

Hatwai Creek Steelhead Habitat Restoration Plan

Addendum to Agricultural Implementation Plan

NEZ PERCE SOIL & WATER CONSERVATION DISTRICT

U.S. FISH & WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR

GREAT SEAL OF THE STATE OF IDAHO
ESTO PERPETUA

Hatwai Creek Watershed Restoration Plan

2014

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EXECUTIVE SUMMARY

The Hatwai Creek Steelhead Habitat Restoration Plan proposes to address the primary factors limiting abundance and productivity of the focal species, steelhead (*O. mykiss*) within the Hatwai creek watershed. Restoration projects were identified to address limiting factors based on the Clearwater Subbasin Plan (NPCC, 2005), The Draft Lower Clearwater Tributaries Management Plan (NPSWCD, 2014 Draft) and the Hatwai TMDL Agricultural Implementation Plan (ISWCC, 2011).

Limiting factors for the Lower Clearwater Steelhead population in the Hatwai Creek watershed were recently updated. The results of this exercise identified the following as limiting factors for the watershed: anthropogenic barriers, riparian vegetation, bed and channel from, instream structural complexity, increased sediment quantity, temperature, increased water quantity, and decreased water quantity.

The project goal is to restore the Hatwai Creek watershed, so that the physical habitat no longer limits recovery of the ESA threatened Lower Clearwater Steelhead population.

Objectives include:

Objective 1 – Improve Aquatic Habitat Diversity and Complexity
Objective 2 – Reduce Stream Temperatures
Objective 3 – Reduce Instream Sedimentation

Geographic Scope

Hatwai Creek Watershed (20,935 acres) is located in the northwest corner of Nez Perce County with its confluence three miles east of Lewiston, Idaho. It is a third order tributary to the Clearwater River and flows 7.8 miles in a southeasterly direction to its confluence at the Clearwater River. The main stem of Hatwai Creek originates on the southern breaks of the Palouse Prairie, along the east side of Idaho State Highway 95, and flows into a steep basalt canyon where it is fed by several springs before reaching the Clearwater River three miles east of Lewiston, Idaho. The lower 2.5 miles of Hatwai Creek are within the Nez Perce Reservation. Elevations range from 775 feet at the mouth to 2,964 feet. Most of the watershed is cropland and rangeland; the remaining land uses are pastureland, rural dwellings and industrial facilities. The watershed was listed on Idaho's 303(d) list and also listed as critical habitat for steelhead salmon. The National Marine Fisheries Service (NMFS) listed steelhead as threatened in Hatwai Creek.

Steelhead Status

Steelhead (*Oncorhynchus mykiss),* are a culturally and ecologically significant resource within the Hatwai Creek watershed. Steelhead of Hatwai Creek are also within a subpopulation of the Snake River Basin Steelhead distinct population segment (DPS) listed as threatened under the Endangered Species Act. As a tributary to the lower Clearwater River, Hatwai Creek is considered critical habitat for anadromous steelhead.

Steelhead Habitat Restoration Needs

In order to restore and improve the steelhead habitat within the watershed the following treatments are needed:

A – Improve riparian condition – 49 miles riparian restoration.
B – Reduce Streambank Erosion – 41 miles streambank protection.
C – Remove or retrofit fish barriers – remove 1 barrier.
D – Improve watershed hydrology - Install 110 acres wetland enhancements, 760 acres upland grass/forb planting, and 380 acres upland tree planting.
E – Reduce sediment delivery to streams from uplands – 11,132 acres upland treatment.
F – Reduce Road Associated Sediment Delivery to the Stream – 23.9 miles road improvements;
G – Restore Floodplain Access and Reconnect Channel – 41 miles.
H- Water Withdrawals – 17 water withdrawals
I – Protection Reaches – 1.56 miles of stream recommended for protection



CHAPTER 1: INTRODUCTION

The goal within the Hatwai Creek watershed is to restore the aquatic ecosystem, so that the physical habitat no longer limits recovery of the ESA Threatened Lower Clearwater Steelhead population. As a part of an ongoing partnership with regional, state, federal, tribal, and local agencies, as well as landowners, the sponsors, propose to implement habitat improvement projects to address primary limiting factors in order to increase the productivity and viability of the watershed's steelhead population.

This document is an addendum to the Hatwai Creek TMDL Agricultural Implementation Plan developed by the Idaho Soil and Water Conservation Commission (ISWCC) in 2011 which focuses on water quality improvement needs (ISWCC, 2011). The TMDL implementation planning process started in 2011 and ended in 2014 and includes the compilation of the majority of the watershed physical characteristic information and identified water quality related problems within the watershed. Many of these characteristics and water quality related problems directly impact steelhead habitat, in addition to physical habitat diversity within streams, fish barriers, riparian complexity, and hydrologic characteristics.

The Nez Perce Soil and Water Conservation District (NPSWCD) developed this plan to address the steelhead habitat restoration needs not defined in the TMDL plan as a supplement to the water quality and watershed characteristics defined within the Hatwai Creek watershed in the TMDL Agricultural Implementation plan. The two plans together should form complete understanding of improvements needed within the Hatwai Creek watershed to support steelhead population. Where feasible, the previous efforts under the TMDL implementation plan are referenced. Steelhead habitat restoration objectives are:

- Objective 1 – Improve aquatic habitat diversity and complexity
- Objective 2 – Reduce stream temperatures
- Objective 3 – Reduce instream sedimentation

Sponsors

This watershed plan was sponsored by the Nez Perce Soil and Water Conservation District (NPWCD), the Idaho Governor's Office of Species Conservation (OSC), The U.S. Fish and Wildlife Service (USFWS) and the USDA – Natural Resources Conservation Service (NRCS).

The Nez Perce Soil and Water Conservation District (NPSWCD) is a subdivision of Idaho State government organized on a county level. The NPSWCD coordinated the plan development, collected field data for identified information gaps and provided matching funds to develop the plan. The NPSWCD will use the plan to implement restoration projects in the future.

The Idaho Governor's Office of Species Conservation (OSC) provided funds from The U.S. Fish and Wildlife Service's Pacific Coast Salmon Recovery Program (Project #00709). The OSC provided funding and technical support and was a member of the Technical Team.

The USDA – Natural Resource Conservation Service (NRCS) provided funds for stream inventory data collection and plan development through USDA's Conservation Technical Assistance program (Project #11052). In addition, to providing funding, NRCS was a member of the Technical Team.

The US Fish and Wildlife Service's Pacific Coastal Salmon Recovery program provided over funding for plan development.

Goal and Objectives

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

- Objective 1 – Improve aquatic habitat diversity and complexity
- Objective 2 – Reduce stream temperatures
- Objective 3 – Reduce instream sedimentation

Partnerships

Listed below are the partners who assisted in developing this strategy. This list does not represent the entire scope of collaborative effort, as public input, focus groups, and landowner advisory groups, other agencies, and special interest groups were utilized at various stages of this document's development.

The organizations that directly contributed to the development of the watershed plan include:

- Idaho Department of Environmental Quality (IDEQ)
- Idaho Department of Fish and Game (IDFG)
- Idaho Office of Species Conservation (OSC)
- Idaho Soil and Water Conservation Commission (ISWC)
- Nez Perce County (NPC)
- Nez Perce Soil and Water Conservation District (NPSWCD)
- Nez Perce Tribe (NPT)
- NOAA Fisheries
- United States Department of Agriculture- Natural Resources Conservation Service (NRCS)

Public participation in the watershed planning and implementation process has included newsletters, direct mail to watershed landowners, and public meetings conducted through the NPSWCD's public meeting process. In addition, watershed advisory groups were used to review and identify natural resource improvement projects and strategies.

Document Organization

This document summarizes years of extensive technical work by many groups and community partners, and provides guidance in implementing watershed improvements. The Restoration Plan contains:

- Introduction (Chapter 1)
- Methods (Chapter 2)
- Fish habitat assessment (Chapter 3)
- Objectives (Chapter 4)
- Restoration Strategies (Chapter 5)

Significance to Regional Programs:

This plan proposes actions to specifically address factors that limit the abundance and productivity of lower Clearwater River A-run steelhead. The actions and limiting factors are consistent with those outlined in the documents listed below. An extended network of management, protection and restoration efforts, as well as fish and wildlife programs, exist for the Hatwai Creek drainage on the local, tribal, state and federal level. The regional efforts outlined below provide guidance for the basins within which the watershed falls.

This plan proposes restoration treatments for tributary habitats as mitigation for the Federal Columbia River Power System (FCRPS) and as part of recovery efforts for listed A-run steelhead trout. As such, the plan addresses components of the Pacific Northwest Electric Power Planning and Conservation Act and the Endangered Species Act. Implementation of this plan addresses numerous objectives and strategies identified throughout the Clearwater Subbasin Management Plan. (NPCC, 2005)

CLEARWATER SUBBASIN MANAGEMENT PLAN

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

The Subbasin plan identifies one priority management unit (PMU) within the Hatwai Creek (PR-6) watershed. The subbasin plan identified priority restoration issues for this PMU to include high stream temperatures, dewatering, and sedimentation (NPCC, 2005).

This plan specifically addresses the identified restoration issues in the subbasin plan through the implementation of restoration actions.

This plan is consistent with the Clearwater Subbasin Management Plan's vision for "a healthy ecosystem with abundant, productive, and diverse aquatic and terrestrial species, which support sustainable resource-based activities" (NPCC, 2005)

The five highest priority limiting factors within the Clearwater River Subbasin include: in-stream temperature, sedimentation, loss/disturbance or riparian habitats, change in vegetative structure, and alteration of environmental process. The plan addresses all of the identified five priority limiting factors.

2008 FCRP BIOLOGICAL OPINION (NMFS 2008)

This plan facilitates implementation of Reasonable and Prudent Actions (RPAs) called for in the 2008 Biological Opinion for the Federal Columbia River Power System (NOAA Fisheries, 2005). These RPAs include #149 address passage, screening, or flow problems, #152 support development of Clean Water Act Total Maximum Daily Load (TMDL) process, and #153 riparian buffers. Consistent with the requirements outlined in RPA Action 35, the Action Agencies committed to implement tributary habitat projects that improve habitat function quality by addressing limiting factors and threats for numerous Chinook and steelhead populations. These habitat improvements are expected to improve the egg-smolt survival of targeted populations.

THE NOAA SALMON AND STEELHEAD RECOVERY PLAN FOR STATE OF IDAHO (NMFS, 2011)

Hatwai Creek is identified as one of the six Minor Spawning Aggregation (MiSA) areas within the Lower Clearwater Basin (**Error! Reference source not found.**). This plan addresses the following restoration objectives identified in the Salmon Recovery Plan which are designed to improve habitat condition and bolster salmonid productivity:

(a) 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,

(b) 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,

(c) Improve water quality and geomorphic integrity by implementing watershed restoration and reducing accelerated sediment impacts in localized areas of the Lower Clearwater mainstem,

(d) 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, and

(e) Inventory existing roads (classified and unclassified) within the Lower Clearwater mainstem to identify watershed improvement activities, particularly in relation to fish passage.

The Lower Mainstem Clearwater is one of five extant populations within the Clearwater River MPG and Snake River Steelhead DPS and is classified as A-run. The Clearwater River MPG currently does not meet MPG-level viability criteria and at least three of the six populations need to be at viable status to satisfy these criteria.

Also, one of the criteria suggested for a viable MPG for the Clearwater River is the Lower Clearwater Mainstem must achieve viability since this is the only large-sized population left and because this is the only A-run population. The population's current status is "Maintained" with a desired status of "Viable". Actions identified in the recovery plan over the next 10 years are not likely to move this population to the desired status. The recovery plan stresses site-specific restoration priorities should be based on watershed plans based on fish distribution/abundance and habitat data. Actions recommended by the recovery plan included restore channel forming processes by reestablishing floodplains, increase riparian areas to create shade and LWD recruitment, reduce fine sediment, and increase access to historic spawning and rearing areas. Treatments proposed in this plan align with actions identified in the recovery plan.

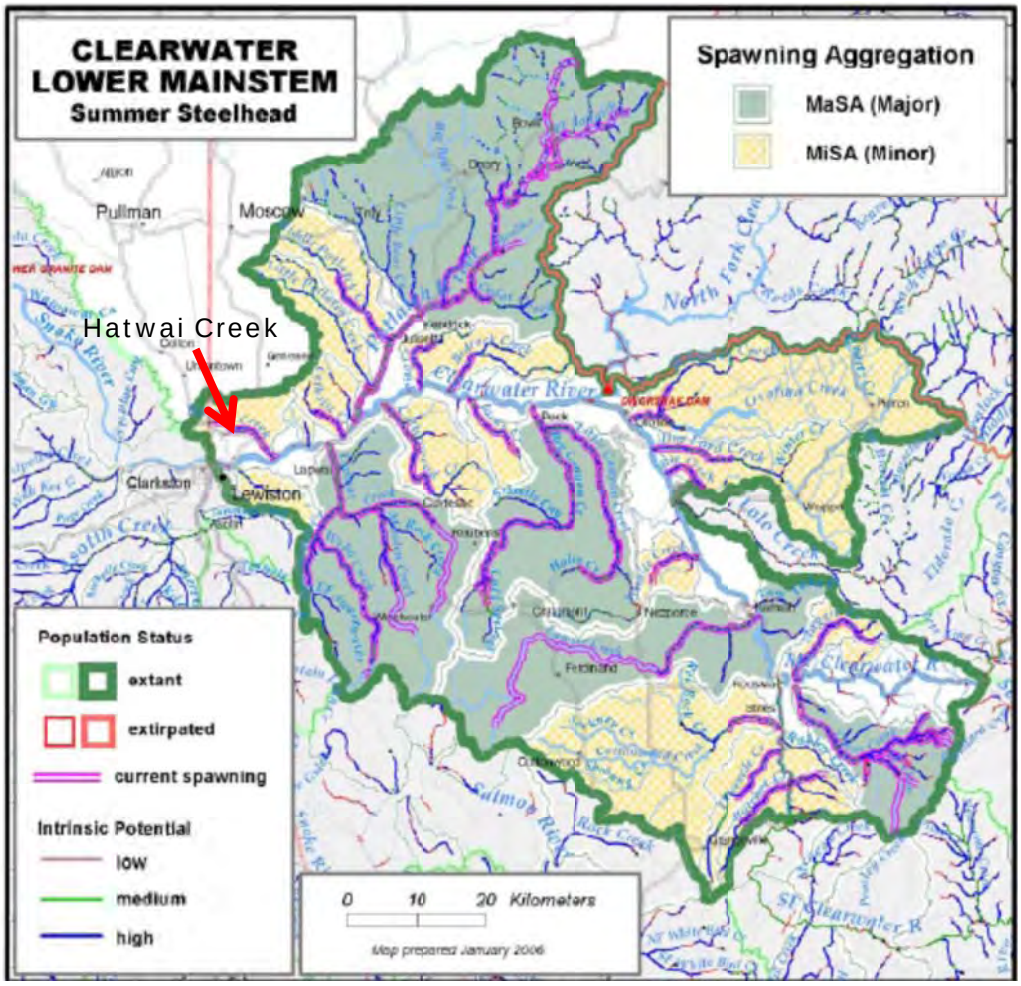


Figure 1 Major and minor steelhead spawning areas in lower mainstem Clearwater River

HATWAI CREEK TMDL AND TMDL IMPLEMENTATION PLAN

The ISWCC in coordination with the NPSWCD and the Hatwai/Lindsay/Tammany Creeks Watershed Advisory Group (WAG) developed the Hatwai Creek TMDL. The Hatwai TMDL identifies the following pollutants in the watershed:

- E.Coli bacteria with associated load reduction target of 68%
- Phosphorus associated load reduction target of 80%
- Nitrogen with associated load reduction target of 97%
- Temperature with lack of shade reduction target of 11%

Hatwai Creek is within the boundaries of this TMDL. The TMDL Implementation plan identifies the treatment needs on agricultural lands to meet the load reductions allocated by the Hatwai Creek TMDL. This plan implements actions identified in the TMDL implementation plan and will reduce pollutants identified in the plan, specifically phosphorus and temperature. Some nitrogen and bacteria reductions will also be achieved through planned treatment on animal feeding operations.

2006 COLUMBIA RIVER RESEARCH PLAN (NPCC 2006-03)

The Northwest Power and Conservation Council, as a part of their program, has identified restoration and ecosystem management principals. These principals are based on the understanding that ecosystems are dynamic, are controlled by biological and physical process (and humans), must maintain diversity, and that the focal species are integrally linked to the characteristics of their ecosystem (pg. 6). This ecosystem perspective drives restoration goals for the NPSWCD. Restoration goals focus on providing diverse habitats through culvert and barrier removals, restoring hydrologic process through floodplain restoration, and providing the habitat structure necessary for biological process to develop over time and space (instream habitat complexity and riparian plantings). Restoration projects are developed specifically to restore "habitats and habitat connectivity and on developing ecosystem conditions and functions that will support diverse species" as outlined by the NWCC (pg 14). This plan addresses critical uncertainties including, assessing the accuracy of limiting factors in individual watershed (pg. 15), developing projects that will help ameliorate effects of climate change in watersheds (pg. 19), addressing invasive species for ground disturbing activities (pg. 20), and addressing toxins for those projects, such as mining restoration, that have the potential to expose historic toxins in the watersheds (pg. 20).

IDAHO STATE LINKS

In addition to these federal linkages, this plan simultaneously supports the implementation of several State of Idaho programs, processes and plans.

This plan is consistent with the established priorities and recommendations within the Idaho Agriculture Pollution Abatement Plan (Ag Plan). The goal of the Ag Plan is to “contribute toward full support of identified beneficial uses through enhancement and maintenance of the quality of surface and ground waters of Idaho, to the extent that they are impacted by agricultural nonpoint source pollutants” (ISCC 2003, p. A-1). Many of these listed nonpoint pollutants (e.g., sediment) affect steelhead habitat within the watershed.

The NPSWCD, by state law, has the responsibility to provide assistance to private landowners in the conservation, improvement, and enhancement of Idaho’s natural resources. The NPSWCD’s annual work plan and the 5-year conservation plan prioritize restoration of anadromous fish habitat within the Lower Canyon Tributaries geographic area, of which Hatwai is included. This restoration effort occurs with the development of resource conservation projects on private lands using voluntary, incentive-based programs.

The NPSWCD, and supporting state and federal agencies, will address A-run steelhead habitat issues through the development, adoption and implementation of the Hatwai Creek Watershed Restoration Plan. The Hatwai.plan development process, and related assessment and inventory efforts, was part of the Idaho Governor’s Office of Species Conservation Pacific Salmon Recovery Program, funded by the U.S. Fish and Wildlife Service, in 2011 (Project #00709).

CHAPTER 2: METHODS

This watershed restoration plan was developed using methods adapted from the *Oregon Watershed Assessment Manual* (Oregon Governor's Watershed Enhancement Board, 1999) and the *Environmental Protection Agency's Handbook for Developing Watershed Plans to Restore and Protect Our Waters* (EPA, 2008).

A technical team consisting of scientists from local, state, federal and tribal agencies was convened to review data, select steelhead limiting factors, and prioritize restoration strategies. Local landowners were consulted in the selection of restoration strategies. The steps used to complete the restoration plan are outlined below.

Compile existing information

A literature review was completed by searching NPSWCD archives, the University of Idaho Library, and an internet search for relevant data or information pertaining to Hatwai Creek. This effort resulted in the collection of past watershed studies conducted within the watershed including:

- Pesticide Residue Evaluation conducted in 2012 by Idaho State Department of Agriculture (ISDA, 2013)
- Hatwai Creek TMDL Agricultural Implementation Plan developed by ISWCC (ISWCC, 2011)
- Hatwai Creek Subbasin Assessment and TMDLs (Lower Clearwater HUC 17060306) conducted in 2010 by the Idaho Department of Environmental Quality (IDEQ, 2010)
- Stream temperature data collected by NPSWCD from 1998 through 2012 and in 2013 was summarized (Fales & Stubbers, 2013, Larson & Rasmussen, 2014).

A call for data was sent to agencies and organizations within the region. Data obtained during this effort included water quality data from IDEQ and fish distribution and abundance data from the IDFG and IDEQ.

Collect additional resource data

Additional resource data was collected during the planning process. Each data set is briefly described below.

STREAM TEMPERATURE ANALYSIS

Previous data had been collected at the five locations within the watershed primarily near the mouth of the watershed and where the stream intersects Highway 95. Data was collected according to the Nez Perce Soil and Water Conservation District's Stream Temperature Monitoring Protocol (Rasmussen & Knoll, 2014). The 2013 data is summarized in the Nez Perce County Stream Temperature Monitoring Data Summary – 2013 (Larson & Rasmussen, 2014)

TURBIDITY ANALYSIS

Turbidity data was collected at the mouth of Hatwai Creek in 2011, 2012, and 2013. Data was collected according Nez Perce Soil and Water Conservation District's Turbidity Monitoring Protocol (NPSWCD, 2013). Data is summarized in The Nez Perce County

Turbidity Monitoring 2013 Results report (Osborne, 2014) and the Nez Perce County Turbidity Monitoring 2011-2012 Results Report (Fales, 2012).

STREAM HABITAT INVENTORY AND ASSESSMENT

A stream inventory and assessment was conducted along streams and flowpaths in Hatwai Creek. This field level exercise followed the Nez Perce Soil and Water Conservation District's Stream Assessment Methodology protocol (NPSWCD, 2012). Data is summarized in the Lower Canyon Tributaries Stream Inventory and Assessment report (Dau & Rasmussen, 2014).

FISH DISTRIBUTION AND ABUNDANCE

Fish distribution and abundance data has been collected by the IDFG and DEQ in the 1990s to monitor the response of trout to restoration of fish habitat and canopy cover along Hatwai Creek during this time (IDEQ, 2010).

Selection and identification of fish limiting factors

The Hatwai 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 steelhead 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.

Goal and objective determination

A technical team consisting of local scientists as well as landowner representatives reviewed the available data as well as selected limiting factors and developed a set of goals and objectives. Goals and objectives were based upon those identified in the Clearwater Subbasin Plan (NPCC, 2005), the Hatwai Creek TMDL Agricultural Implementation Plan (ISWCC, 2011) and the Lower Canyon Tributaries Management Plan (NPSWCD, Draft 2014). Goals and objectives are discussed in Chapter 3.

Selection of restoration strategies

Restoration strategies were selected by reviewing strategies used in similar watersheds within the Clearwater and Snake River drainages as well as those identified in the Clearwater Subbasin Plan, the Hatwai Creek TMDL Agricultural Implementation Plan (ISWCC, 2011), and the Lower Canyon Tributaries Management Plan. Treatments to address the identified limiting factors are discussed in Chapter 5. Treatment types and extents were developed based upon protocols in the Oregon Watershed Assessment Manual and the USDA Natural Resources Conservation Service planning manual.

Prioritization rationale

Treatment prioritization was identified based upon fish distribution and abundance data and areas identified in the stream assessment and inventory. Priorities are identified in Chapter 5.

CHAPTER 3:
FISH HABITAT ASSESSMENT

The physical characteristics of the watershed are described in detail in the Hatwai Creek TMDL Agricultural Implementation Plan (ISWCC, 2011). This chapter expands on the previous efforts and focuses on those parameters of the watershed that are important to fish.

Watershed Background

Hatwai Creek watershed confluence is located 7.2 miles east of Lewiston, Idaho. The Hatwai Creek watershed encompasses Whitman County, Washington (15%-3,140 acres), and (85%-17,795 acres) Nez Perce County, Idaho. The majority of the land within the watershed is privately owned (97%). For more information on the watershed background refer to (ISWCC, 2011, pp. 4-5).

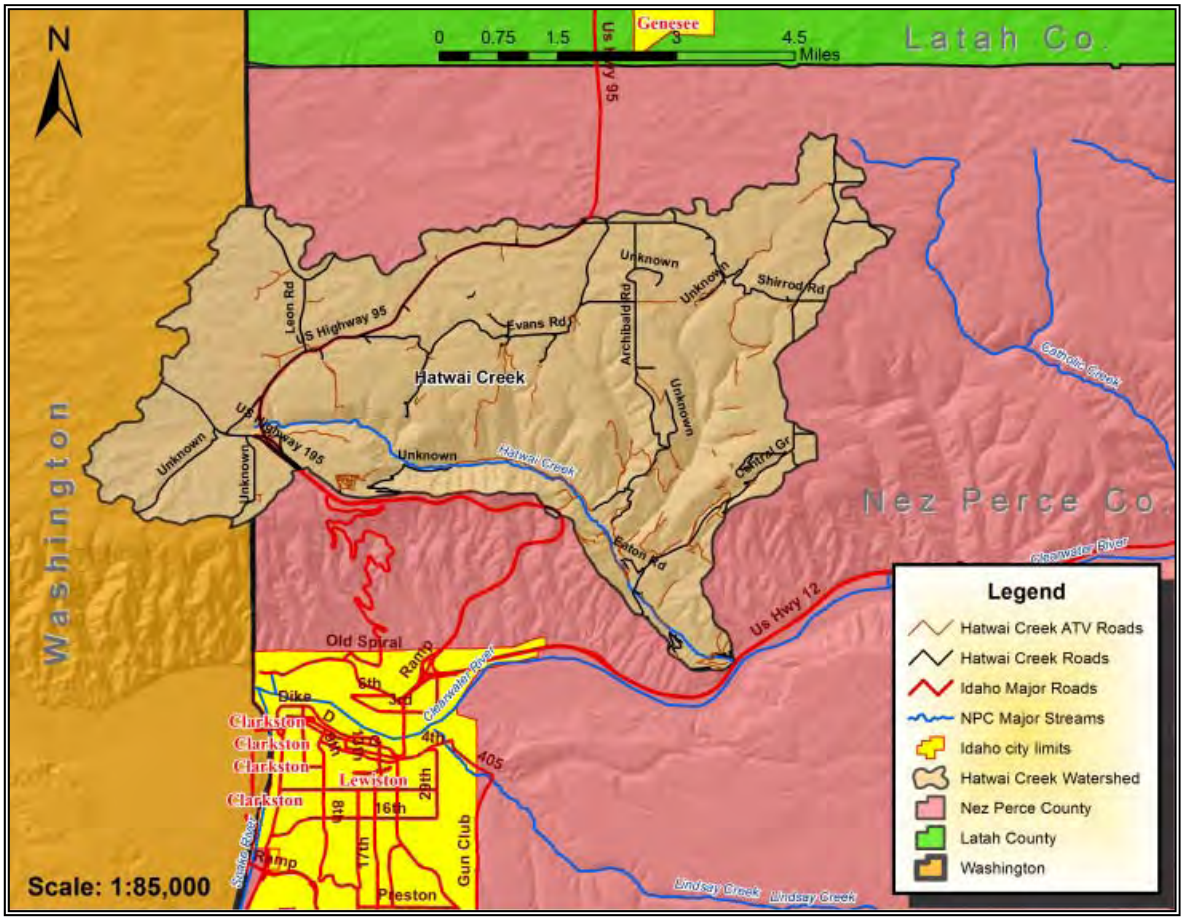


Figure 1. Hatwait Creek watershed location

Vegetative Resources

LAND COVER

Land cover is primarily cropland (63%) and grasses (33%) with remaining land as forest and shrubland (2%) and developed or rural areas (2%). Detailed land cover information can be found in (ISWCC, 2011, p. 9)

RIPARIAN AREAS

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

A total of 50 miles out of 66 riparian zone miles have poor or fair riparian cover (Kayla Dau, 2014)(Figure 3). NOAA Fisheries identifies Riparian Condition as one of the most important limiting factors to salmonid productivity. NOAA also lists a lack of large woody debris recruitment as a major contributor to a decrease in salmonid habitat complexity (National Oceanic and Atmospheric Administration , 2012). Detailed riparian information can be found in (ISWCC, 2011, p. 21)

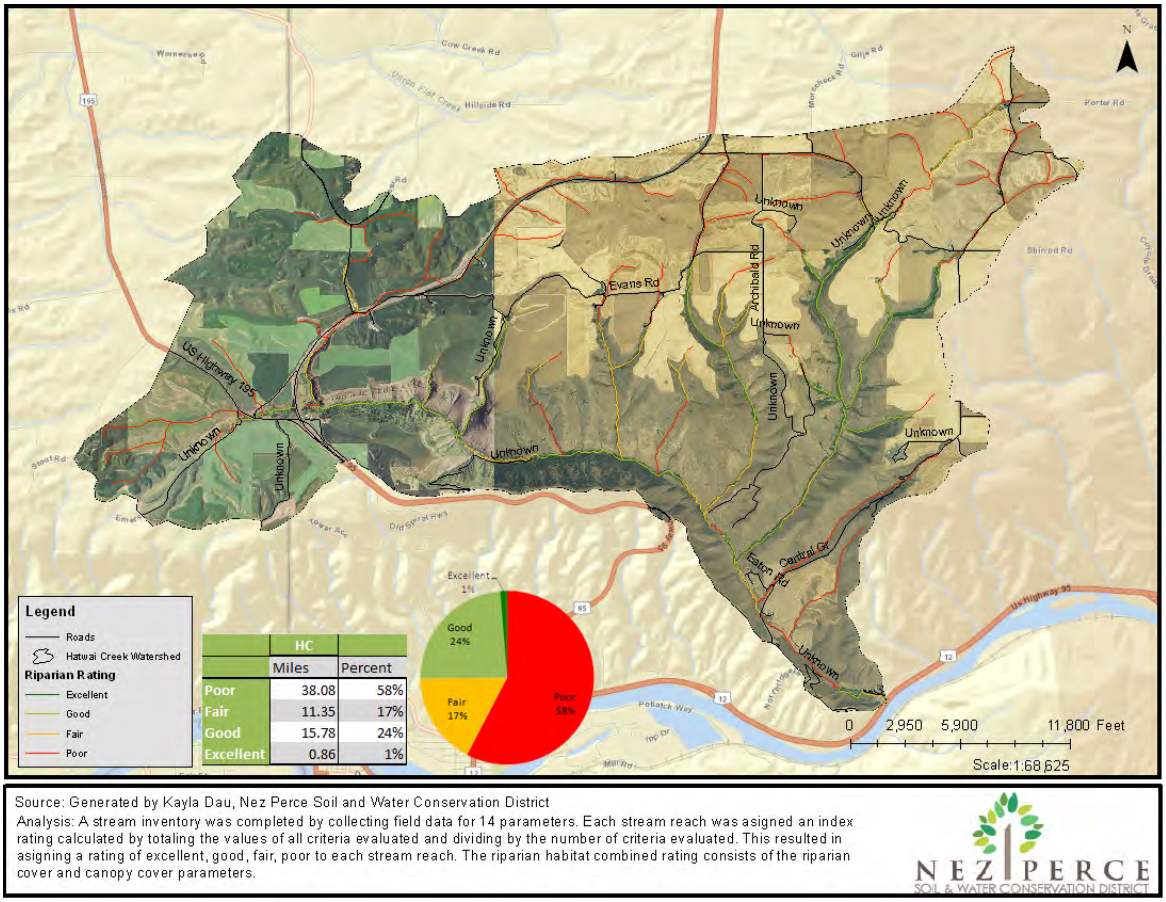


Figure 2. Hatwai Creek Riparian reaches

WETLANDS

Wetlands within the Hatwai Creek watershed have been degraded through grazing, roads, and draining for agricultural production. Some important functions of wetlands in a watershed may include, but are not limited to: water quality improvement, flood attenuation and desynchronization, groundwater recharge and discharge, and fish and wildlife habitat.

A total of 85 acres of wetland have been recorded in the Hatwai Creek watershed with the majority occurring in the agricultural headwaters. There are four types of wetland including: freshwater emergent wetlands, freshwater forested/shrub wetlands, freshwater pond, and riverine. Freshwater forest/shrub wetlands and freshwater emergent wetlands are the predominant wetlands within the Hatwai Creek watershed.

Wetland areas were identified from two sources; the US Fish and Wildlife Service's National Wetland Inventory (Figure 3) and the hydric soils designation from the USDA-NRCS soil surveys (Figure 4). The wetland inventory defines areas where the current wetland vegetation exists. Hydric soils contribute to groundwater recharge, therefore increasing water retention, in addition to having hydric characteristics to support riparian and wetland vegetation. Both the wetland inventory and the hydric soils tend to have overlap in describing wetland conditions. Hydric soil mapping indicates there are more wetland areas than currently exist. Therefore, areas of hydric soils that are not currently under wetland vegetation are a priority for restoration.

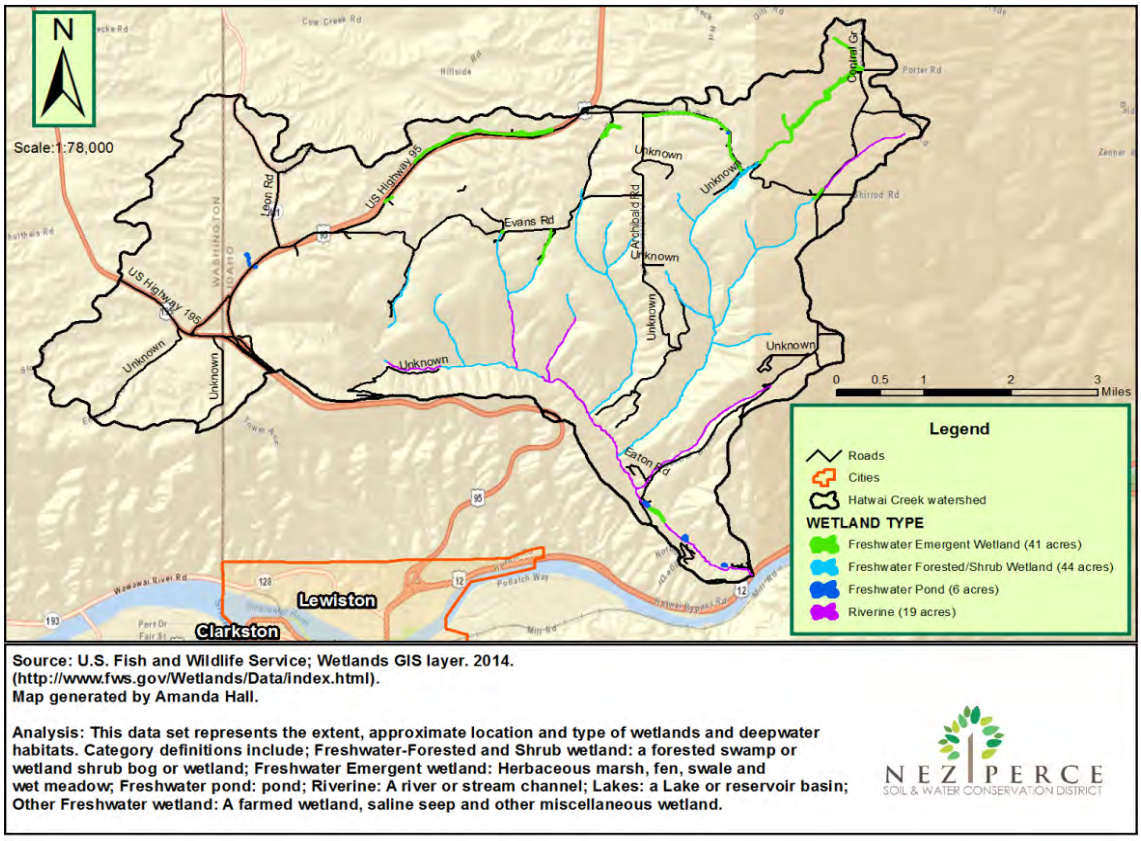


Figure 3. Hatwai Creek watershed wetlands

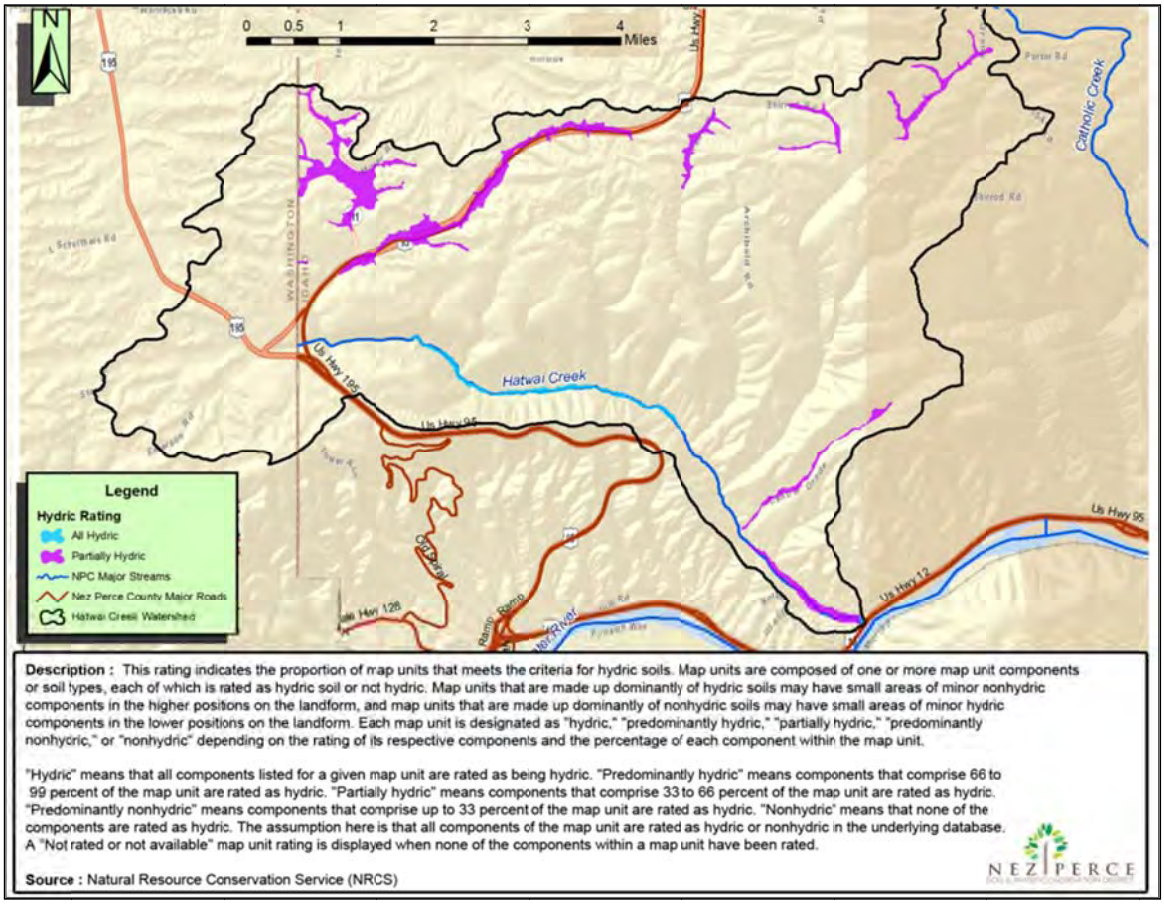


Figure 4. Hatwai Creek hydric soils

Floodplains

A floodplain is the alluvial surface adjacent to the stream channel that is frequently inundated during run-off or precipitation events. A stream's connection to its floodplain allows the stream to dissipate excess energy during high flow events that would otherwise scour or downcut the stream channel. The inundation of the floodplain provides backwater habitat for young, small salmonids, while storing water that then seeps back into the stream during drier periods when stream flows decrease. Floodplains also allow the stream to deposit fine sediment outside the channel, which reduces the impact of fine sediment on fish. For these and other reasons, NOAA Fisheries has identified Floodplain Condition as a key limiting factor to salmonid productivity. Dikes, diversions and intentional straightening of the channel (channelization) all impair a stream's ability to connect with its floodplain and reduce available salmonid habitat.

Nez Perce County floodplain ordinances restrict development within floodplains adjacent to mainstem Hatwai. Hatwai Creek has little access to it natural floodplain in the upper watershed where it has been channelized for the ease of farming. Additional floodplain impacts include roadways and dikes. Floodplain impacts within Hatwai Creek include roads constructed within floodplains, dikes and levees (mostly within lower three miles), and channel incision.

Land Use

The land uses that are most predominant in the Hatwai Creek watershed are cropland (63%) and rangeland (33%). The remaining land uses include shrubland and forest (2%) developed areas (2%), hay and pastures (<1%). Detailed land use in the Hatwai Creek watershed is described in the Hatwai Creek TMDL Agricultural Implementation Plan (ISWCC, 2011, p. 9).

ROADS

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

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

Road density and distribution throughout the lower Clearwater is typically less than 3 miles/square mile. Higher road densities are associated within the Cities of Lewiston and Orofino, Idaho.

Road density of the Hatwai Creek drainage averages 3.1 miles road/mile^2 (Figure 5) Although this density is below average compared to other drainages in the Lower Clearwater (4.4 miles road/mile^2), increased sedimentation and stream channel modifications on salmonid spawning and rearing habitat as a result of roads and road construction are still of concern and the watershed is defined as “poorly functioning” (NMFS, 1996).

Rural roads as potential sediment sources were defined in the Hatwai Creek watershed as roads within 200 LF of the stream (Larson, Hall, & Rasmussen, 2014). A sediment source survey identified 23.9 miles (26%) of road within 200 LF of the stream. Of these roads, 5.5 miles (6%) exceeds a 20% slope into the drainage.

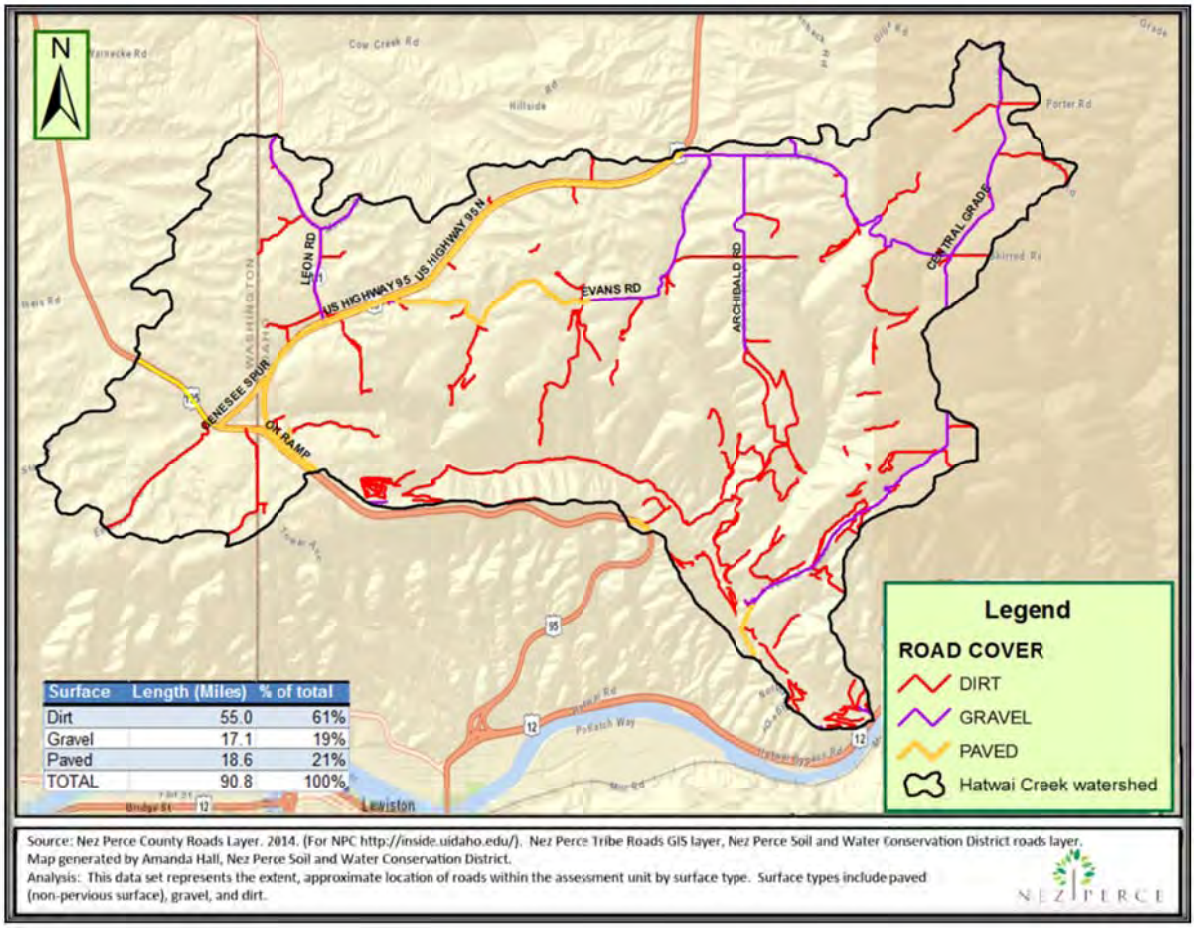


Figure 5. Road density in the Hatwai Creek watershed

Water Resources

WATER QUALITY

Beneficial use designations for Hatwai Creek include secondary contact recreation, cold water aquatic life, and salmonid spawning. Hatwai Creek was identified as a first priority stream segment through the Idaho Agriculture Pollution Abatement process, suggesting significant water quality impacts from agricultural practices. Pollutants within the Hatwai Watershed include temperature, nutrients, and bacteria. More detailed regarding surface water quality can be found in the Hatwai Creek watershed TMDL Plan for Agriculture (ISWCC, 2011).

GROUNDWATER

The Hatwai Creek watershed overlies the Clearwater Plateau ground water system. The aquifer is the Clearwater uplands flow system is within the Columbia River Basalts that flowed into the valley lowlands forming the Clearwater Embayment. The flow system is likely composed of isolated saturated zones of limited extent. Yields to wells are probably low and depths to groundwater may vary considerably. Recharge is probably from downward percolation of precipitation and snowmelt, and leakage from streams

that intersect permeable zones within the basalts. Throughout the Clearwater Plateau area, groundwater is found to occur in three primary locations below the surface of the earth: 1) in fractures in rock bodies, 2) in the pore spaces of sedimentary material, and 3) in the interflow zones of basalt flows (IDWR, 1976). A total of 13 wells are located in Hatwai Creek watershed with depths ranging from 175 to 960 feet (Figure 6).

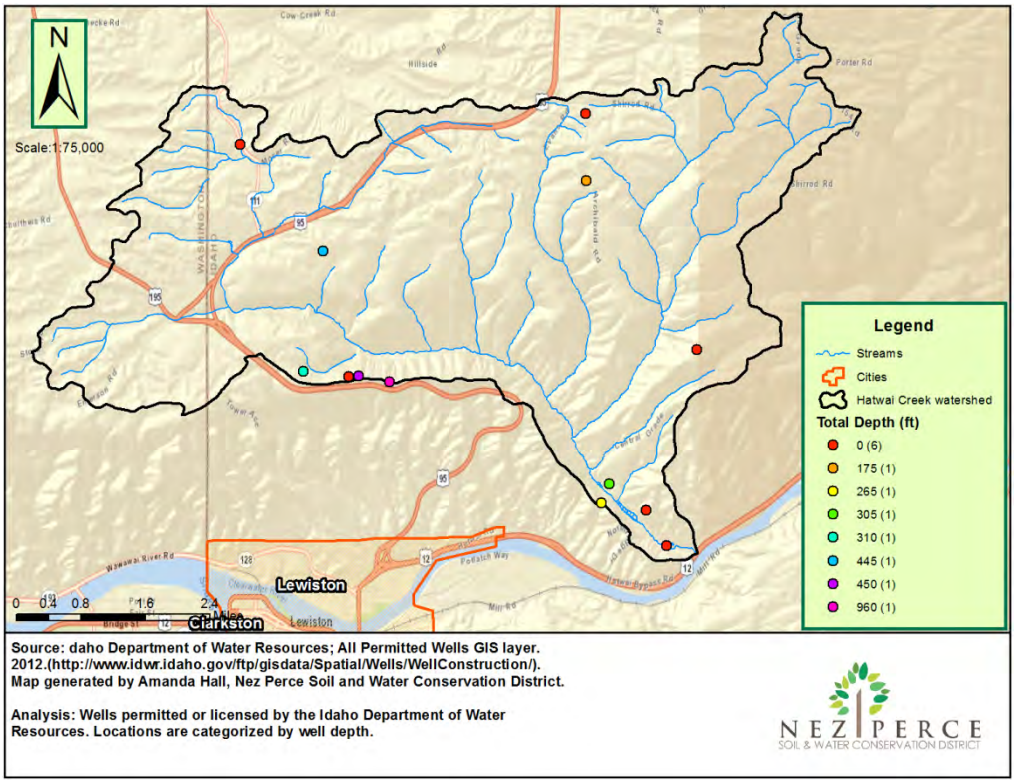


Figure 6. Hatwai Creek watershed wells and well depths

HYDROGRAPHY

The mainstem Hatwai Creek originates at near Shirrod Hill along Highway 95 in Nez Perce County, Idaho. The Hatwai Creek watershed derives its flow from a network of tributaries. The watershed's hydrology and stream network are detailed in a separate report, *The Hatwai Creek Watershed Hydrology Analysis* (Teasdale G. N., 2014).

The hydrological regime of a watershed is the foundation for all stream function. Significant land cover alterations throughout the drainage have resulted in dramatic changes to watershed runoff and peak discharge following storm events.

FLOW REGIME

Surface water flows are typically largest in March or April, decreasing significantly in the summer months. Sections of Hatwai Creek with channel instability are noted to flow subsurface during summer base flow periods.

The headwaters of Hatwai Creek have been hydrologically modified in order to promote drainage from croplands. Headwater stream segments have been drained and channelized, which creates higher peak flows in the spring by decreasing the

headwaters' holding capacity. The decrease in holding capacity also creates diminished base flows and contributes to lower reaches becoming de-watered entirely during the hottest months of the year. NOAA Fisheries identifies this type of modification to the hydrologic regime as key limiting factors to salmonid productivity—Increased Water Quantity and Altered Flow Timing (NOAA 2012).

The prediction interval reported for Hatwai Creek is not unusual for peak flow statistics in Idaho. Baseflow hydrology can be found in the Hatwai Creek watershed TMDL Implementation Plan for Agriculture (ISWCC, 2011)

STREAM CLASSIFICATION

As part of the watershed planning effort Hatwai Creek's stream were characterized as perennial or intermittent. It is often difficult to differentiate perennial and intermittent streams in semiarid regions without actually observing the streams during period of low flow.

Several sources were considered in identifying the perennial and intermittent stream segments with the reconditioned National Hydrography Dataset (NHD) chosen as the source for planning purposes. The NHD identified 68 miles of flow lines in the Hatwai Creek watershed, with a stream density of about 2.0 stream miles per square mile of watershed area (Teasdale G. N., 2014). Of these, 18 miles are considered perennial (Figure 7).

The majority of the streams within the watershed are intermittent, however, the lower eastern drainages and the main stem of Hatwai Creek are perennial (Figure 7).

Classification of streams into perennial, intermittent and ephemeral types does not convey the importance of stream channels as aquatic habitat. Regardless of flow duration, stream channels that have been formed by geologic and hydrologic process over extended periods of time provide habitat diversity and support ecological niches that are not present elsewhere in the watershed landscape (Teasdale G. N., 2014).

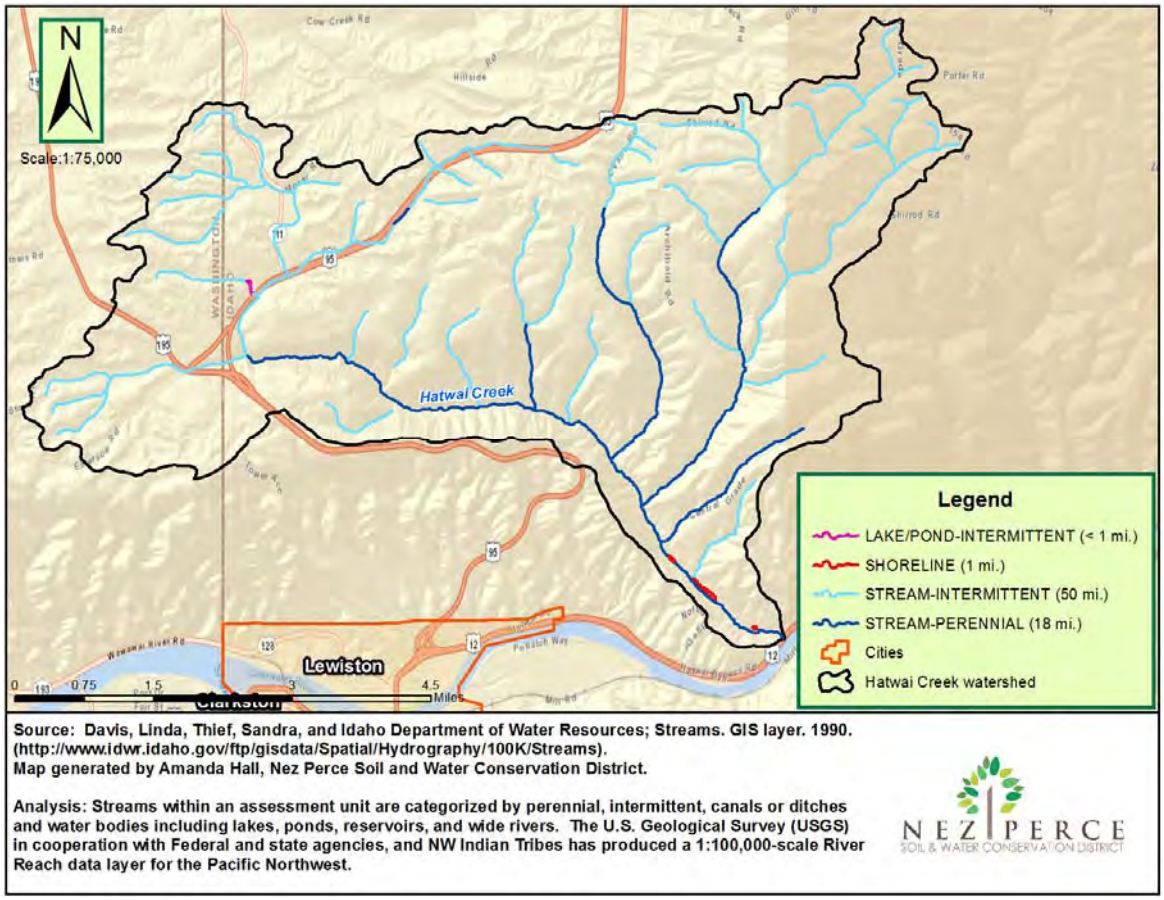


Figure 7. Hatwai Creek watershed streams

MODELED HYDROLOGY

A hydrological analysis was conducted as part of the watershed planning effort (Teasdale G. N., 2014). The objective of the analysis was to estimate peak runoff for selected annual exceedance probabilities (return periods) for the current and possible future land cover conditions for the watershed. There are no stream gages or metrological stations in the watershed so it is not possible to reconstruct the hydrology of past runoff events or develop hydrological statistics directly from measured data. For this reason runoff volumes were determined using hydrologic modeling software.

Hatwai Creek's annual peak discharge varies from 339 cfs for a 2-year return period to 2410 cfs for a 100-year return period (Teasdale G. N., 2014). The average monthly discharge for August (low flow conditions) is estimated at 0.49 cfs and peak flow volumes of 2.11 cfs in March (Teasdale G. N., 2014). The analysis showed that fire affects in the watershed could increase peak runoff rates by 10%.

Table 1. Hatwai Creek outlet USGS NSS Peak-Flow Streamflow Statistics

[A]Drainage area 32.7 sq. mi., mean basin elevation 2,480 ft.

Return Interval (years)	Annual Exceedance Probability (percent)	Discharge (cfs)[A]	Prediction Error (percent)	90-Percent Prediction [illegible][A]	
				Minimum	*Maximum*
2	50%	339	69	117	984
5	20%	727	49	326	1620
10	10%	1070	44	511	2220
25	4%	1560	43	757	3230
50	2%	1970	44	935	4170
100	1%	2410	46	1100	5300

Table 2. Hatwai Creek NSS Monthly and Annual Streamflow Statistics

Exceedance Probability	Average Monthly Discharge (cfs)[A]											
	Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*
20%	30.4	9.98	11.30	4.28	3.99	1.42	0.82	0.75	0.81	0.89	1.65	7.03
50%	6.37	4.83	5.12	1.57	1.61	0.92	0.67	0.64	0.69	0.77	0.83	10.7
80%	1.11	2.11	1.71	0.88	0.95	0.69	0.56	0.49	0.48	0.59	0.72	0.86
Annual:	3.48											

[A]Watershed parameters are outside the range allowed by regression analysis

Table 3. Hatwai Creek NSS Low-Flow Streamflow Statistics

Low Flow Statistic	Discharge (cfs)
1-day 10-year[A]	0.20
7-day 10-year[B]	0.29
7-day 2-year[C]	0.52
30-day 5-year[D]	0.55

[A]1-day mean low flow that occurs on average once in 10 year
[B]7-day mean low flow that occurs on average once in 10 year
[C]7-day mean low flow that occurs on average once in 2 years
[D]30-day mean low flow that occurs on average once in 5 years

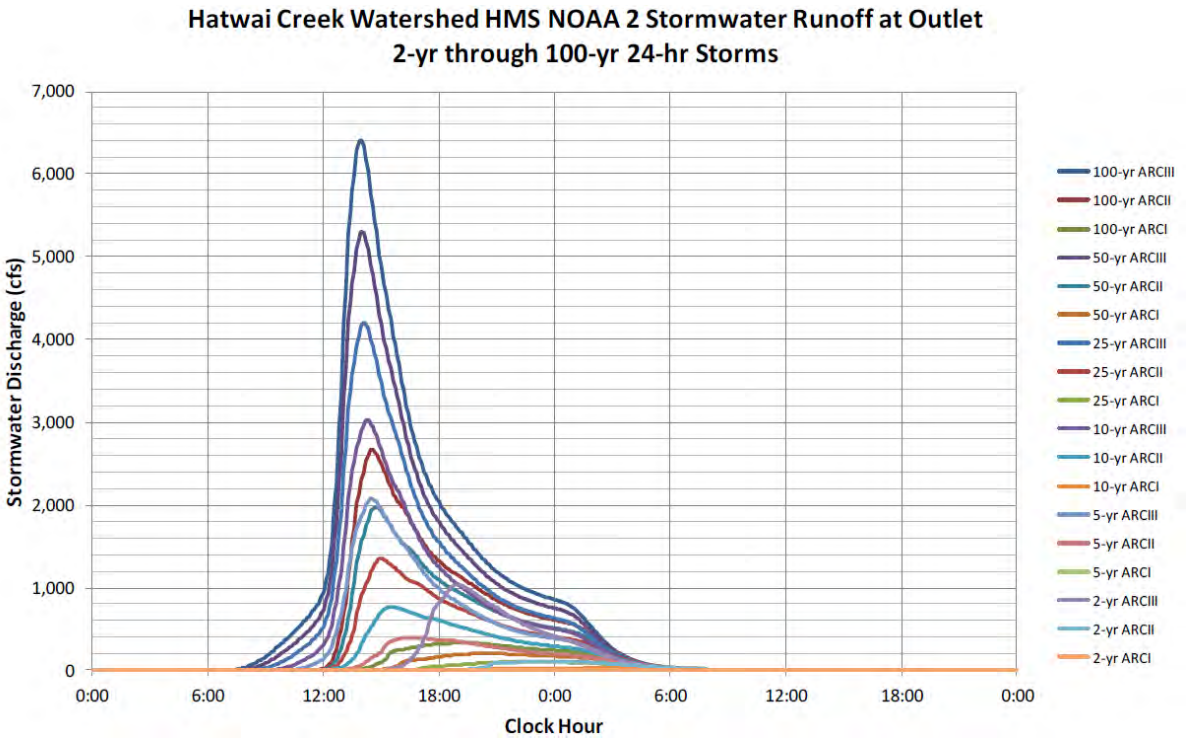


Figure 8. Runoff hydrographs for the outlet of Hatwai Creek watershed for the 24-hour precipitation frequency storms (Teasdale G., 2014)

WATER USE

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

There are currently 50 water rights held in the Hatwai Creek watershed, the majority of which use groundwater as the diversion. An analysis of the IDWR data shows that the majority (44%) of diversions are from groundwater sources, while 34% are from streams (Table 4, Figure 9) (IDWR, 2012).

Each diversion point's maximum allowed diversion rate is illustrated in Figure 10. Diversion rates range from 0.02 to 0.76 cfs with a total of 4.00 cfs permitted for diversion within the watershed. An analysis of the total allowed diversion by sources show that water diverted from stream sources (both Hatwai Creek as well as unnamed stream) is 39% of the total (Table 4).

Low flows are one of the limiting factors for fish habitat in this watershed. Based upon review of the water rights allocations, the Technical Team recommends further investigation of actual water use and feasibility of returning some of the diverted water to the stream.

The majority of water diversions are used for domestic and agricultural purposes. Agricultural uses are mainly livestock water with minimal acres of irrigated crop production.

Table 4. Hatwai Creek watershed point of diversion by source

Category (Source)	Count	Percent	Volume (cfs)	Percent
Groundwater	22	44	1.11	28
Hatwai Creek	7	14	1.54	39
Spring(s)	11	22	1.15	24
Unnamed Stream	10	20	0.20	5
Totals	**50**	**100**	**4.00**	**100**

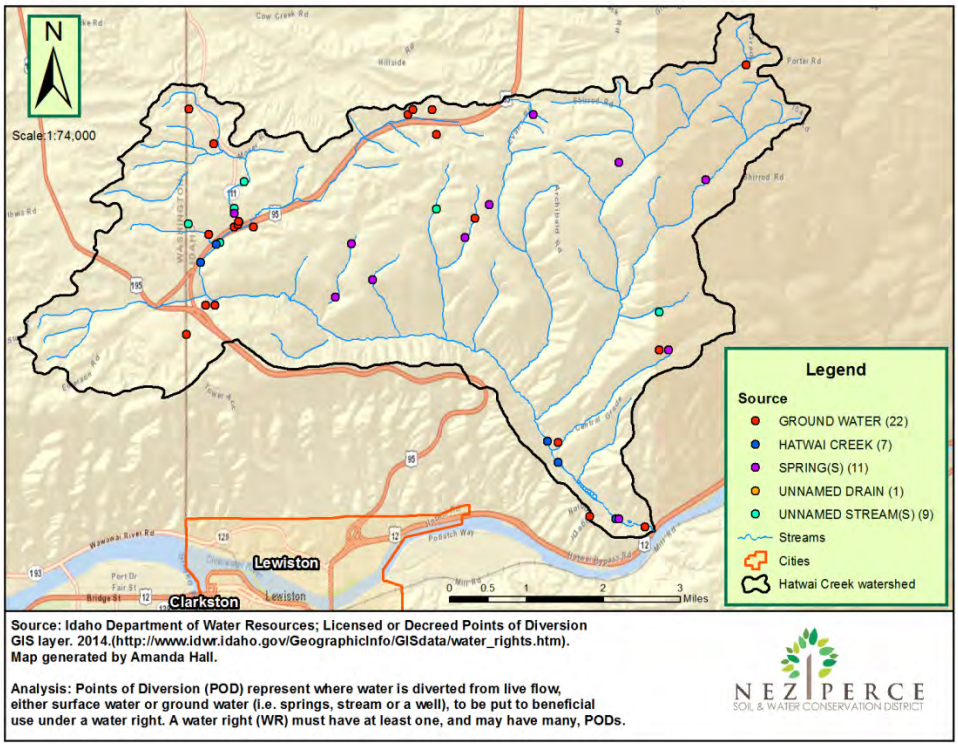


Figure 9. Hatwai Creek watershed points of diversion

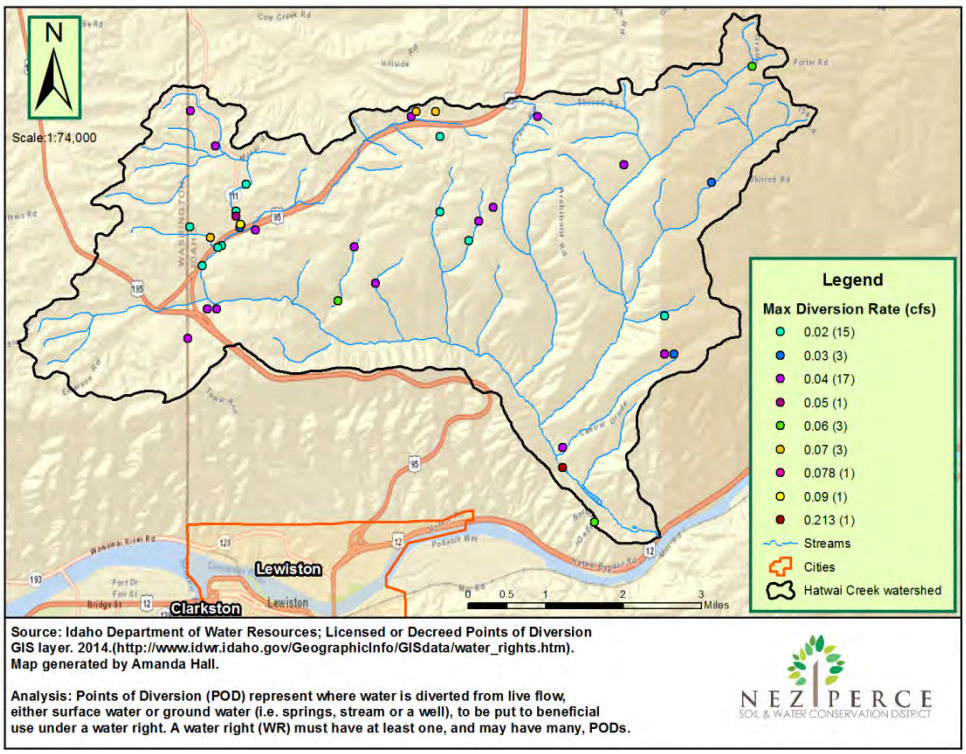


Figure 10. Hapwai Creek watershed maximum diversion rate by points of diversion

Fish Resources

The lower Clearwater is critical habitat for wild steelhead and fall Chinook salmon within the Clearwater subbasin, including all or a substantial majority of range in the subbasin. Spring Chinook salmon are not known to use the lower Clearwater except as a mainstem migration corridor; likewise bull trout and westslope cutthroat trout are most often found in the mainstem Clearwater River. Steelhead was selected as the primary focal species for the Hatwai Creek watershed based upon the documentation of their presence within the system.

The Interior Columbia Technical Recovery Team (consortium of scientists) identifies the Lower Clearwater River and its tributaries as among the few areas in the Snake River basin having predominantly wild steelhead production with limited hatchery influence (NMFS 2006).

According to archeological evidence, the mouth of Hatwai Creek has been used as a fishery for thousands of years. The Idaho Department of Fish and Game considers Hatwai Creek critical habitat for threatened anadromous steelhead. IDEQ stream survey fishing efforts in 1996 and 1998 recorded rainbow trout, shiners, dace and suckers. IDEQ's determination was that both the salmonid spawning and cold water aquatic life beneficial uses were fully supported in the stream's lower section (IDEQ, 2010).

In the late 1990's, restoration efforts were initiated to improve fish habitat and canopy cover along Hatwai Creek . The Idaho Department of Fish and Game monitored the responses of trout to these restoration activities. Results, for 1995 to 1998, from a demonstration project indicate that trout density increased annually. Trout density in the project area rose from 0.32 per 100 square meters (100 m^2) in 1995 to a high of 13.24/100 m^2 in 1998; in the control area, trout density was 0.87/100 m^2 in 1996, 3.00/100 m^2 in 1997, and 3.06/100 m^2 in 1998.

The improvement was attributed to enhanced riparian conditions that included stabilized stream banks, more canopy cover, and reduced stream temperatures (IDEQ, 2010).

STATUS AND IMPORTANCE OF STEELHEAD

The Hatwai 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.

Fish data indicates steelhead presence within the Hatwai Creek drainage. Steelhead habitat requirements, relative to other fish species in the watershed, are fairly specific. Habitat conditions adequate for supporting productive populations of steelhead will help ensure high-quality habitat for other aquatic biota as well; in this way, they may be considered an indicator species.

Most significant to Hatwai Creek and the scope of this management plan are the ESA listed Snake River steelhead (*Oncorhynchus mykiss*) that currently use the watershed for spawning and rearing. After researching the available literature, collecting data, and reviewing the existing data on Hatwai Creek, the NPSWCD then compared the suite of findings to NOAA Fisheries' Ecological Concerns, finding direct correlation between several of the fisheries limiting factors identified by NOAA Fisheries and the existing conditions in Hatwai Creek. Given the current water and habitat quality in Hatwai Creek, steelhead found there exhibit the ability to survive environmental conditions which include frequent droughts and relatively high summer temperatures. A robust population of steelhead possessing the ability to survive such adversities would be of great importance to the region.



Limiting Factors

Limiting factors refer to those habitat parameters which limit a population's viability and productivity. In 2011 NOAA fisheries created a standardized set of limiting factors for steelhead that are used region wide. The Lower Canyon Tributaries limiting factors were originally selected by an expert panel process in 2012. Hatwai Creek is included within the Lower Canyon Tributaries. Through the development of this watershed plan the Hatwai Creek limiting factors were further evaluated and prioritized by the Technical Team.

In 2008 the Federal Columbia River Power System (FCRPS) developed a Biological Opinion (BiOp) detailing habitat improvements aimed at steelhead. One of the actions identified in the BiOp requires the convening of expert panels to evaluate habitat quality and identify limiting factors. The Expert Panel met in 2012 and defined the steelhead limiting factors for the entire Clearwater Subbasin, which consists of 36 geographic areas (Figure 12). Hatwai Creek is within the Lower Canyon Tributaries geographic area shown in red in Figure 12 and also referred to as LCS6B. Hatwai Creek is one of the 16 assessment units identified in the Lower Canyon Tributaries geographic area (Figure 11).

There are a number of limiting factors that have contributed to the decline of productivity for Snake River Steelhead in the Hatwai Creek watershed are listed in Table 5 and discussed below. The Technical Team prioritized these factors as they apply to Hatwai Creek. Each applicable limiting factor discussion includes the benchmark criteria and the current status in meeting the identified benchmark.

Table 5. Hatwai Creek Limiting Factors Priorities

Limiting Factor	Tech. Team Priority
1.1 Habitat Quantity: Anthropogenic Barriers	Low
4.1: Riparian Conditions: Riparian Vegetation	High
6.1: Channel Structure and Form: Bed and Channel Form	Low
6.2: Channel Structure and Form: Instream Structural Complexity	High
7.2: Sediment Conditions: Increased Sediment Quantity	High
8.1: Water Quality: Temperature	Low
9.1: Water Quantity: Increased Water Quantity	High
9.2: Water Quantity: Decreased Water Quantity	High

WHO IS THE EXPERT PANEL

Expert Panels are comprised of:

- representatives from sovereign States and Tribes
- the Action Agencies
- NOAA Fisheries

WHO IS THE TECHNICAL TEAM

The technical team is comprised of local scientists. The Technical Team for the Lower Canyon Tributaries, including Hatwai Creek, is as follows:

- Clint Chandler, Nez Perce Tribe (NPT)
- Damon Keene, Idaho Department of Fish and Game (IDFG)
- Bob Reis, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries)
- Janet Hohle, Idaho Governor's Office of Species Conservation (OSC)
- Greg Teasdale Ph.D., Private Consultant, channel stability specialist (Teasdale)
- Lynn Rasmussen, Nez Perce Soil and Water Conservation District (NPSWCD)
- Rob Sampson, USDA - Natural Resources Conservation Service

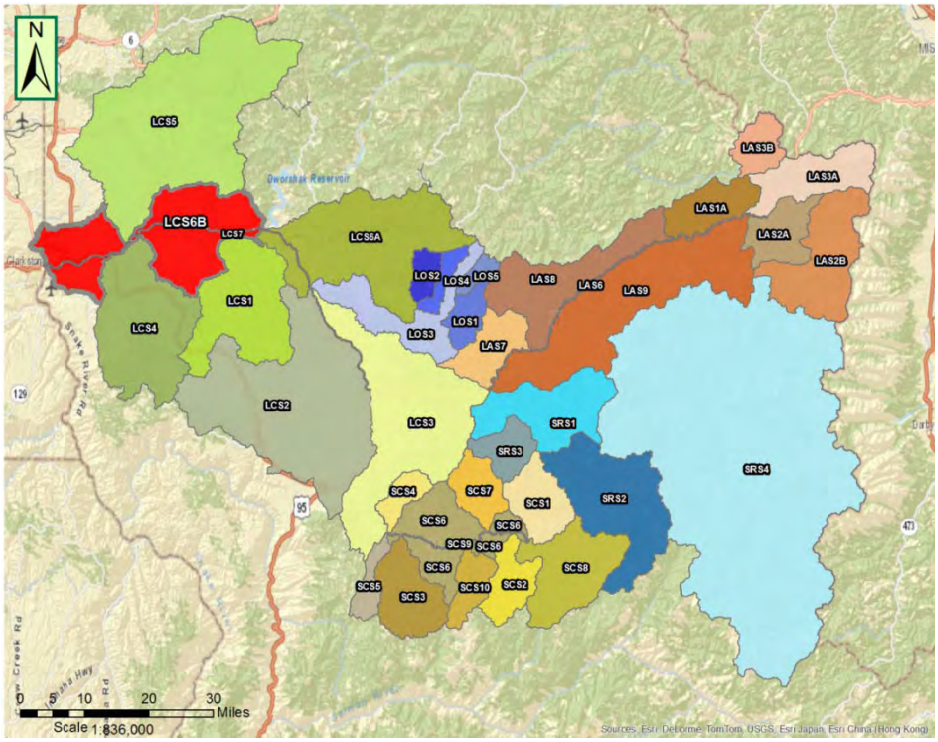


Figure 11. Clearwater Subbasin Geographic Areas – Lower Canyon Tributaries is identified in red and denoted as LCS6B

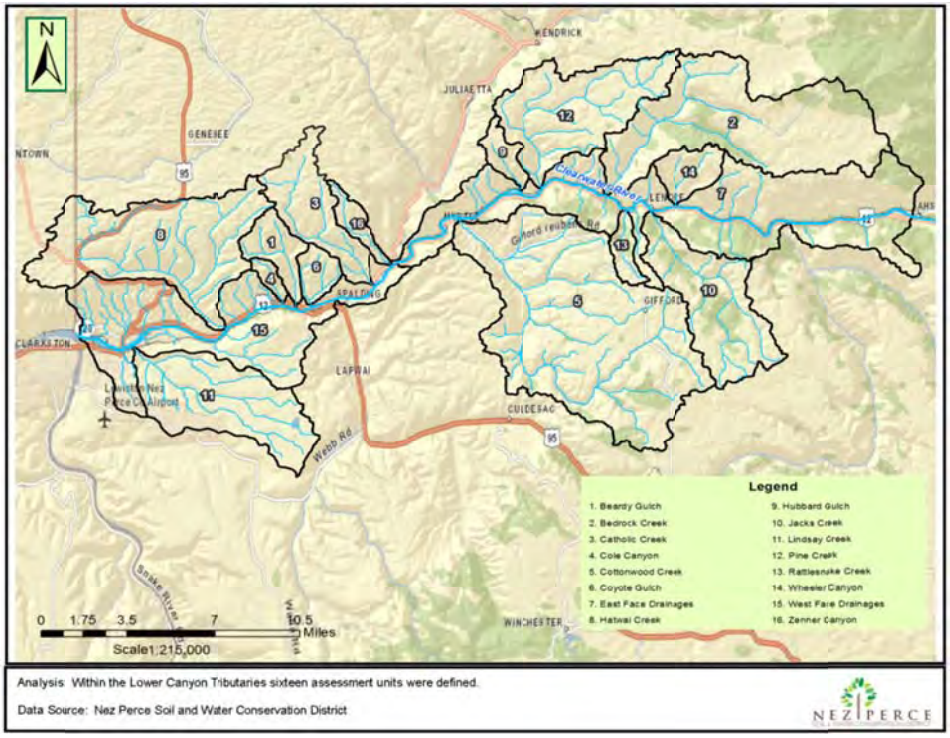


Figure 12. Lower Canyon Tributaries Assessment Units

MIGRATION BARRIERS

(NOAA Fisheries limiting factor number 4.1: Riparian Conditions: Riparian Vegetation)

Steelhead move upstream and downstream throughout their lives seeking out spawning, rearing, feeding, resting, and refuge areas. As they move through the stream they encounter road-stream crossings in the form of fords, culverts, or bridges. The ability of a steelhead to pass a culvert depends on a variety of factors including the depth of the pool downstream of the culvert, the velocity and depth of water in the culverts, the height the fish has to jump to enter the culvet, the size of the fish, the number of passage attempts, distance of migration, and the presence of large wood and other debris in the culvert. (Reiser, Huang, Beck, Gagner, & Jeanse, 2006) Removal of barriers increases the habitat available for fish to utilize and ensures the survival of different life histories. Barriers can isolate segments of the population and can perhaps increase local extirpation (Cahoon, McMahon, Stein, Burford, & Blank, 2005). Loss of spawning habitat is critical because it could lead to decreased fish production.

This limiting factor pertains to man-made barriers (anthropogenic) within the watershed. Barriers impair fish passage and access to crucial areas of aquatic habitat and affect the rearing and survival of focal species. Habitat access within streams is critical for spawning, rearing and migration. The benchmark criteria for this limiting factor are that all-man made barriers must allow upstream and downstream fish passage at all flows (NOAA Fisheries, 1996).

In 2013, the NPSWCD conducted a survey of passage barriers within the Hatwai Creek watershed and found a total of three barriers including two culverts which block passage year round where the third barrier is considered seasonal. The man-made barriers are blocking 7.12 miles of habitat.

DEGRADED RIPARIAN CONDITIONS

(NOAA Fisheries limiting factor number 4.1: Riparian Conditions: Riparian Vegetation)

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 stream flow. 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 & Reiser, 1991).

Assuming that large wood debris (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 & Reiser, 1991). Within the Hatwai 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.
A habitat survey conducted in 2012/2013 by the NPSWCD identified 50 miles of riparian area in poor or fair condition. The majority of riparian areas identified in poor to fair condition lacked riparian vegetation or had a riparian zone of less than one-third of the stream's active channel width. (Dau & Rasmussen, 2014)

Benchmark criteria for this limiting factor includes water temperature of 16°C, adequate sources of woody debris recruitment, and bank erosion of <10%, and >80% of riparian intact. (NOAA Fisheries, 1996)

REDUCED HABITAT COMPLEXITY

(NOAA Fisheries limiting factor number 6.2: Channel Structure and Bed Form: Instream Structural Complexity)

Physical habitat attributes within a stream reach effect 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.
Additionally, species living within diverse habitat have a greater chance to survive and flourish (Shively, Dan, 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 is a function of gradient, channel confinement, riparian function and large woody debris.

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 stream flow. 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 in stream cover may show a decreased number of pools, decreased depth and surface area, increased velocity and decreased fish biomass (Bjornn & Reiser, 1991).

Hatwai Creek has decreased complexity, including reduced riparian width and density which leads to decreased thermal insulation, cover and organic input, as well as reducing large woody debris recruitment. In the case of reduced or altered flow, fish will tend to use pools primarily, followed by runs and then riffles (Bjornn & Reiser, 1991). Upland hydrology and riparian cover are crucial element necessary to reestablish geomorphic processes that create and maintain pools. The importance of pools in the Hatwai Creek watershed is great due to the increased frequency of drought conditions where pools are the only portions of the stream that remain below the water table.

Habitat surveys conducted by the NPSWCD in 2012/2013 throughout the watershed identified 3.8 miles of poor to fair in critical steelhead habitat. The stream miles receiving a poor to fair in-stream fish cover rating are those segments with less than 5 cover types. Cover types include LWD, deep pools, overhanging vegetation, boulders/cobble, riffles, undercut banks, thick root mats, dense macrophyte beds and isolated/backwater pools.

The benchmark criteria for this factor are wetland and riparian functions are maintained, pools meet NOAA frequency standards, and LWD occurs at >20 pieces per mile.

BED AND CHANNEL FORM

(NOAA Fisheries limiting factor number 6.1: Channel Structure and Bed Form: Bed and Channel Form)

Bed and channel form refers to physical stream channel characteristics including width to depth ratios, sinuosity, bank and channel erosion and bedload movement. Bed and channel form impacts the physical in-stream habitat which can lead to reduced habitat complexity (see discussion under Reduce Habitat Complexity).

Hatwai Creek has low sinuosity and large areas where the stream is currently disconnected from its floodplain, which results in habitat diminished both in quality and size. Hatwai Creek's flashy hydrograph leads to increased stream energy, affecting the ability of the channel to make natural adjustments. As a result, processes of meander

formation through scour and deposition no longer function to form series of pools and riffles. Upland hydrology and riparian cover are crucial elements necessary to reestablish geomorphic processes that create and maintain channel form.

Habitat surveys conducted by the NPSWCD in 2012/2013 throughout the watershed identified 31 miles in poor to fair channel condition. The stream miles receiving a poor to fair channel condition rating are those segments with channel alterations occurring on >50% of the stream reach, and/or floodplain restrictions, and/or channel widening or downcutting, and/or excess braiding.

The benchmark criteria for this factor are stream channel width/depth rations less than 10, streambanks are 90% stable, overbank flows occur, and wetland and riparian functions are maintained.

EXCESS SEDIMENT

(NOAA Fisheries limiting factor number 7.2: Sediment Condition: Increased Sediment Quantity)

The amount of fine sediment present in, or passing through, a stream reach effects the relative survival or performance of fish species. This limiting factor is important during spawning, incubation and rearing. Sedimentation can be a result of anthropogenic causes (poor road placement, timber harvesting or agriculture production activities) and natural causes (landslides or wildfires can contribute to high turbidity).
Waters with high concentrations of suspended sediments result in high levels of turbidity, which can delay migration. For example, 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 & Reiser, 1991). The NOAA Matrix of Pathways and Indicators (NOAA Fisheries, 1996) requires a turbidity of <50 NTU or <12% of fines in gravel for the watershed to properly function.

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. The NOAA Matrix of Pathways and Indicators (NOAA Fisheries, 1996) requires a substrate embededdness of <20% for the watershed to properly function.

Increased sediment within a watershed may be a result of hillslope erosion from agriculture, disturbance, and roads within the watershed, in addition to eroding streambanks or degrading streambank condition. The NOAA Matrix of Pathways and Indicators (NOAA Fisheries, 1996) requires at least 90% of streambanks to be stable with less than 10% of streambanks actively eroding for the watershed to properly function.

The benchmark criteria for this limiting factor includes turbidity is low (<50 NTU), <12% fines in gravels, streambanks are >90% stable with less than 10% of outside banks eroding.

Water quality turbidity surveys performed in the Hatwai watershed by NPSWCD between 2011 and 2012 at one site reflected an average turbidity of 6.6 NTU ranging between 0.03 NTU and 87.8 NTU. These measurements of turbidity are used to reflect

conditions of suspended solids within the stream. Turbidity measurements within the watershed indicate degraded water quality as a result of suspended sediment and may affect feeding and territorial behavior of juvenile salmonids. (Fales, 2012)

Sediment from eroding banks could be contributing to the high turbidity and the high substrate embeddness may be exasperated by eroding banks within the stream. A survey was conducted by the NPSWCD at all stream reaches within the watershed during 2011 - 2012. Approximately 35 miles or 53% of the streambanks are compromised and are not stable (Dau & Rasmussen, 2014).

TEMPERATURE

(NOAA Fisheries limiting factor number 8.1: Water Quality: Temperature)

High water temperature as a parameter of water quality is especially important to fish in the incubation and rearing stages, and during low summer flows. 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.

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 (U.S. Environmental Protection Agency, 2003). Regional adaptations of a National Marine Fisheries Service (NMFS) 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) while the NOAA Matrix of Pathways and Indicators (NOAA Fisheries, 1996) requires zero days of water temperature exceeding 16°C for the watershed to properly function.

The benchmark criteria selected for this limiting factor is to reduce overall days exceeding daily average temperatures at less than 16 degrees Celsius for spawning and rearing for anadromous salmonids and less than 20 degrees Celsius under all circumstances.

The NPSWCD collected stream temperature data at five sites within the watershed. All sites exceeded the maximum limit of 16° Celsius for at least one day through (April to October) for sampling years 2007-2012. (Fales & Stubbers, 2013)

Temperature exceedence results from reduced canopy cover in riparian areas. Canopy cover provided from intact riparian communities intercepts and diffuses solar insolation, moderating thermal shifts from radiant heat. Data from 2012 and 2013 habitat surveys indicate that 49 miles (75% of total stream miles) within the Hatwai Creek watershed have canopy cover of less than 50%. (Dau & Rasmussen, 2014)

Mitigation of temperature as a limiting factor may include the development of riparian cover, limitations of water withdrawals, and controls to decrease streambank erosion.

FLOW

(NOAA Fisheries limiting factor number 9.1: Water Quantity: Increased Water Quantity and 9.2: Water Quantity: Decreased Water Quantity)

The amount of stream flow, or the pattern and extent of flow fluctuations within the stream reach effects the relative survival or performance of salmonids. 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.
Streams in the Hatwai Creek watershed appear to have been affected by altered flow regimes. Hydrologic profiles for this watershed are characterized by low duration, high intensity spring flow events and low summer base flow levels. Discharge data modeled for Hatwai Creek from indicates summer low flows ranging from 0.2 to 0.55 cfs and annual peak discharges ranging from 339 cfs (2 year return) to 2,410 cfs (100 year return) (Teasdale G. N., 2014).

The watershed's hydrologic profile includes intense spring runoff and diminished summer flows, with peak timing in February/March annually.

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, and agricultural activities. These same factors also reduce groundwater recharge, which further diminishes low summer base flow. 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.

The Hatwai watershed includes 34 permitted water rights with a maximum allowed diversion of 1.7 cfs within the stream. Stream flows in the lower reaches are moderately to severely impacted by water withdrawals. Establishing minimum flow levels in this watershed will improve the late summer flow conditions.

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, and irrigations withdrawals 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).

The benchmark criteria for this limiting factor are a watershed hydrograph where peak flow, base flow, and flow timing characteristics are comparable to an undisturbed watershed of similar size, geography and geology as well as a zero or minimum increase on drainage network density due to roads.

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CHAPTER 4: OBJECTIVES

The project goal is to restore the Hatwai Creek watershed, so that the physical habitat no longer limits recovery of the ESA threatened Lower Clearwater Steelhead population.

In order to meet this goal three objectives were selected from the Lower Clearwater Tributaries Management Plan and are consistent with the Clearwater Subbasin Management Plan. The Technical Team prioritized the objectives specifically for the Hatwai Creek watershed.
The NPSWCD proposes to achieve the goal through implementing habitat restoration measures (strategies) which address the primary fish limiting factors. Objectives and strategies will be revised as needed when new or additional data becomes available.

Objective1 – Improve aquatic habitat diversity and complexity

Improve aquatic habitat diversity and complexity to levels consistent with objectives in the Lower Clearwater Tributaries Management Plan (NPSWCD, 2014) and the Clearwater Subbasin Plan (Northwest Power and Conservation Council , 2005), with particular emphasis on recovery of anadromous stocks. Aquatic habitat condition (including diversity and/or complexity components) is limiting all focal species. Improvement in habitat productivity is considered critical to attainment of goals for both anadromous and resident species. Address priority problems with protection and restoration activities designed to promote development of more complex and diverse habitats through improved watershed condition and function. Desired outcomes include additions of large woody debris, improved stream channel conditions, increased habitat access, increased pool quality/quantity, floodplain reconnection, protecting and restoring wetland, and improved hydrologic functions.

Benchmarks for this objective include stream channel width to depth ratios <10, floodplains are hydrologically linked to the main channel, overbank flows occur on a 1.5 to 2 year event, all man made barriers allow upstream and downstream fish passage at all flows, adequate source of large wood debris recruitment is present within the riparian areas, large woody debris occurs at >20 pieces per mile, pool frequency meets NOAA standards, <20% substrate embeddedness, >90% of streambanks are stable with an average streambank erosion of <10%, wetland/riparian are properly function, and a watershed hydrograph that indicates peak flow, base flow and flow timing characteristics are comparable to an undisturbed condition.

Restoration strategies associated with this objective include A, B, C, D, G, H, and, I. Each strategy and its relationship to the objective are described below.

Restoration Strategy	*How the strategy helps meet the objective*
A - Improve Riparian Condition	This strategy focuses on improving vegetation in the riparian zone. Increased wood vegetation will in turn increase the amount of LWD available for recruitment and may make small to moderate changes in the hydrograph's peak flow.
B - Reduce Streambank Erosion	Protecting streambanks from erosion reduces sediment delivery to the stream helping to reduce substrate embeddedness and stabilizing streambanks. Installation of streambank stabilization measures directly impacts this objective's management criteria of <20 % substrate embeddedness through reduction of fine sediment to the stream.
C - Remove or Retrofit Fish Barriers	Installation of fish passage measures meet's this objectives management criterion for upstream and downstream fish passage occurring at all flows.
D - Improve Watershed Hydrology	Installation of treatment measures under this strategy are designed to decrease surface runoff and increase water infiltration. These measures directly relate to the objectives management criteria of watershed hydrograph changes to reduce peak flows, increase base flows and changing flow timing in order to provide adequate low summer flows for fish and to decrease channel scouring and bedload movement form peak flows.
G - Restore Floodplain Access and Reconnect Channel	Installation of treatment measures identified in this strategy meets this objectives management criteria for channel width/depth ratios <10, and overbank flows occurring on a 1.5-2 year event.
H - Water Withdrawals	Installation of treatment measures in this strategy helps meet this objective's management criteria of a watershed hydrograph with base flow characteristics comparable to an undisturbed condition.
I - Protection	This strategy provides protection of reaches that already meet the objective's management criteria.

Objective 2 – Reduce stream temperatures

Reduce water temperatures to levels meeting applicable water quality standards for life stage specific needs of anadromous and native resident fish, with an established upward trend in the number of stream miles meeting standards. The benchmark for this objective is to reduce overall days exceeding daily average temperatures at less than 16 degrees Celsius for spawning and rearing for anadromous salmonids and less than 20 degrees Celsius under all circumstances. Desired out comes include restoring hydrologic functions related to temperature--identifying and rehabilitating wetland and floodplain areas, restoring riparian functions related to temperature--continuing efforts aimed at increasing streamside shading where streamside shading has been reduced by anthropogenic activities.

The restoration strategy associated with this objective is A. The strategy and its relationship to the objective is discussed below.

Restoration Strategy	*How the strategy helps meet the objective*
A - Improve Riparian Condition	This strategy will provide the largest benefits to the reduce instream temperature objective by providing canopy cover which intercepts and diffuses solar insulations. In addition this strategy improves riparian functions in areas where stream side shading has been reduced by anthropogenic activities.

Objective 3 – Reduce instream sedimentation

Reduce instream sedimentation to levels meeting applicable water quality standards, with an established upward trend in the number of stream miles meeting standards. Benchmarks for this activity include streambanks are >90% stable, < 20% cobble embeddedness, and turbidity is low (NOAA, 1996).

Desired outcomes include restoring streambank condition, reducing sediment delivery to the stream from hydrologically connected roads and uplands, and reducing sediment inputs by implementing practices that address problems from logging, mining, agricultural and other historic and current sediment producing activities.

Restoration strategies associated with this objective include A, B, C, D, E, and F. Each strategy and its relationship to the objective are described below.

Restoration Strategy	*How the strategy helps meet the objective*
A - Improve Riparian Condition	Removal of livestock from stream banks will result in reduced streambank erosion due to bank degradation from trampling. Many of the stream segments treated through this strategy do not have a vegetative buffer and current cropland tillage practices occur either through or adjacent to the channel. The establishment of riparian buffers in these segments will result in significant sediment reductions to the stream. Planned treatments include (a) limiting or excluding livestock access to the stream and (b) establishment of vegetated buffers where none exist and (c) enhancing existing vegetated buffers to meet width and species complexity criteria.
B - Reduce Streambank Erosion	This strategy treats streambank erosion through structural and bio-engineering practices. The streambank protection measures are expected to result in a large decrease in bank erosion for the impacted reaches as these measures are directly adjacent to the stream channel.
C - Remove or Retrofit Fish Barriers	This strategy relationship to this objective is dependent upon the type of barrier replaced and the condition of the barrier. The amount of erosion is dependent upon the specific site, so impact and relationship to this objective will vary on a case by case basis. Installation of treatment measures at sites where erosion is occurring meets all of the objective's management criteria.
D - Improve Watershed Hydrology	This strategy focuses on increasing upland water infiltration rates and decreasing runoff in order to impact peak flows. Sediment reductions will be an added benefit and will achieve sheet/rill erosion reductions in the range of 5 to 22 tons/per acre (range is based on specific soil types and current land management activities – higher rates in cropland, lower rates on rangeland). The majority of the sheet/rill erosion is delivered to streams from surface runoff. Achieving a higher infiltration rate will reduce the amount of surface runoff, therefore greatly decreasing detachment of soil particles and their subsequent delivery to the stream. This deliverable will not address the streambank erosion management criteria for this objective, but will help in achieving the substrate embeddedness management criteria.
E – Reduce Sediment Delivery to Streams from Uplands	Implementation of the planned upland erosion control measures meets one of the objective's management criteria: <20% substrate embeddedness. The highest level of impacts will be achieved from gully erosion control measures that are hydraulically connected to the perennial stream.
F – Reduce Road Related Sediment Delivery to Streams	Implementation of the planned road erosion reduction measures meets one of the objective's management criteria: < 20% sustrate embeddedness. Installed measures are expected to result in a moderate to high decrease in the amount of sediment delivered to the stream. Highest impacts will be achieved from road segments within 400 LF of the stream, with moderate impacts from those segments >400 LF from the stream.

CHAPTER 5: RESTORATION STRATEGIES

Strategies identified to address the limiting factors, objectives, and goal are discussed in this chapter. Restoration strategies outlined for implementation through this plan will meet identified benchmark and management criteria. Criteria are based on the NOAA Matrix of Pathways and Indicators (NOAA, 1996) (Table 6)

Table 6. NOAA Matric Pathways and Indicators

Factor	Criteria
Water Temperature	Zero days of water temperature exceeding 16°C
Water Quality/Turbidity	Turbidity is low, < 50 NTU
Habitat Access	Any man-made barriers allow upstream and downstream fish passage at all flows
Habitat Elements	Adequate source of woody debris recruitment in riparian areas; pool frequency is 184 pools/mile for channel widths <5 feet, 96 pools/mile for channel widths 5-10 feet; substrate embeddedness <20%
Channel Condition & Dynamics	Width/depth ratio <10, streambank condition >90% stable, with on average, less than 10% of banks actively eroding; floodplains are hydrologically linked to main channel; overbank flows occur and maintain wetland functions, riparian vegetation and succession.
Flow/Hydrology	Watershed hydrograph indicates peak flow, base flow and flow timing characteristics comparable to an undisturbed watershed of similar size

Restoration strategies are grouped into nine categories based on treatment type (Table 7)

Each strategy's discussion includes benchmark criteria, treatment description, and treatment extent. Below is the relationship of restoration strategies to identified limiting factors

Table 7. Restoring strategy treatment summary

Strategy	Extent
A - Improve Riparian Condition	49 miles riparian restoration
B - Reduce Streambank Erosion	41 miles streambank protection
C - Remove or Retrofit Fish Barriers	1 barrier
D - Improve Watershed Hydrology	Install 40 acres wetland enhancements, 760 acres
E - Reduce Sediment Delivery to Stream from Uplands	11,132 acres upland treatment
F - Reduce Road Related Sediment Delivery to Streams	23.9 miles road improvements
G - Restore Floodplain Access and Reconnect Channel	41 miles
H - Water Withdrawals	17 water withdrawals
I - Protection	1.56 miles of stream protection

A - Improve Riparian Condition: Degraded Riparian Condition, Reduced Habitat Complexity, and Temperature
B - Reduce Streambank Erosion: Channel & Bed Form and Excess Sediment
C - Remove or Retrofit Fish Barriers: Migration Barriers
D - Improve Watershed Hydrology: Reduced Habitat Complexity, Channel & Bed Form, and Flow
E - Reduce Sediment Delivery to Stream from Uplands: Excess Sediment
F - Reduce Road Related Sediment Delivery to Streams: Excess Sediment
G - Restore Floodplain Access and Reconnect Channel: Reduced Habtiat Complexity and Channel and Bed Form
H - Water Withdrawals: Reduced Habitat Complexity
I - Protection: Reduced Habitat Complexity

A – Improve Riparian Condition

Information gathered in the 2014 Lower Canyon Tributaries Stream Inventory and Assessment (Dau & Rasmussen, 2014) will guide restoration efforts in targeting riparian treatments in areas designated as poor or fair condition. Management criteria are based on the NOAA Matrix of Pathways and Indicators (NOAA Fisheries, 1996). These include water temperature of 16°C, adequate sources of woody debris recruitment, and bank erosion of <10%.Reaches with poor and fair riparian habitat were identified for restoration under this strategy. 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.

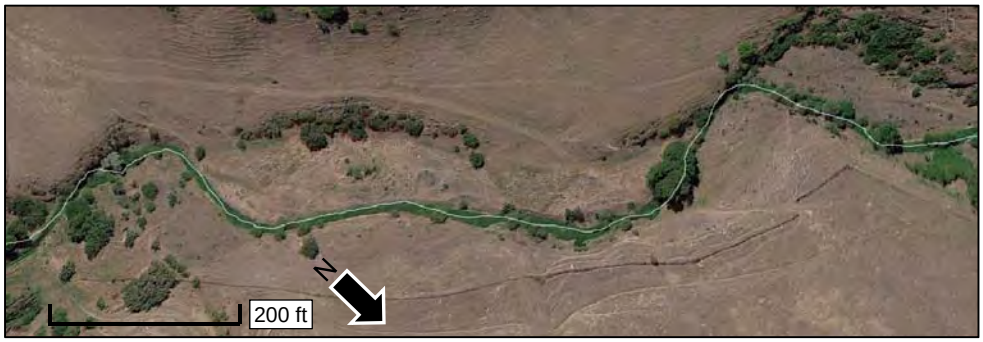


Figure 13. Example of an area needing riparian restoration.

This strategy helps meet objectives 1, 2, and 3 identified in Chapter 4 of this plan. Treatments include reducing livestock impacts to the stream, restoring riparian corridors, and establishing vegetative buffers.

Riparian treatments include invasive weed control, vegetative plantings and maintenance in areas lacking stream adjacent forest. Vegetation will be suited to site conditions and capable of supplying large wood within the riparian area, providing a buffer to filter nutrients and sediment, providing stream shade and stabilizing the streambanks. In areas impacted by livestock, treatments include development of a grazing management plan which identifies stocking capacity, forage amounts, and timing of grazing activities; fencing of sensitive areas including springs, wetlands and streams, and installation of alternative watering systems if livestock are utilizing streams, springs or wetland as their water source. The majority of Hatwai Creek 58% has a poor rating and 17% fair condition for riparian condition. The major treatments needed to bring these scores into the good or excellent range are tree plantings, filter strips, and buffer strips. In addition, several of the areas are adjacent to roads, where road maintenance activities such as spraying and removal of vegetation have impacted the rating.

Recommendations:
Reaches identified as poor and fair are recommended for improvements to reach a good or excellent condition. Figure 16 illustrates the locations for poor and fair rated reaches. An estimated 49 miles are identified for treatment. In addition, the Ag Implementation Plan identified treatment needs under the cropland and pastureland treatment units which are summarized on pg. 38 of the plan.

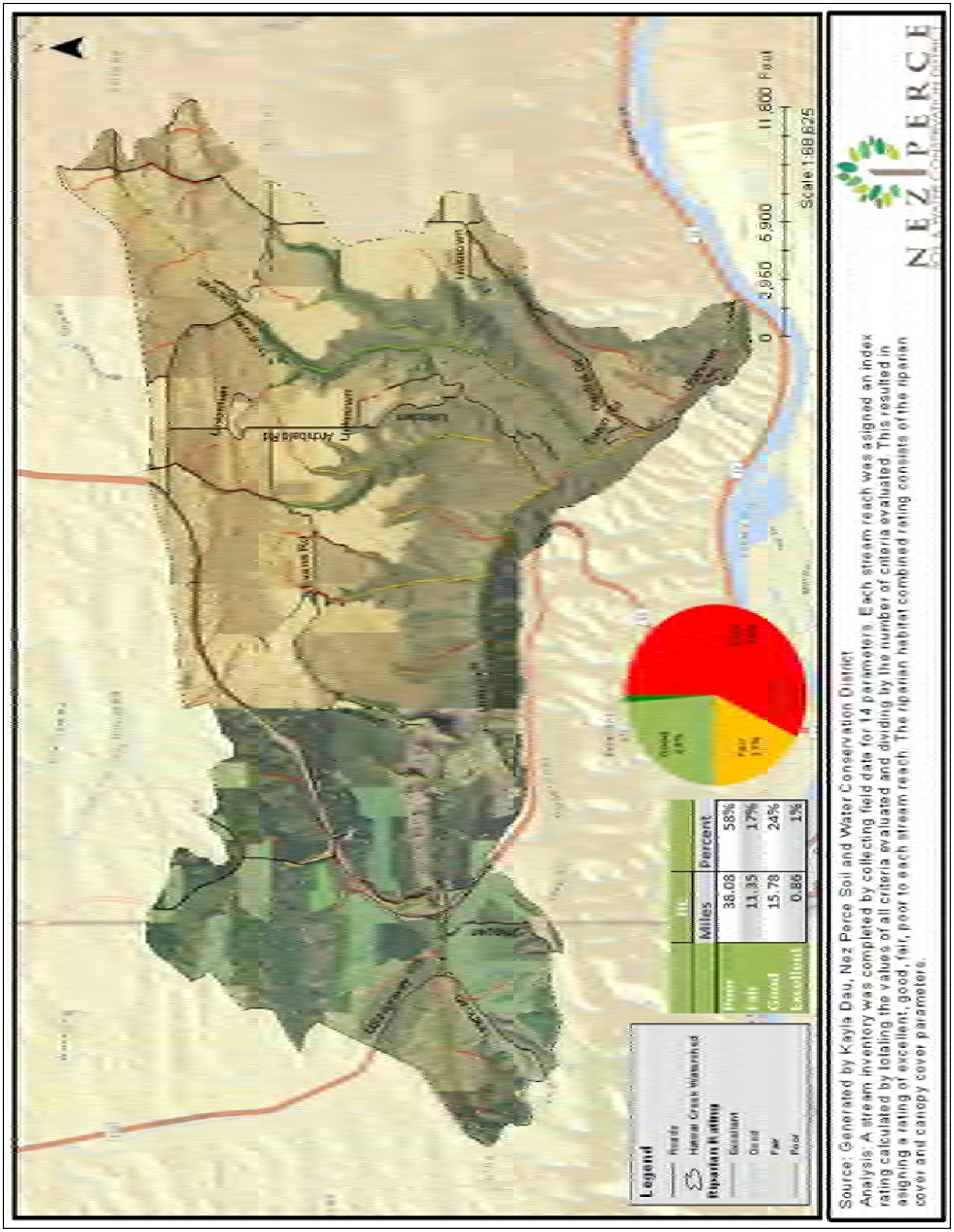


Figure 14. Hatwai Creek watershed riparian habitat ratings

B – Reduce Streambank Erosion

Information gathered in the 2014 Lower Canyon Tributaries Stream Inventory and Assessment (Dau & Rasmussen, 2014) reports will guide the restoration efforts in targeting channel segments that are actively eroding and delivering sediment to designated spawning and rearing habitats. Collectively, the effected sites to not meet management criteria. Management criteria are based on the NOAA Matrix of Pathways and Indicators (NOAA, 1996) for channel condition and dynamics. These indicators list streambank conditions as >90% stable, with on average, less than 10% of banks actively eroding, and <20% substrate embeddedness through reduction of fine sediment to the stream



Figure 15. Representation of area needing streambank treatment

This strategy helps meet objectives 1 and 2 identified in Chapter 4 of this plan. Treatment includes both bioengineering and structural methods.

Reaches in this group are those that received a poor channel function rating (shown as red lines in Figure 16). 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.

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. The major treatments needed include streambank protection measures, restoring access to floodplains, barrier removal, and re-meandering stream channels.

Recommendations:

A total of 41 miles is identified for treatment shown as poor or fair channel function rating on Figure 16. Restoration efforts will target channel segments that are actively eroding and delivering sediment to designated spawning and rearing habitats.

In addition, the Hatwai TMDL Agricultural Implementation Plan identifies specific treatment needs on pg. 36 of the plan.

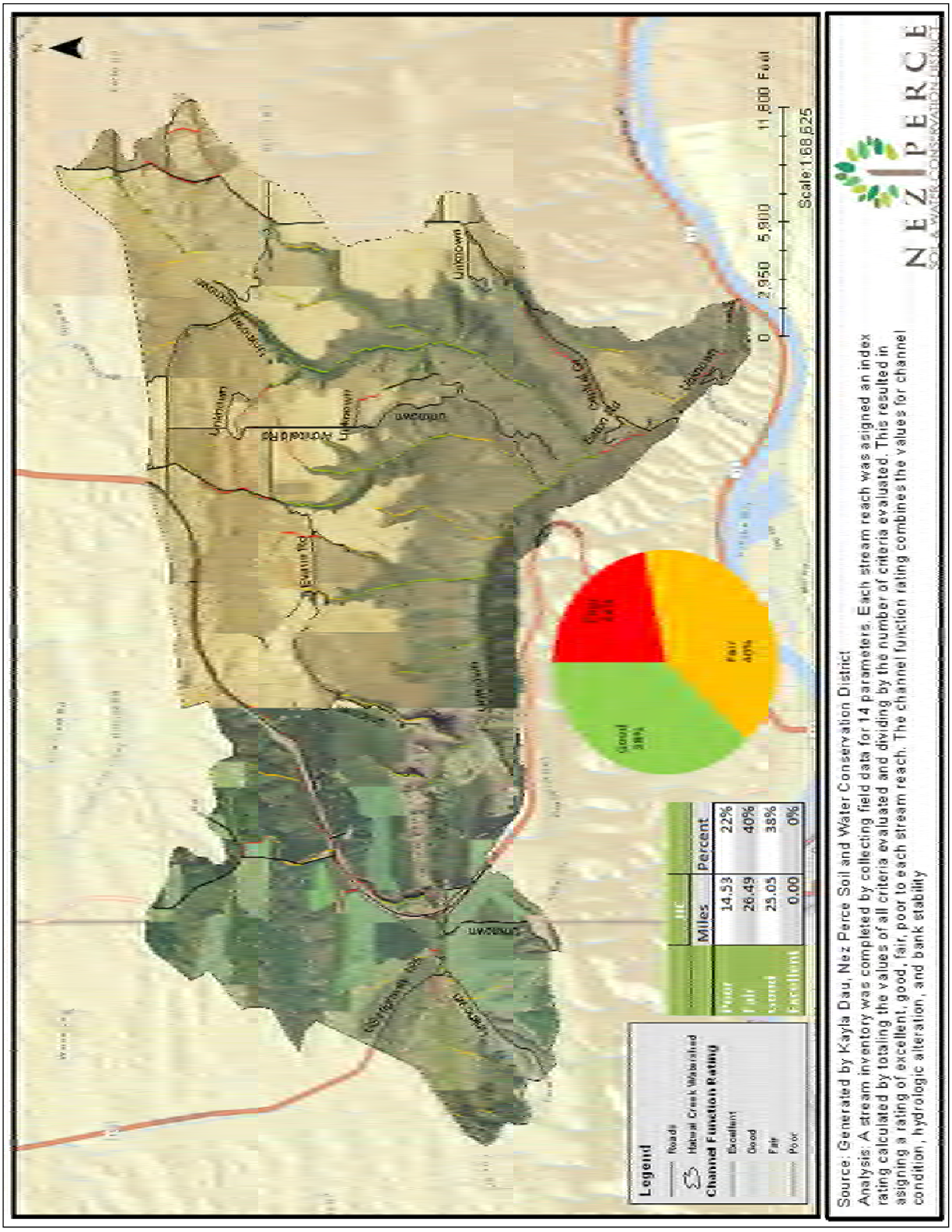


Figure 16. Hatwai Creek watershed channel condition ratings

C – Remove or Retrofit Fish Barriers

Information gathered in the Hatwai Creek Fish and Fish Habitat Report (NPSWCD, 2014) as well as the Watershed Hydrologic Analysis Channel Stability Assessment Hatwai Creek (Teasdale G. N., 2014) will guide the restoration efforts in targeting fish barriers.

Management criteria are based on the NOAA Matrix of Pathways and Indicators (NOAA Fisheries, 1996), which states that all man-made barriers allow upstream and downstream passage at all flows.

This strategy helps meet objective 1 identified in Chapter 4 of this plan. Treatments include barrier removal, replacement, and retrofitting. Prevention measures include county road department and landowner education to increase awareness of fish passable crossing design and construction criteria.

Designs will follow the NOAA Criteria for Anadromous Salmonid Passage Facility Design (NMFS, 2008). Culvert barriers are replaced with either a fish passable structure; stream crossings are shaped and strengthened to match the existing channel profile.

Recommendations:

The Hatwai Creek Fish and Fish Habitat Report (NPSWCD, 2014) identified three fish barriers within the watershed. Table 1 identifies the type of barrier and miles of habitat blocked while Figure 17 illustrates the locations of these barriers. All barriers blocked juvenile and adult steelhead. Only one of these barriers that was an irrigation diversion experienced seasonal blockage. Barrier HC2.D is recommended for treatment. The other two barriers cross under Highway 95 and would require substantial resources to treat; so they are not recommended for treatment at this time.

Table 8. Fish barriers and resulting blocked habitat in the Hatwai Creek watershed

Barrier ID	Description	Miles of Habitat Blocked
HC2.0	irrigation diversion	11.37
HC7.96	road culvert	0.87
HC9.0	road culvert	4.25
	10 road culverts exist above culvert HC9.0. These are not listed individually as they are in perennial flow area, but not considered useable by steelhead.	4.25

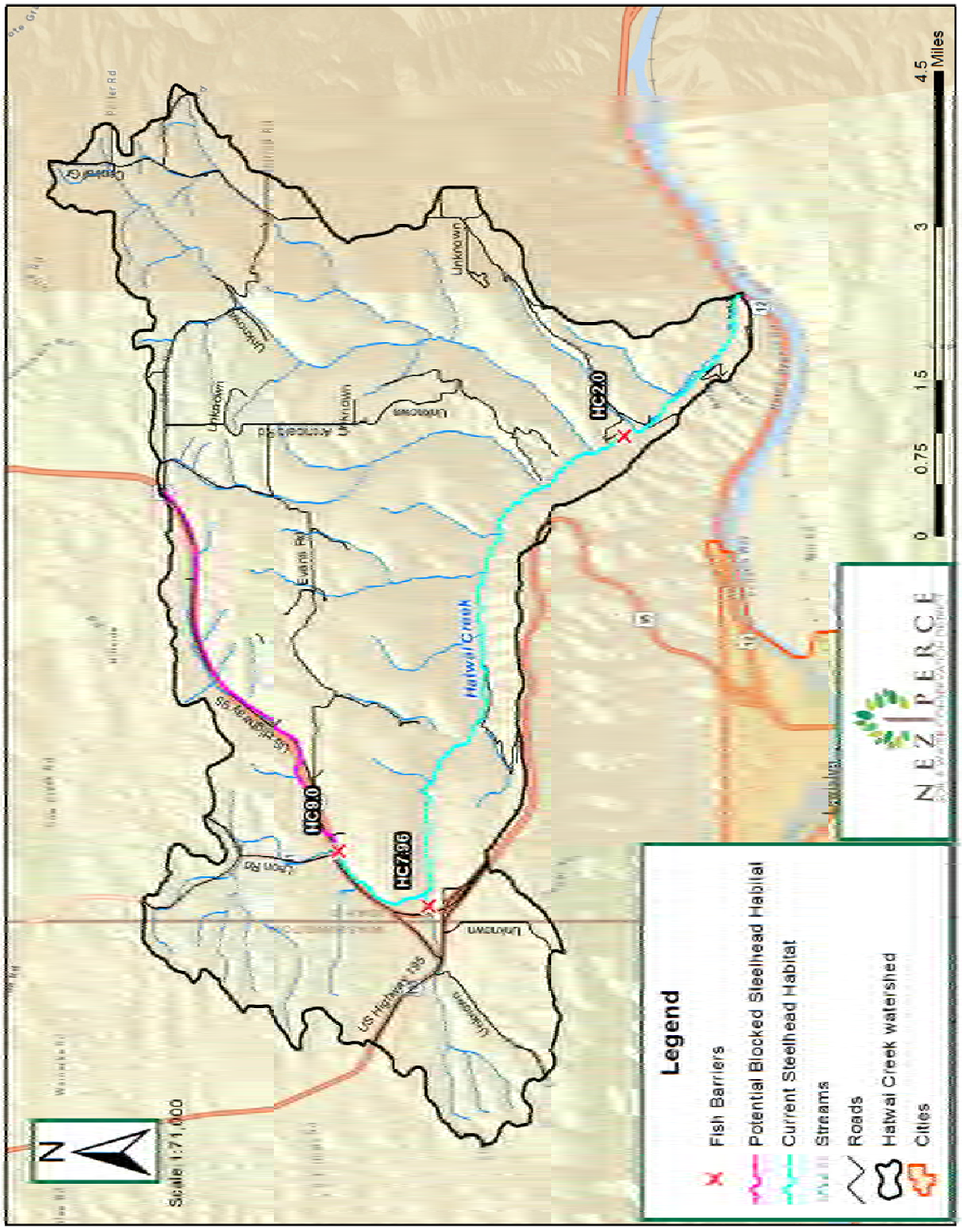


Figure 17. Hatwai Creek watershed fish barriers and steelhead habitats

D – Improve Watershed Hydrology

Information gathered in the 2014 Lower Canyon Tributaries Stream Inventory and Assessment (Dau & Rasmussen, 2014) and the Hydrologic Analysis of the Hatwai Creek Watershed (Teasdale G. N., 2014) will guide restoration efforts in targeting areas with impaired hydrologic function.

Collectively the identified sites do not meet management criteria. Management criteria include adequate flows for fish. This deliverable focuses on watershed hydrograph characteristics of peak flow and flow timing. Management criteria are based on the NOAA Matrix of Pathways and Indicators (NOAA, 1996) for flow/hydrology. A properly functioning condition is identified as a watershed hydrograph that indicates peak flow, base flow and flow timing characteristics are comparable to an undisturbed condition.

This strategy helps meet Objectives 1 and 2 identified in Chapter 4 of this plan. Treatments include actions that 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.

Hydrologic conditions in the watershed areas are driven by upland conditions. Focus areas are restoring wetlands, restoring native vegetation, and reducing surface runoff from agricultural fields. There are 3,802 acres within the watershed with C or D soil hydrologic ratings (Figure 18). These areas have the highest surface water runoff due to their soil properties. Restoration efforts will target areas with impaired hydrologic function.

Recommendations:

Wetland enhancements will occur in springs and areas with wetland soils that have been converted either by drainage or by removal of hydric vegetation. Priority areas for wetland enhancements are shown in Figure 19 and include 110 acres. These areas were identified from the natural wetland inventory and maps and need a field site assessment to identify specific treatment needs.

Upland vegetation projects will be selected in areas with a C or D soil hydrologic rating (shown as pink, purple or blue areas on Figure 18). Treatment includes planting of grass/forbs and upland trees or other treatments that increase surface infiltration rates to a minimum of 0.6 inches/hour. Estimated treatment needs include 760 acres of upland grass planting and 380 acres of upland tree planting.

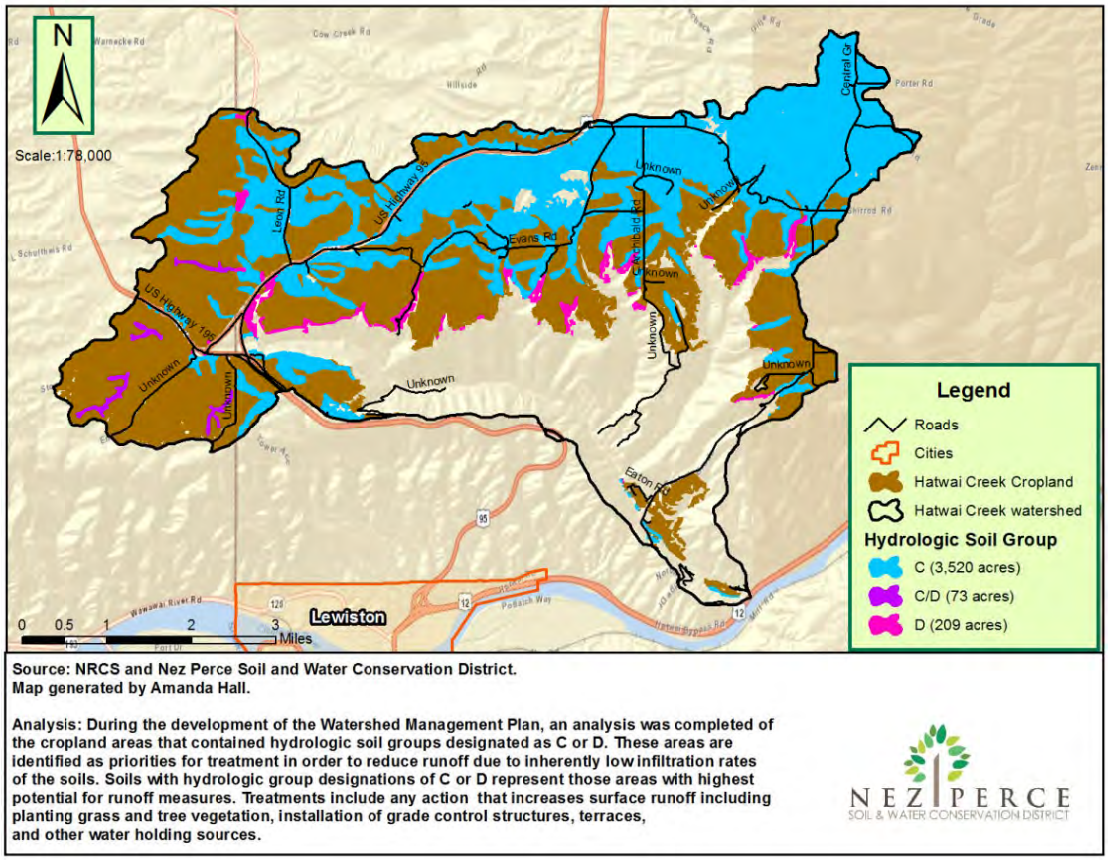


Figure 18. Hatwai Creek watershed hydrologic modification priorities

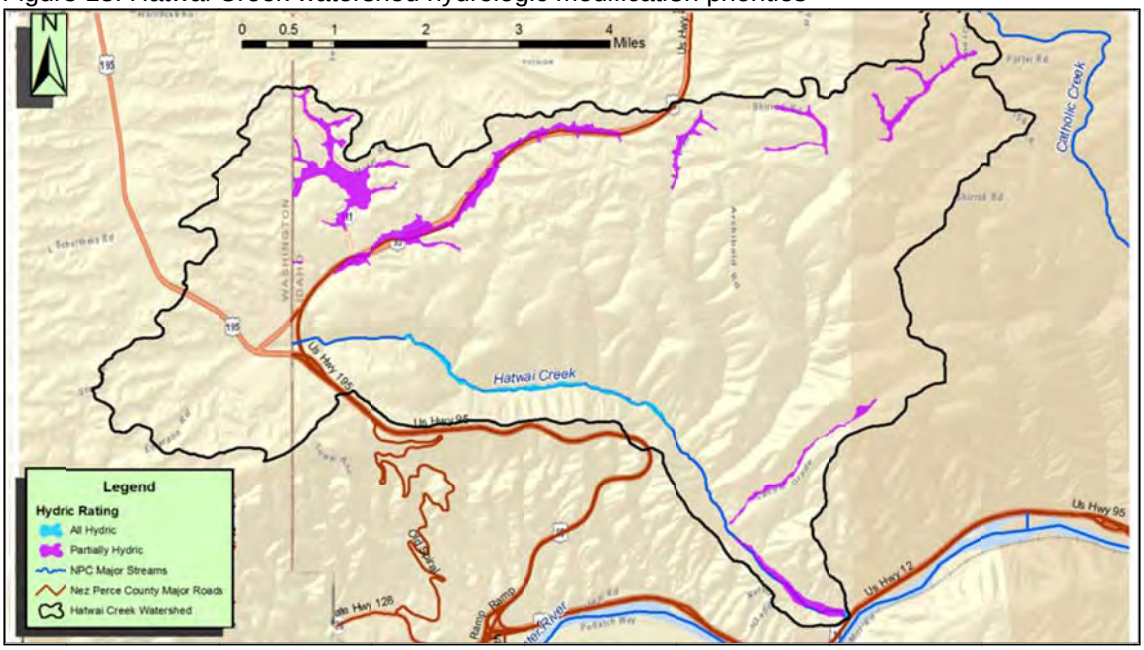


Figure 19. Hatwai Creek watershed hydric soils

E – Reduce Sediment Delivery to Steams from Uplands

Information gathered in the Watershed Hydrologic Analysis Channel Stability Assessment Hatwai Creek (Teasdale G. N., 2014) and a Water Erosion Prediction Project (WEPP) model erosion analysis will guide the restoration efforts in targeting upland areas that are actively eroding and delivering sediment to designated spawning and rearing habitats.

The affected areas do not meet management criteria. Benchmarks include soil erosion rates at 1.5 times the specific soils' tolerance rate as established by the Lewis and Nez Perce Soil Survey (NRCS, 2004), cobble embeddedness <20, turbidity is low (<50 NTU) (NOAA Fisheries, 1996), and uplands identified as having high sediment delivery rates are those areas with a soil K factor exceeding 0.37.

This strategy helps meet objective 2 identified in Chapter 4 of this plan. Treatments include the installation of erosion control measures including vegetative buffers, surface treatments, grade control structures, water and sediment control structures, and reduction and/or prevention of erosion within the identified critical areas. In addition to croplands, road, canyonland, and forested areas are also identified as potentially requiring treatment.

Figure 20Figure 20 identifies priority areas with the highest susceptibility to erosion in pink. The upland sediment treatment group addresses sheet, rill, and gully erosion from upland areas. There are an estimated 11,132 acres of high risk erosion areas, these are found in

Recommendations:

Restoration efforts should target upland areas that are actively eroding and delivering sediment to designated spawning and rearing habitats. In evaluating the land treatments and management systems used within these areas, the Technical Team recommended that 80% of the high risk erosion area acres be treated for sheet/rill and gully erosion. An estimated 13,915 acres need treatment.

In addition, the Hatwai TMDL Ag Implementation Plan identifies specific best management practices needed to control sheet/rill and gully erosion on pg. 36 of the plan.

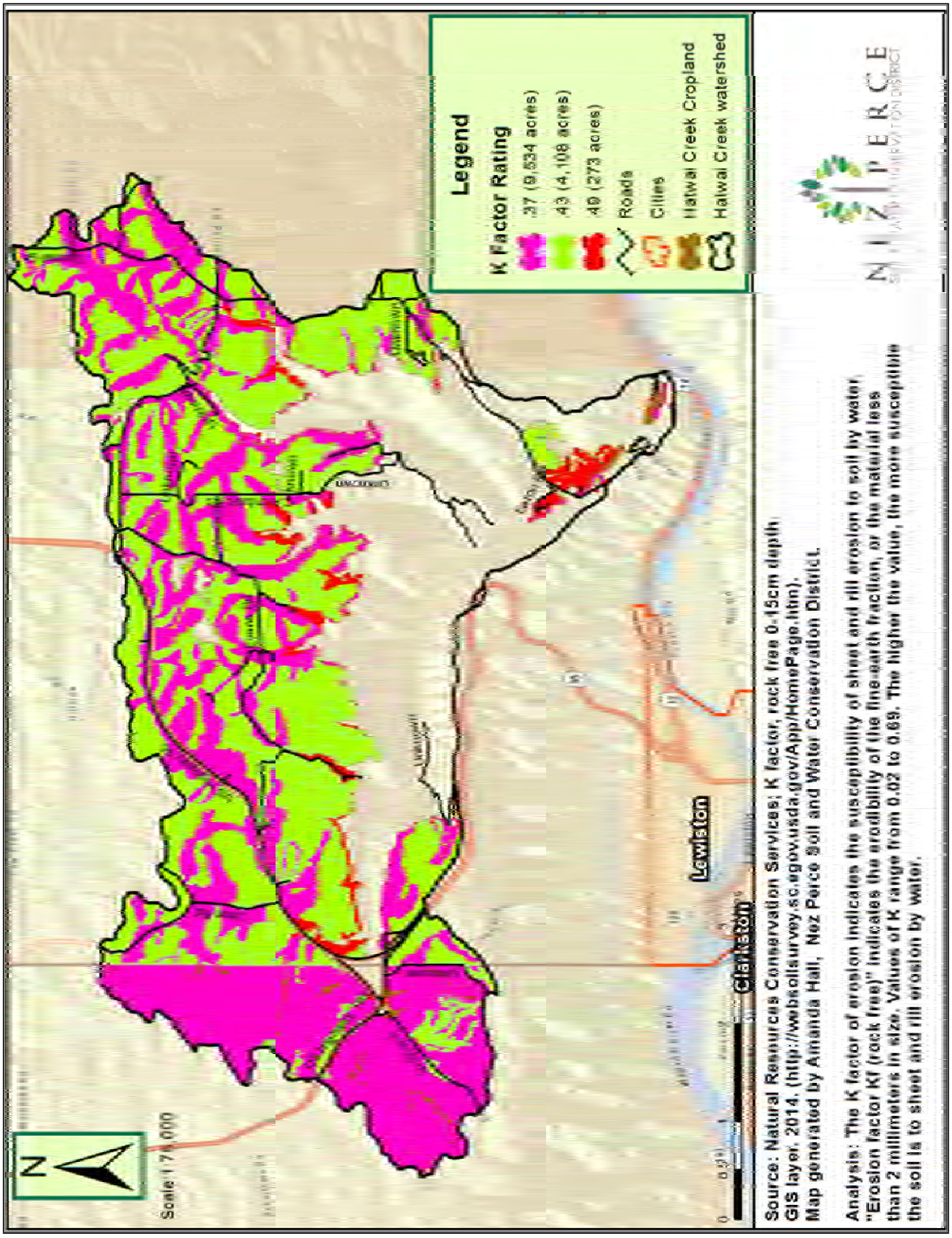


Figure 20. Hatwai Creek watershed priority upland erosion treatment areas

F – Reduce Road Related Sediment Delivery to Streams

Information gathered in the Lower Canyon Tributaries Road Inventory and Assessment (Lane, 2014) will guide the restoration efforts in targeting road segments that are actively eroding and delivering sediment to designated spawning and rearing habitats.

Management criteria for the reduce sediment objective are based on the NOAA Matrix of Pathways and Indicators (NOAA Fisheries, 1996) with specific indicators selected for sediment/turbidity, embeddedness and streambank condition. Installed measures are expected to result in a moderate to high decrease in the amount of sediment delivered to the stream. Highest impacts will be achieved from road segments within 400 LF of the stream, with moderate impacts from those segments >400 LF from the stream.

This strategy helps meet Objective 2 outlined in Chapter 4 of this plan. Treatment measures include installation of cross drains, culvert replacement, reducing road gradient, increasing vegetation on cut slopes, improving road surface conditions, road relocation, and road obliteration.

Recommendations:

Treatment areas relating to roads were identified (Figure 21) 23.9 miles of road are identified for treatment.



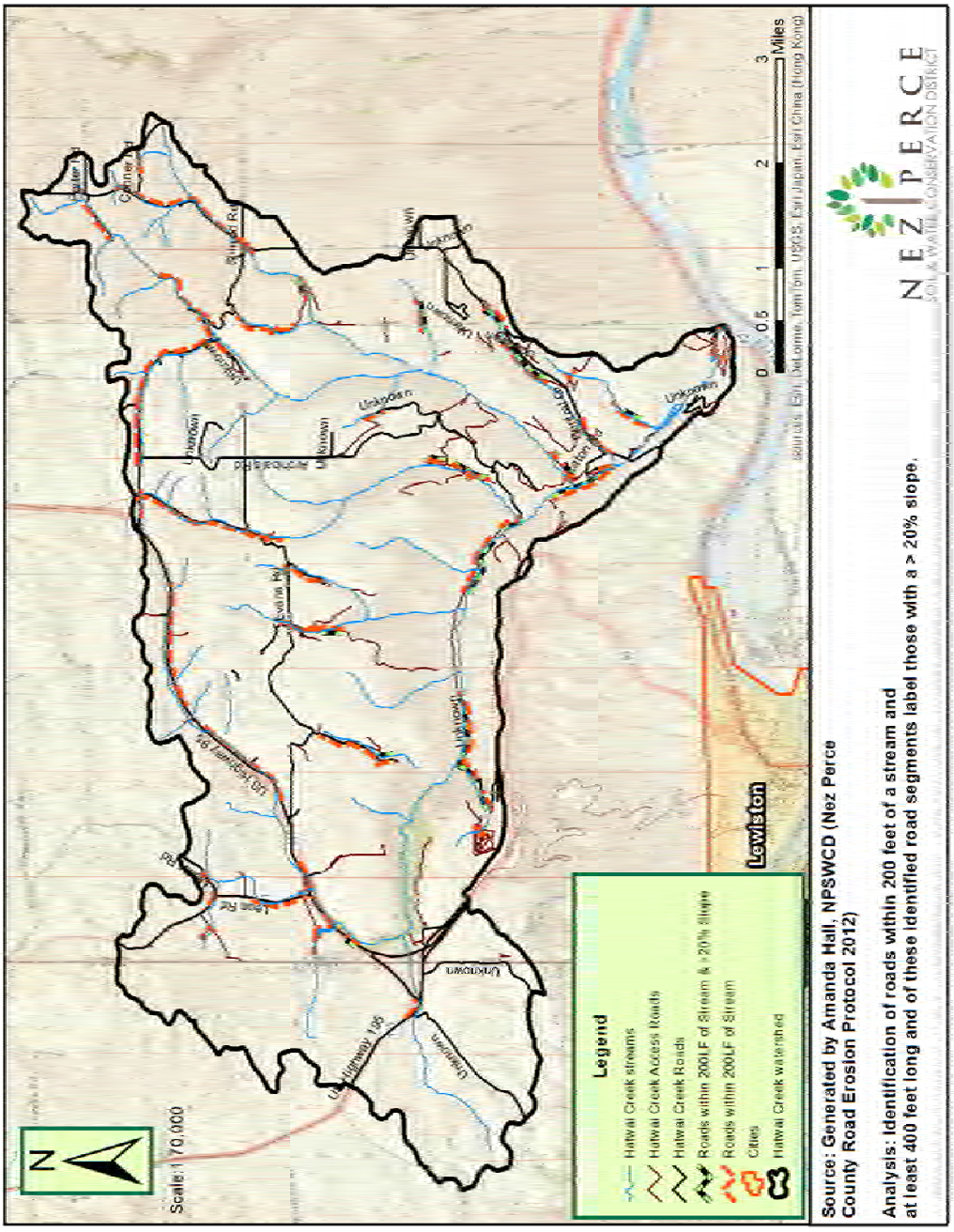


Figure 21. Hatwai Creek watershed priority road treatments

G – Restore Floodplain Access and Reconnect Channel

Information gathered in 2014 Lower Canyon Tributaries Stream Inventory and Assessment (Dau & Rasmussen, 2014) and the Watershed Hydrologic Analysis Channel Stability Assessment Hatwai Creek (Teasdale G. N., 2014) reports will guide the restoration efforts in targeting areas where floodplain access is not meeting management criteria.

Management criteria are based on the NOAA Matrix of Pathways and Indicators (NOAA, 1996) for channel condition and dynamics. These indicators include width to depth ratios <10, streambank conditions are >90% stable, with on average, less than 10% of banks actively eroding, and overbank flows occur on a 1.5 – 2 year event.

This strategy helps meet objectives 1 and 3 identified in Chapter 4 of this report. Treatments include removal, relocation, or retrofitting of channel confining structures such as levees and roads.

Levees prohibit access to the floodplain and cause on-site as well as downstream impacts. Downstream impacts include streambank erosion, impacts on road crossings, and additional bedload deposition.

Recommendations:

A total of 41 miles of channel are estimated to be confined and do not have adequate access to their floodplains.



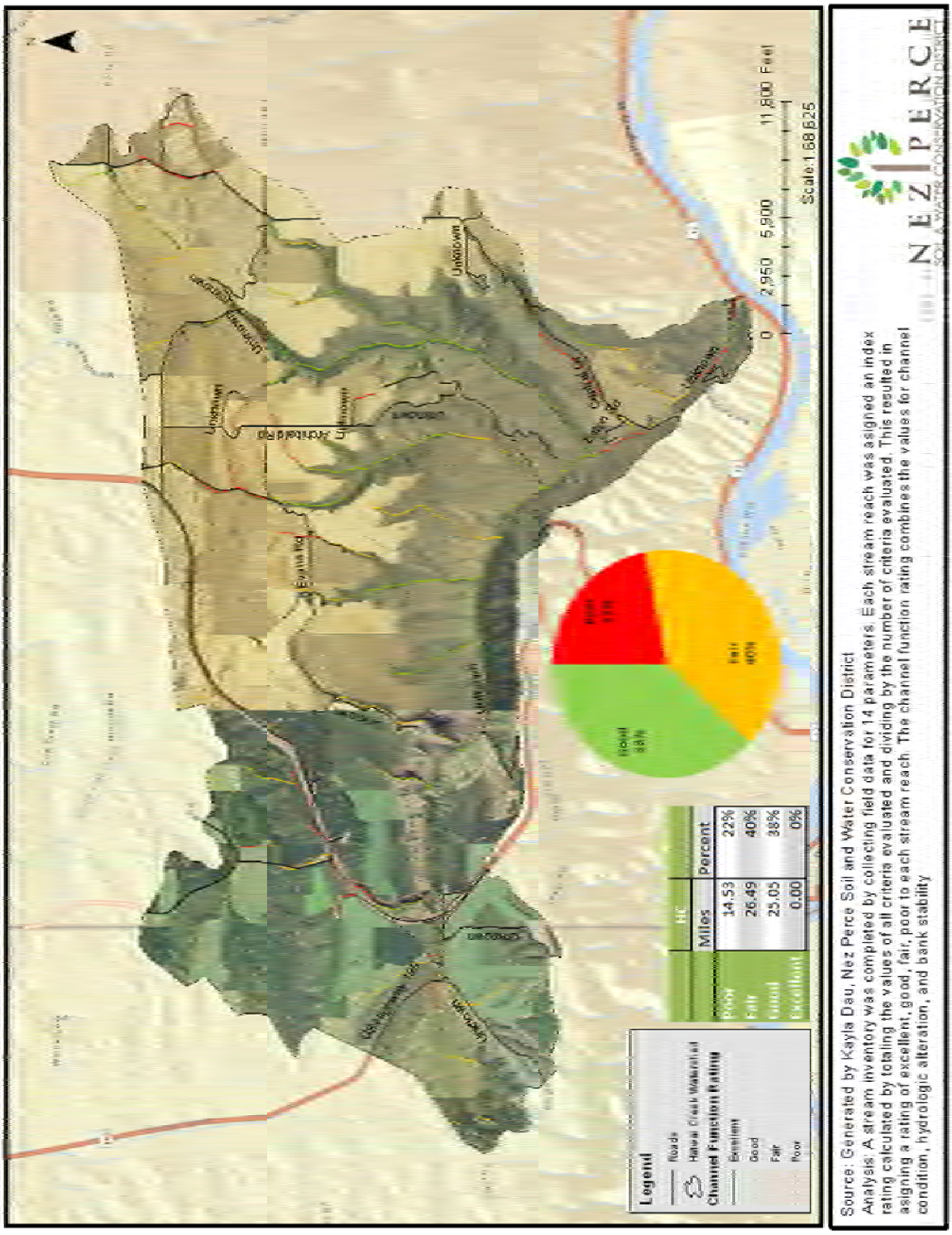


Figure 22. Channel condition ratings.

H – Decrease Water Withdrawals

Information gathered in developing the water use section (Chapter 3) of this plan will guide restoration efforts in targeting water withdrawals for treatment. Management criteria are based on the NOAA Matrix of Pathways and Indicators (NOAA Fisheries, 1996) and include base flows adequate for all life stages of salmonids.

Reaches that are affected by water withdrawals often show highly variable seasonal flow, low flow in the summer months, increased water temperature and potentially reduced water quality. Water withdrawals may be the result of diversion structures, pumps canals, pipelines or a combination thereof. Withdrawals may be for domestic livestock or irrigational purposes. Water withdrawals were identified through the Lower Canyon Tributaries Stream Inventory and Analysis (Dau & Rasmussen, 2014) and Idaho Department of Water Resources water permit records. If the maximum permitted volume of water is used a total of 4.0 cfs would be diverted from Hatwai Creek.

This strategy helps meet Objective 1 identified in Chapter 5 of this plan. Treatments include purchasing water rights, changing points of diversion, changing type of diversion, improvements to diversion pump and delivering system, and development of irrigation water management plans which identify water application rates and frequency.

Due to the lack of information on the status of these withdrawals, additional site specific field work will be needed to specify the need and appropriate type of treatment.

Recommendations:

Water withdrawals diverting water from a stream are identified for treatment (17 sites). Treatments should focus on those withdrawals along perennial stream segments first. Recommended treatment includes seven sites diverting from Hatwai Creek and 10 from unnamed tributaries.



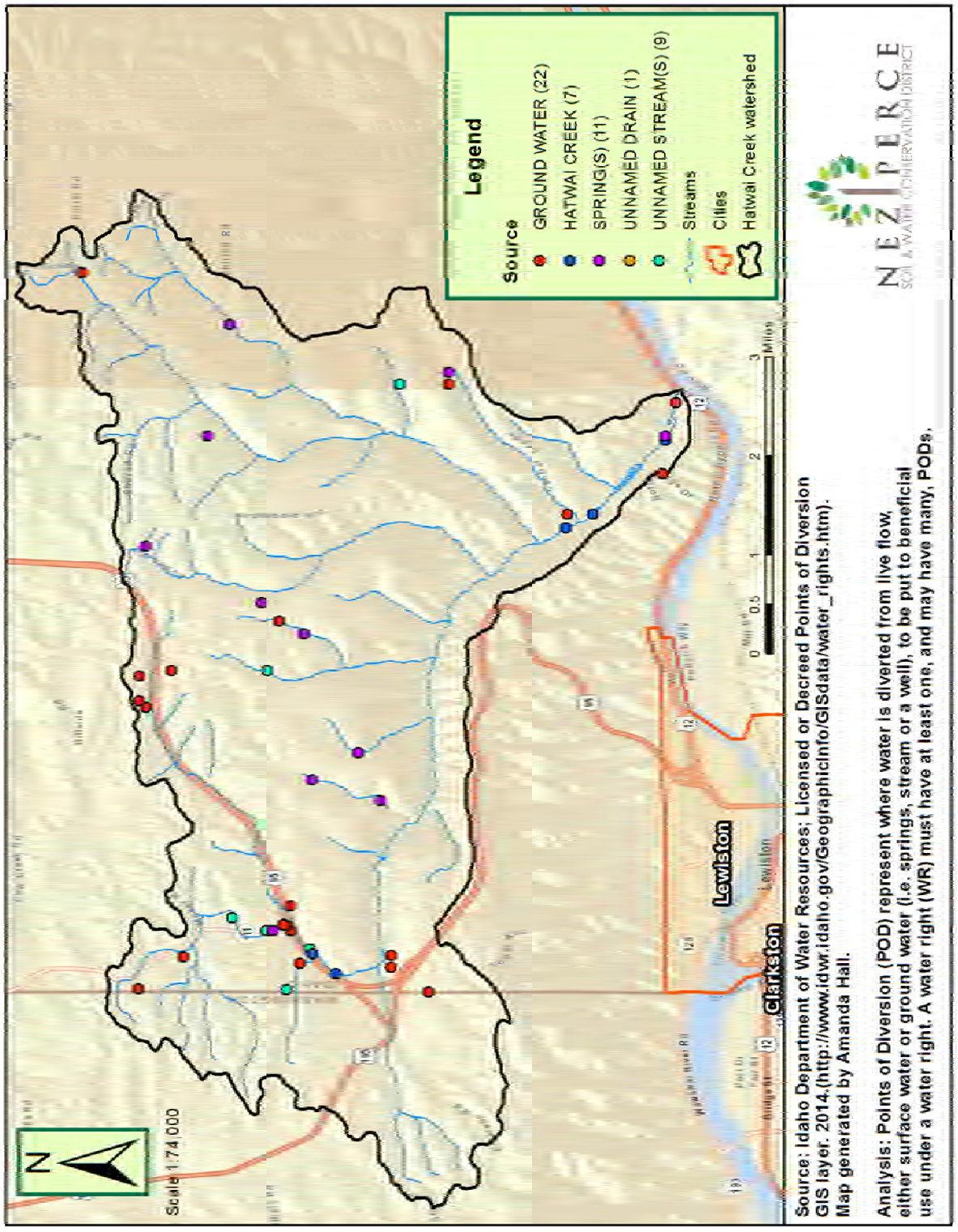


Figure 23. Hatwai Creek watershed priority water withdrawal treatments

I – Protect High Quality Habitat

Information gathered in the 2014 Stream Inventory and Assessment Report (Dau & Rasmussen, 2014) will guide protection efforts in targeting stream segments in good to excellent condition.

This strategy consists of those reaches receiving an excellent stream condition rating. Through the stream inventory process, 65. miles of stream were identified within the watershed (Figure). Additional excellent rated reaches may be located within the watershed and not identified at the time of publication of this report. As these reaches are identified they will be added to the protection treatment group.

This strategy helps meet objective 1 identified in Chapter 4 of this plan. As treatments addressing limiting factors throughout the watershed are implemented, the 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.

Treatments needed for any stream segment receiving an excellent rating focus on protection of that reach. Treatments may include land use management plans specifying practices such as fencing, weed control, or conservation easements needed for protection. The goal of identified treatments is to maintain the existing high quality habitat to prevent degradation.

Recommendations:

Protect 1.56 miles of Hatwai Creek habitat rated in excellent condition (Figure 24)



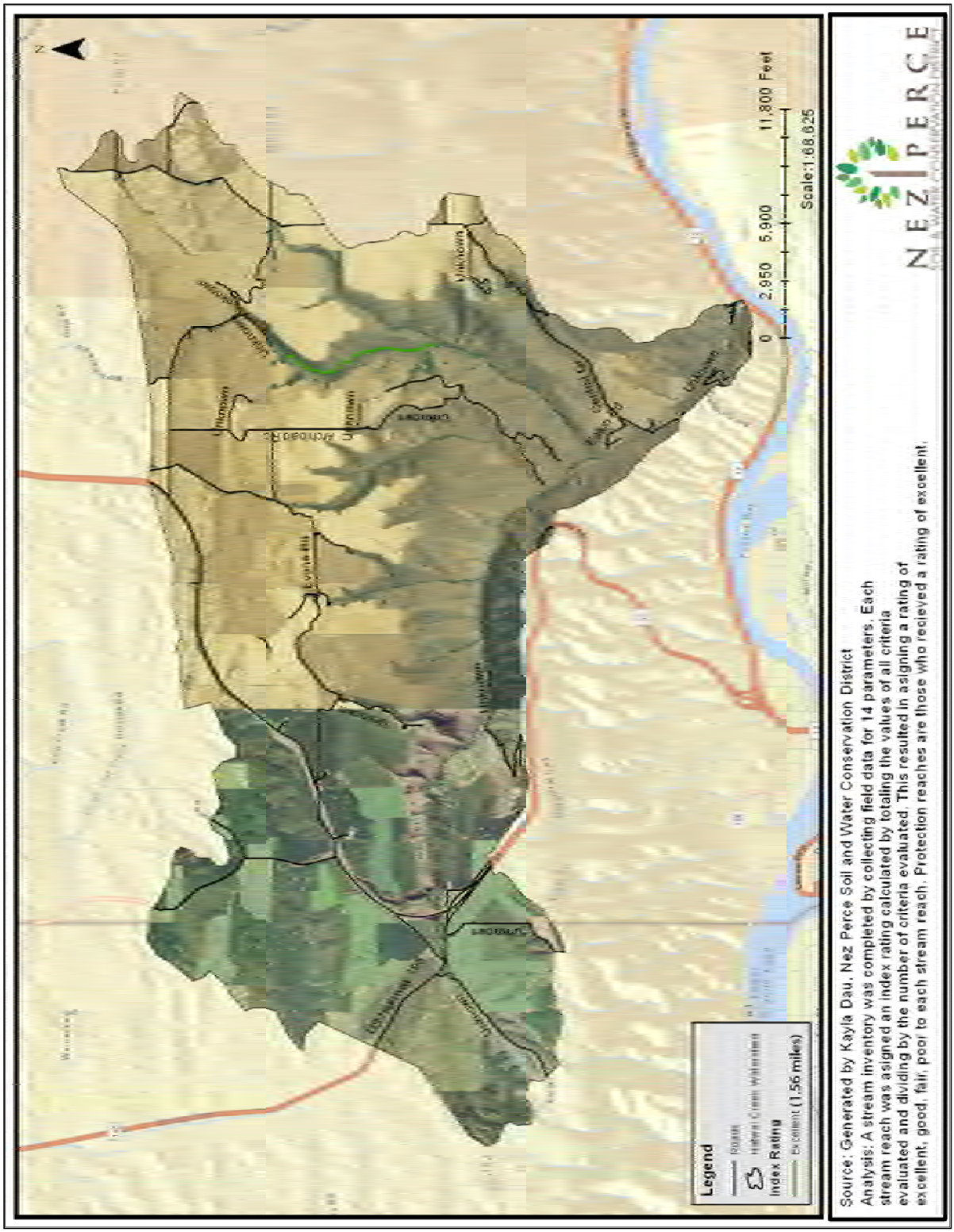


Figure 24. Hatwai Creek Protection Reaches

Prioritization Rationale and Ranking

Data collected in the Lower Canyon Tributaries Stream Inventory and Assessment (Dau & Rasmussen, 2014) can be used to help establish where conservation and restoration actions are most needed in the watershed. The stream survey consists of 14 parameters. Each criterion is given a numerical rating on a scale of 1 to 10, where the highest number represents the best condition. An index is created by totaling the values of all criteria evaluated and dividing by the number of criteria evaluated. This index is then divided into a four component ranking system consisting of Poor, Fair, Good, and Excellent categories (Figure 25).

Project Prioritization and Selection Process

All potential projects shall be ranked on the following:

- Work will occur within areas of perennial flow first with primary focus on mainstem channels and major tributaries first, later moving to intermittent tributaries.
- In the event that multiple restoration opportunities arise, projects will be developed for the higher ranking priority limiting factor first. Priority limiting factors are 1) flow, 2) riparian vegetation, and 3) sediment reductions.
- Treatments that will improve the poor and fair ranked reaches to good or excellent condition. (Figure 25) Stream segments assigned a rating of poor, fair, good or excellent based on a set of criteria evaluated during the stream inventory and assessment (Dau & Rasmussen, 2012). The goal of the restoration activities selected is to treat streams such that 75% of the stream reaches identified as poor and fair may achieve a rating of good to excellent.

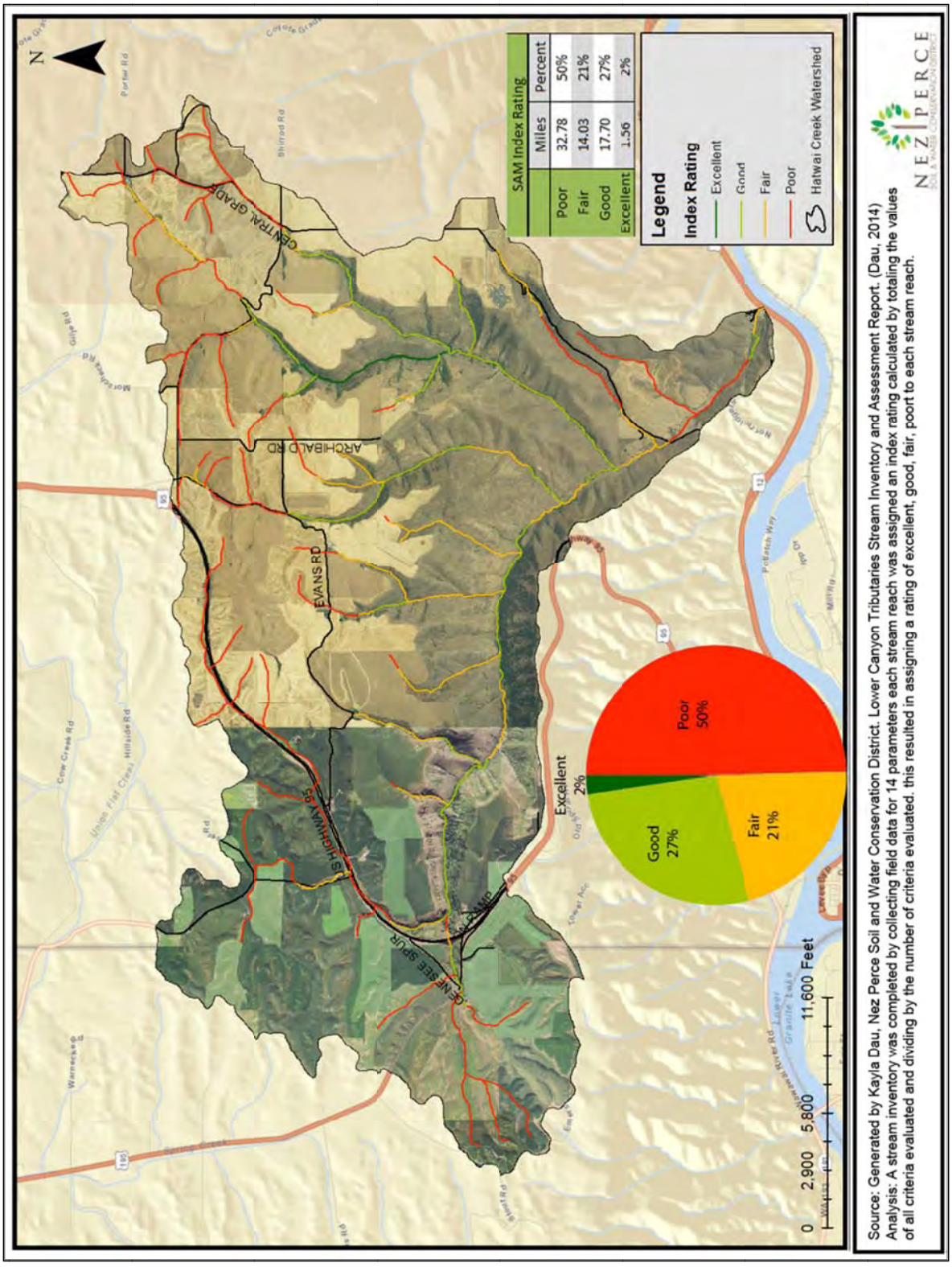


Figure 25. Hatwai Creek reach condition rankings

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