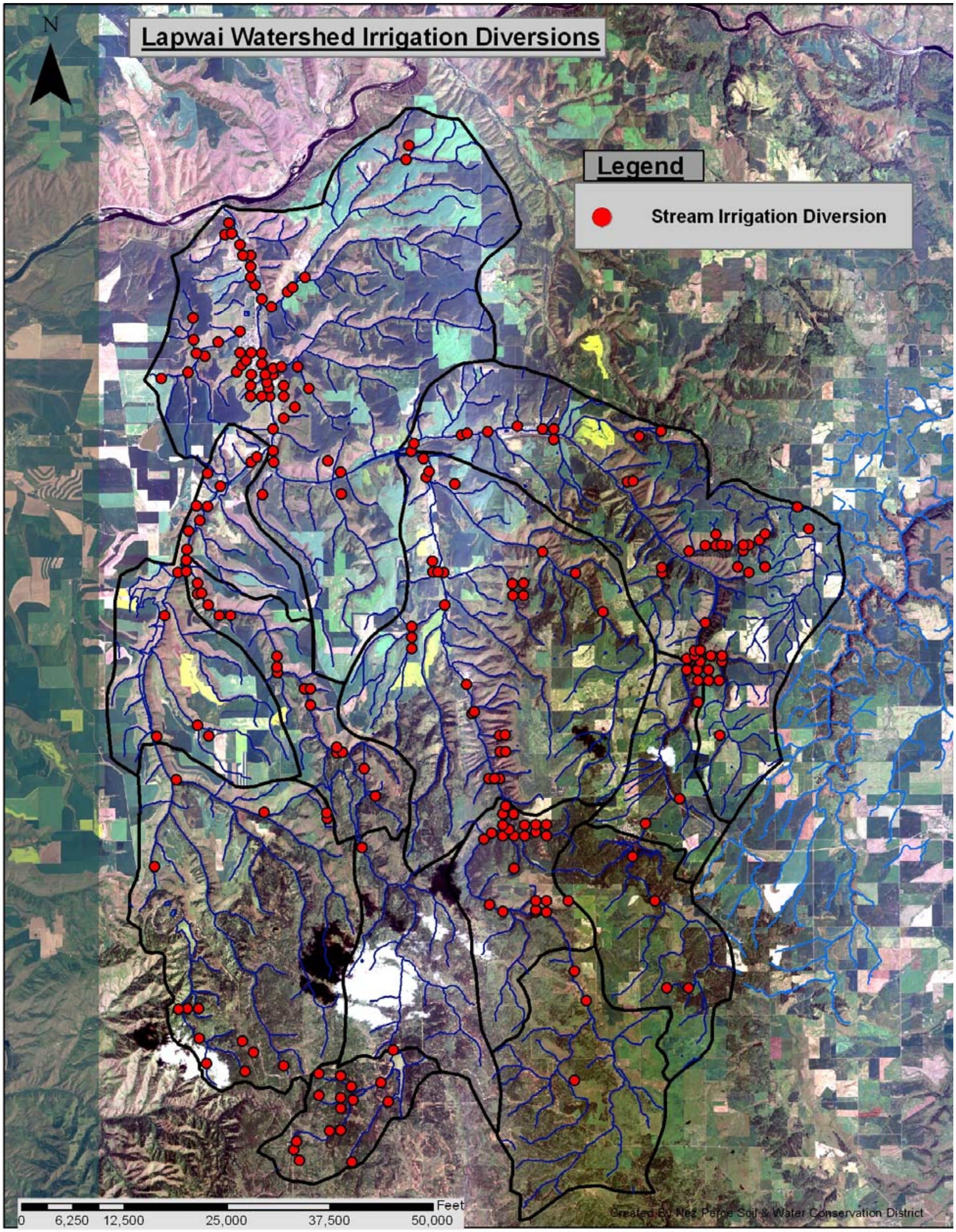


Figure 6. Barrier Locations in the Lapwai Creek Basin

Chapter 3: Justification

> "When I used to work with my dad, we saw so many steelhead in Lapwai Creek… there were more than you knew what to do with. Joe Broncheau, who used to work for my dad, would use a pitch fork to get the steelhead they were so thick." - Don Herndon

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 Lapwai Creek and its watershed that make it a high priority for restoration and protection, including:

- Diverse assemblages of native fishes and other aquatic resources
- Presence of federally-listed Hé-yey (*Oncorhynchus mykiss* (steelhead trout))
- Potential to increase successes of K'állay, or coho salmon (Oncorhynchus kisutch), outplants
- Assessments completed in the watershed examining passage barriers and watershed resources
- High levels of interest and investment from landowners and other stakeholders
- Identification of Lapwai Creek as having high potential for spawning and rearing activity in the Lower Clearwater River Subbasin

Focal Species

Lapwai Creek provides habitat for a variety of resident and anadromous fish species. Fish observed in Lapwai Creek include species listed in Table 6. The anadromous stocks include wild A-run Hé-yey (steelhead (*Oncorhynchus mykiss*)), fall- run Nacó'x (Chinook salmon (*Oncorhynchus tshawytscha*)) and recently reintroduced K'állay (coho salmon (*O. kisutch)*). The Tribe has began a recovery effort for Heesu, or anadromous lamprey (*Lampreta tridentata*), often referred to by the Nimiipuu as eels. According to oral tradition, Heesu are a species of previous and enduring significance within this drainage.

The majority of the Lapwai Creek drainage is federally designated as critical habitat for the Snake River Basin Steelhead DPS. The Snake River Basin Steelhead DPS is a December 2005 continuance of the August 1997 62 FR 43937 ESU (evolutionary significant unit) listed as threatened under the Endangered Species Act. The Snake River fall chinook ESU was listed as threatened under the Endangered Species Act on December 28, 1993 (58 FR 68543).

A robust data set exists within the watershed that shows Hé-yey (steelhead or *O. mykiss*) distribution and relative abundance throughout the entire Lapwai Creek drainage. Hé-yey habitat requirements, relative to other fish species in the watershed, are fairly specific. Habitat conditions adequate for supporting productive populations of Hé-yey will help ensure high-quality habitat for other aquatic biota as well; in this way, they may be considered an "indicator" species. Because of these two important factors, Hé-yey are used as the focal species for this document.

Table 6. Fish Species Observed through Surveys within the Lapwai Creek Drainage

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 of Hé-yey (*Oncorhynchus mykiss*)

Oral histories of the Nez Perce Tribe and local residents 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. Stories told of this area describe fish so thick within Sweetwater Creek that children caught them in gunnysacks and men didn't have to travel to the Clearwater because they could catch enough fish for their families in Lapwai Creek. Traditions of harvesting salmon, Muq'uc or suckers (*Catostomus spp.*) and resident fish are discussed in *Salmon and His People* (1999), a written history of the Nimiipuu's interaction with fisheries resources throughout time.

A 2006 Biological Opinion issued by NOAA Fisheries states that the steelhead population utilizing Sweetwater Creek, a Lapwai Creek tributary with a historically high volume of cool spring-fed flow, was likely a "significant and unique" or "source" population for the Clearwater basin during times of low flows in the years prior to Sweetwater Creek irrigation diversions. Irrigation diversions notwithstanding, comparisons of electrofishing data sets for the Lapwai Creek and Potlatch River basins reveal that juvenile steelhead capture densities observed within the Lapwai Creek (Chandler, C.A., and Parot, R. J. 2006, Chandler C. A. 2006) watershed in 2003 and 2004 were as high as or higher than those noted within concurrent and comparable electrofishing surveys of the nearby Potlatch River basin (Bowersox, B. and Brindza, N. 2006). The NOAA 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 fish 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. High juvenile Hé-yey densities have been recorded within monitoring sites in which summer water temperatures exceeded 20º C (68º F) on a daily basis while low densities have been found within the boundaries of a Lapwai Creek monitoring site in which water temperatures as high as 31.8º C (89.2º 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.

Condition of the Habitat

A scarcity of information exists regarding the historic vegetation communities within the Lapwai drainage. The upper parts of the watershed that were not dominated by conifer forests were likely dominated by herbaceous communities with mixed shrubs. Cooler north-facing slopes likely consisted of ponderosa pine with a sparse, wildfire-maintained understory. Wetland areas are thought to have been dominated by sedges, rushes, grasses and forbs, with large communities of camas, a culturally significant plant to the Nimiipuu. The riparian areas were likely composed of willows (*Salix ssp.),* quaking aspen (*Populus tremuloides*), black cottonwood (*Populus trichocarpa*), black hawthorn (*Crataegus douglasii*), red-osier dogwood (*Cornus sericea*), and red alder (*Alnus rubra*). Remnants of these types of vegetative patterns remain, but conditions prior to settlement are largely speculative, relying heavily on local knowledge and reconstruction from current conditions and impairments. Many years of logging, grazing, irrigation and dryland agriculture have all contributed to a significantly altered streamflow and aquatic habitat in the Lapwai Creek system. The cumulative effects of these impacts may be greater than currently understood. Prior to the degradation of the watershed, the waters of Sweetwater Creek were believed to have healing powers and people came from throughout the Columbia Plateau to bathe in them (Emmit Taylor, declaration, Nez Perce Tribe v. NOAA, 2005, unsubmitted).

The 2006 NOAA Fisheries BiOp indicates that during the summer flow season of July to September, when streams within the lower Clearwater Basin are prone to drying, discharge from the Twenty One Ranch springs flowing into Sweetwater Creek were historically between 1.6 and 11.1 cfs.[5] Juvenile steelhead also benefited from the

[5] 4.6-6.1 cfs from 1907-1914 (prior to use of Lake Waha as reservoir), 6.0-11.1 cfs from 1957-1960 and 1.6-6.1cfs from 2003-2004

atypically cool temperatures (8.3°C-10.6°C) provided by the spring. The biological opinion states that in relation to other streams of the lower Clearwater basin, Sweetwater Creek was likely of very high biological value for steelhead because of the unusually large amount of cool summer flow, providing refuge during times of drought.

Because of the significant cool water inputs and reaches 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 will fully return to its role as a vital part of sustaining regional anadromous and resident fish populations. Both the Clearwater Subbasin Management Plan and Assessment model (2003) state that Lapwai Creek has moderate to high potential productivity, while the NOAA recovery plan for the lower mainstem Clearwater river shows that the majority of reaches in the Lapwai watershed have moderate to high intrinsic spawning and rearing potential. The Clearwater Subbasin Inventory lists Lapwai Creek as having “fair" A-run steelhead habitat conditions and identifies limiting factors to include: temperature, flow, sediment, watershed disturbances and habitat degradation. Stream temperature and flow could be significantly improved in the near future due to a 2006 NOAA Fisheries Biological Opinion which requires the U.S. Bureau of Reclamation to increase minimum flows within Sweetwater Creek. Additional requirements within this BiOp may serve to provide access to a large quantity of spawning and rearing habitat previously inaccessible to steelhead.

Twenty One Ranch Springs

Restoration Potential

In-stream rehabilitation of the Lapwai Creek watershed to the extent that it can better support anadromous and resident species will be a long-term investment. The Tribe and the District have made significant contributions toward fostering an atmosphere where there is both the community support for restoration activities and the technical expertise to implement them. However, the basin does face fundamental challenges to restoration, including irrigation withdrawals, flood control structures, and floodplain development including a major highway and railroad. Managers within the watershed are in communication with Idaho Transportation Department to limit impacts to Lapwai Creek from future expansion development and have made progress in the past toward removing the railroad bed prisms. Additionally, a NOAA BiOp regarding the operation of BOR irrigation diversions is in place, which requires minimum flows within Sweetwater and Webb Creeks. This biological opinion states that long-term salmon and steelhead productivity may be “significantly and rapidly improved” by ceasing water withdrawal.

Physical components in the basin provide a sound basis for restoration, including: significant levels of low temperature groundwater input, stretches of complex habitat, intact and increasing amounts of riparian cover, and the potential for woody debris input. While some sections of Lapwai creek are likely to never be reconnected with their floodplain due to the proximity of U.S. Highway 95, many other stream sections have the potential for a level of connectivity. A combination of passive and active rehabilitation of natural stream and watershed processes will be used where the potential for natural recovery exists, and the use of artificial means will be considered as a last resort in places where natural features and processes are irretrievably lost. Many of the habitat problems can be solved by changing social and management practices in the basin through working with farmers, ranchers, residents, and owners of commercial timber lands. Lapwai Creek and its tributaries are highly visible and the use and protection of its resources, including fish populations and water quality, are of concern to a great many people within the watershed. Because of these attributes, restoration is likely to be well-supported at the community level.

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 Lapwai Creek watershed requires the same conditions that salmonids and other fish throughout the region require: cool, clean water without excessive sedimentation, and adequate stream discharge quantity and velocity for migration, spawning and rearing activities. Hé-yey (*O. mykiss)* of the Lower Clearwater River Basin, including the Lapwai Creek system are unique, however, in that they are seemingly adapted to environmental conditions which include frequent droughts and relatively high summer temperatures. In the face of climate change, steelhead of the Lapwai Creek Basin could potentially harbor genetic traits essential for survival of steelhead in a warmer, drier climate.

The restoration activities recommended in this strategy will:

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

- Increase riparian corridor function through plantings: reduces stream temperature through increased 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

- Implement riparian corridor fencing and off-stream watering sources: reduces livestock access to streams, reducing soil compaction, trampling and removal of riparian area vegetation, helping to decrease sedimentation and improve water quality

- Remove artificial passage barriers: examines 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

Chapter 4: Limiting Factors

This chapter describes the primary limiting factors identified within the Lapwai Creek watershed. Methods for determining these limiting factors are found in Chapter 3.

> "When I used to fish in Webb Creek, redside shiners were so thick they filled entire pools."
>
> "Before the highway was put in towards the mouth of Lapwai Creek, beavers created pools huge enough for us to dive into as kids. These pools were thick with fish."
>
> - Elmer Crow

Limiting factors are those conditions that tend to limit the production and distribution of fish due to human alteration of their environment. Within the scope of this document, the discussion of limiting factors will be restricted to factors that affect the overall quality of aquatic habitat in which fish live. Understanding the presence and effects of these altered functions is important to identify specific restoration needs within the watershed and to address root causes of impairment. It is important to recognize that these limiting factors are typically interconnected and often act synergistically. Therefore, while an examination of limiting factors can help prioritize areas of limited functionality, treating them often requires a more holistic approach. This idea is supported by the sponsors' "ridgetop-to-ridgetop" approach to management, further bolstered by the 2003 Independent Scientific Advisory Board (ISAB) document "A Review of Strategies for Recovering Tributary Health," which promotes a focus on "dynamic processes that create and maintain ecologically complex and resilient watersheds (14)."

To best guide restoration efforts, a reference reach or stream and/or historic conditions are often used. As historic conditions are largely unknown and pristine conditions in a system that closely mirrors Lapwai Creek watershed have not been identified at this time. Criteria from appropriate management agencies are used as proxy.

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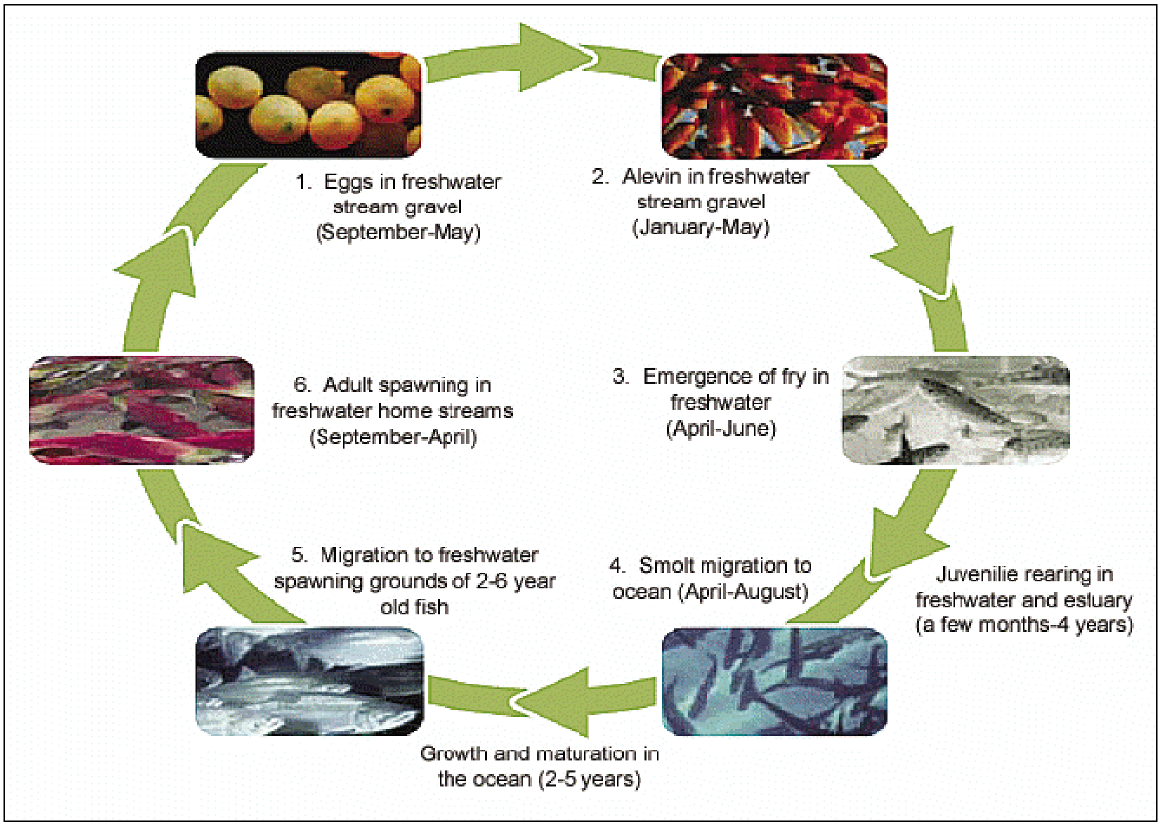


Figure 7. Generalized Salmonid Lifecycle

Limiting Factor Descriptions with Salmonid Habitat Requirements

Six limiting factors identified through the surveys listed above as having the greatest impact on salmonid habitat rehabilitation within the Lapwai Creek drainage were: flow, temperature, habitat diversity, sedimentation, water quality and passage. These limiting factors are corroborated by earlier work by Kucera (1983) and NRCS (2000). Each limiting factor is described below in terms of how it affects salmonids in general, how it specifically applies within the basin, and what the most favorable conditions for salmonids of different life stages are in each category.

Specific habitat needs for salmonids vary throughout the year and different life stages (see figure 7 above). While regional aquatic habitat data is only available for the summer season, mitigation of the primary limiting factors recognized within this watershed will serve to promote the continued existence of native resident and anadromous species.

Flow*:* The effect of the amount of stream flow, or the pattern and extent of flow fluctuations within the stream reach on the relative survival or performance of salmonids describes flow. Flow reductions or dewatering due to water withdrawals will be included as part of this attribute. This limiting factor can affect all life stages throughout the year.

All streams in the Lapwai basin appear to have been affected by severely altered flow regimes. Hydrologic profiles for this watershed are characterized by low duration, high intensity spring flow events and exceptionally low summer base flow levels. Rheic flow values recorded near the mouth of Lapwai Creek ranged from 1,420 cfs to 1.2 cfs within a six-month period in the first year of habitat monitoring by the Tribe. Discharge data recorded near the mouth of Lapwai Creek from 1975 to 2008 indicates summer base flows have diminished significantly in the last 30 years.

Regional hydrology is thought to have shifted from moderated spring and summer flows derived from prolonged snowmelt periods which peaked in May or June, to the current pattern of intense spring runoff and diminished summer flow produced by rain and snow-driven systems which typically peak in March or April. The cause of this shift is likely due to multiple factors, beginning with warmer winters and accelerated snowmelt profiles due to agriculture and forestry practices. High spring flows have been further exacerbated by diminished wetland and riparian vegetation area, increased impervious surface area, an increased drainage network (ditching, roads, culverts), stream channelization and reduced floodplain storage, agricultural activities and timber harvest. These same factors also reduce groundwater recharge, which further diminishes low summer base flow. Summer discharge has also been reduced throughout a number of streams by irrigation withdrawals and domestic water use, while rheic base flow has been further diminished, or lost in many areas due to severe bedload deposition incurred during the intense spring-flow events.

With spring events that provide both periods of extremely high flow (exceeding that preferred for salmonid migration) and greatly diminished flow (below that preferred for salmonid migration), the abrupt hydrology within this watershed can decrease the duration of 'trigger' flow for both adult and juvenile migration while potentially dewatering redds located outside of the stream thalweg.

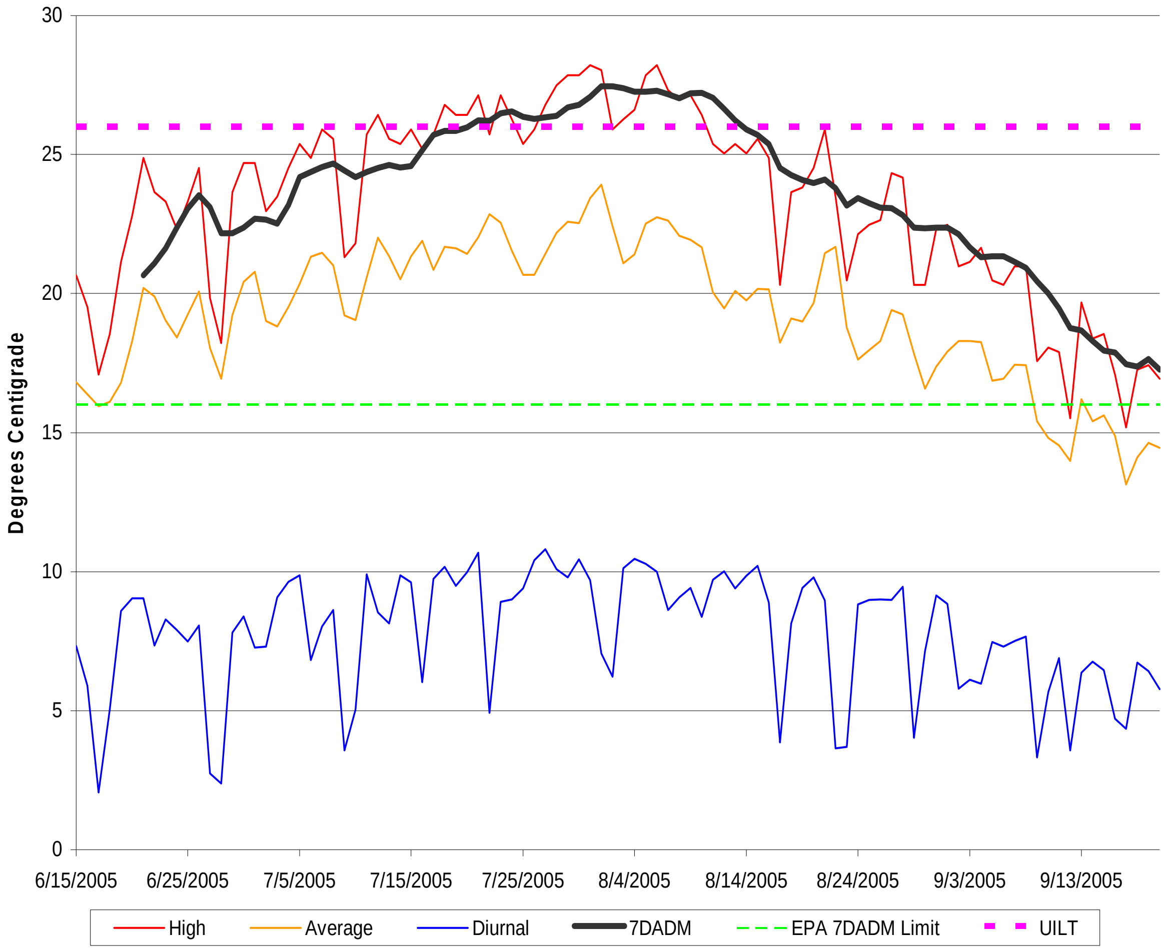
No less important, altered flow regimes are inexorably linked to many of the other limiting factors within this watershed, particularly temperature, habitat complexity, and sedimentation. Summer water temperature, as well as habitat complexity, is affected not only by decreased summer flows, but by channel conditions incurred through extremely high spring flows. Likewise, fine sediment recruitment may increase not only directly through higher spring flows, but through increased shear stresses found under high flow conditions (Rosgen, 1996). Temperature and habitat complexity are also impacted through sustained reductions in base flow incurred through withdrawal of stream flows for irrigation and domestic use, most significantly, those flows diverted from Webb and Sweetwater Creek by the Lewiston Orchards Irrigation District (LOID) for residential irrigation and domestic use.

The Lewiston Orchards Irrigation District (LOID) removes a significant amount of flow from the Lapwai Creek basin via a network of Bureau of Reclamation diversions and canals for residential irrigation and domestic use. The NPT is working closely with LOID and the Bureau of Reclamation to develop Sweetwater and Webb Creek instream flow requirements for a NOAA Fisheries Biological Opinion on LOID actions.

2006 Mission Creek Mid-basin Survey Site Showing Low Summer Flow Conditions

Temperature: The effect of the relative in-stream thermal condition on fish species. This limiting factor is especially important to fish in the incubation and rearing stages, and during low summer flows.

Thermally impaired conditions have been observed throughout most streams of the Lapwai Creek watershed during the months of July and August. Daily maximum temperatures in many of the stream reaches populated by juvenile steelhead have been recorded in excess of 20º C for numerous consecutive weeks with daily maximum temperatures exceeding 23º C recorded for periods of several consecutive days (Chandler and Parot, 2003; Chandler, 2004; Chandler, 2005).



Diurnal=Daily Maximum value minus Daily Minimum value.
7DADM=Average of Daily Maximum value for seven consecutive days.
7DADM Limit= 16°C for Juvenile Salmonid Core Rearing Habitat [6]
UILT= 26°C Upper Incipient Lethal Temperature for Juvenile Salmonid Rearing (24 hour exposure = 50% mortality) [6]

Figure 8. 2005 Thermograph for Mouth of Lapwai Survey Site (LM1)

During the 2003 survey season, the NPT Monitoring and Evaluation project found that the EPA- recommended seven day average daily (7DADM) maximum limit of 16°C was exceeded throughout 75% of sites surveyed within the Lapwai Creek drainage. All 16 sites sampled within the Lapwai Creek watershed exceeded the 7DADM maximum in 2004, while 14 out of 16 sites failed to meet the EPA criteria in 2005. Figure 7 displays 2005 thermal data collected at a monitoring site located near the mouth of Lapwai Creek.

[6] EPA Region 10 Guidance for Pacific Northwest State and Tribal Temperature Water Quality Standards, U.S EPA 910-B-03-002, April 2003

Salmonid species are particularly temperature-sensitive during the juvenile life-stage. A 16°C maximum seven day average daily maximum (7DADM) is recommended through US Environmental Protection Agency Region 10 guidance for juvenile salmonids in a core rearing area (EPA 1996). Regional adaptations of a National Marine Fisheries Service watershed condition matrix utilized by local U.S. Forest Service and Bureau of Land Management Offices have classified temperatures above 17.8 °C 7DADM as poor quality juvenile salmonid rearing habitat (BLM et. al 1998, NMFS 1995). Observations have been made, however, of juvenile steelhead and Chinook salmon that remained healthy within an Idaho stream that attained daily maximum temperatures of 24 °C for brief periods of the day, but had low evening temperatures of 8-12 °C. (Bjornn and Reiser, 1991).

High summer water temperatures may result from increased stream width-depth ratios, diminished rheic baseflow due to water withdrawals, reduced groundwater recharge, or unstable channel conditions. These temperatures may also result from reduced canopy cover due to levee development, road prism encroachment, and agricultural and silvicultural activity. Elevated summer water temperatures tend to concentrate the distribution of juvenile steelhead to stream reaches benefiting from spring, groundwater, or hyporheic recharge, thereby reducing 'available' habitat to a fraction of the watershed's habitat potential.

Canopy cover provided from intact riparian communities intercepts and diffuses solar insolation, moderating thermal shifts from radiant heat. Data from 2003 and 2004 NPT distribution surveys indicate that canopy cover throughout the four primary streams of the Lapwai Creek watershed varied from as little as 5% in sections of Mission and Lapwai Creeks, to as high as 97% in upper Sweetwater Creek. These extremes were reflected in stream averages as well, with Mission and Lapwai Creeks having moderately low canopy cover values on average as well, while canopy cover on Sweetwater and Webb Creeks was generally more intact.

Table 7. Canopy Cover

Lapwai Creek Canopy		**Mission Creek Canopy**	
Average	31%	Average	38%
Median	25%	Median	32%
High	85%	High	85%
Low	5%	Low	5%
Sweetwater Creek Canopy		**Webb Creek Canopy**	
Average	68%	Average	55%
Median	80%	Median	60%
High	97%	High	75%
Low	15%	Low	10%

<u>Habitat Diversity:</u> The effects of physical habitat attributes within a stream reach on relative fish survival or performance. This limiting factor is important for all life stages throughout the year, but especially critical for newly hatched and rearing salmonids.

Essentially, species living within diverse habitats have a greater chance to survive and flourish (Mt. Hood Aquatic Assessment, 2006). Habitat needs vary greatly by life-stage, daily activity (feeding, resting, hiding), seasonal activity (actively metabolizing vs. overwintering), and hydrologic condition (baseflow vs. high flow event). Habitat diversity, largely a function of gradient, channel confinement, riparian function and large woody debris, is a limiting factor in most of the Lapwai drainage reaches. Several of the reach lengths are highly confined by railroad prisms, U.S. Highway 95, or other roads. In these reaches, confinement has resulted in decreased complexity, including the following: decreased sinuosity leading toward increased gradient and uniform bedload, reduced riparian width and density which leads to decreased thermal insulation, cover and organic input, as well as reducing large woody debris recruitment. Additionally, because of some land use practices, many of the Lapwai Creek drainage reaches are currently disconnected from their floodplain, resulting in habitat diminished both in quality and size.

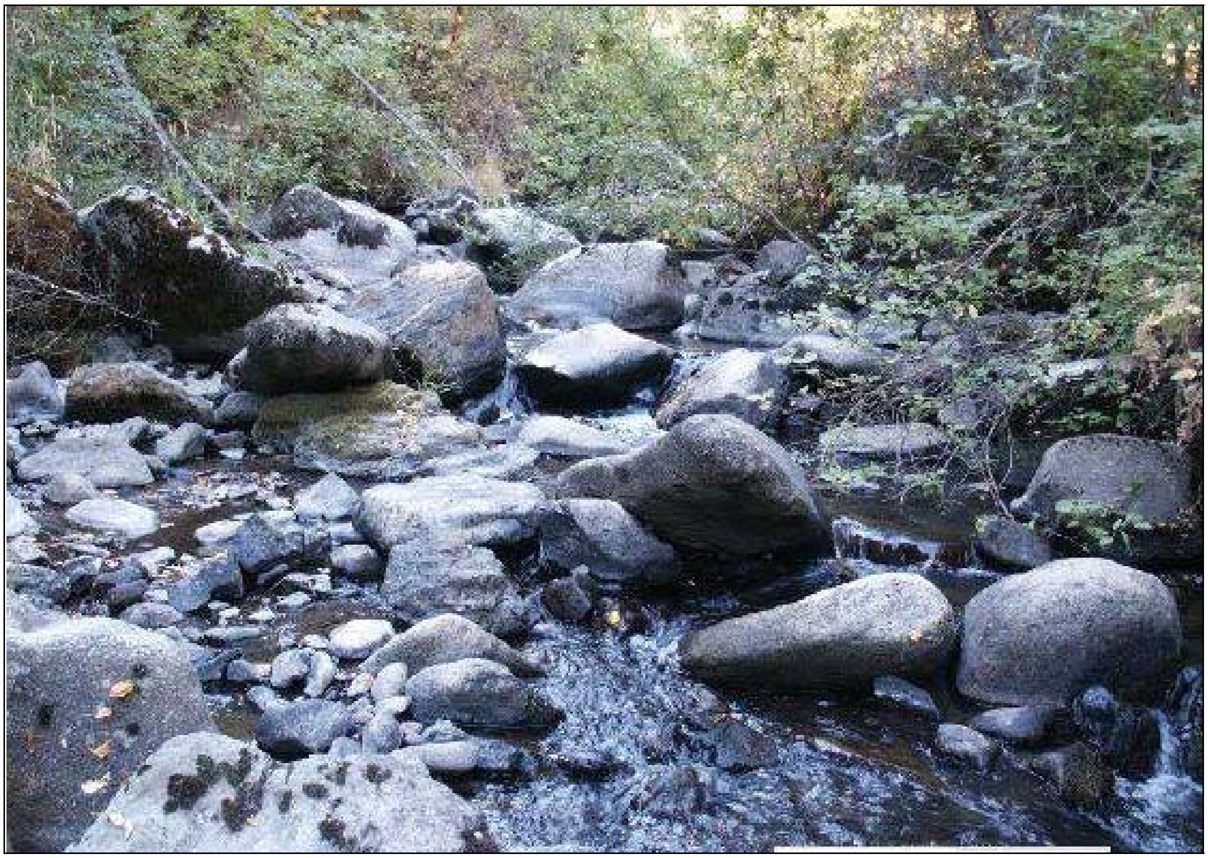
The “flashy” hydrograph of the Lapwai Creek watershed has led to increased stream energy, while the ability of the channel to make natural adjustments has diminished due to levees and other flood control measures. As a result, processes of meander formation through scour and deposition no longer function to form series of pools and riffles. Instead, bedload becomes deposited uniformly throughout the channel, creating uniform bed topography that is higher than the water table in late summer. In the case of reduced or altered flow, fish will tend to use pools primarily, followed by runs and then riffles (Bjornn and Reiser, 1991). Stable pools cannot form in many segments of the Lapwai Creek drainage due to confinement of the channel within relatively straight stream banks reinforced for flood control. Floodplain restoration is a crucial element necessary to reestablish geomorphic processes that create and maintain pools. The importance of pools in the Lapwai Creek watershed is great due to increased frequency of drought conditions where pools are the only portions of the stream that remain below the water table.

Substrate composition is critical for spawning and incubation, resident and juvenile anadromous fish cover, and habitat for macroinvertebrates utilized as food sources. As one aspect of habitat diversity, substrate is an indicator of habitat quality but is not currently identified through data analysis as a limiting factor. Distribution and Abundance surveys conducted in 2003 and 2004 by the NPT identified dominate substrate types for the four primary streams in the Lapwai Creek drainage.[7] This information helps form a more complete view of habitat diversity, as various sizes of substrate serve different functions within the stream channel.

[7] Totals less than 100% because only top three substrate types are reported. Full results available by request from the NPT.

Table 8. Creek Substrates

Lapwai Creek Substrate		Mission Creek Substrate	
Boulder	16.3%	Coarse Gravel	17.0%
Coarse Gravel	26.1%	Boulder	20.0%
Cobble	48.6%	Cobble	32.0%
Sweetwater Creek Substrate		**Webb Creek Substrate**	
Boulder	10.7%	Boulder	14.0%
Coarse Gravel	28.6%	Coarse Gravel	26.6%
Cobble	54.1%	Cobble	49.4%



Boulders in Mission Creek

Habitat availability is the amount of space a salmonid species will occupy and is determined by habitat diversity and quality, food availability, suitability of substrate for spawning, and presence, size, and behavior of nearby species. Fish densities within a stream are not uniform, but rather increase and decrease relative to the above parameters. During the summer months, when reduced flow and high temperatures limit fish access to and availability of adequate cool water refugia, pool structures are critical. Surveys of habitat diversity throughout the four primary streams within the Lapwai Creek watershed were conducted in 2003 and 2004 by the NPT. Overall, rates of pool habitat were fairly low throughout, indicating reduced cover and cool refugia for salmonids:

Table 9. Creek Habitats

Lapwai Creek Habitat		**Mission Creek Habitat**	
Pool	6.6%	Pool	4.9%
Glide	27.2%	Glide	30.7%
Riffle	65.9%	Riffle	64.4%
Sweetwater Creek Habitat		**Webb Creek Habitat**	
Pool	2.8%	Pool	7.8%
Glide	32.6%	Glide	8.5%
Riffle	64.6%	Riffle	83.7%

Cover and productivity are important at all life stages, emergent fry to spawning adults require cover in different forms to avoid predation and conserve energy otherwise expended in undeflected streamflow. Many of the same aspects that offer cover, such as undercut banks, large woody debris, streamside vegetation, rocks, and logs also act as sources of organic input critical to primary and secondary productivity. Streams lacking instream cover may show a decreased number of pools, decreased depth and surface area, increased velocity and decreased fish biomass (Bjornn and Reiser, 1991). Data from the 2003 and 2004 NPT distribution surveys indicate that the four primary streams within the Lapwai Creek watershed showed moderate canopy cover throughout.

Assuming that LWD is part of a stream's functional background, a lack of LWD as a result of reduced riparian density may lead to decreased productivity in a stream (Bjornn and Reiser, 1991). Within the Lapwai Creek watershed, a lack of intact riparian vegetation leads not only to reduced primary production, cover and solar insulation, but reduces LWD recruitment and subsequent channel roughness. Across the 16 sites surveyed by the NPT, more than half (56%) lacked woody input large enough to be characterized as LWD in 2003. In 2006, approximately 32% of the surveyed sites lacked LWD, indicating low recruitment.

<u>Sediment Load:</u> The effect of the amount of fine sediment present in, or passing through, a stream reach on the relative survival or performance of fish species. This limiting factor is important during spawning, incubation and rearing.

Waters with high concentrations of suspended sediments result in high levels of turbidity, which can delay migration. Excessive amounts of sediment can embed free matrix cobble and gravel, reducing the amount of available spawning substrate. Additionally, sedimentation in areas where redds have been created can cause suffocation of eggs prior to emergence and reduce available interstitial substrate space for juvenile cover. Natural events, such as landslides or wildfires can contribute to high turbidity, as can unnatural and man-made events, such as poor road placement, and logging or trans-basin diversion. Although data regarding total suspended solids and turbidity is spatially and temporally inconsistent within the basin, surveys performed by the NPT in 2003 and 2006 indicated moderate to severe impairment of bank stability throughout all 16 sites over both sample years. This is likely to contribute to the overall levels of turbidity and suspended solids.

While a small amount of cobble embeddedness data has been compiled throughout the Lapwai Creek watershed, the physical parameters required in order to collect acceptable cobble embeddedness samples are very narrow, resulting in a 50% survey rate of sites in 2003 by the NPT and a 56% survey rate in 2006. In 2003, of the sites surveyed, 62.5% showed highly impaired conditions, and 25% showed moderate impairment. In 2006, 57% indicated high impairment and an additional 29% were considered moderately impaired. A complete description of methods and results are available by request from the NPT.

Juvenile salmonids tend to avoid streams with regular high turbidity, which can disrupt feeding and territorial behavior. Typically, juvenile fish are not significantly impacted by low or infrequent levels of turbidity, such as those that occur following a storm event. Favorable turbidity levels for juvenile salmonids are < 50 NTU for newly emerged fry and <60 nephelometric turbidity units (NTU) for older fry and parr (Bjornn and Reiser, 1991).

Water Quality: This describes the effects of water's chemical and biological characteristics on production and survival. This limiting factor affects all life stages throughout the year.

Analysis of water quality data, including dissolved oxygen and phosphorus, may indicate impaired conditions within much of the Lapwai Creek watershed. Many of these water quality issues are exacerbated under low flow and extreme stream water temperatures. Within the Lapwai Creek watershed, all 16 sites monitored in 2003, 2004 and 2005 by the NPT had phosphorus levels in excess of water quality standards established by Idaho DEQ, with the exception of two sites on Mission Creek in 2004.

Dissolved oxygen (DO) concentrations, a product of water temperature, velocity, surface and intragravel oxygen exchange, and oxygen demand of organic materials, can greatly affect the swimming performance of migrating salmonids. Minimum levels of DO required for spawning are spawning fish are no less than 5.0 mg/L and at least 80% saturation, according to Bjornn and Reiser (2001). Lower DO levels in redds were correlated with percent survival and size; newly hatched alevins are able to detect and seek out higher levels of DO. Cobel (1961, as cited by Bjornn and Reiser, 1991) concluded that intragravel dissolved oxygen must average 8 mg/L for embryos and alevins to survive well. After reviewing numerous studies, Davis (1975) stated that a dissolved oxygen concentration of 9.75 mg/L is fully protective of larvae and mature eggs, while at 8 mg/L the average member of the incubating population will exhibit symptoms of oxygen distress, and at 6.5 mg/L a large portion of the incubating eggs may be affected. Bjornn and Reiser (1991) reviewed numerous references and recommend that dissolved oxygen should drop no lower than 5 mg/L, and should be at or near saturation for successful incubation. Low DO concentrations of <5 mg/L adversely affect food conversion efficiency, swimming performance, and growth in juvenile salmonids. Fish affected by low levels of DO may be further stressed by the warm water temperatures that often accompany low DO (Bjornn and Reiser, 1991).

In the 2003 survey year, NPT found that 7 (43.75%) of 16 sites sampled showed levels of DO lower than optimal survey levels. DO levels in concurrent years were somewhat better, with just 12.5% of sites showing severe impairment in both 2004 and 2005.

Diatom samples were collected by the NPT at 16 monitoring sites in the Lapwai Creek basin. The samples were analyzed and scored on a variety of parameters used to indicate water quality. These scores were then summed to provide a multimetric index score of impairment in comparison to unimpaired stream values established by Idaho DEQ. In the 2003 survey year, one site showed little or no impairment, two showed high levels of impairment and the remaining 13 showed moderate impairment. In 2004 and 2005, all sites but one (2005) showed moderately impaired conditions.

Garden Gulch

Connectivity: The effect of impaired access to crucial areas of aquatic habitat upon the rearing and survival of focal species. This limiting factor is critical for spawning, rearing and migration.

Fish passage, or the ability of fish to access quality habitat, is of concern within the Lapwai Creek watershed because of the high levels of infrastructure within 300 feet of the stream. The abundance of roads, railroad prisms, dikes and levees has resulted in barriers to fish passage for both adults and juveniles. Some are ephemeral or seasonal, while others are year-round or otherwise permanent barriers.

In 2004, the NPT conducted a survey of passage barriers within the Lapwai Creek watershed and found barriers to passage on the mainstems of Lapwai, Mission and Sweetwater Creeks, three of the four major streams in the watershed[8]. While Webb Creek lacked any mainstem diversions, a natural barrier measuring 12m in height is present at stream km 14.8, effectively blocking steelhead passage (Taylor, E.E., 2004). While natural barriers, including debris jams, waterfalls and excessively high water velocities, can be insurmountable to fish at certain times, many salmonids can navigate past them, given suitable depths at the foot of barriers (Bjornn and Reiser, 1991).

For proper function, all man-made barriers to fish passage should be addressed to provide passage for all life stages of all species at a minimum of 100-year flood event flows (NPT DFRM Strategic Management Plan, 2007, draft). Man-made barriers such as dams, culverts or other diversions may require fish-specific modifications to enable passage; optimally, bridges would be used in place of in-stream modifications (Bjornn and Reiser, 1991).

Other Limiting Factors

Watershed surveys were conducted during summer base-flow conditions; aquatic habitat data is not available for over-wintering conditions within the Lapwai Creek watershed. Over-wintering conditions were therefore not included within the discussion of primary limiting factors.

Favorable over-wintering conditions, including reduced levels of sedimentation, habitat complexity, moderate temperatures and adequate in-stream flow, have the potential to increase survivorship in salmonids. Please see full descriptions of each of these aspects within the prior limiting factor descriptions. While survey data is not available, general observations made throughout the Lapwai Creek basin indicate that over-wintering conditions are not likely to present as great a limitation to aquatic habitat quality as summer conditions. Relative to a “normal” flow regime, winter flow conditions appear to be much less impaired than summer baseflow, while water temperatures are unlikely to drop to heavily impaired levels for prolonged periods due to the region’s mild climate.

[8] For locations of barriers, please see map in Appendix G.

Chapter 5: Restoration Framework: Prioritization

This chapter presents a detailed prioritization framework for ranking each stream reach. The framework considers several aspects of watershed health including watershed processes and fish populations present. The ultimate product of this framework is a prioritized ranking for active restoration within the Lapwai Creek basin. The methods for data collection are discussed in this chapter as well.

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). The Working Group determined the best way to define management areas in the watershed was to use significant shifts in juvenile Hé-yey (*Oncorhynchus mykiss*) density as boundary delineations (Figures 8 and 9). Notably, all of the shifts in juvenile Hé-yey (*O. mykiss*) density coincided with perennial or ephemeral physical passage barriers[9]. Many of these barriers would prevent passage of adult steelhead under all conditions, while several of the barriers would theoretically be passable during high spring flows. The complete list of AUs can be found in Figure 10.

The acreage within the watershed varies slightly from previously published figures because the watershed boundaries were created along topographical lines rather than along HUC boundaries. Two AUs (Lapwai 4 and Webb 3) originally included in the prioritization are located above reservoirs, and there was little to no data collected at these sites; consequently, they have been removed from the prioritization. Complete descriptions of each AU can be found in Appendix F.

[9] It is important to note that while the causes of these barriers may be related to human actions, they are not artificially constructed barriers (dams, culverts, etc.).

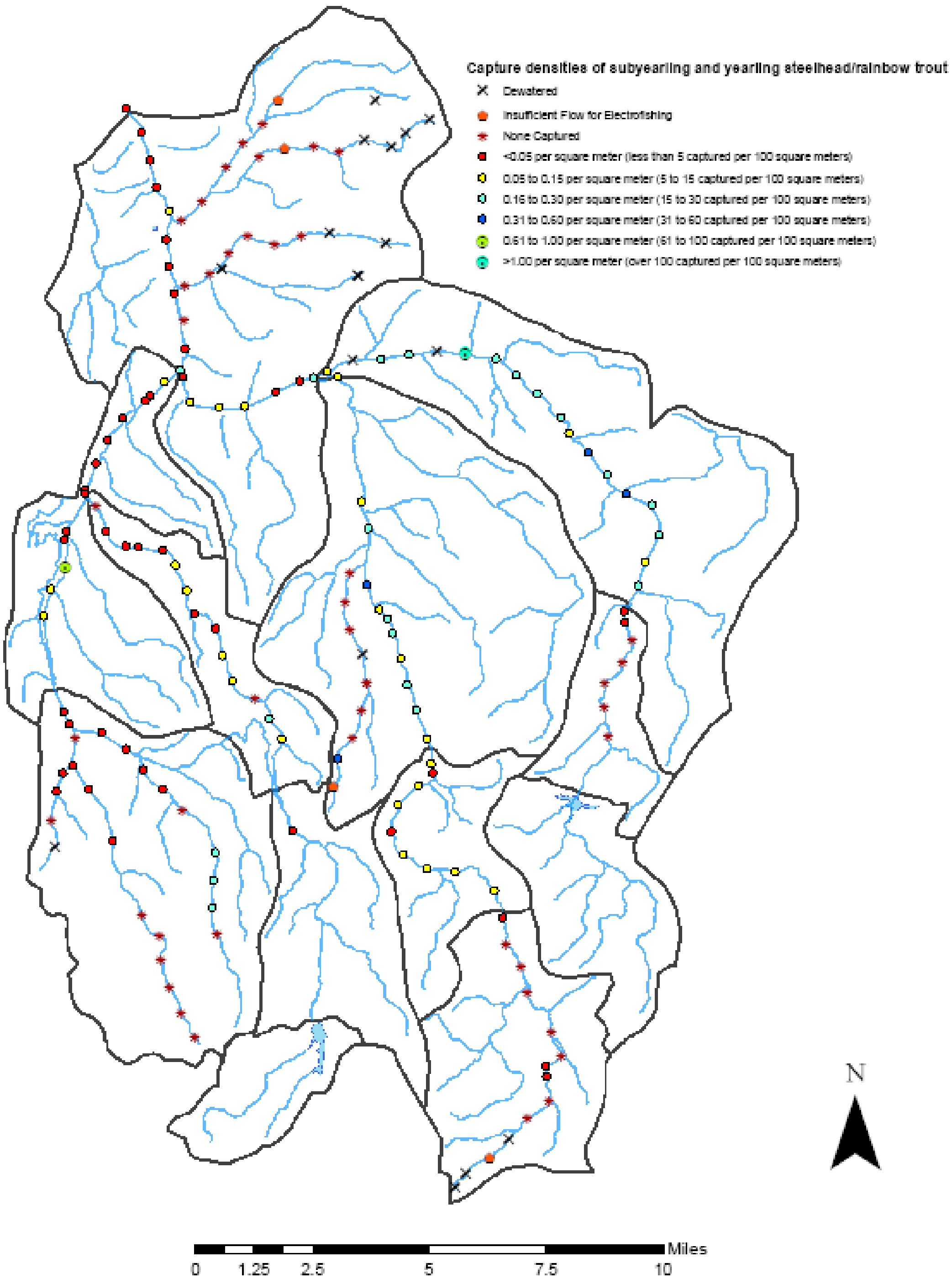


Figure 9. Juvenile O. Mykiss Fish Densities within the Lapwai Creek Basin

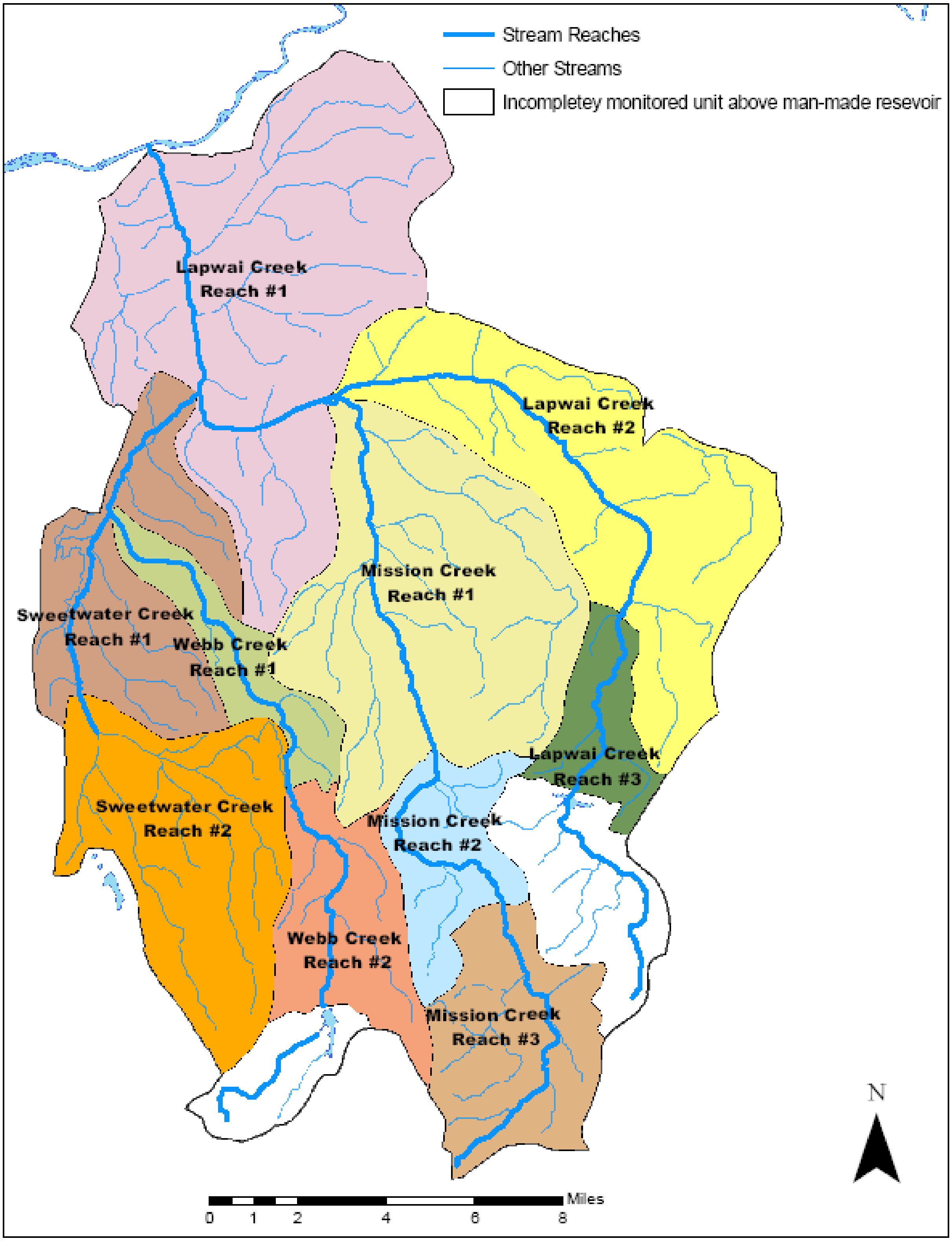


Figure 10. Assessment Units in the Lapwai Creek Drainage

Figure 11. Assessment Units for Prioritization within the Lapwai Creek Watershed, Broken out by Juvenile Hé-yey (O. mykiss) Densities

Lapwai Creek

km 0.0 to km 17	Below dewatered segment. Subyearling *O. mykiss* present in consistently low densities.
km 17 to km 34	Between dewatered segment and I-95 passage barrier (culvert). High subyearling and yearling *O. mykiss* densities.
km 34 to Winchester Lake	Above I-95 passage barrier (culvert). Very low *O. mykiss* densities; age structures indicative of resident fish population.

Mission Creek

km 0.0 to km 15	Lower and mid canyon; below high-gradient stream segment. Moderate subyearling and yearling *O. mykiss* densities.
km 15 to km 24.5	Upper canyon; between high-gradient segment and passage barrier (culvert). Low subyearling and moderate yearling *O. mykiss* densities.
km 24.5 to km 34	Headwaters; above passage barrier (culvert). Very low *O. mykiss* densities; age structures indicitive of resident population.

Sweetwater Creek

km 0.0 to km 13	Below BOR/LOID irrigation diversion. Moderately low densities of subyearling *O. mykiss* present.
km 13 to km 15	Above BOR/LOID irrigation diversion. Very low *O. mykiss* densities.

Webb Creek

km 0.0 to km 15	Below natural passage barrier. Low subyearling and low to moderate yearling *O. mykiss* densities.
km 15 to Soldiers Meadows	Above natural passage barrier (waterfall). Low *O.mykiss* densities; age structures indicitive of resident population. Electrofishing data restricted to one monitoring site.
Above Soldiers Meadows	No electrofishing data.

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 (2006). The goal of the framework is to identify areas of the watershed where restoration efforts would be most beneficial. To achieve that goal, the essential task 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 investigated and evaluated for implementation.

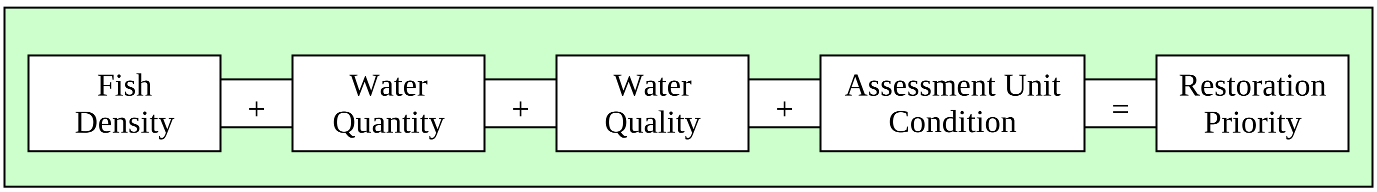


Figure 12. Conceptual Framework for Prioritizing Aquatic Habitat Restoration Activities in the Lapwai Creek Watershed

While there are several species of interest in the Lapwai 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 impairment. *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 AU with high fish densities but relatively low habitat quality would theoretically receive a higher priority ranking than an area that contains relatively high quality habitat but is devoid of fish.

For each component, the technical team compiled and analyzed relevant data. Both statistical and spatial analyses were utilized in this process, as was professional opinion from those whom have worked most extensively in the basin. The two single-metric parameters, *Fish Density* and *Water Quantity*, were ranked by simple order of one through ten. The two multi-metric parameters, *Water Quality* and *Assessment Unit Condition*, were weighted internally prior to being ranked. Figure 12 shows the overall weighting scheme for the Assessment Unit Prioritization, including the internal weighting for both the AU Condition and *Water Quality* parameters. The rankings within these two parameters were normalized by determining the percentage of the mean in order to avoid situations in which ties between AUs resulted in an uneven spread between parameters.

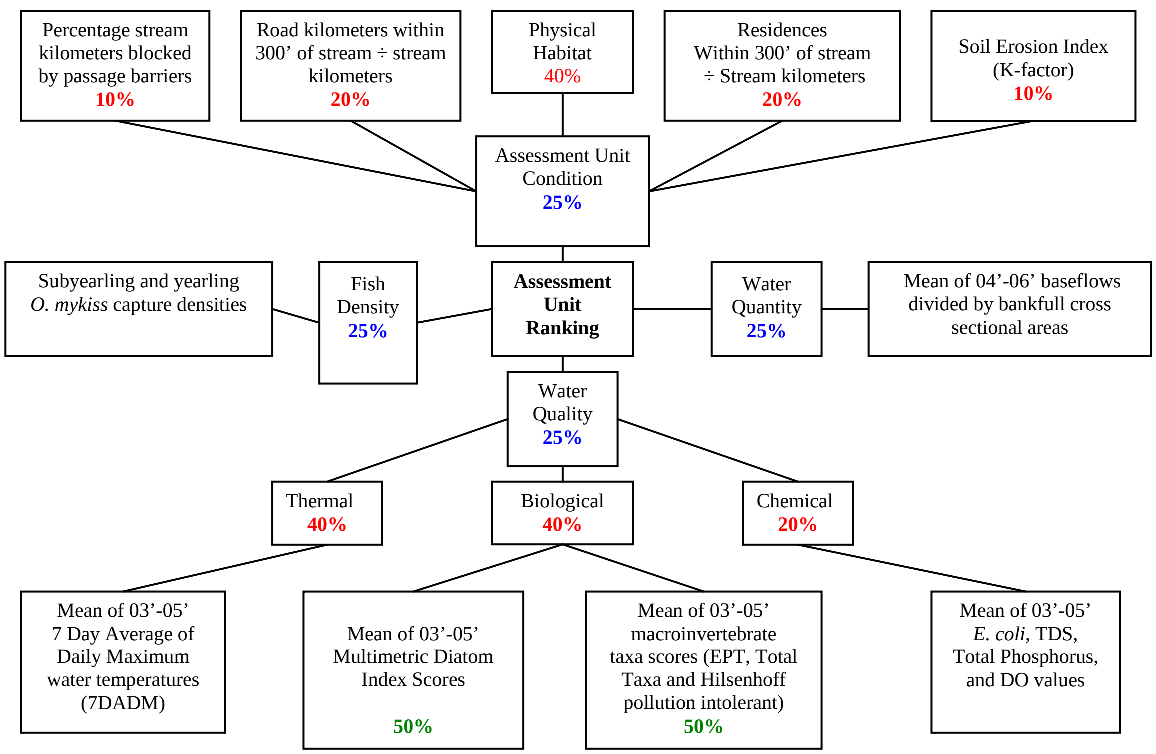


Figure 13. Assessment Unit Ranking Flowchart

Fish Density

The Fish Density parameter endeavors to identify aquatic habitat restoration needs in the Lapwai Creek basin essential to all anadromous and resident salmonid species. It is reasonable to assume that, considering salmonids' fairly specific habitat requirements, high-quality salmonid habitat will provide high quality habitat for non-salmonid resident fishes of the region. Although there are several species of salmonids within the Lapwai Creek basin, Hé-yey (*O. mykiss)* were chosen as the primary species of interest due to their relative abundance, legal status and cultural importance. A complete list of the fish species found in the Lapwai Creek basin is found in Table 6.

Hé-yey densities were taken from two years of data collection across 135 sites. Lapwai, Mission and Sweetwater Creeks were sampled in 2003, and Webb Creek was sampled in 2004 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 16 Monitoring and Evaluation sites within the Lapwai Creek 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 presence. Fish species rankings were assigned on a scale of 1-10; 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 10.

Table 10. Assessment Unit Rankings for Fish Density

Assessment Unit	Subyearling and yearling steelhead/rainbow trout captured per m2 surveyed	(#/100m^2)	Ranking
Mission 3	0.004	0.44	**1**
Lapwai 3	0.005	0.55	**2**
Sweetwater 2	0.006	0.61	**3**
Webb 2	0.014	1.40	**4**
Lapwai 1	0.040	3.98	**5**
Webb 1	0.045	4.47	**6**
Sweetwater 1	0.055	5.50	**7**
Mission 2	0.071	7.12	**8**
Mission 1	0.204	20.38	**9**
Lapwai 2	0.268	26.78	**10**

In the table above, a ranking of 1 indicates a lower priority for restoration while a ranking of 10 indicates a high priority for restoration, relative between AUs.

Water Quality

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

Water quality rankings were assigned on a scale of 1-10 with higher scores assigned to those assessment units displaying lower levels of water quality. This biases prioritization of restoration activities to those sites with greater degrees of water quality impairment. Water quality scores were a composite of three components:

Thermal: The mean of 2003-2005 seven day average of daily maximum water temperatures.

Chemical Parameters: The mean of 2003-2005 rankings for *E. coli*[10], total phosphorus, dissolved oxygen, and total dissolved solids (TDS) concentrations.

Biological Indicators: The mean of 2003-2005 pollution and sedimentation sensitive diatom data (multimetric diatom index) and pollution sensitive macroinvertebrate data

[10] Presence of excessive E. coli is used as a proxy for water quality issues introduced by livestock.

(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 Score	Ranking
Webb 2	0.87	**1**
Mission 2	0.87	**2**
Sweetwater 2	0.88	**3**
Mission 1	0.98	**4**
Webb 1	0.98	**5**
Mission 3	1.03	**6**
Lapwai 2	1.03	**7**
Lapwai 3	1.03	**8**
Sweetwater 1	1.21	**9**
Lapwai 1	1.28	**10**

In the table above, a ranking of 1 indicates a lower priority for restoration, while a ranking of 10 indicates a higher priority for restoration, relative between AUs.

Water Quantity

Low in-stream summer 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. The Lapwai basin has a complex system of withdrawals and impoundments managed by the LOID, providing irrigation water to 5,700 homes and domestic potable water to approximately 7,200 homes. Additional water rights exist throughout the basin which, if exercised to their full extent, would have the potential to dewater significant portions of the Lapwai drainage. Finally, un-permitted 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[11] to establish monitoring site base-flow to high-flow ratios. Water Quantity rankings of 1-10 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 13) while AUs demonstrating less variability between high and low flow levels received low scores (Figure 14). A score of 1 indicates relatively good water quantity relative within all 10 Aus, and a score of 10 indicates relatively impaired water quantity conditions. This ranking paradigm reflects intent to prioritize restoration within those areas with diminished levels of summer flow relative to total flow available.

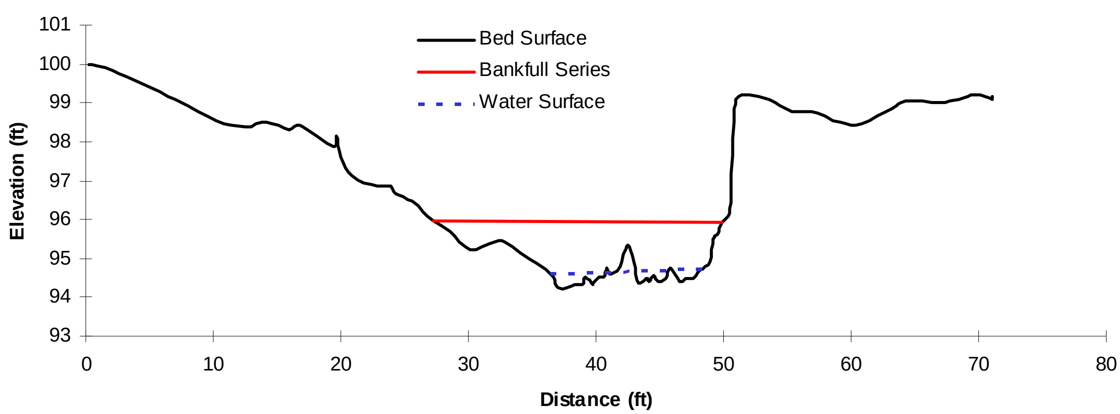


Figure 14. Low Base-flow to Bank-full Ratio Resulting in Poor Ranking

[11] Methods for derivation of the base flow and bankfull measurements are described in Chapter 5 above.

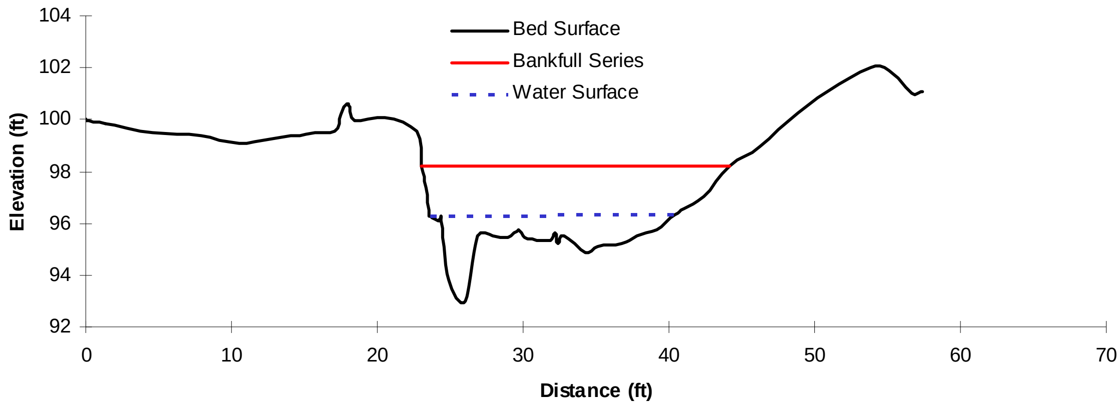


Figure 15. Higher Base-flow to Bank-full Ratio Resulting in Improved Ranking

Table 12. Assessment Unit Rankings for Water Quantity Parameter

Assessment Unit	Baseflow : Bankfull Ratio	Ranking
Sweetwater 2	2.251851852	1
Webb 2	0.375699947	2
Lapwai 1	0.200474918	3
Lapwai 3	0.165869219	4
Lapwai 2	0.121459769	5
Mission 1	0.080378738	6
Sweetwater 1	0.075796583	7
Mission 2	0.042109786	8
Webb 1	0.00953965	9
Mission 3	0.0043377	10

In the table above, a ranking of 1 indicates a lower priority for restoration, while a ranking of 10 indicates a higher priority for restoration, relative between AUs.

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 Lapwai Creek drainage. The backgrounds of these professionals include: soils science, fish biology, aquatic habitat restoration, hydrology and aquatic ecology. Five components went into establishing a ranked order of AUs for the Lapwai Creek watershed:

Percentage of stream kilometers blocked by fish passage barriers: In 2004, the NPT submitted a report to BPA documenting barriers to fish passage within the Lapwai Creek watershed. The barriers in that report that were identified to completely block adult anadromous passage were overlaid on the AU layers, and the percentage of stream kilometers blocked to total stream kilometers present was calculated as a simple ratio. This aspect of Assessment Unit Condition is also reflected by densities of juvenile Hé-yey (*O. mykiss*) ranked in the Fish Density parameter.

Road density within 300' of the stream, per AU: 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 structures 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; 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 aspects, commonly including diminished riparian vegetative density, disruption of groundwater exchange patterns, increased impervious surfaces, livestock waste input, lawn and garden herbicide and pesticide runoff.

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 data obtained through the District's SAM/SVAP protocol[12] 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.

Values for the five assessment unit condition components were normalized (each AU value divided by the watershed mean value for that component) prior to being combined in such a manner that 10% of the final AU condition value was contributed by percentage stream km blocked, 10% by K-factor, 20% each by riparian road and residential densities, and 40% by SVAP/SAM physical habitat data. A number of factors were considered in deriving this weighting scheme. While passage barriers and soil erosion issues were recognized to be extremely significant limiting factors, these parameters were also addressed through fish density and water quality components, respectively. Likewise, while the importance of road and residential densities were recognized, a higher degree of weighting was given to habitat quality data, which could potentially reflect conditions imposed by these two anthropogenic impacts. High composite AU condition scores resulted in high AU rankings, reflecting an intent to bias prioritization of restoration activities upon those sites with the greatest degree of habitat impairment.

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

Table 13. Assessment Unit Rankings for Assessment Unit Condition Parameter

Assessment Unit	Composite Score	Ranking
Webb 1	0.712	**1**
Mission 3	0.807	**2**
Mission 2	0.812	**3**
Mission 1	0.870	**4**
Webb 2	0.876	**5**
Lapwai 3	1.035	**6**
Sweetwater 2	1.053	**7**
Sweetwater 1	1.097	**8**
Lapwai 1	1.409	**9**
Lapwai 2	1.427	**10**

In the table above, a ranking of 1 indicates a lower priority for restoration, while a ranking of 10 indicates a higher priority for restoration, relative between AUs.

Synthesis and Results

Each component of the prioritization framework, Fish Density, Water Quantity, Water Quality and Assessment Unit Condition, was 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 1-10, with the highest scoring AU ranked 1, indicating the highest restoration priority. Two AUs (Mission 2 and Webb 1) 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 14. A map locating the top three prioritized AUs is found in Figure 15.

Table 14. Normalized Results for Assessment Unit Rankings

Assessment Unit	Ranked Priority	Fish Priority Species	Water Quantity	Water Quality	AU Condition	Composite Ranking Mean
Lapwai 2	1	10	5	7	10	8.00
Sweetwater 1	2	7	7	9	8	7.75
Lapwai 1	3	5	3	10	9	6.75
Mission 1	4	9	6	4	4	5.75
Mission 2	5	8	8	2	3	5.25
Webb 1	6	6	9	5	1	5.25
Lapwai 3	7	2	4	8	6	5.00
Mission 3	8	1	10	6	2	4.75
Sweetwater 2	9	3	1	3	7	3.50
Webb 2	10	4	2	1	5	3.00

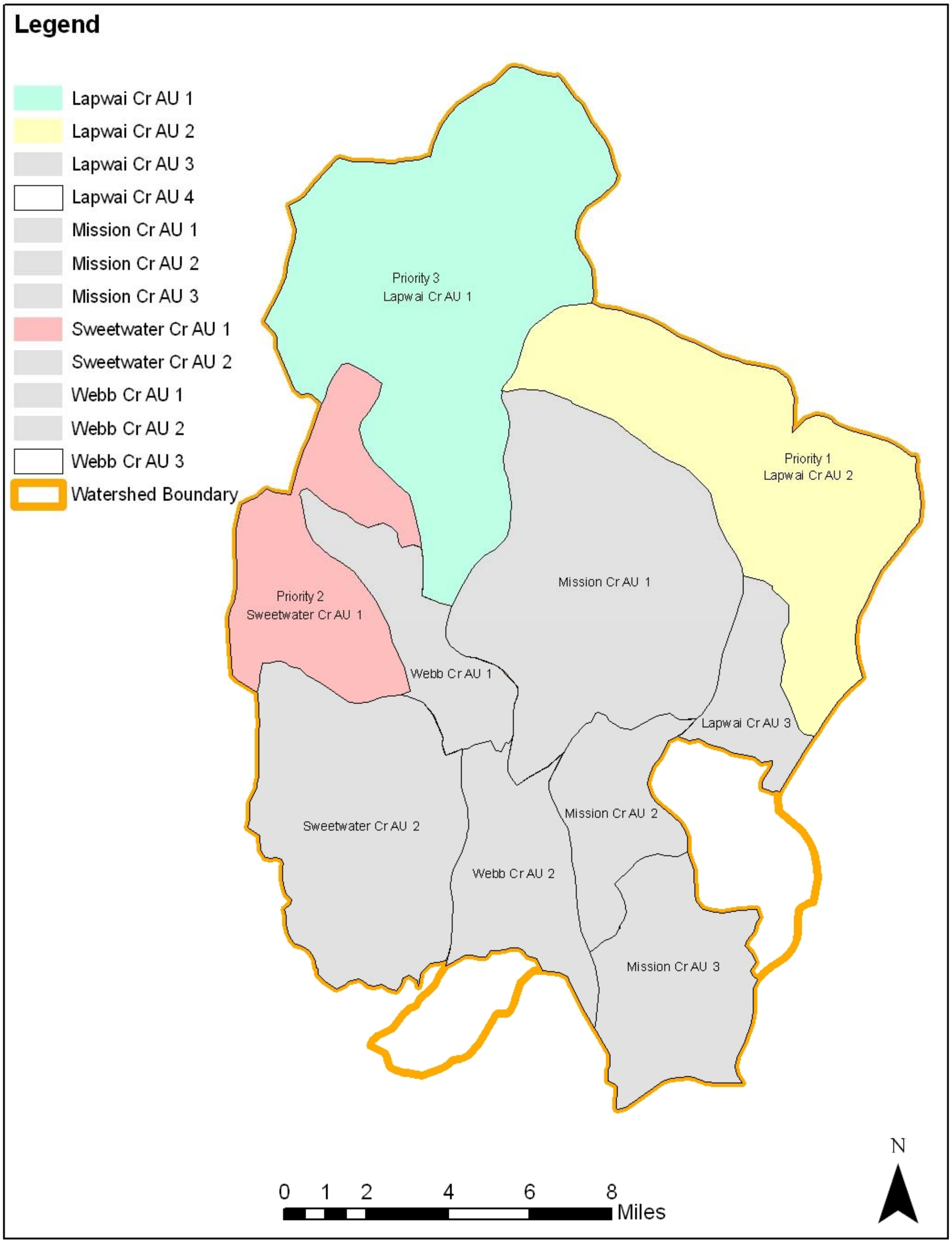


Figure 16. Top Three Prioritized Assessment Units in the Lapwai Creek Watershed

Chapter 6: Restoration Framework: Strategies

This chapter is related to the previous chapter in that, together, they provide a complete picture of where and how restoration will occur within the Lapwai Creek watershed. Establishing criteria for project selection and developing treatments to target degraded stream conditions caused by human alterations are the next, critical aspects of pursuing restoration actions in the Lapwai Creek basin.

The prioritization framework in Chapter 5 primarily utilized quantitative data to determine an order for treating sub-optimal conditions within the Lapwai Creek basin. Both the determination of limiting factors and the prioritization framework were based largely on the habitat requirements of Hé-yey, which acted as a proxy for all aquatic biota. The treatments outlined in this chapter, by comparison, are based primarily on qualitative data collected through the District's SAM/SVAP surveys. A complete discussion of methods is found in Section 2.

Watershed Goals

The Working Group strives to treat streams within the watershed such that 90% of stream reaches previously surveyed with the SAM/SVAP protocol may achieve a ranking of Good or Excellent. During the initial 10-year timeline outlined in this document, priority restoration actions will be implemented in the top three prioritized Assessment Units to work toward that goal. They will develop conservation management plans on each reach of perennial stream within the Lapwai Creek watershed. This will help ensure that areas in need of protection or restoration receive appropriate treatment. The lessons learned from actions undertaken in this initial period will be critical in refining and focusing future restoration efforts. This number of AUs was established with the recognition that some projects will be immediately achievable, while others might take up to several years of preparation, permitting and planning.

The top three prioritized Assessment Units for the Lapwai Creek watershed, in order of priority, are Lapwai Creek Assessment Unit 2, Sweetwater Creek Assessment Unit 1, and Lapwai Creek Assessment Unit 1.

Project Selection

Taking a potential project from selection to implementation is often a multi-year process involving project area selection, development of a conservation management plan, permitting and project design, implementation, monitoring and maintenance. Because multiple actions may be occurring simultaneously, work may be conducted within multiple AUs. This enables managers 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

The general process for project selection is as follows: Areas of highly concentrated Poor or Fair SAM/SVAP rankings will be identified. As landowners of these areas are identified and contacted, SAM/SVAP data will be reviewed and ground truthed to determine the components that are most limiting to the overall reach score. For each willing landowner, a conservation management plan will be developed, from which projects will be identified. Project design, implementation and monitoring—dependant upon available funding and technical expertise—will follow. The following apply for all potential projects:

- 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.
- Restoration efforts will initially be focused in the top priority AU, Lapwai Creek 2; once high priority projects have been addressed in this AU, efforts will be refocused toward the second and then third highest priority areas.
- Projects will be coordinated with other management agencies at annual meetings.

Regardless of an overall restoration strategy, the potential exists for high priority 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.

This approach is currently being employed for project selection and implementation within the Lapwai Canyon Creek watershed. Appendix H demonstrates how the Strategy for the Restoration of Lapwai Creek Watershed can be used to ensure that the highest priority projects are being implemented.

Treatment Groups

Based on the SVAP and SEC inventories, reaches were categorized into groups for treatment. Groups were determined based on their similarities and the treatments recommended for each reach. Some reaches may be included in more than one group. For complete descriptions of each Treatment Group and maps showing the extent of impact for the Lapwai watershed, see Appendix G.

Table 15. Treatment Groups

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

Recommended Treatments for Prioritized Assessment Units

The following pages entail the scope of identified potential restoration actions intended to achieve the goal of 90% of surveyed stream reaches attaining an SVAP rating of Good or Excellent within the top three prioritized Assessment Units. Prior to a description of general recommendations by Treatment Group, a brief description of the top three prioritized AUs is given, followed by a master chart showing the extent of work needed in each AU to bring the overall rating up to Good/Excellent. The extent of work shown for each treatment group was accurate at the time of development, but as watersheds are dynamic systems, managers will develop appropriate projects to address current conditions.

The maps are based on Idaho Department of Water Resources (IDWR) coverage of perennial flow for the state of Idaho. The designation of “perennial” is somewhat subject to the conditions present when the water body was surveyed for mapping. Potential projects should be ground-truthed to ensure that implementation is occurring in the highest priority areas.

Lapwai Creek Assessment Unit 2

Lapwai Creek Assessment Unit 2 encompasses the area that drains directly into Lapwai Creek between stream km 17 and stream km 34. Lapwai 2 is the third largest of the AUs within the Lapwai Creek drainage at 24,841 acres, representing about 16% of the watershed.

This stretch of Lapwai Creek is delineated by a perennial anadromous salmonid passage barrier (U.S. Highway 95 culvert) at the upper boundary, and a segment which has been noted to be dewatered under extremely low flow conditions at the lower boundary. Light residential development is evident along this reach, as are agricultural and grazing activities. The Lapwai Creek channel is highly confined by both U.S. Highway 95 and a railroad prism throughout the majority of the AU with severe channel incision evident through the lower half of this section. Water temperatures recorded within the two monitoring sites located in this AU were thermally classified as highly impaired as per criteria established by the National Marine Fisheries Service (NMFS 1996). Within a 300' riparian buffer, Lapwai 2 had the 3rd highest density of structures and the 4th lowest road density.

Hé-yey (*O. mykiss*), paiute sculpin (*Cottus beldingi*) and speckled dace (*Rhinichthys osculus*) were captured through 2003-2004 electrofishing surveys of this AU. Average Hé-yey survey capture densities for this AU were $0.271/m^2$, or 27.1 fish per $100m^2$.

Resource Description

Table 16 indicates the land cover types found within the Assessment Unit. The majority of land cover is cropland**.**

Urban areas include the cities of Culdesac, Reubens and developed areas along U.S. Highway 95. Concerns related to these areas include domestic water supply, sub-surface sewage disposal, and road maintenance activities. The City of Culdesac's sewage lagoon is located within the floodplain and within 300 feet of Lapwai Creek. The lagoon was renovated in 2007 and a liner was installed to prevent seepage.

Limiting Factors

SVAP overall condition ratings for LC2 include Poor (58 miles –68%), Fair (25 miles – 29%), and Good (2 miles – 2%). No reaches within this AU received an Excellent rating. Figure 16 illustrates the location of the ratings within the AU.

Reaches receiving a condition rating of Poor were limited by the following items (in order of priority): Fisheries Habitat, Riparian Habitat, Barriers and Channel Function.

Reaches receiving a condition rating of Fair were limited by the following: Barriers, Channel Condition, Nutrients, Fish Habitat, and Riparian Habitat.

Reaches receiving a condition rating of Good were limited by the following: Barriers, Nutrients and Channel Condition.

Table 16. Land Use Types within Lapwai Creek Assessment Unit 2.

Landcover	Acres	% cover
Bare Rock	298.4	1.20%
Bare Soil	994.5	4.00%
Brush	2301.5	9.26%
Deciduous Forest	963.0	3.88%
Evergreen Forest	1878.4	7.56%
Grassland	1968.7	7.92%
Mixed Forest	1625.8	6.54%
Pasture/Hay/Alfalfa	45.1	0.18%
Small Grains	14194.9	57.14%
Urban	169.9	0.68%
Water	3.6	0.01%
Wetlands	397.7	1.60%

Table 17. Recommended Treatments

Summary for Recommended Treatment: LC2			
Limiting Factor	**Treatment Practice**	**Unit**	**Extent**
Riparian Habitat	Riparian Corridor Fencing	Miles	32
	Water Developments	Each	24
	Grazing Management	Acre	2,000
	Weed Control	Acre	1,400
	Vegetative Plantings	Miles	64
Channel Condition	Stabilization	Miles	83
	Planting	Miles	25
	Dike removal	Each	Site Specific
	Channel Reconfiguration	Miles	Site Specific
Fish Habitat	Remove Passage Barriers	Each	58
	Riparian Plantings	Miles	64
	Upland Land Use Plans	Acres	23,000
	Rip Rap Replacement using soft engineering	Miles	14
	Livestock Exclusion through fencing	Miles	32
Nutrients	Nutrient Management Plans	Acre	10,000
	Riparian Corridor Fencing	Miles	30
	Water Developments	Each	20
	Livestock Waste Management	Each	10
	Septic Upgrades	Each	Site Specific
Barriers	Remove or replace culverts	Each	40
	Remove or replace diversions	Each	10
	Replace or remove road crossings	Each	8
Upland Sediment	Cropland Management Practices	Acre	23,000
	Vegetated Buffers	Miles	15
	Erosion Control Structures	Each	22
	Sediment Basins	Each	8
	Grazing Management	Acre	3,000
	Invasive Weed Control	Acre	3,000
	Vegetative Plantings	Acre	3,000

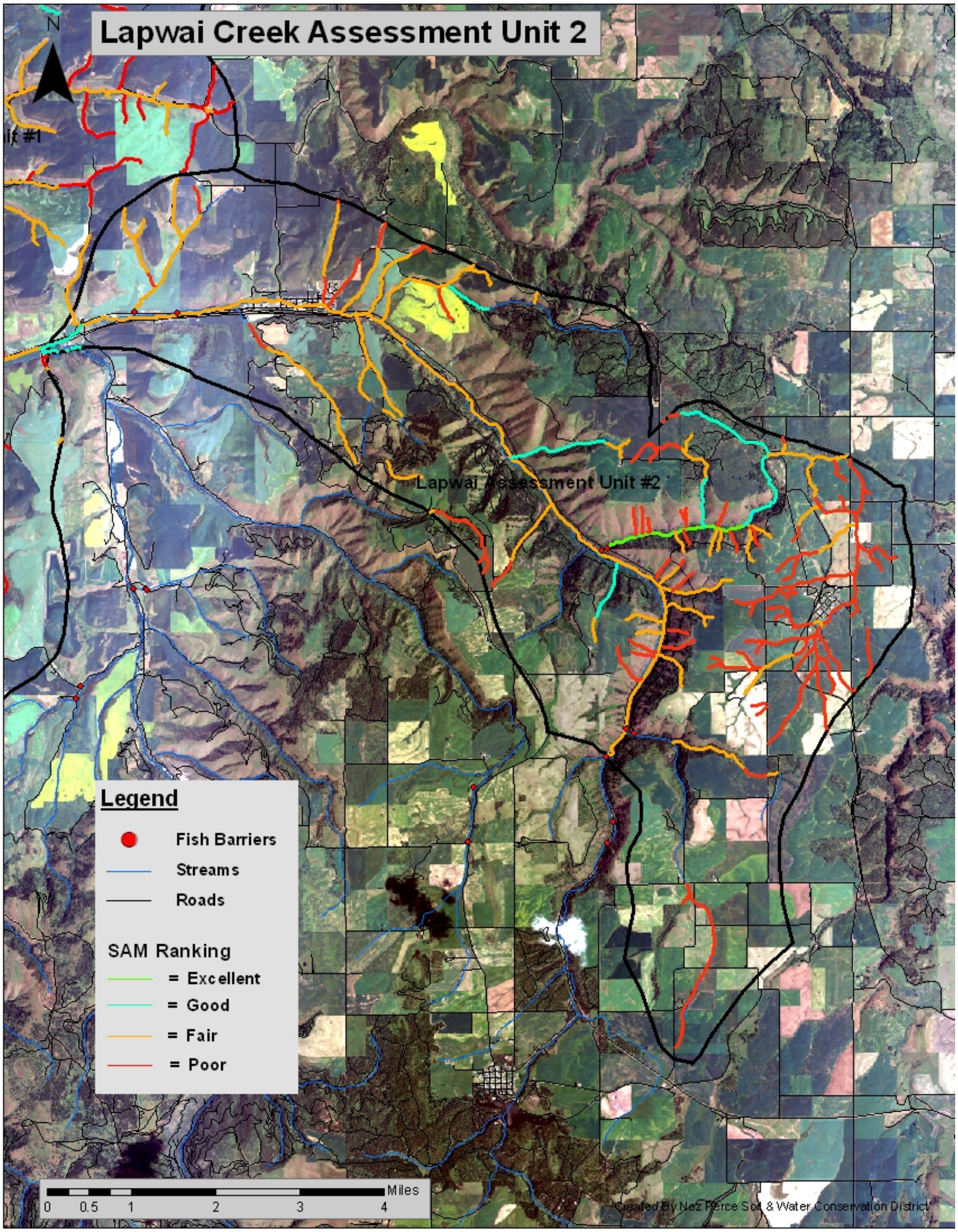


Figure 17. SAM Rankings for Waterways in LC2, Highest Priority AU

Sweetwater Creek Assessment Unit 1

Sweetwater Creek Assessment Unit 1 consists of the area from the mouth of Sweetwater Creek where it enters mainstem Lapwai Creek to stream km 13. This AU contains 13,715 acres, representing the third largest AU at just over 8% of the watershed.

The segment of Sweetwater Creek located within this AU is bordered by light residential development and cultivated agricultural lands. Several livestock feeding operations are present along this reach of Sweetwater Creek; water quality analysis of the AU's three monitoring sites revealing very high levels of *Escherichia coli*. While a high degree of habitat complexity was found throughout these monitoring sites, bank stability was uniformly low at the three locations. Summer water temperatures recorded within the three monitoring sites were all thermally classified as highly impaired as per criteria established by the National Marine Fisheries Service (NMFS 1996). Sweetwater Creek assessment units 1 and 2 are separated by a Bureau of Reclamation irrigation structure which diverts the vast majority of summer flow from the upper stream reaches to a remote reservoir. As such, summer flows within assessment unit 1 are minimal.
A high degree of vegetative density was found throughout the moderately wide riparian corridor present along this section of Sweetwater Creek. This AU possessed the 2nd highest density of structures within 300 feet of its streams, while road density was 5th highest.

Three species of fish were captured through 2003-2004 electrofishing surveys of this AU, the majority of which were *Cottus* (sculpin) and *Rhinichthys* (dace) species. Average Hé-yey (*O. mykiss)* survey capture density at that time was 0.055/m^2 or 5.5 fish per 100 m^2.

Limiting Factors

SVAP overall condition ratings for SC1 include Poor (34 miles –85%), Fair (5 miles – 13%), and Good (1 miles – 3%). No reaches within this AU received an Excellent rating. Figure 17 illustrates the location of the ratings within the AU.

Reaches receiving a condition rating of Poor were limited by the following items (in order of priority); Fish Habitat, Barriers, Channel Condition, Riparian Zone, Hydrologic Alteration, Withdrawals, and Sediment.

Reaches receiving a condition rating of Fair were limited by the following; Nutrients, Channel Condition, Barriers, Riparian Zone, and Erosion.

Reaches receiving a condition rating of Good were limited by the following: Nutrients, Riparian Habitat, Erosion, Hydrologic Alteration, and Channel Condition.

Table 18. Land Use Types within Sweetwater Creek Assessment Unit 1

Landcover	**Acres**	**% cover**
Bare Rock	93.6	0.68%
Bare Soil	118.1	0.86%
Brush	2017.2	14.71%
Deciduous Forest	141.4	1.03%
Grassland	2444.5	17.82%
Mixed Forest	21.6	0.16%
Pasture/Hay/Alfalfa	0.9	0.01%
Small Grains	8726.3	63.63%
Urban	122.0	0.89%
Water	0.2	0.00%
Wetlands	29.2	0.21%

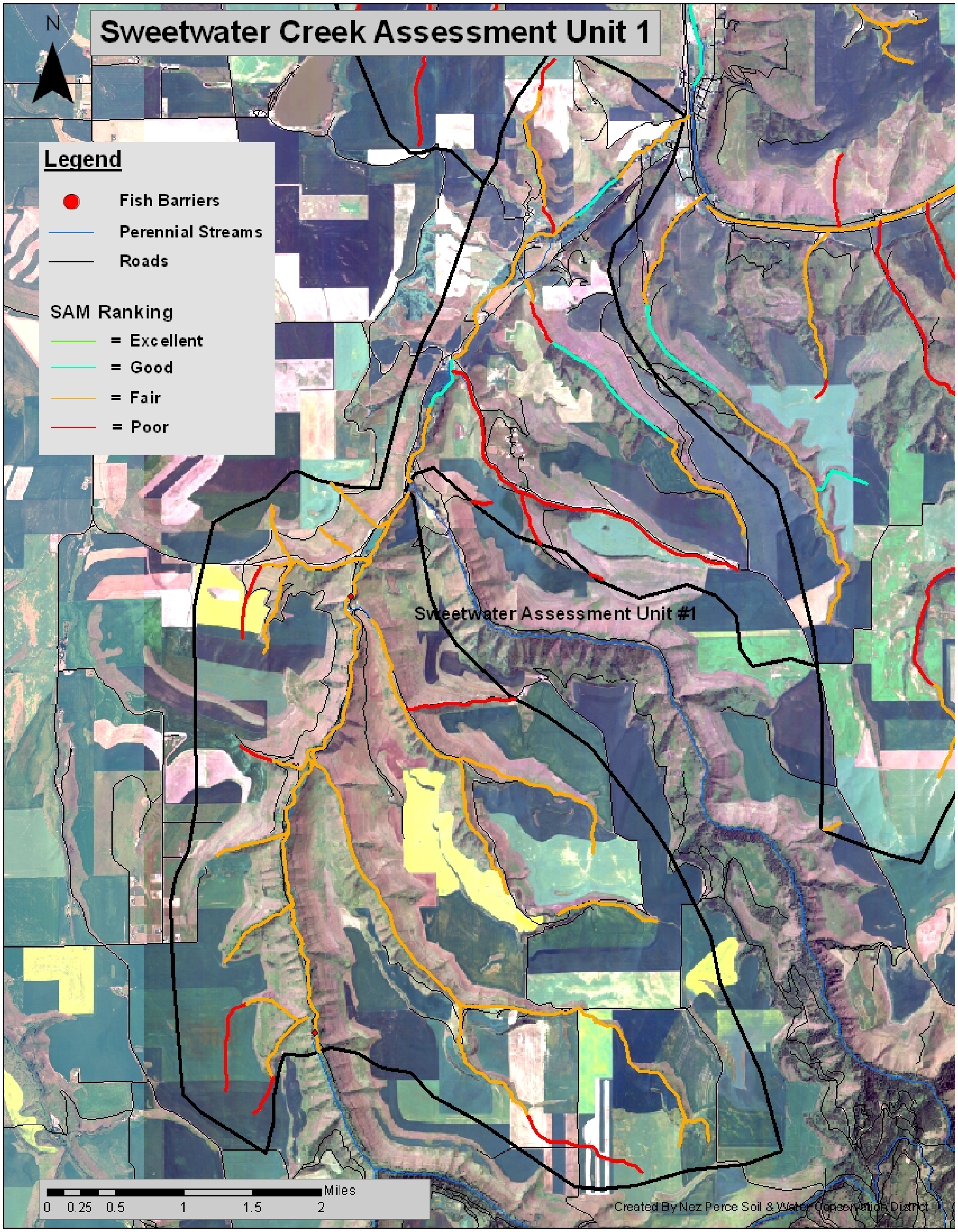


Figure 18. SAM Rankings for SC1, Second Highest Priority AU

Table 19. Land Use Types-Recommended Treatments: SC1

Summary for Recommended Treatment: SC1			
Limiting Factor	**Treatment**	**Unit**	**Extent**
Riparian	Riparian Corridor Fencing	Miles	16
	Water Developments	Each	19
	Grazing Management	Acre	1,000
	Weed Control	Acre	600
	Vegetative Plantings	Acre	600
Channel Condition	Stabilization	Miles	33
	Planting	Miles	25
	Dike removal	Each	Site specific
	Channel Reconfiguration	Miles	Site specific
Nutrients	Nutrient Management Plans	Acre	4,000
	Riparian Corridor Fencing	Miles	30
	Water Developments	Each	15
	Livestock Waste Management	Each	4
	Septic Upgrades	Each	Site specific
Barriers	Remove or replace culverts	Each	8
	Remove or replace diversions	Each	5
	Replace or remove road crossings	Each	8
Upland Sediment	Cropland Management Practices	Acre	16,000
	Vegetated Buffers	Miles	11
	Erosion Control Structures	Each	15
	Sediment Basins	Each	4
	Grazing Management	Acre	3,600
	Invasive Weed Control	Acre	3,600
	Vegetative Plantings	Acre	3,600

Lapwai Creek Assessment Unit 1

Lapwai Creek Assessment Unit 1 encompasses the area that drains directly to Lapwai Creek from the mouth where it enters the Clearwater River, to stream km 17. Lapwai 1 is the largest of the AUs within the Lapwai Creek drainage at 36,792 acres, comprising approximately 23% of the total watershed surface area.

While this lower section of Lapwai Creek has fewer stream-side roads that the upper stream segments, the stream channel here is still somewhat confined by the proximity of U.S. Highway 95, rural roads, levees, and a railroad prism. The stream is further impacted by the presence of grazing and agricultural activities, and residential development immediately adjacent to the stream at numerous locations. There is moderately high residential development within this AU as compared to the rest of the drainage with the communities of Lapwai, Spalding, Sweetwater and Culdesac located in close proximity to Lapwai Creek. The Lapwai Creek channel exhibited a low degree of bank stability within this AU with a sparsely vegetated riparian buffer and low to moderate levels of canopy cover. Relatively low quantities of pool habitat were noted within the riffle and glide dominated channel. Water temperatures recorded within the one monitoring site located in this AU were thermally classified as highly impaired as per criteria established by the National Marine Fisheries Service (NMFS 1996). This AU was found to have the 5th highest density of structures and the lowest density of roads within a 300' riparian buffer

Eleven species of fish were captured through 2003-2004 electrofishing surveys of this AU, the majority of which were *Cottus* (sculpin) and *Rhinichthys* (dace) species. Average Hé-yey (*Oncorhynchus mykiss* (steelhead/rainbow trout)) survey capture density at that time was 0.040/m^2 or 4 fish per 100m^2.

Limiting Factors

SVAP overall condition ratings for LC1 include Poor (99 miles –83%), Fair (19 miles – 16%), and Good (2 miles – 2%). No reaches within this AU received an Excellent rating. Figure 18 illustrates the location of the ratings within the AU.

Reaches receiving a condition rating of Poor were limited by the following items (in order of priority): Fish Habitat, Barriers, Withdrawals, Nutrients, Riparian Habitat, Hydrologic Alteration and Channel Condition.

Reaches receiving a condition rating of Fair were limited by the following: Withdrawals, Barriers, Nutrients Hydrologic Alteration, Channel Condition, Bank Stability, riparian Zone, and Fish Habitat.

Reaches receiving a condition rating of Good were limited by the following: Barriers, Withdrawals, Riparian Habitat, Hydrologic Alteration, and Channel Condition.

Table 20. Land Use Types within Lapwai Creek Assessment Unit 1

Landcover	Acres	% Cover
Bare Rock	360.9	0.98%
Bare Soil	257.3	0.70%
Brush	8226.3	22.36%
Deciduous Forest	146.1	0.40%
Grassland	4586.2	12.47%
Mixed Forest	24.6	0.07%
Pasture/Hay/Alfalfa	15.8	0.04%
Small Grains	22383.5	60.84%
Urban	748.3	2.03%
Water	2.9	0.01%
Wetlands	39.8	0.11%

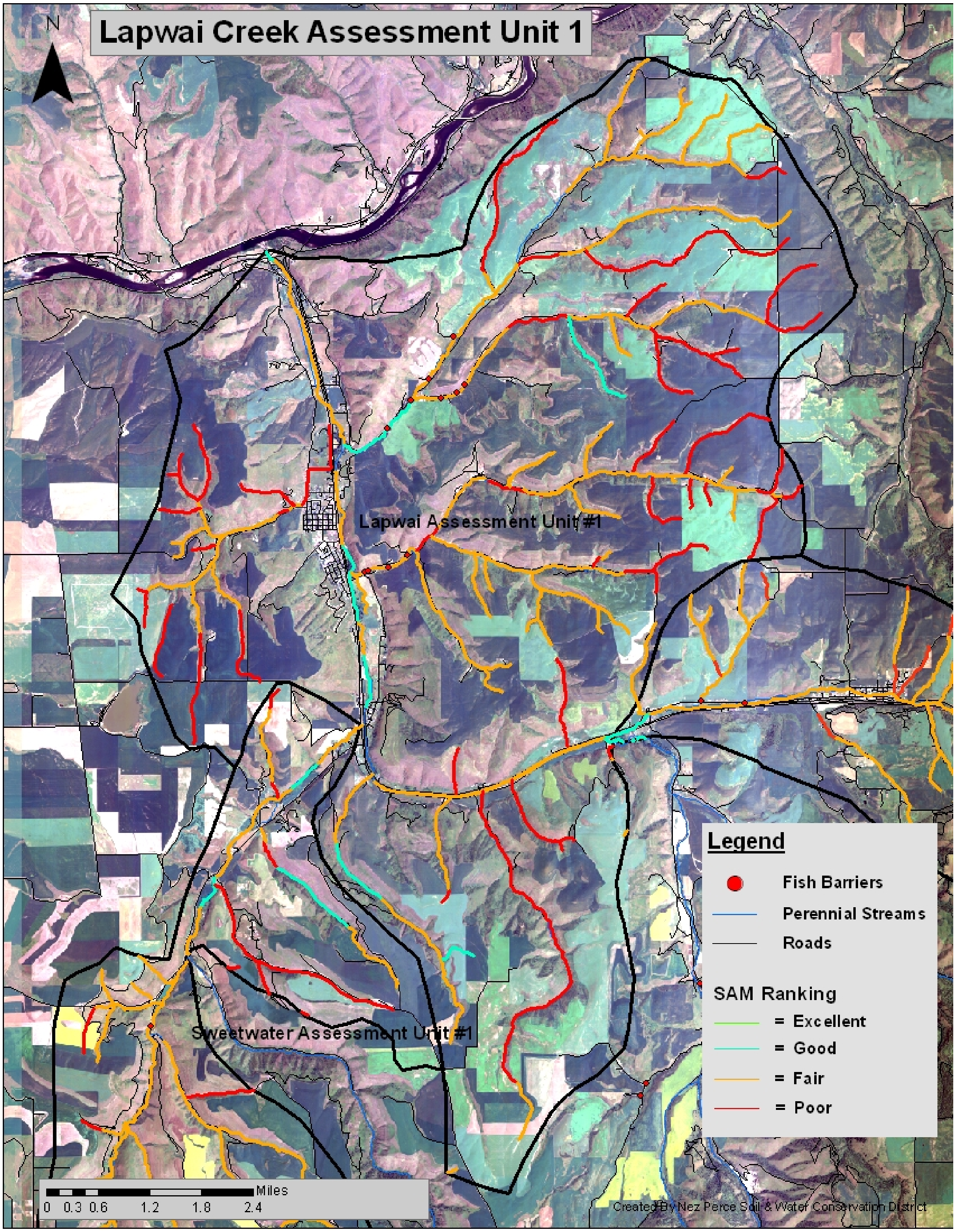


Figure 19. SAM Rankings for LC1, Third prioritized AU

Master Chart for Recommended Treatment: LC1			
Limiting Factor	**Practice**	**Unit**	**Extent**
Riparian	Riparian Corridor Fencing	Miles	30
	Water Developments	Each	15
	Grazing Management	Acres	900
	Weed Control	Acres	900
	Vegetative Plantings	Acres	900
Channel Condition	Stabilization	Miles	99
	Planting	Miles	30
	Dike removal	Each	Under development
	Channel Reconfiguration	Miles	Under development
Nutrients	Nutrient Management Plans	Acre	9,000
	Riparian Corridor Fencing	Miles	30
	Water Developments	Each	25
	Livestock Waste Management	Each	20
	Septic Upgrades	Each	Under development
Barriers	Remove or replace culverts	Each	98
	Remove or replace diversions	Each	26
	Replace or remove road crossings	Each	29
Upland Sediment	Cropland Management Practices	Acre	19,000
	Vegetated Buffers	Miles	25
	Erosion Control Structures	Each	15
	Sediment Basins	Each	5
	Grazing Management	Acre	6,500
	Invasive Weed Control	Acre	6,500
	Vegetative Plantings	Acre	6,500

Treatment Group Recommendations

Group A – Riparian Habitat

LC2 has the second highest incidence of degraded riparian habitat within the watershed, with 24%, but also includes eight miles of riparian habitat that ranked an SVAP rating of Good. The initial focus within LC2 should be to protect those eight miles before directing efforts toward more than 64 miles that need significant improvement, the majority of which are located in the agricultural upland areas or along U.S. Highway 95. An additional 27 miles need minor improvement to upgrade their rating from Fair to Good.

Two miles of stream surveyed within **SC1** rated a score of Excellent and protecting these miles should be the first course of action within this AU for this treatment group. SC1 also contains 32 miles of degraded riparian corridor habitat needing significant improvement, and seven additional miles that require minor improvement.

LC1 includes the highest percent of degraded riparian habitat within the watershed. More than 94 linear miles of riparian corridor are in need of significant improvement while an additional 27 miles need minor improvements. The majority of miles needing treatment are located either along U.S. Highway 95 or in the upland agricultural areas.

Recommendations

Riparian plantings consisting of forb, tree, and shrub components are recommended for all areas where adequate riparian zones do not exist.

Conservation easements should be used where feasible.

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

Vegetative buffers, including both filter strips and riparian plantings, are needed in cropland areas where tillage occurs adjacent to the stream channels.

It is likely that herbicide drift-- from aerial and ground applications upon croplands near riparian areas-- reduces riparian density and canopy cover and may have a negative impact upon mature trees. Pest management plans that integrate control strategies such as manual weed control, fencing, grazing management, spray buffers and riparian plantings are recommended to address this issue.

Pursue the designation of critical waterways in cooperation with the Idaho Department of Lands and Nez Perce Tribe – Forestry Division. Increase the amount of riparian vegetation left in place following timber harvest activities through harvest management plans, landowner education, and improvements to the Idaho Forest Practices Act.

Areas threatened by noxious and invasive weeds should be treated in accordance and cooperation with the Clearwater Basin Weed Steering Committee.

Areas with impacts from recreational vehicles require exclusion fencing, access gates, improved trails, road signs, recreational planning, and rider education and outreach.

Road decommissioning should be considered where roads are located within the riparian area and are causing reduced riparian function

Group B - Channel Condition

Within **LC2**, approximately 70 miles of roads were identified within a 300' stream buffer. While SEC data indicates that one mile of actively eroding bank needs immediate attention within this AU, another 25 miles of stream bank were observed to be either bare or nearly bare, indicating an increased risk for erosion. The SVAP data indicates that 25 miles of stream have active substrate deposition indicating unstable condition; however, active deposition has been observed throughout many of the streams in this AU and may not indicate severe instability.

LC2 Channel Condition	
Poor	34 mi
Fair	49 mi
Good	6 mi
Excellent	0 mi

According to SVAP data collected for **SC1**, approximately 35 miles of roads within a 300' stream buffer in this AU. SEC data indicates that there is one mile of actively eroding bank needing treatment within SC1. Twenty-five more miles of stream bank were observed to be either bare or nearly bare, indicating an increased risk for erosion. SVAP data indicates that 17 miles of stream have active substrate deposition indicating unstable condition; however, active deposition has been observed throughout many of the streams in this AU and may not indicate severe instability.

SC1 Channel Condition	
Poor	9 mi
Fair	24 mi
Good	7 mi
Excellent	0 mi

Based on the SVAP data collected for **LC1**, there were 30 miles of stream bank observed to be either bare or nearly bare, indicating an increased risk for erosion. The SVAP data indicates that 25 miles of stream have active substrate deposition indicating unstable condition; however, active deposition has been observed throughout many of the streams in this AU and may not indicate severe instability. Restoration actions may include recommendations found below.

LC1 Channel Condition	
Poor	10 mi
Fair	89 mi
Good	22 mi
Excellent	0 mi

Recommendations

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.

Remove cattle from areas adjacent to the stream to help reduce erosion, soil compaction, and promote healthy bank and riparian function.

Dikes and berms that tend to limit floodplain access, potentially leading to incision, channelization and straightening, 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.

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

Group C – Fish Habitat

Within **LC2**, 61 miles of stream were ranked as Poor or Fair for fish habitat, representing 69% of the total stream lengths surveyed. Twenty-seven miles of the 88 (31%) surveyed received a Good ranking. The major impairments within this AU include encroachment of riprap from U.S. Highway 95 prism, upland land use practices, excessive fine sediment, barriers to passage, high water temperature, and lack of in-stream fish cover.

Within **SC1**, 35 miles of surveyed sites were given either Poor or Fair condition ratings for fish habitat condition, representing 88% of the total surveyed stream distance. Five miles, or about 12% received a rating of Good. The most limiting factor identified in this AU was flow and the associated issues that accompany a compromised hydrograph.

One of the major water rights holders in the Lapwai Creek Basin is the Lewiston Orchards Irrigation Project (LOP), which is managed by the Lewiston Orchards Irrigation District (LOID) and the US Bureau of Reclamation (USBR). Currently, LOID diverts significant amounts of stream-flow from Sweetwater Creek and Webb Creek during the spring, summer and fall irrigation seasons. Restoring flow is extremely critical in order to improve aquatic habitat quality within Sweetwater and Lapwai Creeks.

The majority of fish habitat (88%) surveyed in **LC1** was rated as Poor or Fair according to the SVAP. Land use practices within the stream channel and in the uplands have had severe impacts on fish habitat. The main limiting factors include lack of insect/invertebrate habitat, shallow and few pools, excessive fine sediment, high water temperature, and lack of in-stream fish cover.

<u>Recommendations</u>

Impaired Fish Habitat is essentially the result of other stream conditions identified by the SVAP parameters and treatments addressing those conditions will have a great effect on improving fish habitat.

Engineering, or hard restoration actions may be ill-suited for this region due to the extreme hydrologic fluctuations inherent to this system, but will be considered, should a beneficial action be identified.

Existing hard structures are encroaching upon streams, especially along U.S. Highway 95. Working with the Idaho Transportation Department, develop plan to remove rip rap where it is causing impaired conditions and replace with bioengineering or other “soft” bank stabilization.

Mechanical input of large woody debris may be appropriate in certain areas but must be supported by primary riparian zone enhancement to provide a long term source for large woody debris.

Livestock should be removed from within riparian zone, in conjunction with riparian fencing, planting, and off-site water development.

Sweetwater Creek Showing High Turbidity and Evidence of Erosion

Group D –Nutrients

To address the reaches that classify as Poor or Fair for this treatment group, practices targeting agricultural fertilizers, livestock waste, and septic waste are needed.

Nutrient Enrichment	
AU	**Miles needing treatment**
LC2	70
SC1	41
LC1	94

Recommendations

Livestock Sources:

A total of more than 100 livestock operations occur within the top three prioritized Assessment Units, the majority of which are horse facilities with less than five animals having direct access to streams. A typical livestock operation will need a combination of practices to address not only excessive nutrient input, but also diminished riparian cover, compaction, decreased quality and quantity of fish habitat, and impaired channel function. Actions may include:

- Relocate livestock or fence out of waterways
- Develop alternative water source development
- Install vegetative plantings and stream bank erosion controls
- Install waste management systems designed to prevent runoff from the feedlot area from being delivered to the stream including: roof gutter systems, corral berms, filter strips, waste storage facilities, fencing, and alternative livestock watering system
- Relocate feedlots located within the 100-year flood zone, cobble-dominated valley bottoms, or in other areas with direct access to streams

Human Sources:

Many of the septic systems in the watershed were installed prior to the 1970's. 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, especially along Lapwai Creek, upgrades or removals of septic systems are recommended. Culdesac, Idaho has a treatment facility located within the floodplain, which should be evaluated to determine the extent of nutrient output and options for improvement. Vegetative plantings downstream of the facilities will assist in nutrient uptake, reducing input to stream.

Agricultural Sources:

Agricultural cropland is the major land use within the Lapwai Creek basin. Fertilization practices within the watershed include fall and spring applications of nitrate nitrogen on cereal grain crops. The majority of crop rotations include a cereal grain every second year. In any given year, approximately 50% of the total cropland acres (about 9,000 acres) are fertilized.

Recommendations for cropland management include:

- longer crop rotations
- manage the amount, timing and application method of fertilizers to reduce potential for nutrient delivery to the stream
- develop nutrient management plans, including soil testing on a high frequency basis to assist agricultural producers in managing fertilizer inputs
- install vegetative buffers along drainage corridors

Nutrient loading in Lapwai Creek

Group E – Barriers

LC2 contains 58 identified barriers and consists of 40 culverts, eight road crossings, and 10 other barriers, including diversion structures, dams and headcuts. The total kilometers of LC2 streams greater than 2nd Strahler order equal approximately 26km. Of that, 22km, or 85%, are blocked to anadromous fish passage. Within the SVAP scoring scheme, a reach with barriers receives a Poor rating, while barriers within 3 km. of a reach give that reach 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 previously unavailable habitat.

SC1 contains 21 identified barriers, consisting of 8 culverts, 8 road crossings, and 5 other barriers, including diversion structures, dams and headcuts. The total kilometers of SC1streams, *including* 1st Strahler order streams equal approximately 62km. Of that, 26km, or 42%, are blocked to anadromous fish passage. Within the SVAP scoring scheme, a reach with barriers receives a Poor rating, while barriers within 3 km. of a reach give that reach 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 previously unavailable habitat.

LC1 contains 153 identified barriers. These consisted of 98 culverts, 29 road crossings, and 26 other barriers, including diversion structures, dams and headcuts. The total kilometers of LC1streams greater than 2nd Strahler order equal approximately 34 km. Of that, 13.5 km, or 39%, are blocked to anadromous fish passage. Within the SVAP scoring scheme, a reach with barriers receives a Poor rating, while barriers within 3 km. of a reach give that reach 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 previously unavailable habitat.

Recommendations

- Remove all known artificial barriers to fish passage, including bridges, culverts, diversions, or stream crossings
- Replace artificial barriers with suitably-designed bridges or other acceptable culvert alternatives
- Contour new passages appropriately to discourage further damage to the stream channel
- Rehabilitate new crossings through plantings and stabilization as necessary

Through the District's SVAP protocol and the Tribe's Fish Passage Assessment, multiple barriers were identified within the top three AUs. 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.

Group F - Water Withdrawal

Diversion rates for each AU include rights to springs, groundwater and/or ponds.

Water Withdrawal			
AU	In-stream diversions	Diversions per acre	Maximum diversion rate (cfs)
LC2	41	0.594	12.5
SC1	20	0.328	1.9
LC1	69	0.585	83.8

Recommendations

A number of water rights exist within the basin, the majority of which are not in use. Landowners who are exercising their water rights should be given the opportunity to upgrade their systems to optimize water use. Further recommendations to restore a natural hydrograph include:

- Purchase water rights within the basin
- Educate land owners
- Update irrigation systems and diversion points
- Install irrigation management plans
- Develop outreach campaign to remove diversions and educate water users on water optimization

Group G - Hydrologic Alteration

Within LC2, the proximity of U.S. Highway 95 to the Lapwai Creek channel exacerbates the impaired hydrologic regime. Neither the highway surface, nor stream bank riprap absorb surface or ground water produced by the rapid dissipation of snowmelt on cultivated fields. These anthropogenic materials displace native vegetation and floodplain wetlands, which act to store this water for later release. This accelerates the delivery of surface runoff to the stream channel, increasing the magnitude of already enhanced spring run-off events while minimizing summer base-flow potential. While there is little chance of relocating the highway due to the narrow and steep nature of the canyon in this location, bioengineering solutions could replace some of the riprap with road prism protection that is less disruptive to stream function. Plantings within riprapped areas that cannot be altered are recommended. Finally, as hydrologic function is predominately driven by upland conditions, it is recommended that historic upland wetlands be restored while protecting extant wetlands and returning native vegetation to headwater sections.

As with the other priority areas, SC1 is challenged by the inherently flashy nature of the Lapwai Creek watershed. However, SC1 does not suffer the same degree of channel confinement as the other two reaches. In general, conditions for recovering hydrologic function in this AU are good; the primary limiting factor, as identified in Group F-Water Withdrawals, is the removal of flow by LOID. 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. Remaining timberlands 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.

LC1 is located at the lowest position within the watershed and thus feels the impact hydrologic alterations from within every other assessment unit. LC1 is characterized by extreme fluctuations in surface flow. During winter and spring high flow events, it is not unusual for discharge rates to increase several thousand-fold over summer base flows. Stream flows are greatest between January and April and lowest from July through September. As streams in the upper watershed are confined to narrow, deep canyons with moderate to steep gradients, relatively modest precipitation events can result in severe flash flood conditions, exacerbating unstable streambed and riparian corridor conditions present throughout LC1. Treatments for Hydrologic Alteration will be highly dependent upon the land use of the area in which they occur.

Recommendations

The change in land cover from predominantly grass/herbaceous/tree cover to cropping systems— and the subsequent changes to land management practices—may be responsible in part for profound alterations to the hydrological regime of the Lapwai 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.

Areas identified for treatment include those with a hydrologic group C or D soil rating. Regardless of land type, crucial elements to address alteration will include invasive weed control, land use planning and zoning, as well as a complete and updated flood zone designation. Additionally, actions should be employed to promote water retention and land surface roughness, such as: detention basins, road decommissioning, transportation planning, wetland enhancement and protection, restoration of drained lands, spring protection, vegetative plantings, and changing agricultural management practices.

Cropland areas: Implement conservation management practices, buffer strips, water retention structures, grass waterways, terraces, concentrated flow control structures, tree plantings, and grass seeding

Canyonlands: Reduce road density, perform plantings and grass seeding 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

Group H – Protection

Reaches with fairly unimpaired conditions are found infrequently within the watershed and require protection. One reach within LC2, located on Rock Creek, was identified as needing protection. It is also essential that conditions upstream of this reach 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. If Legacy reaches are identified through further survey, their protection will be prioritized.

Group I - Upland Sediment

Fifty-eight percent of the land within LC2 has a high K factor value. For treatment purposes, the high K value acreage from MC1, MC2, and LC3 is included in the treatment acres for LC2. The working group chose to include small pieces of non-priority Assessment Units where AU boundaries crossed problem areas. This allows managers to use a unified approach to treatment. With the inclusion of acreage from the other AUs, treatment is proposed for more than 34,000 acres. Of these acres, 66% are cropland, 18% are forestland, and 14% are canyonlands. The extents of treatment shown to the right are estimates based on SAM inventory, RIPP inventory, and soil limitations.

Sites surveyed within the SC1 area comprise the second highest percentage (79%) of soils with high K factor within the watershed. For treatment purposes, acres with high K factor from SC2, WC1, and WC2 are included within this AU. Treatment is proposed for approximately 16, 000 acres. Of these acres, 65% are cropland, 10% are forestland, and 22% are canyon lands. The extent of treatments shown below are estimates based on SAM inventory, RIPP inventory, and soil limitations.

Cultivated cropland constitutes 62% of the surface area present within LC1 while 85% of the soils within this AU have a high K factor, indicating a higher tendency toward erosion. Located adjacent to steeply-sloped stream canyons, these vast tracts of highly erodible and repeatedly-disturbed surface area deliver tremendous quantities of fine sediment to the largely unbuffered streams of this AU. As such, an urgent need for cropland treatments exists. The extents of treatment shown to the right are estimates based on SAM inventory, RIPP inventory, and soil limitations.

Recommendations

Factors including slope, soil type, precipitation, land use, and soil depth are considerations when selecting treatments for upland sediment. Treatment types vary by landuse and are generally divided into the separate categories of cropland, grazing lands and roads.

To address sources of erosion in cropland, longer and diversified crop rotations, conservation tillage, contour farming, improvements to soil quality and vegetative plantings are recommended. The majority of cropland lacks adequate buffers for drainage ways and streams. This leads to the high potential for sediment delivery to the stream. Using the SAM protocol, many reaches were identified as having a high SEC index within the cropland fields. These areas with a high SEC index 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. Soils are limiting within this AU for structural treatments. Shallow, rocky soils do not have adequate soil depth to physically construct the treatments. Extents are estimates based on SAM inventory, RIPP inventory, and soil limitations.
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Grazing lands are located in canyon areas and are impacted by winter grazing, invasive weeds, and lack of native vegetation. Treatments for these areas include invasive weed control, grazing management plans that identify the amount and timing of use, and establishment of native vegetation. Wildfires are frequent within this AU, providing an opportunity for canyon land restoration efforts. Fires remove the existing vegetation and leave 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.

Treatments to address sediment input from roaded areas include the following: regular, appropriately timed maintenance, slope stabilization, shaping and water bars. Roads with limited use or utility should be considered for road relocation or decommissioning.

Group J – Invasive Species

The presence of terrestrial and aquatic invasive species is of great concern within the Lapwai Creek watershed. The potential for invasive species to spread is vast, due to the presence of humans in the watershed. 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.”

Invasive Species are an epidemic within the Lapwai Creek watershed. Diverse efforts exist to help identify, control, and eradicate these threats to watershed health and all restoration actions associated with invasive species should be aligned with these efforts. It is critical that employees conducting restoration or sampling do not become vectors for spreading noxious weeds. The Clearwater Basin Cooperative Weed Management Area (CBWMA) 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.

Recommendations

- Establish a protocol to reduce or eliminate the spread of invasive species by employees by removing all seed and plant material from vehicles, equipment, and gear before moving between locations where invasives are present

- Disinfect equipment, shoes, etc. before moving between locations where invasives are present

- All employees, including support staff, attend invasive plant trainings and learn to identify noxious weeds

- Report new infestations and locations

- Create a dedicated noxious weed eradication crew at the reservation and/or county level

- Incorporate noxious/invasive weed eradiation/control plans into all restoration and protection projects

Chapter 7: Support for Restoration Actions

This chapter discusses some of the steps to take in order to sustain the momentum of active restoration within the Lapwai 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.

On-the-ground restoration actions are the physical aspect of the hard work that goes into restoring a watershed to the point that its habitat is not a limiting factor for fish production. It is rewarding and often promotes renewed investments in the landscape by stakeholders because it is tangible and inspiring. No less important is the work that goes on inside offices, creating the bones, or support structure, upon which successful restoration hangs.

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 Lapwai Basin in order to coordinate on-the-ground projects from year to year. Regional partners include but are not limited to NRCS, Nez Perce and Latah County Soil and Water Conservation Districts, USBR, Idaho Transportation Department (ITD), Nez Perce Tribe Water Resources (TMDL) and Land Services Department, BLM, and the Lewiston Orchards Irrigation District. Communications will include e-mail, telephone, compressed videoconferences, and face-to-face meetings. Meetings will occur quarterly with one interagency coordination meeting per year held prior to project development.

Policy

The Lapwai 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.

Funding

As stated early in this report, many funding agencies are requiring management plans with a monitoring component; a 10-year prioritized plan that serves as a blueprint for restoration activity for all agencies in the Lapwai Creek basin fulfills 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.

Education and Outreach

Undertaking restoration activity within a dynamic system requires addressing two fundamental principles: that many actions will have both upstream and downstream effects, and that many conditions affecting a watershed start in the uplands. With this in mind, it is imperative in the planning process of any restoration action to involve not only all agencies working in the basin, but also private landowners and other stakeholders. 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. Outreach to students, k-12 as well as college students, about the principles and practices of watershed restoration and function is a critical aspect of inspiring a sense of stewardship in the Big Canyon basin. **All of the improvements brought about through active restoration actions can be easily be undermined or reversed if both future generations and current landowners are not provided the educational opportunities to learn about their connections to the watershed and their impacts on the land.**

Data

A wealth of data exists for the Lapwai Creek drainage. The organization and analysis of this data, as performed in the development of the restoration strategy, will be extremely valuable as managers pursue monitoring for adaptive management. Not only does this analysis form a baseline data set for trend monitoring, but it provides guidance for specific data collection necessary to evaluate our efforts over the coming 10-year period.

The working group is aware that several data sets relative to the Lapwai Creek basin and our restoration actions there are currently being processed. Two data sets will support our restoration actions in the next 10 years and will be used as we create action plans for the remaining 13 AUs. The first, collected for the Lapwai Creek TMDL, is currently being analyzed by an independent consulting firm and will be available within the coming year. The second is FLIR thermal infrared data collected throughout the Lapwai Creek basin; this data set is complete but has yet to be geo-referenced. When fully edited, the FLIR data set will provide a more comprehensive view of thermal regimes throughout the basin while potentially facilitating development of a predictive model correlating temperature and fish density.

Monitoring and Evaluation

From 2003 to 2006, the Tribe collected baseline data from 16 sites within the Lapwai Creek basin using a rigorous, quantitative protocol developed by tribal biologists that was approved by the ISRP in preparation for the 2003 field season.[13] Additionally, the District has used the SVAP/SAM protocols discussed in Section 2 to collect both qualitative and quantitative data throughout both drainages. Prior to the end of the 10-year time outlined in this document, all 16 sites in the Lapwai Creek drainage will be assessed again with the goal of collecting data necessary to determine relative shifts in fish populations and aquatic habitat quality. Additionally, the reaches evaluated with the SAM/SVAP 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.

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

Five primary questions the working group will address within the Monitoring and Evaluation period are:

1. **What projects have been accomplished?** Of the identified projects within the priority areas, how many and of what types have been installed or completed? What, physically speaking, has been achieved? This will be addressed through an examination of deliverables reporting to funding and/or oversight agencies and will aid the development of future restoration actions.
2. **What change is apparent?** SVAP/SAM protocol will be repeated on all stream reaches within the Lapwai basin that were evaluated using that protocol previously in order to enumerate changes in aquatic habitat conditions. The Tribe will conduct appropriate quantitative surveys to examine changes to aquatic and biota impairment.
3. **How has the landscape changed?** Within the next 10 years, many changes to land ownership and land management are likely. These changes may be critical to restoration progress within the basin and should be monitored throughout the period of implementation, culminating in a comprehensive overview of cumulative change.
4. **What do we do next?** The priorities and treatments here are the initial stages of a highly focused attempt to restore proper function to the Lapwai Creek basin. At the end of this 10-year period, managers must take the lessons learned and create a new set of priorities and goals, using updated information and data.
5. **How are changes in fish distribution and abundance correlated with restoration?** With limited funding for monitoring and evaluation, establishing direct cause and effect between restoration actions and fish abundance would largely be an exercise in speculation. However, changes in fish distribution and abundance should be examined in relation to the locations and types of restoration action to identify and recognize emerging long term trends.

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SECTION TWO: METHODS

Methods

This section describes the primary data sets that were compiled for use in this document. The three primary aspects of the restoration strategy required available data to be utilized in three distinct ways. To determine limiting factors (Chapter 4), data from the Nez Perce Tribe and District surveys were examined. To build a prioritization matrix for the Assessment Units, spatially and temporally appropriate data from a variety of sources was built into a framework that determined what order to pursue restoration. Finally, treatment strategies to address limiting factors within the priority Assessment Units were determined though the District's SAM/SVAP protocol results. Each of these is described in more detail below.

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. While there is an abundance of data for this 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. A spreadsheet outlines the extent of the known available data sets for the Lapwai Creek watershed.

Methods to Determine Limiting Factors

The Lapwai Creek watershed lacks a comparable reference reach or stream, often used to guide restoration efforts. Historic conditions are not known for many aspects of watershed health within this basin. For this document, the Technical Team used applicable criteria from appropriate management agencies to determine habitat conditions sufficient to support and promote Hé-yey productivity. The Technical Team then compared parameters for which data was available with those baselines to establish what factors were most limiting within the watershed and to identify benchmarks for recovery. The resultant limiting factors are found in Chapter 4.

Nez Perce Tribe Monitoring and Evaluation Project 2003-2005

In 2003, the Nez Perce Tribe Department of Fisheries Resources Management initiated a multi-year monitoring and evaluation project within the Lapwai Creek watershed. Sixteen sites within the basin were sampled at baseflow conditions each year beginning in 2003 and ending in 2006. Biological, chemical, and physical assessments of aquatic habitat were conducted within the Lapwai Creek watershed of the Lower Clearwater Subbasin. Fish, macroinvertebrate, periphyton, water chemistry, water temperature, stream discharge, riparian condition and channel morphology data were collected from 100+ meter monitoring reaches located throughout six streams identified as critical habitat for the CRLMA subpopulation of the Snake River Basin steelhead DPS. One monitoring site was located at the mouth of each stream while three additional sites were located throughout each of the six streams through use of systematic stratified random site selection. Full protocol and results of the surveys are available by request from the Tribe.

Site locations for the Tribe's M&E project

Creek	Site	Location (km from mouth)
Lapwai	LM1	0.0
Lapwai	LM2	23.0
Lapwai	LM3	33.0
Lapwai	LM4	34.5
Mission	MM1	0.0
Mission	MM2	10.5
Mission	MM3	16.5
Mission	MM4	32.0
Sweetwater	SM1	0.0
Sweetwater	SM2	1.5
Sweetwater	SM3	7.5
Sweetwater	SM4	14.5
Webb	WM1	0.0
Webb	WM2	3.0
Webb	WM3	12.0
Webb	WM4	16.5

Sampling during the 2004 season

Nez Perce Tribe Distribution and Abundance 2003, 2004, 2006

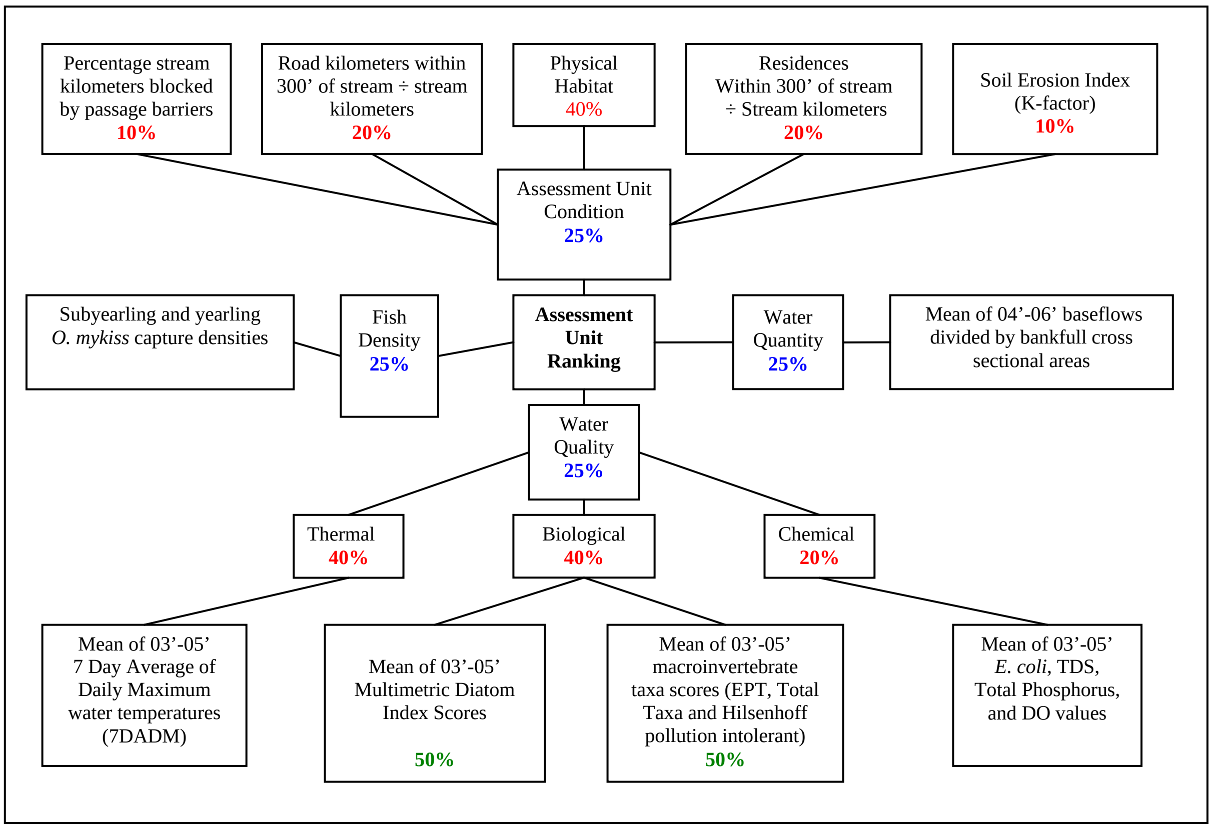
Fish distribution and relative abundance surveys were conducted throughout the Lapwai Creek watershed on all perennial stream reaches downstream of natural fish passage barriers. One 50+ meter reach was identified within every stream kilometer through systematic site selection utilizing a random number generator. Channel morphology data and canopy cover estimates were also collected from each site.

Nez Perce Soil and Water Conservation District SAM/SVAP

The District conducted Stream Assessment Methodology (SAM) surveys in the Lapwai Creek watershed that encompassed 490 stream miles and 600 designated stream reaches. The SAM process collects both quantitative and qualitative data using a mixture of Rosgen, Stream Erosion Condition Index (USDA\USGS), and the Stream Visual Assessment Protocol (SVAP) from USDA. Data collected includes stream morphology, channel cross sections, pebble counts, invasive weeds, vegetative species composition, streambank erosion, and 14 parameters in the SVAP protocol including instream habitat, macroinvertebrate habitat, pools, canopy cover, riparian zone, channel condition, nutrient enrichment, water appearance, macroinvertebrates, hydrologic alteration, riffle embeddedness, manure, and bank stability.

Data Sets for Prioritization Framework

The Prioritization Framework (Chapter 5) was designed to establish a geographic priority within the watershed that would direct project managers toward areas that had a high priority for restoration, whether due to their relative habitat condition or relative abundance of Hé-yey. This was achieved by the development of a prioritization matrix (shown below) that used analysis of several datasets from the Tribe and the District. The data sets used within the matrix to determine scoring are shown and discussed in greater detail below. Results of the prioritization are found within Chapter 5.



Assessment Unit Ranking Flowchart

Data Set	Agency/Organization	Qualitative or Quantitative	Timespan of Data Collected
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 (note-kilometer designations begin with 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 50 thalweg meters. Fifty-meter long surveys were also conducted within 16 aquatic habitat monitoring sites located throughout the watershed. Twelve of these monitoring sites were located through systematic stratified random site selection while four 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, one, two, and more than two-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 aspect of 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 seven 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 16 monitoring sites located throughout the Lapwai Basin. Stream discharge data was collected in accordance to USGS protocol (Nolan, et al., 2001) by use of a USGS vertical axis pygmy meter with top setting rod and AquaCalc

2000 sectional discharge recorder. Twenty to 30 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 16 monitoring sites within the Lapwai 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 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 Lapwai 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 17 lists the K factor ranking per Assessment Unit. The numeral 1 represents the AU with the highest percentage of high K factor soils, indicating a higher potential for soil particle detachment in bare soil conditions.

Table 21. K Factor Ratings for the Lapwai Creek Basin

AU	Ranking	% of soils with K factor >.37	Acres of soils with K factor >.37	Total Acres in AU
LC1	1	85.12%	31316.52	36792.00
SC1	2	78.62%	10371.79	13192.00
LC3	3	62.22%	3081.38	4952.00
LC2	4	58.44%	14517.04	24841.00
MC1	5	57.32%	15748.02	27474.00
WC1	6	32.06%	2245.09	7003.00
MC2	7	20.13%	1417.60	7042.00
SC2	8	13.90%	2807.80	20207.00
MC3	9	12.35%	1390.63	11263.00
WC2	10	8.87%	803.30	9052.00

Macroinvertebrates: Benthic macroinvertebrate sampling followed 2002 EMAP-SW targeted riffle draft protocol (Klemm et al., 2002) with the exception of utilizing 0.09m², 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.

Data used for Treatment Groups

The Treatment chapter (Chapter 6) was designed to direct project managers to high priority restoration projects within high priority Assessment Units. Qualitative data from the District's SAM/SVAP surveys was used to determine the types of restoration efforts that would be most effective to address the factors most limiting to aquatic habitat, as surveyed within the protocol. The results of this analysis for the top three Assessment Units may be found in Chapter 6.

Stream Assessment Overview

During the summers of 2003 through 2007, the Nez Perce Soil and Water Conservation District (District) conducted stream inventories and assessments throughout the Lapwai 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 Lapwai Creek Stream Assessment Report (Rasmussen, 2009).

The Lapwai watershed was divided into more than 600 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. The District coordinated with more than 700 landowners prior to field data collection, and 490 miles of stream inventory were conducted.

SVAP Component

SVAP consists of 14 parameters[14]. Each criterion is given a numerical rating on a scale of 1-10, 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 AU 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).

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

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 four 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 Habitat, Fish Habitat, Nutrients and Channel Function.

Other parameters were addressed separately, as they did not fall specifically under one of these categories. These parameters, Passage Barriers, Hydrologic Alteration, Legacy, Water Withdrawals, Sedimentation, and Invasive Species, were identified by the working group as having cause and consequence throughout each AU, with treatments potentially requiring a different approach than the systematic approach suggested by this plan. For example:

- high quality reference reaches identified within the prioritized AUs require immediate protective action
- reaches with significant levels of invasive species may require a coordinated basin-wide, multi-agency effort, potentially including a field crew specifically devoted to invasive species identification and eradication
- passage barriers restricting access to high quality habitat should be treated as high priority throughout each of the prioritized AUs
- reaches that suffer from extreme sedimentation can not be treated at the reach level, but must be treated by reducing sediment input in the uplands

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 ratings were calculated per reach; one for the actively eroding banks (bank that should be treated in the opinion of the evaluators) and the other for the remaining banks in the reach. 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.

SECTION THREE: APPENDICES

Appendix A: Ties to Related Efforts

Protect and Restore Anadromous Fish Habitat in the Lapwai Creek Watershed (BPA project number 1999-017-00)

The Protect and Restore Anadromous Fish Habitat in the Lapwai Creek Watershed is a project funded through the Bonneville Power Administration and sponsored by the Nez Perce Tribe DFRM - Watershed. The project funds watershed restoration efforts in the Lapwai Creek basin to benefit 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 NPT properties.

The Lapwai 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 District since 2002. BPA project number 1999-017- 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, and abundance data collected on the mainstem of Lapwai, Mission, Sweetwater and Webb 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 ties to this restoration plan:

BPA project number 1999-017-00 identifies the habitat factors limiting fish productivity for Lapwai Creek. According to these guiding documents, the greatest limiting factors in Lapwai 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.

Mission-Lapwai Creek Watershed - Supplemental Watershed Protection Plan – Environmental Assessment Supplemental No. 1 & 2

The original Protection Plan was produced by the Natural Resources Conservation Service (NRCS) and completed in 1990. Two supplements have been added to the original. The first (1994) covers the area above Mission Creek and the second (2000) the area below Mission Creek. The two supplements incorporate treatment strategies to provide enhancement and protection of riparian vegetation to address hydrologic modifications and reduce stream temperatures. These supplements give the following purpose and goals:

Purpose:

Improve anadromous and resident cold-water fish habitat and water quality through: 1) Riparian area enhancement and protection; 2) Enhancement of in-stream habitat; 3) Reductions in sediment, nutrient, and bacterial loadings; and 4) Improvement of base stream flow conditions.

Goals:

1) Improve anadromous and resident cold-water fish habitat through riparian area enhancement and sediment reduction.
2) Reduce stream temperatures through riparian enhancement (lower the maximum mid-summer water temperature by five degrees centigrade).
3) Enhance degraded hydrologic conditions and decrease sediment yield in the upper watershed through runoff retention and detention practices.

All aspects of this strategy work toward supporting the purpose and goals of these supplements.

Lapwai Creek Aquatic Assessment

This assessment, completed in 2001, was conducted by Washington State University. At the time that the assessment was written, the Lapwai 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. In the interim, the Tribe and the District have gathered much of the recommended data and are now able to develop this restoration strategy using that critical data.

Lower Clearwater River Tributaries TMDL

The Nez Perce Tribe WRD began participating in watershed assessments on the reservation in the early 1990's and has played a key role in developing Total Maximum Daily Loads (TMDLs) and implementing restoration plans in the region. In 2002, WRD was awarded special EPA grant funds to develop TMDLs for sub-basins in the Lower Clearwater River Basin on the reservation. To maximize and integrate data collection efforts and products in cooperation with county and state agencies, WRD allocated all CWA Section 106 grant funds from 2002 through 2006 to the TMDL project.

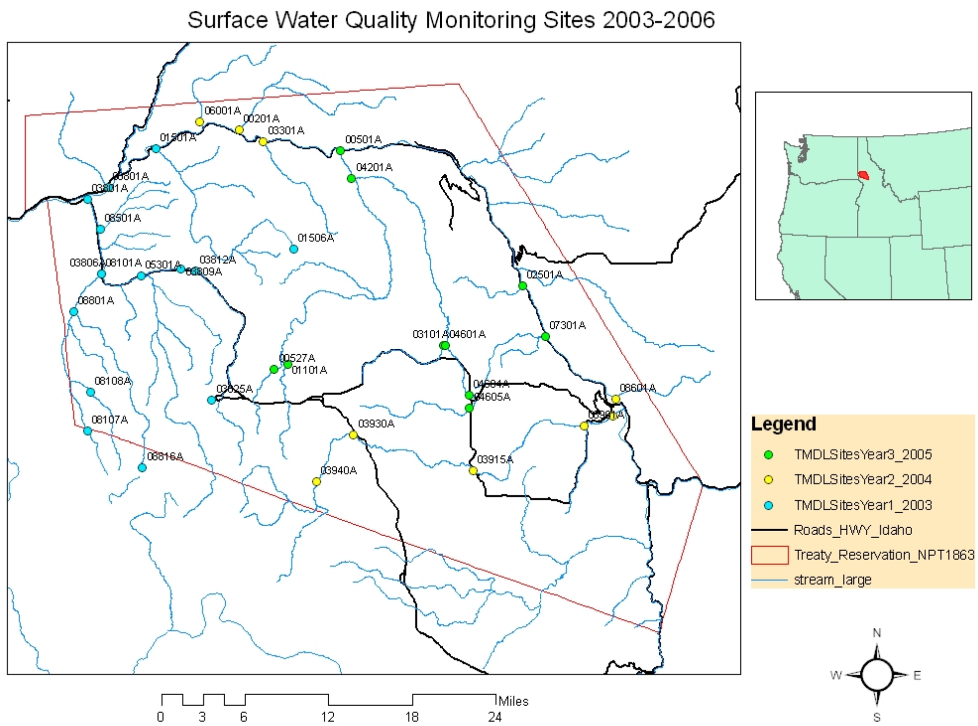

Figure 20: NPT-WR Surface Water Quality Monitoring Sites

The TMDL for the Lower Clearwater River is in publication and includes all sub-basins on the reservation. The Tribe invested in remote sensing technology, provided by a contractor, to collect data for the two most pervasive pollutants of reservation waters, temperature and sediment. These data sets provide 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. As TMDL plans are implemented, monitoring will be incorporated to assess effectiveness and determine trends in surface water quantity and quality on the reservation. This is a dynamic and collaborative process and will be developed in partnership with other stakeholders in the area.

Snake River Basin Adjudication

The Snake River Basin Adjudication (SRBA) was a legal process, aided by technical support from the State of Idaho Department of Water Resources (IDWR). It was the largest adjudication, or judicial administration, of water rights within the state of Idaho and possibly within the nation, with as many as 185,000 claims to water determined. The SRBA was ordered in 1987, as a result of a water rights case involving Idaho Power in 1982.

Specific ties to this restoration plan:

In 2005, the Nez Perce Tribal Committee (NPTEC) accepted the final terms of the water rights claims in the State of Idaho's Snake River Basin Adjudication (SRBA). Included in those final terms were the following:

- 50,000 acre feet of water decreed to the Tribe for on-reservation uses. The majority of this water was to be taken from the Clearwater, although some surface streams and groundwater sources were also identified.
- Instream flows on almost 200 Tribal priority streams are held by the state of Idaho. Streams were divided into “A” and “B” list streams; A-list streams were those for which the determined instream flow was currently available. B-list streams were those for which the determined target flow was not available, requiring a commitment from settlement parties to work to recover sufficient instream flow in a timely fashion.
- 600 springs claims located on about 6 million acres of Federal land in the Tribe’s 1863 ceded area.
- More than 11,000 acres of on-reservation Bureau of Land Management land transferred to the Tribe in trust.
- 96 million in three separate funds, for Tribal drinking water and sewer projects, water development projects, in addition to various Tribal projects including cultural preservation and fishery habitat improvements.

Lapwai, Sweetwater and Webb Creeks are all registered as B-list streams with insufficient flow currently to meet the State’s in-stream flow requirements. The Tribe is currently working with the NOAA Fisheries, the Bureau of Reclamation, and the Lewiston Orchards Irrigation District to restore sufficient flows to the basin in a timely manner.

Clearwater Focus Program, ISCC

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 council'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.

Clearwater Basin Weed Management Area (CBWMA)

According to the Idaho State Department of Agriculture, a Cooperative Weed Management Area is a distinguishable hydrologic, vegetative, or geographic zone based upon geography, weed infestations, climatic or human-use patterns. CWMAs are formed when the landowners and land managers of a given area come together and agree to work cooperatively to control weeds. Please see Appendix D for location map of Idaho's 40 CWMAs.

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.

Lapwai Creek is located within the Mainstem Clearwater sub-basin. A basin-wide Steering Committee coordinates sub-basin activities, consolidates information and maintains the CBWMA Long Range Strategy. The District has a member on 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 toadflax species (*Linaria ssp*), knapweed species (*Centaurea ssp*), rush skeletonweed (*Chondrilla juncea*), hawkweed species (*Hieracium ssp*), scotch thistle (*Onopordum acanthium*), and yellow starthistle (*Centaurea solstitialis*). 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 state. ISDA compiles the weed data into a statewide database for monitoring weed infestations, setting priorities, and developing treatment strategies.

Specific tie(s) to this restoration plan:

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

Lapwai Creek Habitat Marketing Plan

Summary of previous effort:

The District developed a habitat marketing plan as part of its BPA project number 2002-070-00. The plan's purpose is to increase landowner awareness and adoption of fish habitat improvement projects and management practices. Marketing efforts from 2002-2004 focused on increasing landowner awareness of fish habitat needs and installation of erosion control measures in the Rock Creek and Webb Creek 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 Lapwai Creek. These issues included erosion, fisheries, development, water quality, flooding, water availability, and wildlife habitat.

A demographic analysis was completed and identified eight landowner groups. Focus group meetings were held with landowners from each group. Using the USDA-Social Science Institute methodology for measuring landowner participation, the landowner acceptance and participation rate was determined to be 60 to 75% depending upon specific group.

Specific tie(s) to this restoration strategy:

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

Fish Passage Assessment: Lapwai Creek Watershed

In 2004, the Nez Perce Tribe DFRM-Watershed completed a fish passage assessment as a component of the Protect and Restore the Lapwai Creek Watershed Project for the BPA (project number 1999-017-00). The goal of the passage assessment was to identify and prioritized all barrier crossings within the watershed. The project addressed a major information gap identified in the Clearwater Subbasin Plan.

Specific tie(s) to this restoration plan:

Information provided in the passage assessment was used directly in this plan to prioritize assessment units and identify restoration strategies and priorities. The barrier prioritization protocol developed for the passage assessment was adopted in this strategy.

Nez Perce County Transportation Master Plan (Master Plan)

The 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 Lapwai Creek watershed are the paving of gravel roads and improvement of Webb Road. Mid-range projects include improvements to Red Duck Lane and Lapwai Road. Future developments include Webb Road to Hwy 95 to Waha Road, Lapwai Road from the end of pavement to City of Lapwai, Sweetwater to Spalding Bridge, and Sweetwater to Culdesac.

Specific tie(s) to this restoration plan:

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 Lapwai 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.

Appendix B: Sensitive Species

Lewis County

Fish Species:

Acipenser transmontanus	White Sturgeon
Oncorhynchus mykiss	Steelhead
Oncorhynchus nerka	Sockeye Salmon
Oncorhynchus tshawytscha	Chinook Salmon
Oncorhynchus clarki lewisi	Westslope Cutthroat Trout
Salvelinus confluentus	Bull Trout

Bird Species:

Coccyzus erythropthalmus	Black-billed Cuckoo
Haliaeetus leucocephalus	Bald Eagle
Oreortyx pictus	Mountain Quail
Strix nebulosa	Great Gray Owl

Invertebrate Species:

Cicindela columbica	Columbia River Tiger Beetle
Cryptomastix magnidentata	Mission Creek Oregonian

Plant Species:

Aster jessicae	Jessica's Aster
Calochortus nitidus	Broad-fruit Mariposa
Cardamine constancei	Constance's Bittercress
Cirsium brevifolium	Palouse Thistle
Haplopappus liatriformis	Palouse Goldenweed
Leptodactylon pungens ssp. hazeliae	Hazel's Prickly Phlox
Mimulus ampliatus	Spacious Monkeyflower
Mimulus clivicola	Bank Monkeyflower
Silene spaldingii	Spalding's Silene
Trifolium douglasii	Douglas' Clover
Trifolium plumosum var. amplifolium	Plumed Clover
Tripterocladium leucocladulum	Tripterocladium moss

Nez Perce County

Fish Species:

Acipenser transmontanus	White Sturgeon
Oncorhynchus clarki lewisi	Westslope Cutthroat Trout
Oncorhynchus mykiss	Steelhead
Oncorhynchus nerka	Sockeye Salmon
Oncorhynchus tshawytscha	Chinook Salmon
Salvelinus confluentus	Bull Trout

Mammal Species:

Antrozous pallidus	Pallid Bat
Corynorhinus townsendii	Townsend's Big-eared Bat
Euderma maculatum	Spotted Bat
Lynx canadensis	Lynx
Myotis evotis	Long-eared Myotis
Myotis thysanodes	Fringed Myotis
Myotis volans	Long-legged Myotis
Myotis yumanensis	Yuma Myotis
Pipistrellus hesperus	Western Pipistrelle
Sorex merriami	Merriam's Shrew

Bird Species:

Falco peregrinus anatum	Peregrine Falcon
Glaucidium gnoma	Northern Pygmy-owl
Haliaeetus leucocephalus	Bald Eagle
Oreortyx pictus	Mountain Quail
Otus flammeolus	Flammulated Owl
Picoides albolarvatus	White-headed Woodpecker
Sitta pygmaea	Pygmy Nuthatch
Strix nebulosa	Great Gray Owl

Reptile and Amphibian Species:

Bufo woodhousii	Woodhouse's Toad
Diadophis punctatus	Ringneck Snake

Invertebrate Species:

Fluminicola fuscus	Columbia Pebblesnail
Fisherola nuttalli	Shortface Lanx

Plant Species:

Aster jessicae	Jessica's Aster
Astragalus riparius	Piper's Milkvetch
Calochortus macrocarpus var. maculosus	Green-band Mariposa Lily
Calochortus nitidus	Broad-fruit Mariposa
Cardamine constancei	Constance's Bittercress
Chrysothamnus nauseosus ssp. nanus	Dwarf Gray Rabbitbrush
Cirsium brevifolium	Palouse Thistle
Crepis bakeri ssp. idahoensis	Idaho Hawksbeard
Epipactis gigantea	Giant Helleborine
Haplopappus hirtus var. sonchifolius	Sticky Goldenweed
Haplopappus liatriformis	Palouse Goldenweed
Lomatium salmoniflorum	Salmon-flower Desert-parsley
Mimulus ampliatus	Spacious Monkeyflower
Mimulus clivicola	Bank Monkeyflower
Mimulus patulus	Stalk-leaved Monkeyflower
Orthotrichum hallii	
Orthotrichum holzingeri	
Pediocactus simpsonii	Simpson's Hedgehog Cactus
Ribes wolfii	Wolf's Currant
Silene spaldingii	Spalding's Silene
Spiranthes porrifolia	Western Ladies Tresses
Thelypodium laciniatum var. streptanthoides	Purple Thick-leaved Thelypody
Trifolium douglasii	Douglas' Clover
Trifolium plumosum var. amplifolium	Plumed Clover

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Appendix C: Noxious Weed Distribution

Noxious Weed	Confirmed Lewis Co.	Observed Lewis Co.	Confirmed Nez Perce Co.	Observed Nez Perce Co.
Black Henbane *Hyoscyamus niger*		**X**	**X**	
Buffalobur *Solanum rostratum*			**X**	
Canada Thistle *Cirsium arvense*	**X**		**X**	
Common Crupina *Crupina vulgaris*	**X**		**X**	
Dalmation Toadflax *Linaria dalmatica* ssp. *dalmatica*		**X**	**X**	
Diffuse Knapweed *Centaurea diffusa*	**X**		**X**	
Dyer's Woad *Isatis tinctoria*				**X**
Field Bindweed *Convolvulus arvensis*	**X**		**X**	
Hoary Cress *Lepidium draba* ssp. *draba*		**X**	**X**	
Jointed Goatgrass *Aegilops cylindrical*	**X**		**X**	
Leafy Spurge *Euphorbia esula*	**X**		**X**	
Meadow Hawkweed *Hieracium caespitosum*		**X**		
Milium *Milium vernale*		**X**		**X**
Musk Thistle *Carduus nutans*	**X**		**X**	
Orange Hawkweed *Hieracium aurantiacum*	**X**			**X**
Perennial pepperweed *Lepidium latifolium*			**X**	
Perennial Sowthistle *Sonchus arvensis*				**X**
Poison Hemlock *Conium maculatum*	**X**		**X**	
Puncturevine				

Tribulus terrestris		**X**	**X**	
Noxious Weed	**Confirmed Lewis Co.**	**Observed Lewis Co.**	**Confirmed Nez Perce Co.**	**Observed Nez Perce Co.**
Purple Loosestrife *Lythrum salicaria*				**X**
Rush Skeletonweed *Chondrilla juncea*			**X**	
Russian Knapweed *Acroptilon repens*	**X**		**X**	
Scotch Broom *Cytisus scoparius*			**X**	
Scotch Thistle *Onopordum acanthium*	**X**		**X**	
Silverleaf Nightshade *Solanum elaeagnifolium*		**X**		**X**
Skeletonleaf Bursage *Ambrosia tomentosa*				**X**
Spotted Knapweed *Centaurea stoebe* ssp. *micranthos*	**X**		**X**	
Syrian Beancaper *Zygophyllum fabago*				**X**
Yellow Starthistle *Centaurea solstitialis*	**X**		**X**	
Yellow Toadflax *Linaria vulgaris*	**X**		**X**	

Appendix D: Clearwater Basin Coordinated Weed Management Areas

More than 40 Coordinated Weed Management Areas (WMAs) have been established in Idaho. The Lapwai Creek watershed is located within the Clearwater Basin Coordinated Weed Management Area (CBWMA).

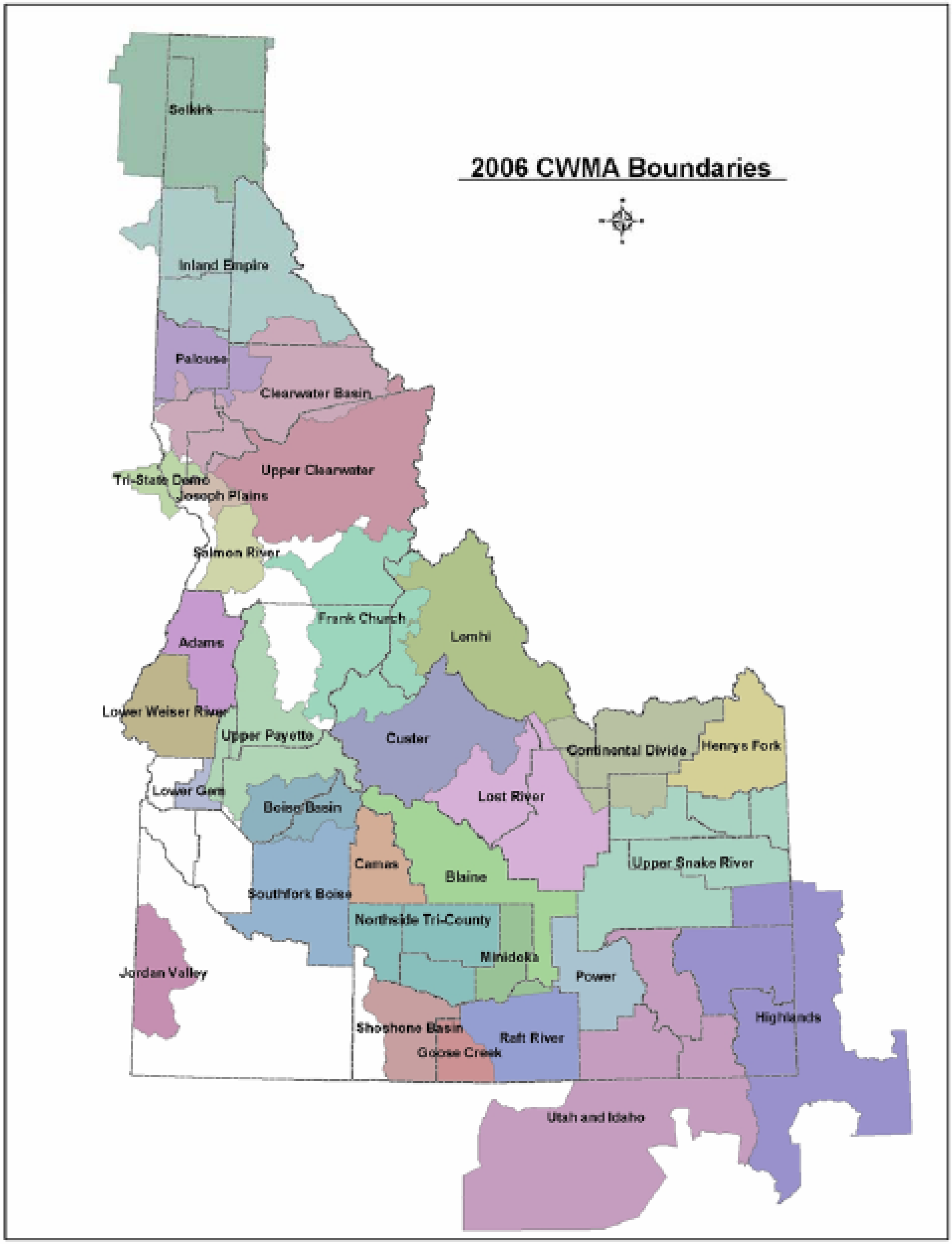
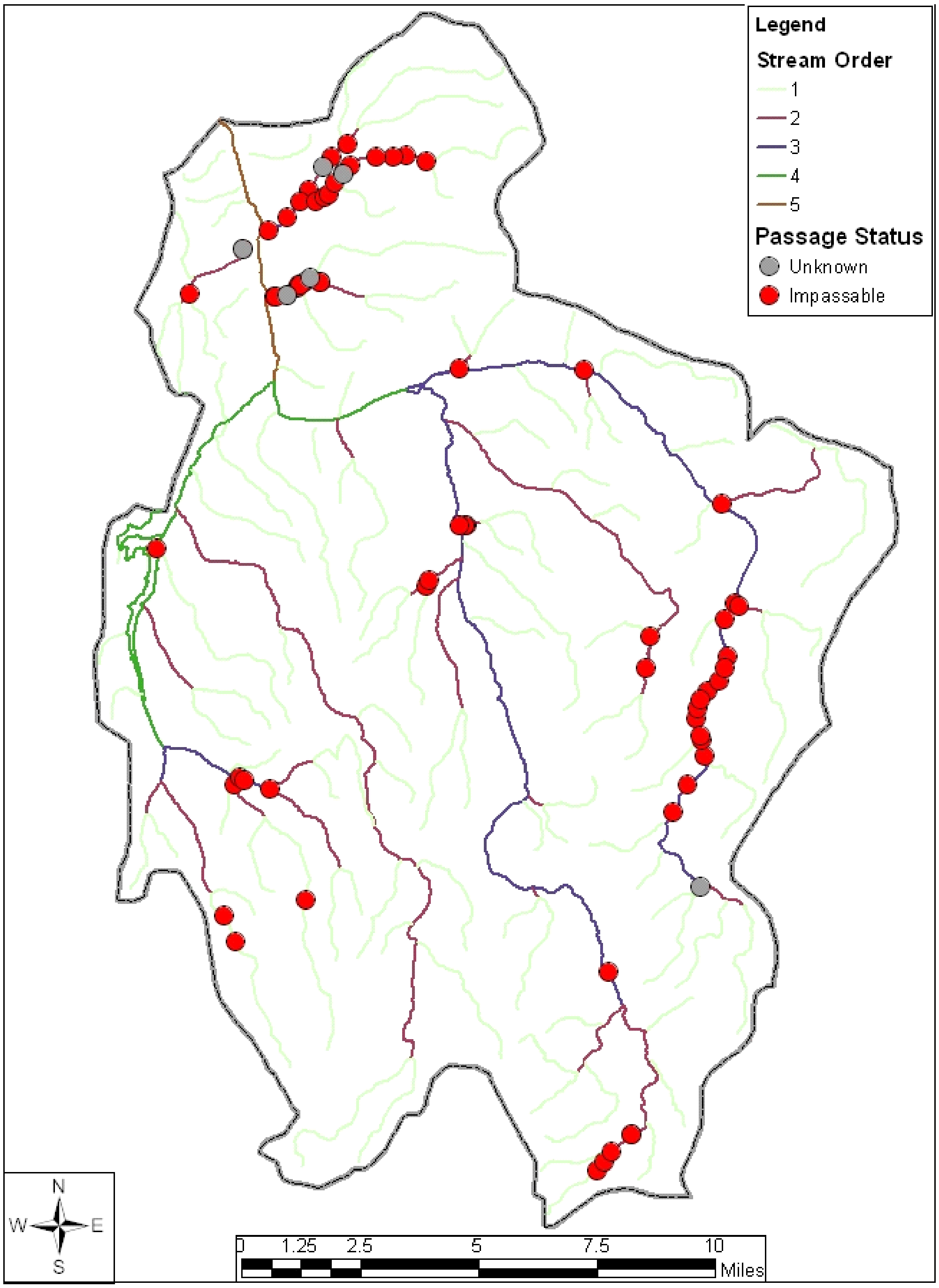


Figure 21. Idaho State Coordinated Weed Management Area Locations

Appendix E: Passage Barrier Locations

In 2003, the NPT conducted a survey and inventory of fish passage barriers in the Lapwai Creek drainage. This map indicates the location of the barriers that were identified in this study. It should be noted that barriers marked "impassable" may be impassable to certain age classes at certain times of the year and may not indicate complete passage barriers.



Passage Barrier Locations

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Appendix F: Assessment Unit Descriptions

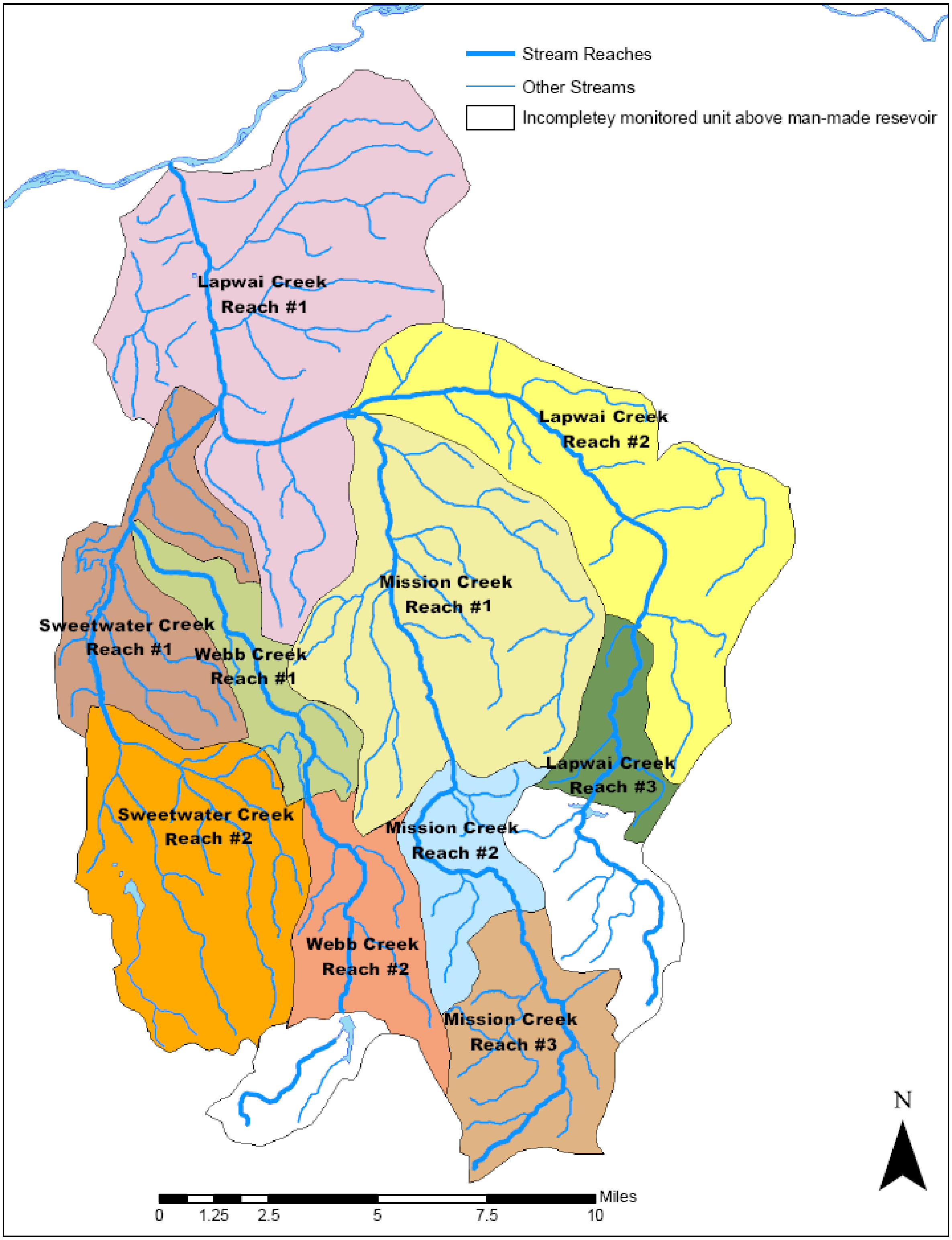

Figure 22. Assessment Units for the Lapwai Creek Watershed

Lapwai Creek Assessment Unit 1

See Treatment Section

Lapwai Creek Assessment Unit 2

See Treatment Section

Lapwai Creek Assessment Unit 3

Lapwai Creek Assessment Unit 3 is the smallest unit within the watershed at 4,952 acres, or approximately 3% of the total watershed surface area. This AU encompasses the area draining into the upper portion of the Lapwai Creek Canyon. An anadromous salmonid passage barrier (U.S. Highway 95 culvert) is located at the lower boundary of this segment of Lapwai Creek while man-made Winchester Lake constitutes a fish passage barrier at the upper boundary.

Table 21. Land Use Types within Lapwai Creek Assessment Unit 3.

Landcover	Acres	% cover
Bare Rock	45.4	0.92%
Bare Soil	238.1	4.81%
Brush	345.1	6.97%
Deciduous Forest	183.9	3.71%
Evergreen Forest	562.8	11.36%
Grassland	377.6	7.63%
Mixed Forest	978.1	19.75%
Pasture/Hay/Alfalfa	1.8	0.04%
Small Grains	2051.4	41.42%
Urban	40.8	0.82%
Water	1.4	0.03%
Wetlands	125.9	2.54%

U.S. Highway 95 abuts this reach of Lapwai Creek for the entire 7 km stretch. Although this section lacks many of the agricultural and grazing impacts found in the lower sections, the road proximity significantly limits riparian corridor width, channel sinuosity, and floodplain connectivity. Water temperatures recorded within the one monitoring site located in this AU were thermally classified as highly impaired as per criteria established by the National Marine Fisheries Service (NMFS 1996). Within a 300’ riparian buffer, Lapwai 3 had the lowest overall density of structures and the 4th lowest road density.

Hé-yey (*O. mykiss*) and paiute sculpin (*Cottus beldingi*) were captured through 2003-2004 electrofishing surveys of the AU. Average Hé-yey (*O. mykiss*) capture densities through this AU were 0.007/m^2, or 0.7 fish per 100m^2.

Mission Creek Assessment Unit 1

Mission Creek Assessment Unit 1 encompasses the area that drains directly into the area between the mouth of Mission Creek, where it enters mainstem Lapwai Creek, and stream km 15. This AU is the 2nd largest within the Lapwai Creek drainage at 27,474 acres, representing 17% of the watershed.

Table 23. Land Use Types within Mission Creek Assessment Unit 1

Landcover	Acres	% cover
Bare Rock	463.8	1.69%
Bare Soil	1410.3	5.13%
Brush	3487.7	12.69%
Deciduous Forest	1226.5	4.46%
Evergreen Forest	3243.9	11.81%
Grassland	2313.9	8.42%
Mixed Forest	3249.7	11.83%
Pasture/Hay/Alfalfa	80.2	0.29%
Small Grains	11276.8	41.05%
Urban	126.5	0.46%
Water	7.8	0.03%
Wetlands	587.0	2.14%

The lower 10.5 km of the creek flows through a wide valley that displays moderate residential development and a high degree of grazing and agricultural activity. The Mission Creek valley floor narrows considerably between stream km 10.5 and km15; no residential development or agricultural activity is currently present throughout this section and grazing activity is greatly diminished. Riparian corridor vegetative density is generally low throughout the lower 10.5 km segment, increasing substantially between channel km 10.5 and km15. Relative to other areas in the watershed, a significant amount of levee development is evident throughout the lower stream segment, confining the stream channel and eliminating floodplain access at several locations. A low level of bank stability was noted within the riffle dominated channel while water temperatures recorded within the AU's two monitoring sites were thermally classified as highly impaired as per criteria established by the National Marine Fisheries Service (NMFS 1996). Within a 300' riparian buffer, Mission 1 had the highest density of structures within the watershed but the second lowest road density.

Six species of fish were captured through 2003-2004 electrofishing surveys within this site, the majority being Hé-yey (*O. mykiss*), paiute sculpin (*Cottus beldingi*) and speckled dace (*Rhinichthys osculus*). Average Hé-yey survey capture density was $0.212/m^2$ or 21.2 fish per $100m^2$.

Mission Creek Assessment Unit 2

Mission Creek Assessment Unit 2 encompasses the area that drains directly into Mission Creek between stream km 15 and 24.5. This is the 8th largest assessment unit at 7,042 square acres, accounting for just more than 4% of the Lapwai Creek watershed.

Table 24. Land Use Types within Mission Creek Assessment Unit 2

Landcover	Acres	% cover
Bare Rock	67.2	0.95%
Bare Soil	563.2	8.00%
Brush	250.5	3.56%
Deciduous Forest	150.2	2.13%
Evergreen Forest	1957.6	27.80%
Grassland	220.5	3.13%
Mixed Forest	3219.6	45.72%
Small Grains	430.8	6.12%
Wetlands	182.7	2.59%

The segment of Mission Creek contained within this AU is located within a moderately deep and narrow canyon. Although the upland slopes of the canyon are heavily timbered by coniferous communities, minimal logging activity is evident within the relatively inaccessible area. Moderate levels of grazing activity are evident within the AU, and significant impacts are evident throughout the riparian corridor. While ground level vegetative density is relatively low, a moderate to high degree of stream canopy cover is afforded by the mature overstories. A low level of bank stability was noted within the AU's one monitoring site while water temperatures recorded at that location were thermally classified as highly impaired as per criteria established by the National Marine Fisheries Service (NMFS 1996). Within a 300' riparian buffer, Mission 2 had the 6th highest density of structure and the highest road density.

Two species of fish, Hé-yey (*O. mykiss*) and speckled dace (*Rhinichthys osculus*) were captured through 2003-2004 electrofishing surveys of this AU. Average Hé-yey survey capture density was $0.082/m^2$ or 8.2 fish per $100m^2$.

Mission Creek Assessment Unit 3

Mission Creek Assessment Unit 3 encompasses the area that drains directly into the area between Mission Creek stream km 24.5 and km 34. At 11,262 acres, Mission 3 represents about 7% of the Lapwai drainage and is the median of the 10 sites.

Table 25. Land Use Types within Mission Creek Assessment Unit 3

Landcover	Acres	% cover
Bare Rock	98.67	0.88%
Bare Soil	2347.96	20.85%
Brush	661.80	5.88%
Deciduous Forest	226.42	2.01%
Evergreen Forest	2018.80	17.93%
Grassland	255.81	2.27%
Mixed Forest	4897.82	43.49%
Small Grains	472.68	4.20%
Wetlands	282.49	2.51%

In this upper section of Mission Creek, there is evidence of cropping up to the stream's edge and moderately high impact from grazing. Although the reach showed high habitat complexity, the value of the habitat was compromised by extremely low flow, high temperatures, excessive phosphorus levels and low dissolved oxygen (DO) and % DO saturation. The creek meanders through a shallow valley with low density riparian zones dominated by deciduous trees. Bank stability in this reach is impaired although there was woody debris present. The segment of Mission Creek contained within this AU is characterized by a low gradient channel that meanders through rolling timberland before dropping into a steep canyon and subsequently increasing in gradient and decreasing in sinuosity. Significant levels of grazing and logging activity are evident within the AU. A low level of bank stability was noted within the AU's one monitoring site located while water temperatures recorded at that location were thermally classified as highly impaired as per criteria established by the National Marine Fisheries Service (NMFS 1996). Within a 300' riparian buffer zone, Mission 3 had the 2nd lowest density of structures and the 3rd lowest road density.

Two species of fish, Hé-yey (steelhead/rainbow trout or *Oncorhynchus mykiss*) and speckled dace (*Rhinichthys osculus*) were captured through 2003-2004 electrofishing surveys of this AU. Average Hé-yey survey capture density was $0.006/m^2$ or 0.6 fish per $100m^2$.

Sweetwater Creek Assessment Unit 1

See Treatment Section

Sweetwater Creek Assessment Unit 2

Sweetwater Creek Assessment Unit 2 encompasses the portion of the Sweetwater Creek watershed that drains into the stream above channel km 13. Sweetwater 2 is the 4th largest AU within the Lapwai Creek drainage at 17,807 acres, representing just more than 11% of the watershed.

Table 26. Land Use Types within Sweetwater Creek Assessment Unit 2

Landcover	Acres	% cover
Bare Rock	215.7	1.21%
Bare Soil	705.0	3.96%
Brush	1694.5	9.52%
Deciduous Forest	920.2	5.17%
Evergreen Forest	3671.6	20.62%
Grassland	1073.0	6.03%
Mixed Forest	6312.8	35.45%
Small Grains	2906.1	16.32%
Urban	10.2	0.06%
Water	0.7	0.00%
Wetlands	297.3	1.67%

Located above a Bureau of Reclamation irrigation diversion structure, discharge within the upper Sweetwater Creek segment was noted to be maintained at relatively high levels throughout 2003-2006 summer surveys. Water temperatures collected within the one AU monitoring site were consistently lower than the other 15 Lapwai Creek watershed sites. The moderately wide riparian corridor present along this section of Sweetwater Creek displayed high levels of overstory vegetative density while groundcover density was minimal. Grazing activity impacts were evident throughout the valley bottoms of this AU. This AU possessed the 3rd lowest density of structures within 300 ft. of its streams while road density was 2nd highest.

Two fish species, Hé-yey (steelhead/rainbow trout or *Oncorhynchus mykiss*) and Paiute sculpin (Cottus beldingi) were identified through 2003-2005 electrofishing surveys within this AU. Average Hé-yey survey capture density was $0.006/m^2$ or 0.6 fish per $100m^2$.

Webb Creek Assessment Unit 1

Webb Creek Assessment Unit 1 encompasses the area that drains directly into Webb Creek between the stream mouth and channel km 15. Webb 1 is the 2nd smallest assessment unit at 5,684 acres, representing just more than 3% of the Lapwai Creek drainage.

Table 27. Land Use Types within Webb Creek Assessment Unit 1

Landcover	Acres	% cover
Bare Rock	105.8	1.86%
Bare Soil	268.6	4.73%
Brush	1248.9	21.97%
Deciduous Forest	396.1	6.97%
Evergreen Forest	738.3	12.99%
Grassland	751.8	13.23%
Mixed Forest	513.9	9.04%
Pasture/Hay/Alfalfa	6.4	0.11%
Small Grains	1604.5	28.23%
Urban	2.4	0.04%
Wetlands	46.9	0.82%

A 12 meter high Webb Creek waterfall is located at the upper boundary of Assessment Unit 1. Below this point, the high gradient (>6%) stream channel courses through a narrow valley for approximately nine kilometers before flowing into a wide valley and diminishing in gradient. The wide riparian corridors adjacent to the lower 15 km of Webb Creek exhibited relatively low vegetative density, but through mature overstory composition, provided moderately high levels of canopy cover to the stream. Relative to Lapwai watershed conditions, a moderate degree of channel complexity was present within this segment of Webb Creek with significant quantities of pool habitat. Bank stability was low within the three monitoring sites of this AU. Summer water temperatures recorded within the lower two monitoring sites were thermally classified as highly impaired as per criteria established by the National Marine Fisheries Service (NMFS 1996) while the upper site was thermally classified as moderately impaired. A Bureau of Reclamation irrigation structure located several kilometers above the upper boundary of this AU diverts all summer flow from Webb Creek. As such, summer baseflow is comprised of minimal quantities of spring input and groundwater recharge. This AU possessed the 7th highest density of structures within 300 ft. of its streams while road density was 4th highest.

Five species were captured through 2003-2005 electrofishing surveys in this AU. Average Hé-yey (steelhead/rainbow trout or *Oncorhynchus mykiss*) survey capture density was $0.046/m^2$ or 4.6 fish per 100 m^2.

Webb Creek Assessment Unit 2

Webb Creek Assessment Unit 2 encompasses the area that drains directly into Webb Creek between stream km 15 and Soldier's Meadow Reservoir (stream kilometer 25). It is the third smallest AU at 9,052 acres, representing nearly 6% of the watershed area.

Table 28. Land Use Types within Webb Creek Assessment Unit 2

Landcover	Acres	% cover
Bare Rock	20.7	0.23%
Bare Soil	365.0	4.03%
Brush	520.0	5.75%
Deciduous Forest	244.1	2.70%
Evergreen Forest	3085.3	34.09%
Grassland	104.8	1.16%
Mixed Forest	4469.9	49.38%
Small Grains	32.8	0.36%
Wetlands	209.2	2.31%

This AU is located immediately upstream of a large waterfall which presents a fish passage barrier. A Bureau of Reclamation irrigation structure located a short distance upstream of the waterfall currently diverts all summer rheic streamflow from the upper section. Discharge above the diversion structure was noted to range between 9.5 and 15.5 cfs through the summer months of 2003-2006. Webb Creek flows through a narrow, deep canyon for the majority of this AU. A one kilometer segment of canyon displayed substantially increased valley bottom width, throughout which significant grazing impacts were noted. Logging activity was considerable throughout the AU during the 2003-2006 survey period. Although high volumes of summer flow were present within the AU's monitoring site, water temperatures were thermally classified as highly impaired as per criteria established by the National Marine Fisheries Service (NMFS 1996). This AU possessed the 4th lowest density of structures within 300 feet of its streams while road density was 3rd highest.

Hé-yey (steelhead/rainbow trout or *Oncorhynchus mykiss*) were the only species captured through limited 2003-2005 electrofishing surveys of this AU. Average Hé-yey survey capture density was $0.014/m^2$ or 1.4 fish per 100 m^2.

Appendix G: Treatment Groups

A. Riparian Habitat

Description

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. Figure 22 provides an example of a reach that would rate Poor through the SVAP evaluation.

Figure 23. Reach Exhibiting Poor Riparian Habitat on Garden Gulch Road in the Lapwai Creek Basin

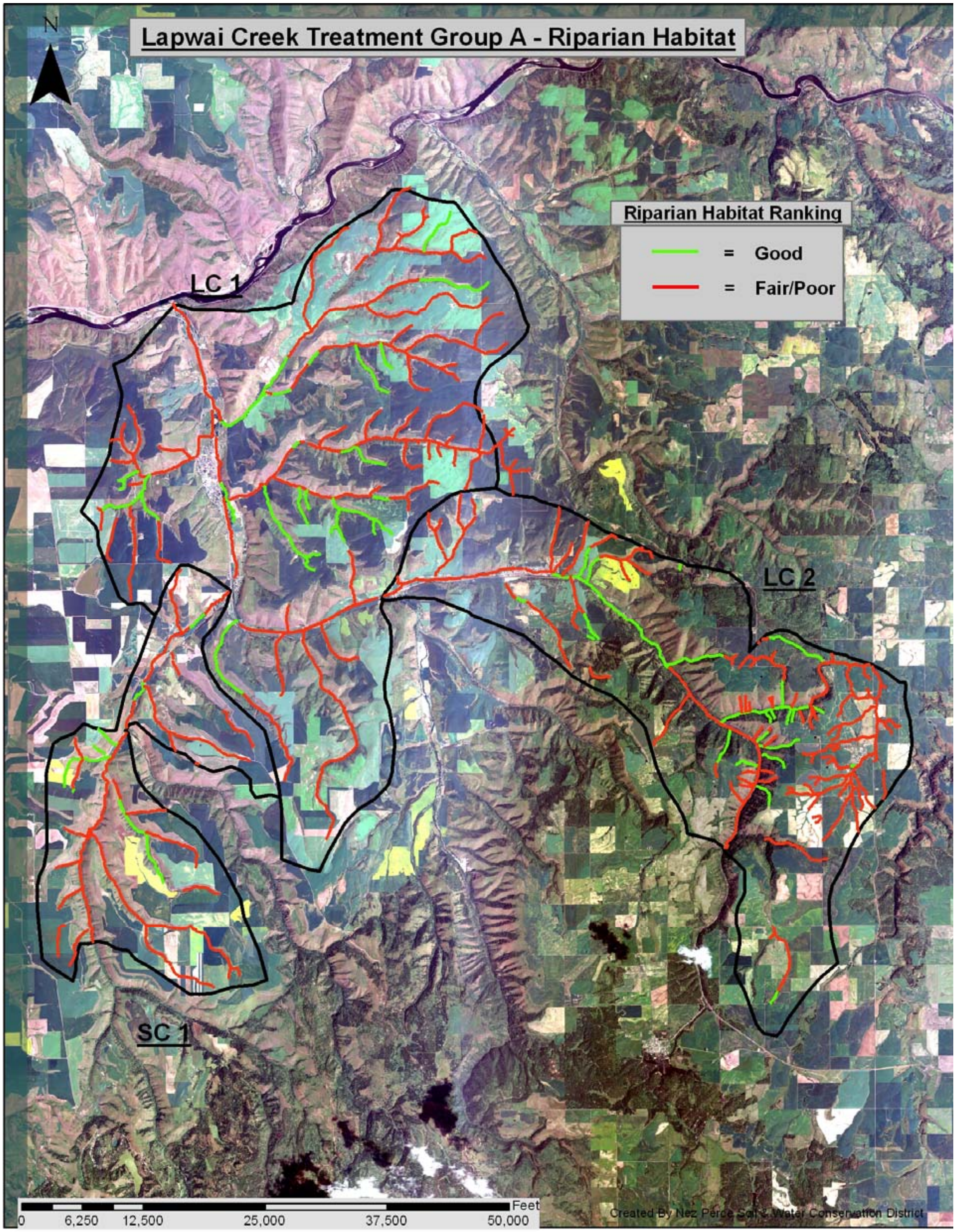

Figure 24. SVAP Ratings for Riparian Habitat in the Lapwai Creek Watershed

B. Channel Condition

Description

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 prism, have little to no floodplain access, are actively downcutting or widening, and less than 50% of the reach is channelized or riprapped. Additionally, the channel may be deeply incised or have water withdrawals, with minimal flooding, and unstable banks. Reaches receiving a Fair rating have less than 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 6-10 years. Reaches receiving a Good rating may include evidence of past channel alteration but with significant recovery of the channel, set back dikes/levees providing access to floodplain, moderately stable banks and limited channel incision.

Figure 25. Reach Exhibiting Poor Channel Condition on Webb Creek in the Lapwai Creek Basin

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: Fish Habitat

Description

Poor Fish 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 located throughout the Lapwai 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 up 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.

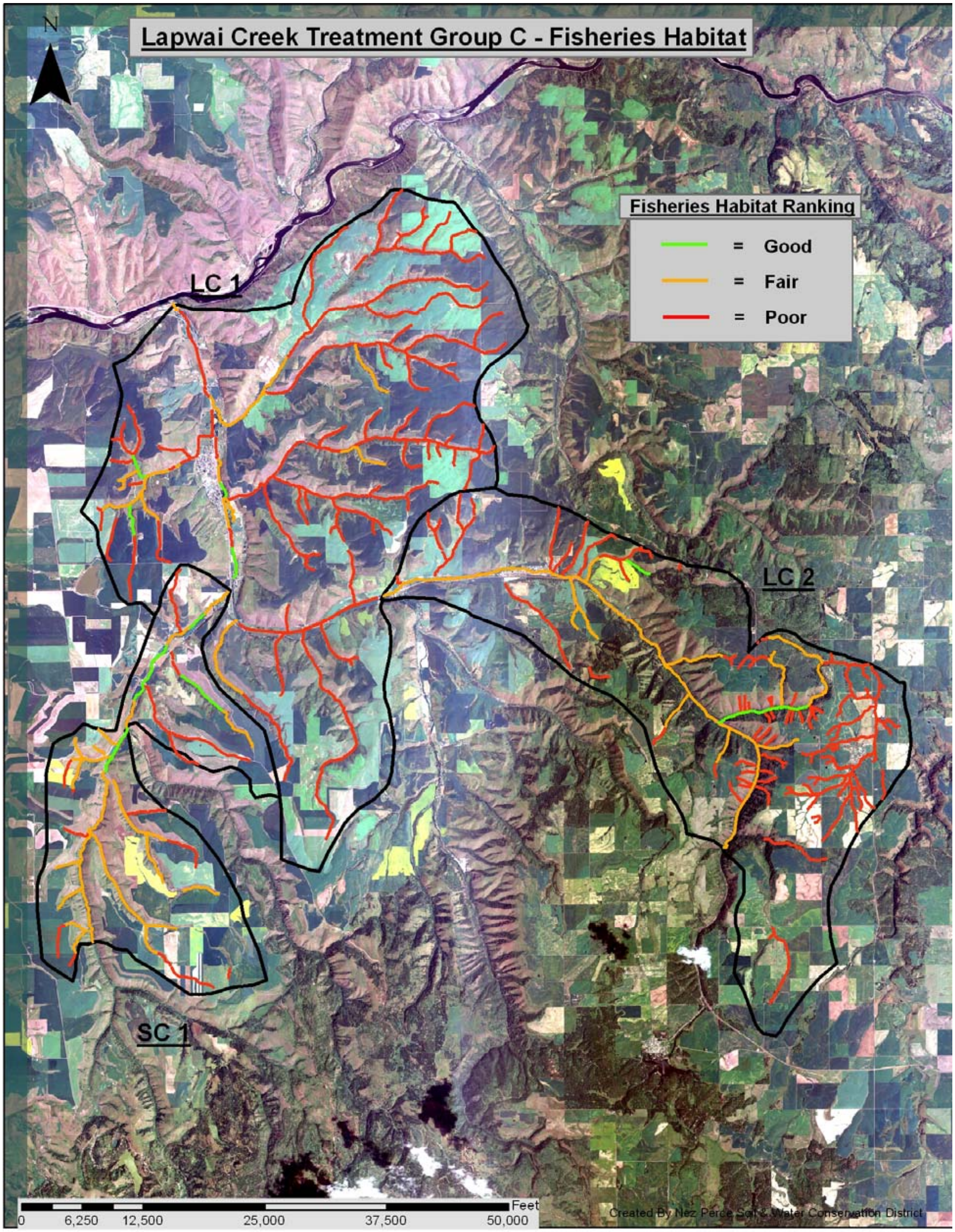

Figure 26. SVAP Ratings for Fisheries Habitat in Lapwai Creek Watershed

D. Nutrient Enrichment

Description

The combined nutrients ratings include the Nutrient Enrichment, Water Appearance and Manure Presence SVAP parameters. Reaches found to be impaired in this group were located 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, *E. coli* and phosphorus.

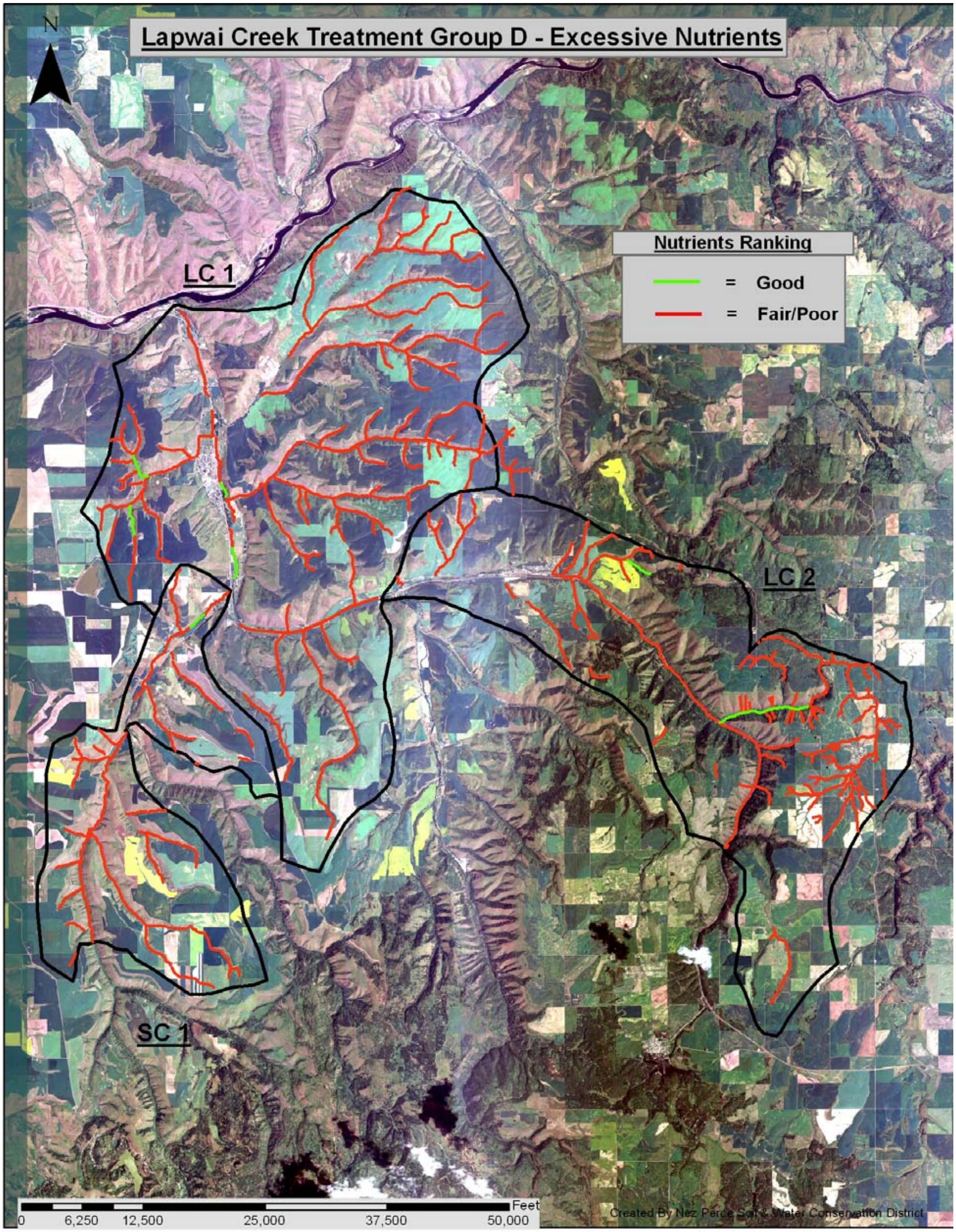

Figure 27. SVAP Ratings for Excessive Nutrients in the Lapwai Creek Watershed

E. Barriers

Description

The NPT and the NPSWCD have located passage barriers throughout the Lapwai 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.

Figure 28. Fish Passage Barrier on Sweetwater Creek in the Lapwai Creek Basin Culvert was recently replaced with bridge.

F: Water Withdrawal

Description

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 irrigation purposes. Currently, the most significant water withdrawal in the Lapwai basin is the Lewiston Orchards Project, managed by the Lewiston Orchards Irrigation District (LOID). This complex series of diversions, canals and reservoirs removes water from the headwater streams of the Lapwai basin, eventually delivering it outside the watershed for domestic irrigation purposes in the residential Lewiston Orchards area. This system directly affects Lapwai Creek AU 1, Sweetwater Creek AU 1, Sweetwater Creek AU 2, Webb Creek AU 1 and Webb Creek AU 2.

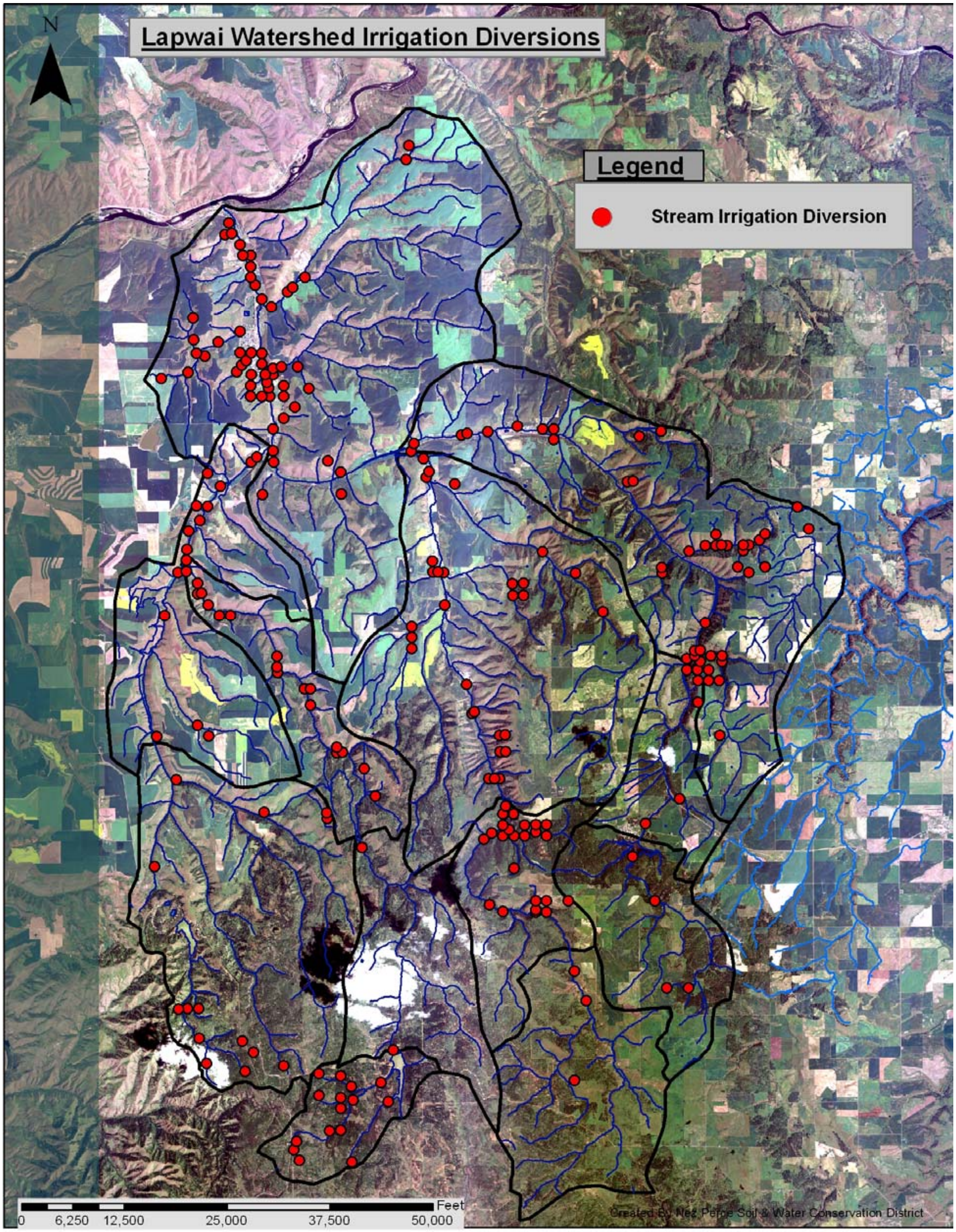

Figure 29. Diversion locations within the Lapwai Creek Watershed

G. Hydrologic Alteration

Description

Reaches with reduced water retention and those reaches with high peak flows and low summer flows (so-called “flashy” areas) were considered impaired. Areas requiring treatment occur primarily within the uplands 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 special treatment. Information on historic wetland areas is sparse; areas identified through the District’s Resource Inventory and Planning Protocol (RIPP) and the NPT’s Natural Resource Assessment and Management Plan (NRAMP) or areas with hydric soils may be further investigated for treatment.

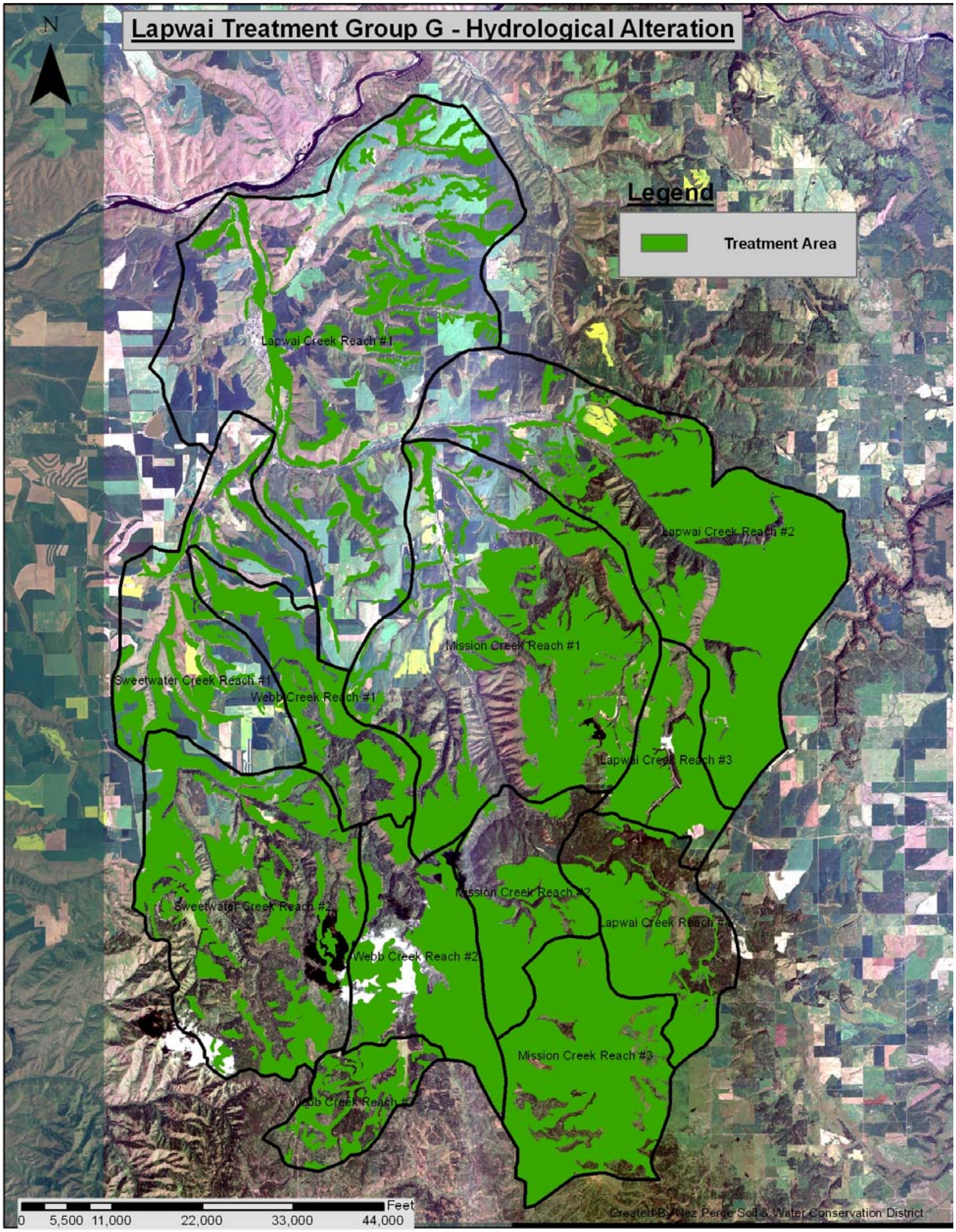

Figure 30. Treatment Areas for Hydrologic Function in the Lapwai Creek Watershed

H. Protection Reaches

Description

Protection reaches are those that received an overall SVAP index rating of Excellent and may be considered reference reaches within the system. Within the watershed, these reaches totaling 3.5 miles are found in Mission Creek, Rock Creek and Sweetwater Creek (Figure 30). Additional Protection reaches may be located within the watershed but were not identified at the time of publication of this report. As these reaches are identified, they will be added to this 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 Protection treatment group.

Example of a Protection Reach

Recommendations

Treatment Group H is a watershed wide treatment group and is not prioritized by Assessment Unit. It is essential that these reaches are 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.

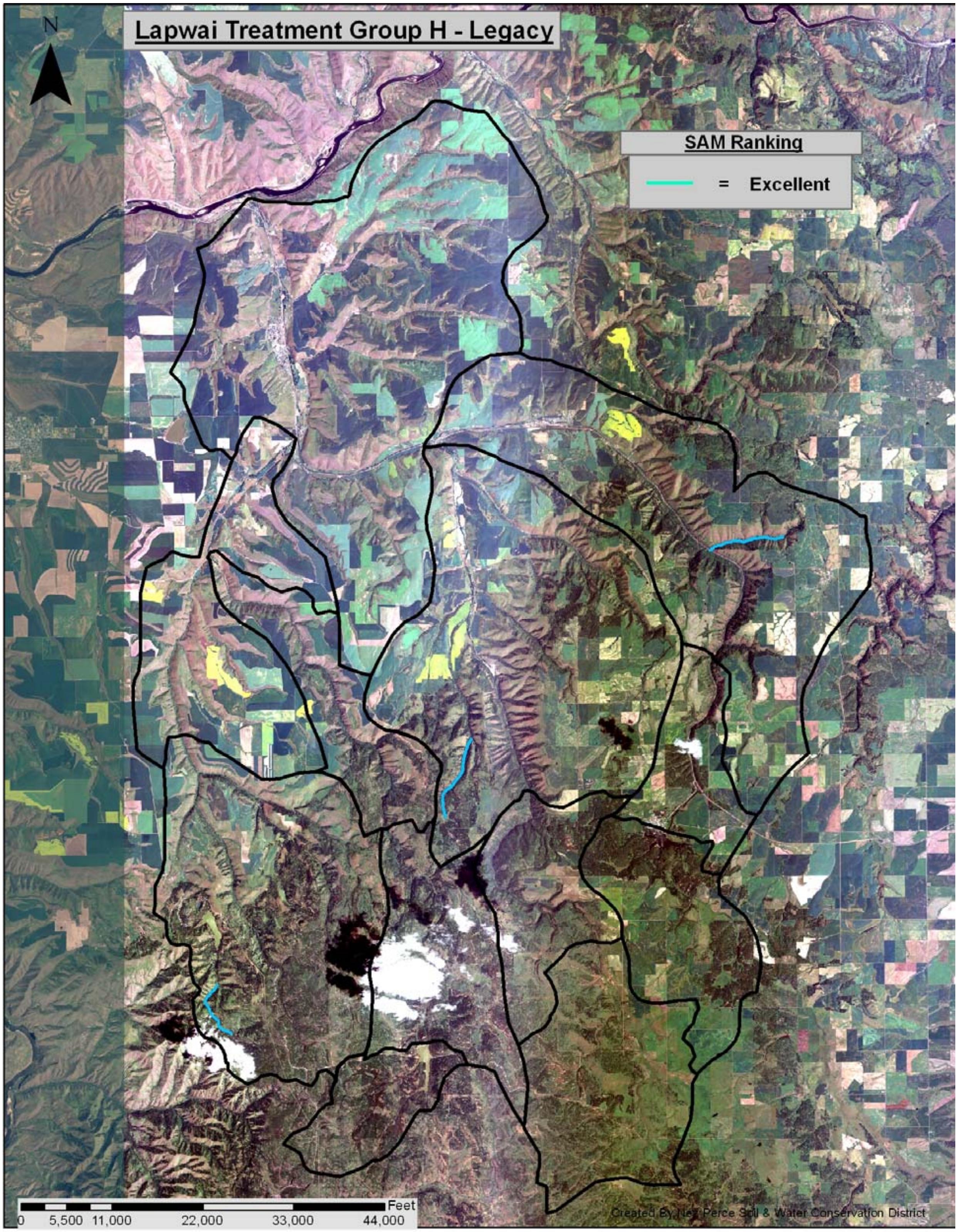

Figure 31. Lapwai Creek Reaches in Excellent Condition through SVAP Ranking

I: Upland Sediment

Description

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, 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.

Treatments for this group include reduction and/or prevention of erosion within the identified critical areas. The management of upland sediment sources can improve water quality and temperature throughout 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, road, canyonland, and forested areas are also identified as potentially requiring treatment.

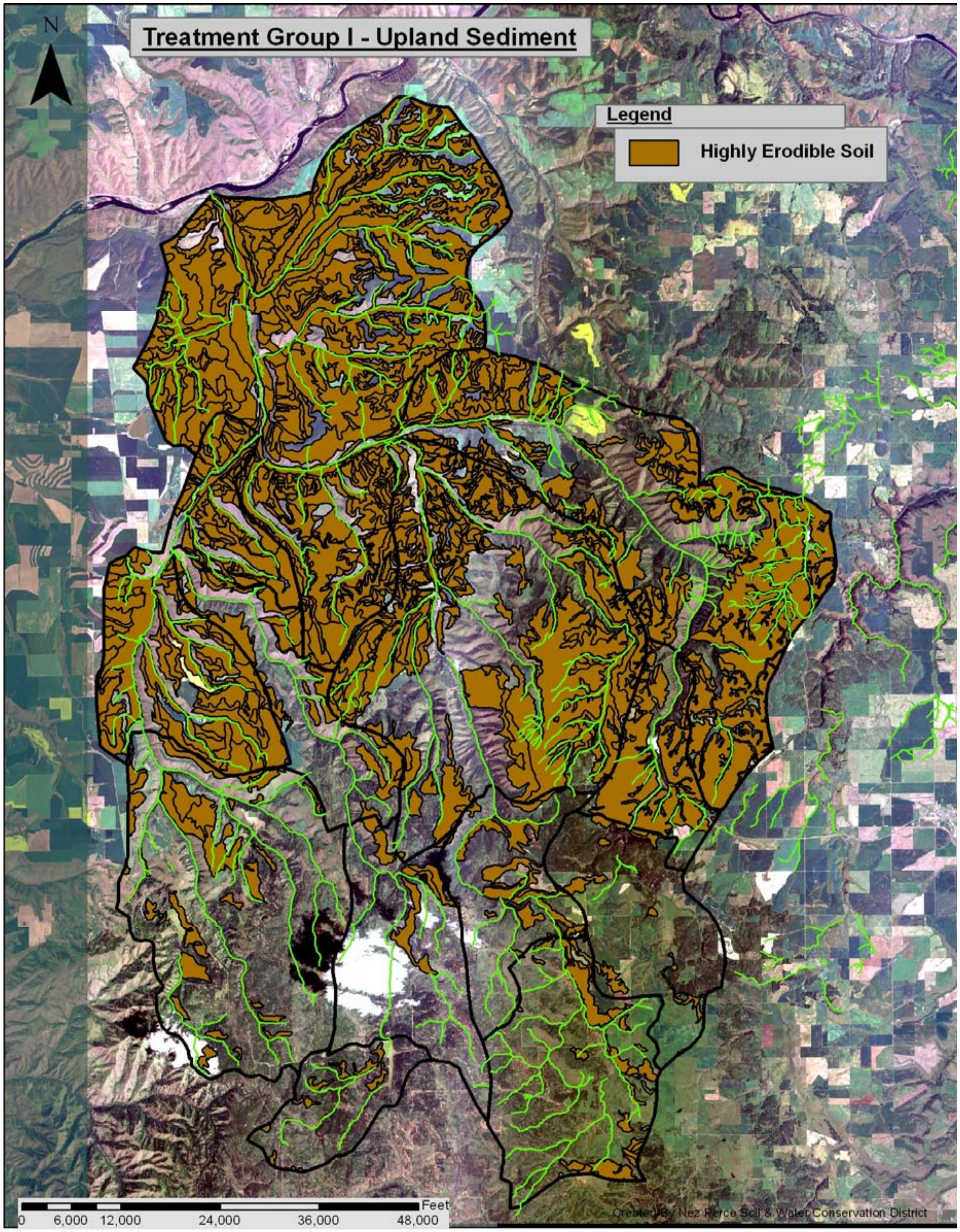

Figure 32. Areas of Highly Erosive Soils in the Lapwai Creek Watershed

J. Invasive Species

Description

Both terrestrial and aquatic invasive species are of great concern throughout the Lapwai Creek basin. Reaches and areas that are impaired due to Invasive Species encroachment may suffer from reduced riparian function, reduced filtration resulting in poor water quality, increased temperature and thermal fluctuation, reduced cover, habitat and food sources for fish and wildlife species, reduced habitat complexity, and reduced bank stability. Some aquatic invasive species observed within the Lapwai Creek watershed, such as the New Zealand Mud Snail or *Myxobolus cerebralis* (the parasite responsible for Whirling Disease), have the potential to severely impact entire populations of a number of species, predominately ESA-listed steelhead and salmon.

The potential for invasive species to spread within the Lapwai 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.”

Recommendations

This group is not prioritized within Assessment Units, as invasives are epidemic within the entire Lapwai Creek Basin. We recommend that a field crew be designated solely to perform noxious weed eradication throughout the Lapwai basin. Further recommendations for treating this potentially devastating group include developing a basin-wide general procedure to reduce the transport and introduction of invasive species. All field crews should be trained in noxious weed identification and vector control to encourage early detection and avoid inadvertent dispersal of noxious weed species between field sites. This may entail treating waders, nets, and other equipment that come in contact with stream water or noxious weeds with saline, bleach, UV exposure or specialized solutions such as Bardac 22C50. Additionally, a protocol outlining disinfection of field equipment that has potentially come into contact with terrestrial invasives such as knotweed, knapweed, or poison hemlock should be pursued for use by managers, landowners and restoration facilitators.

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

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

Appendix H- Implementation

Tribal Allotment 365 was leased as a livestock feeding operation and for production of hay for many years. Management practices associated with these uses severely degraded the riparian habitat and water quality. Two unimproved machinery/vehicle crossings reduced or eliminated passage for aquatic life during summer base flow conditions.

This project was selected due to its location on mainstem Sweetwater Creek, within Sweetwater Creek Assessment Unit 1, the second highest ranked AU. The variety of treatment groups addressed in an area of perennial flow provided further justification for the projects priority. Treatment groups addressed at Tribal Allotment 365 include:

- Riparian Habitat
- Channel Condition
- Fish Habitat
- Nutrients
- Agricultural Sources
- Barriers
- Invasive Species

Project implementation began in 2008. To address the variety of resource concerns listed above, the following treatments were implemented:

- 8.2 acres of weed control
- 0.4 miles of berm removal
- Planted 8.2 acres of riparian habitat (0.5 miles)
- Constructed 0.8 miles of livestock exclusionary fencing and installed one off-site watering facility
- Installed 0.3 miles of vegetative buffer along agricultural ground
- Removed two unimproved vehicle/machinery crossings by replacing a failing bridge

Work continues on Allotment 365, with additional weed control, plantings, and fence maintenance scheduled for 2009. It may take several years for the some of treatments to translate into changes in SVAP Rating, but benefits of removing aquatic passage barriers, restoring access to the floodplain, and some landscape-level improvements are more immediate.

Before Treatment

After Treatment