United States
Department of
Agriculture

Forest
Service

May 2010

Fifteenmile Creek Basin Aquatic Habitat Restoration Strategy

Mt. Hood National Forest
Barlow Ranger District

Photo by Chris Rossel

Fifteenmile Creek Basin
Aquatic Habitat Restoration Strategy

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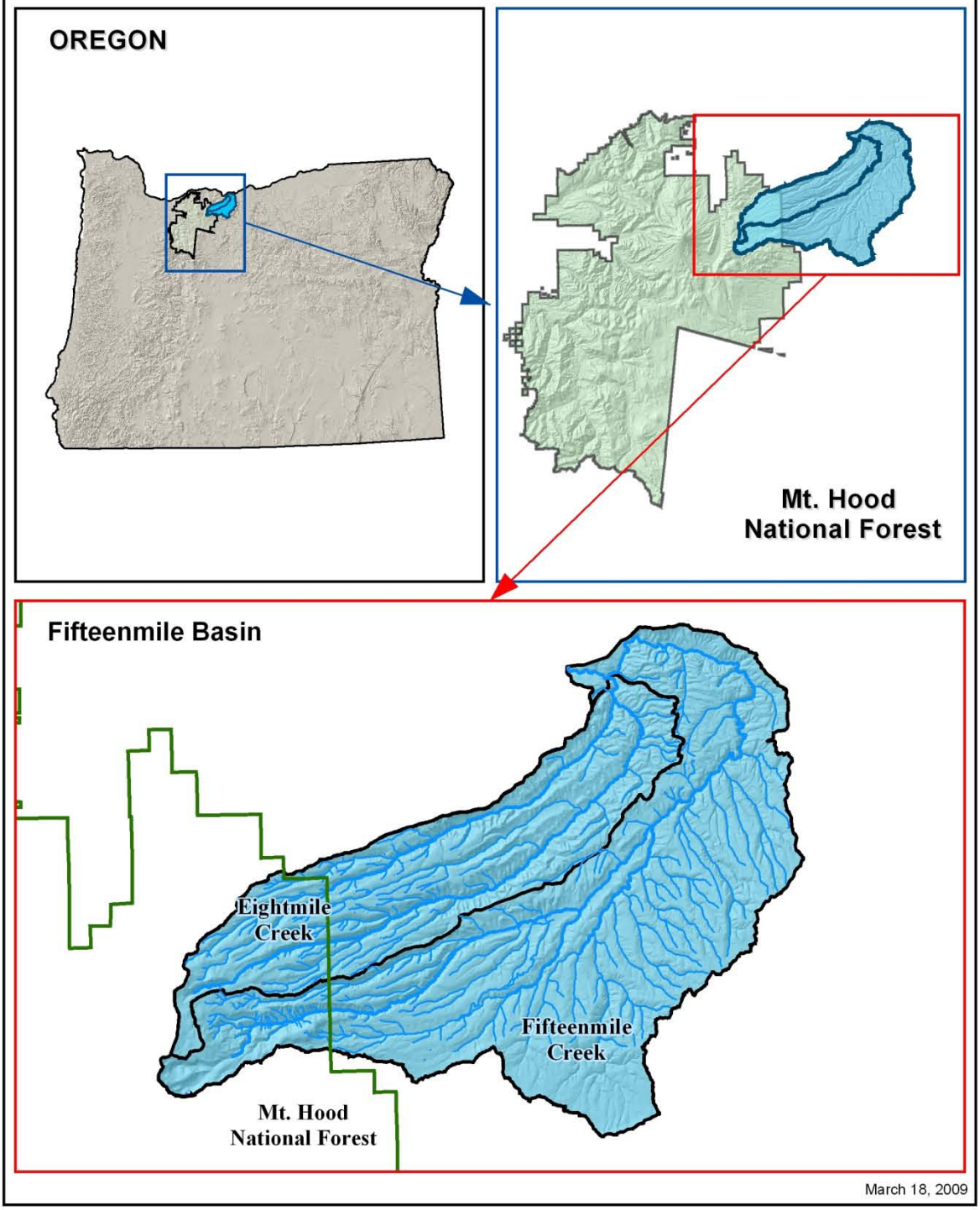
May 2010

Mt. Hood National Forest
Barlow Ranger District
Dufur, Oregon

Reviewed and Approved By: _____ **Date:** 5-26-10
Michael J. Hernandez
District Ranger, Barlow Ranger District
Mt. Hood National Forest

Fifteenmile Basin Aquatic Restoration Strategy
Vicinity Map



March 18, 2009

Executive Summary

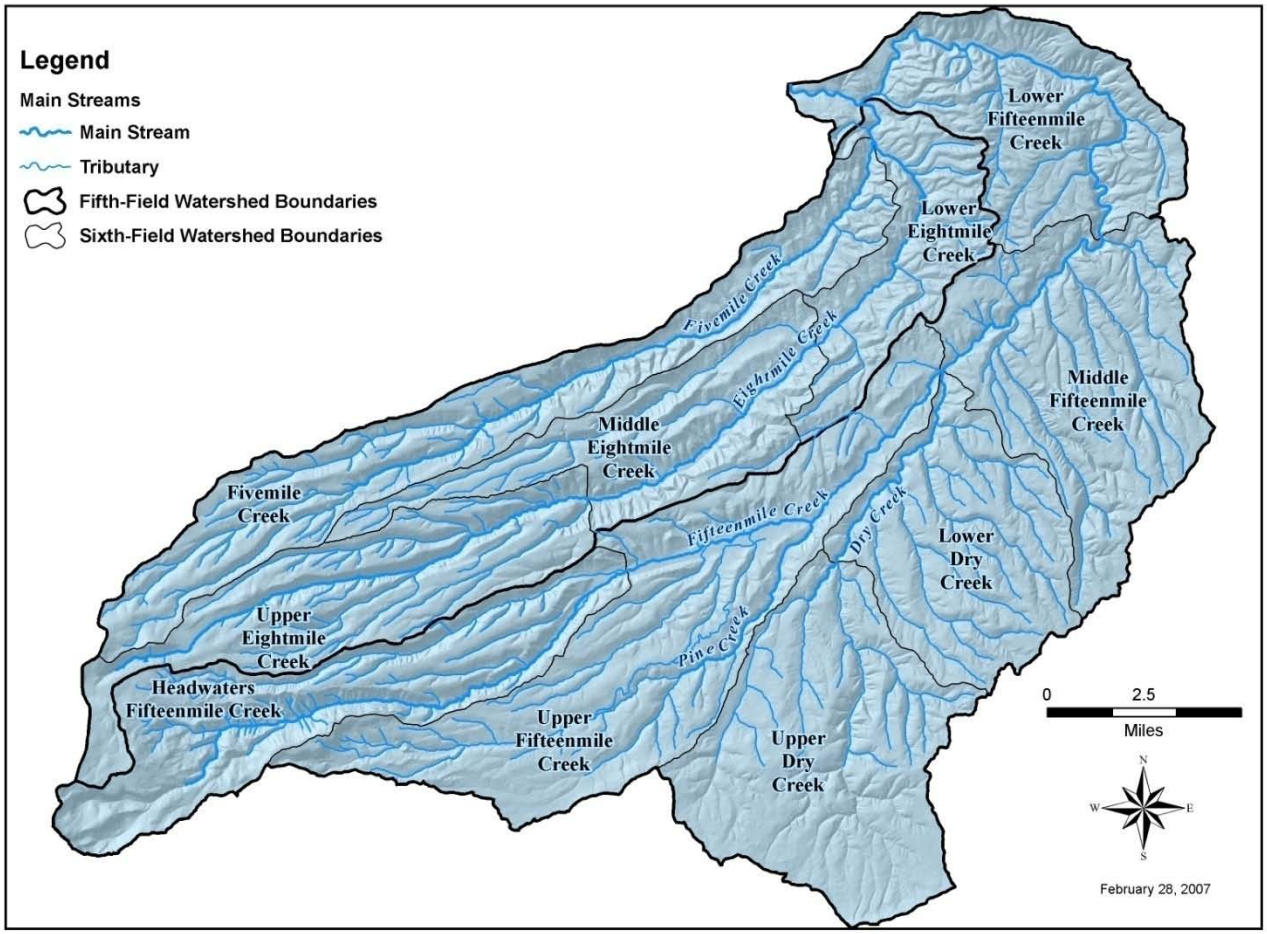
Introduction

Basin Overview

The Fifteenmile Creek Basin is located in North Central Oregon, east of Mt. Hood on the eastern flank of the Cascade Mountain Range about 85 miles east of Portland, Oregon. The basin is part of the Middle Columbia-Hood 4th field watershed. Fifteenmile Creek Basin is roughly 373 square miles (239,000 acres) in size. It contains two individual 5th field watersheds, and nested in those are 10 individual 6th field watersheds. Fifteenmile Creek has four main tributaries; Ramsey, Pine, Dry and Eightmile Creeks and it enters the south banks of the Columbia River at The Dalles Dam in The Dalles, Oregon. The basin lies mostly in the Wasco County with a small portion of the headwaters in Hood River County. The Mt. Hood National Forest manages 15 percent of the basin with 85 percent being located on private lands. The private lands are mostly located in the lower elevations (<1,500 feet) of the basin and are being used as agricultural lands growing primarily wheat, cherries, and cattle. The entire basin contains lands ceded to the United States in the Treaty of 1855 between the U.S. and American Indian Tribes recognized today as the Confederated Tribes of the Warm Springs Reservation of Oregon.

Native, anadromous fish populations are comprised of Middle Columbia River Distinct Population Segment (DPS) steelhead trout and Pacific lamprey. Non-native (unknown origin), anadromous Chinook and coho salmon can be sporadically found in the basin. Resident, native salmonid species include a rainbow-type trout (believed to be interior redband) and cutthroat trout. Sea-run cutthroat trout are believed to be present in the basin, but most likely in low numbers. Many of these fish species have dwindled to very low numbers. Steelhead trout are presently Federally listed as Threatened under the Endangered Species Act, and is managed by the National Marine Fisheries Service. Interior redband trout (rainbow-type trout) is a Regional Forester's Special Status Species. Oregon Department of Fish and Wildlife has listed both interior redband trout and Pacific lamprey as vulnerable.

In 2006, a collaborative working group comprised of key stakeholders representing seven agencies convened in a series of meetings to develop an aquatic habitat restoration strategy for the Fifteenmile Creek Basin. Prior to 2006, there had been many collaborative efforts in the basin focused on developing and implementing aquatic habitat restoration strategies and actions; however, a single basin-wide strategy identifying priority watersheds, limiting factors and priority hilltop-to-valley-bottom restoration actions had not yet been compiled. The collaborative efforts and products described herein do just that. The primary goal of this strategy is to address aquatic habitat restoration needs for resident and anadromous fish species, while addressing needs for streamflow and water quality improvements. All stakeholders involved in the development of this strategy recognized from the outset that several recent efforts in the basin have come very close to delivering an overall end-product for which this effort was directed. Thus, the working group relied heavily upon reviewing existing work in order to develop a stand-alone aquatic habitat restoration strategy for the entire basin.



Fifteenmile Creek Basin 5th and 6th Field Watershed Boundaries.

Participating agencies and entities included:

- Confederated Tribes of the Warm Springs Reservation of Oregon
- Wasco Soil and Water Conservation District
- National Marine Fisheries Service
- Oregon Department of Environmental Quality
- Oregon Department of Fish and Wildlife
- Oregon Water Resources Department
- U.S.D.A. Forest Service

Why is a Basin-wide Aquatic Habitat Restoration Strategy Needed?

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

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

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

While this effort was largely spearheaded by Forest Service staff from the Mt. Hood National Forest, it is intended to provide utility to all Fifteenmile Creek Basin stakeholders interested in aquatic habitat restoration and to foster further development and unification of an already strong and vigorous partnership base. The Fifteenmile Creek Basin has had a good working collaborative partnership base since the late 1990s, with improvements to agriculture and forestry practices, as well as improvements to water quality. This strategy is intended to strengthen existing and future collaborative partnerships in the basin.

What is a Basin-wide Aquatic Habitat Restoration Strategy?

The basin-wide aquatic habitat restoration strategy provides a geographic focus and framework for directing future resources (staff time and funding) towards fulfilling high priority restoration needs for fish habitat and water quality improvements. Specifically, the strategy:

- Identifies priority 6th field watersheds in the basin that provide the cornerstone for addressing freshwater habitat restoration needs of resident and anadromous fish, as well as water quality improvements.
- Describes the limiting factors affecting fish production and water quality.
- Identifies known restoration actions previously identified that will address limiting factors in priority watersheds.
- Identifies types of high priority restoration actions in particular watersheds where they are highlighted through a limiting factors analysis but have yet to be fully scoped and verified on-the-ground.
- Establishes the sequence in which actions should be pursued in order to achieve the maximum benefit.

- Provides a rough estimate of the restoration needs (i.e., quantity) and implementation costs by activity type for each of the 6th field watersheds in the basin.

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

Relation to Watershed Analyses, TMDL Assessment, Subbasin Planning, and Other Analyses

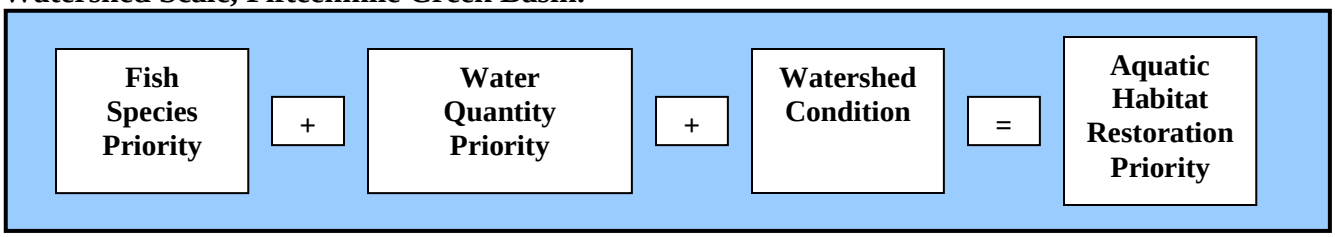
Several previous efforts have been made to assess and analyze stream channel, fish habitat, watershed, and water quality conditions in the basin. These include watershed analyses (both federal and state); the Middle Columbia-Hood (Miles Creeks) Subbasin Total Maximum Daily Load (TMDL) Assessment; and the Northwest Power and Conservation Planning Council's Subbasin Plan. Each of these efforts has been extremely useful in diagnosing conditions and restoration opportunities in various locations in the basin. The key findings and products from these previous efforts, particularly relating to identification of altered watershed processes and limiting factors, were extracted and synthesized in the development of this comprehensive basin-wide, aquatic habitat restoration strategy integrating the needs for both fish population recovery and water quality improvements.

Aquatic Restoration Strategy

Geographic Framework

A model incorporating three components; Fish Species Present, Water Quantity, and Watershed Condition; was developed to establish the relative restoration priority for each of the 6th field watersheds in the basin.

Conceptual Model Used to Establish Aquatic Habitat Restoration Priorities at the 6th Field Watershed Scale, Fifteenmile Creek Basin.

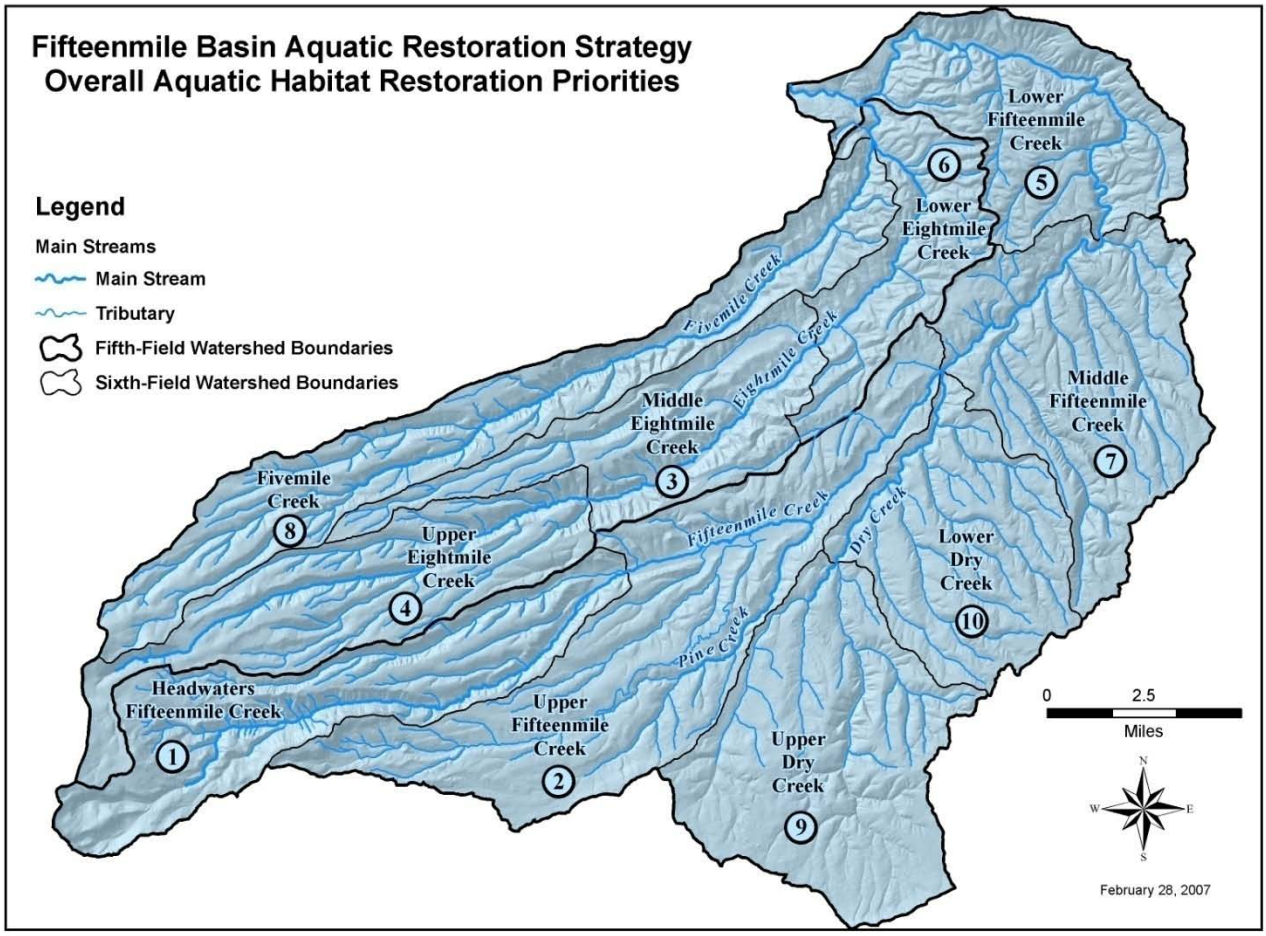


Fish Species Priority identifies important river and stream reaches for: steelhead, rainbow-type trout, cutthroat trout, and Pacific lamprey. Water Quantity identifies reaches of concern due to lack of in-stream flow. Watershed Condition identifies the relative condition of each 6th field watershed, integrating both inherent sensitivity as well as anthropogenic and natural perturbation history. Watersheds in better condition receive a higher priority for restoration. Integrating all three components, an aquatic habitat restoration score was derived for each watershed. Three watersheds tied for the highest score. The amount of fish habitat available determined by Fish Species Present was used to break these ties and establish an overall relative ranking, 1 through 10.

Aquatic Habitat Restoration Priority for 6th Field Watersheds, Fifteenmile Creek Basin.

6th Field Watershed	Fish Species Present[1]	Water Quantity Priority[2]	Watershed Condition[3]	Aquatic Habitat Restoration Score	Miles Occupied by Fish[4]	Aquatic Habitat Restoration Priority based on Fish Species Present Habitat Occupied
Headwaters Fifteenmile	3	6	1	12	21.4	1
Upper Fifteenmile	3	4	3	12	14.6	2
Middle Eightmile	3	1	6	12	7.4	3
Upper Eightmile	2	3	2	12.5		4
Lower Fifteenmile	4	2	9	13.5		5
Lower Eightmile	4	5	7	14.5		6
Middle Fifteenmile	3	7	4	16		7
Fivemile Creek	3	8	5	18		8
Upper Dry Creek	1	9	8	27		9
Lower Dry Creek	2	10	10	27.5		10

Note: Rankings are from 1 to 10, where 1 = highest priority and 10 = lowest priority.
[1]Highest priority given to watersheds with the most fish populations present.
[2]Highest priority given to watersheds with the most water flow diverted.
[3]Highest priority given to watersheds in the best condition.
[4]Stream miles occupied by fish was used only for tie breaking streams with the same aquatic habitat restoration score



Prioritized Aquatic Habitat Restoration for 6th Field Watersheds, Fifteenmile Creek Basin.

Restoration Philosophy

The working group reviewed and endorsed the restoration philosophy set forth in the Fifteenmile Creek Watershed Group's 2005 Watershed Action Plan. It was acknowledged that an effective restoration strategy must first focus on protecting the remaining high quality, productive aquatic habitats in the basin. This is believed to be the most effective and least costly means for ensuring healthy, intact aquatic habitat is maintained over the long term. Where human activities are degrading aquatic habitat, the next course of action would be to curtail those activities or mitigate their impacts and allow conditions to recover naturally. In situations requiring long timeframes for natural recovery, active restoration is encouraged. Watersheds in a healthier condition are considered priority over those that are more degraded. This philosophy is intended to ensure the maximum benefit for the investment made. While the working group agreed this is the best approach, a strong caveat was made – There will often be high priority restoration projects located in lower priority watersheds where funding and implementation in the near-term is justified. The working group acknowledged there will always be geographic-specific restoration opportunities, specific landowners or groups ready to take action, or unique funding sources that will direct active restoration investments in various portions of the basin irrespective of an overall prioritization strategy. The working group strongly supports the continuation of high priority restoration activities even in the lower priority watersheds as opportunities arise based on other factors and to maintain partnership relations that are critical for positive

restoration momentum. It is the intent, over the long term, that restoration investments are focused on high priority actions in priority watersheds in order to move the majority of watersheds in the basin with high ecological value more readily towards restored conditions.

Altered Watershed Processes and Limiting Factors Analysis

A restoration framework was developed to identify and guide implementation of high priority restoration actions in a manner such that the primary and secondary altered processes for each 6th field watershed are first addressed, followed next by the limiting factors affecting fish production. The results from two separate watershed assessments, one federal and one state, a subbasin plan, and one TMDL plan were carefully reviewed to identify the primary and secondary altered watershed processes. Primary altered processes are those watershed processes and functions most greatly affected by past land management activities or existing conditions on the landscape. Watershed processes and functions that may also be altered, but not to as large a magnitude or geographic extent, are categorized as secondary. An understanding of these altered process and functions was important in order for the working group to identify specific restoration actions in specific locations that address the root-causes of impairment. Altered watershed processes considered include:

- Altered Flow Regime via Diversions
- Altered Peak and Base Flow Regime due to Vegetation Manipulation
- Increased Stream Temperature
- Loss of Floodplain Connectivity, Channel Sinuosity, and Channelization
- Lack of In-stream Large Woody Debris (LWD)
- Sedimentation
- Lack of Riparian Vegetation and Potential LWD Recruitment (current and future)
- Potential Nutrient Levels
- Potential Chemical Concentrations
- Impeded Fish Passage

A comprehensive limiting factors analysis for steelhead trout populations was completed during the subbasin planning process that concluded in 2004. This limiting factors analysis utilized the Ecosystem Diagnosis and Treatment (EDT) model. Five environmental attributes were found to have the greatest effect on steelhead trout populations: channel stability, flow, habitat diversity, sediment load, and key habitat quantity. While there are additional species and life-stage specific limiting factors, these five environmental attributes, if addressed through restoration actions, would have the greatest restoration potential benefit for enhancing fish production in the majority of watersheds throughout the basin. The working group melded its assessment of altered watershed processes with the various corresponding EDT limiting factors in order to arrive at a single set or sets of restoration actions that address both. For example, a given watershed that has altered peak and/or base flows correspondingly would have sediment load (SL) and channel stability (CS) identified as key survival factors from the EDT model affecting fish production. Restoration actions would then be identified to not only restore altered peak and/or base flows, but also simultaneously address increased sediment load and/or decreased channel stability from a fish habitat production perspective.

Aquatic Habitat Restoration Actions

A mix of restoration actions (i.e., fish passage, streamflow restoration, road decommissioning and/or storm-proofing, upland and riparian thinning, addition of in-stream woody debris, etc.) was then identified at the sub-watershed and/or stream reach scales to address both the altered watershed process and corresponding EDT limiting factors. In this manner, on a watershed-by-watershed basis, high priority restoration actions were determined. Restoration actions are prioritized and sequenced to ameliorate the root causes of watershed and aquatic habitat impairment. Specific restoration actions, where known, are identified for specific locations to improve watershed conditions, water quality and fish production potential. Where unknown, types of restoration actions are identified for further planning and development. Results from the Mt. Hood National Forest's Roads Analysis completed in 2003 were utilized to estimate the quantity of road mileage in each watershed for restoration activity, including annual road maintenance, road storm-proofing, and road decommissioning. A table of actions was developed for each 6th field watershed in a top-down, watershed approach addressing all of the primary altered watershed processes, followed next by those addressing the remaining secondary altered watershed processes. A second table was compiled for each 6th field watershed categorizing actions into six restoration activity types: fish passage, flow restoration, road-related, riparian-related, in-stream related, and other/miscellaneous. Estimates of restoration activity need (i.e., quantity) and implementation costs are made and summarized for each 6th field watershed.

Summary of Aquatic Habitat Restoration Actions by 6th Field Watershed for the Fifteenmile Creek Basin.

6th Field Watershed	Overall Priority	Estimated Cost by Restoration Activity Type						
		Fish Passage Actions	Flow Restoration Actions	Road-Related Actions	Riparian-Related Actions	In-Stream Related Actions	Other / Misc. Actions	Est. Total Cost
Headwaters Fifteenmile	1	$259,500*	$1,910,000+**	$29,392+**	$665,000**	$21,600+**	$115+	$2,885,607+**
Upper Fifteenmile	2	NA	NA	$16,296+**	$185,000-$300,000**	NA	$115+	$201,411 + / $316,411 +**
Middle Eightmile	3	NA	NA	$12,620+**	$185,000-$300,000**	NA	$115+	$197,735 + / $312,735+**
Upper Eightmile	4	$250,000+*	$500,000+*	$34,794+**	$635,000**	$250,000+**	$115+	$1,669,909+**
Lower Fifteenmile	5	NA	NA	$15,151	$27,000	$132,100+	$115+	$174,366+
Lower Eightmile	6	$0	NA	$7,059	$27,000	NA	$115+	$34,174+
Middle Fifteenmile	7	NA	NA	$15,732	$27,000	NA	$115+	$42,847+
Fivemile	8	$1,100	NA	$32,757+**	$535,000-$720,000**	$31,645+*	$115+	$600,617 + / $785,617+**
Upper Dry Creek	9	NA	NA	$9,590	$27,000	$110,608+	$115+	$147,313+
Lower Dry Creek	10	NA	NA	$12,018	$27,000	NA	$115+	$39,133+
							BASIN TOTAL	$5,993,112 + / $6,408,112+**

*[1] estimated costs do not include yet-to-be determined (NA) actions mostly found on private lands in the lower and middle watersheds of the basin. The U.S. Forest will update estimated costs as additional actions are refined. *Cost estimates associated with projects on Forest. ** Cost estimates associated with projects both on and off Forest. No * cost estimates associated with projects only located off Forest.*

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Chapter 1 – Background

Organization of Document

This document is comprised of five chapters. Chapter 1 provides a background on the development of the aquatic habitat restoration strategy for the Fifteenmile Creek Basin. It covers the scope of this effort – why it was initiated, the sideboards and constraints used, the intent of the document, and who was involved. Additionally, the first chapter identifies some important background information about the basin itself and its collaborative partners. Finally, Chapter 1 briefly summarizes other preceding assessments and strategy efforts and how elements of these were incorporated herein.

Chapter 2 delves into the establishment of a geographic focus for directing future investments in aquatic habitat restoration actions in the basin. The process used for developing a geographic focus for the basin at the 6th field watershed scale is explained. The chapter concludes with a description of the restoration philosophy for the basin developed by the collaborative partners. Important caveats to the application of the restoration philosophy are highlighted.

Chapter 3 lays out the aquatic habitat restoration framework for the basin. This chapter describes the limiting factors analysis method used for each 6th field watershed in the basin and how that translates into the identification of high priority aquatic habitat restoration actions, or types of actions, in specific locations. Results for each of the 6th field watersheds are presented. Altered watershed processes and factors limiting fish production are identified for each watershed, followed by specific high priority restoration actions by project type and location. Where known restoration project opportunities exist for each 6th field watershed, they are highlighted. Otherwise, specific types of restoration actions needed to address altered watershed processes and limiting factors are suggested.

Chapter 4 presents the suite of restoration tools available to implement high priority actions in the basin. This chapter provides a review of the various state, federal, and other programs available to assist in funding aquatic habitat restoration actions focusing on watershed, fish habitat, and water quality improvements. Furthermore, this chapter outlines an initial framework to guide the further development of a technical assistance, outreach, and education strategy specific to the basin.

Chapter 5 summarizes the critical information gaps that surfaced during the development of the aquatic habitat restoration strategy. Identification of these information gaps is important for directing future monitoring, inventory, and refined assessment efforts by the collaborative partners in the basin.

Purpose and Need

While there has been a considerable amount of collaborative effort in the Fifteenmile Creek Basin in both developing and implementing aquatic habitat restoration strategies and actions, a single basin-wide strategy identifying priority watersheds, limiting factors, and priority hilltop-to-valley-bottom restoration actions has not yet been compiled. The collaborative efforts and products described in this document do just that. The primary emphasis of this strategy is to address aquatic habitat restoration needs for resident and anadromous fish species, while at the same time addressing needs for streamflow and water quality improvements. From the outset of this effort beginning in January of 2006, it was fully recognized by all stakeholders involved that several recent efforts have come very close to delivering an overall end-product for which this effort was directed. Therefore, the collaborative working group relied heavily upon reviewing existing work and available products combined with some new synthesis and packaging in order to develop a stand-alone aquatic habitat restoration strategy for the entire basin.

Why is a Basin-wide Aquatic Habitat Restoration Strategy Needed?

Many of the institutions that provide funding for aquatic habitat restoration are beginning to require demonstration of an overall basin-wide strategy, closely linked to a comprehensive assessment of watershed conditions, water quality impairments, priority fish populations and geographic focus areas that identifies necessary high priority actions. These institutions also require partnering, cost-leveraging, and demonstrable on-the-ground results. Many of the primary institutions that commonly fund watershed and aquatic habitat restoration efforts throughout the State of Oregon and in the Pacific Northwest are developing strategies to focus financial investments where there is a demonstrated need, articulated priorities, and clear restoration benefits. As funding becomes scarce and competition in the region expands, a greater emphasis will be given to funding high priority restoration actions in priority watersheds. This is largely being brought about for two reasons: 1) to demonstrate accountability and show completion of high priority restoration actions for whole watersheds and 2) to focus or concentrate available funding to specific areas in order to achieve tangible, aggregated restoration benefits at the watershed-scale as opposed to a “shotgun approach” where many different restoration actions are implemented over a broad landscape making it difficult to detect a restoration benefit.

While this effort was largely spearheaded by Forest Service staff from the Mt. Hood National Forest, it is intended to provide utility to all Fifteenmile Creek Basin stakeholders interested in aquatic habitat restoration and to foster further development and unification of an already strong and vigorous partnership base. The Fifteenmile Creek Basin has had a strong collaborative partnership base since the late 1990’s, with improvements to agriculture and forestry practices, as well as improvements to water quality. This strategy is intended to strengthen the existing, and future collaborative partnerships in the basin.

What is a Basin-wide Aquatic Habitat Restoration Strategy?

A basin-wide aquatic habitat restoration strategy provides a geographic focus and framework for directing future resources (staff time and funding) towards fulfilling high priority restoration needs for fish habitat and water quality improvements. Specifically, the strategy:

- Identifies priority 6th field watersheds in the basin that provide the cornerstone for addressing freshwater habitat restoration needs of resident and anadromous fish as well as water quality improvements.

- Describes the limiting factors affecting fish production and water quality.

- Identifies known restoration actions previously identified that will address limiting factors in priority watersheds.

- Identifies types of high priority restoration actions in particular watersheds where they are highlighted through a limiting factors analysis but have yet to be fully scoped and verified on-the-ground.

- Establishes the sequence in which actions should be pursued in order to achieve the maximum benefit.

- Provides a gross estimate of the costs associated with planning, designing, implementing, and monitoring high priority restoration actions.

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

Background Information on the Basin

The Fifteenmile Creek Basin is located about 85 miles east of Portland, Oregon (Figure 1). The basin comprises part of the Middle Columbia-Hood 4th field watershed and is roughly 373 square miles (239,000 acres) in size. It contains two individual 5th field watersheds, and nested in those are 10 individual 6th field watersheds (Figure 2) as amended by the Regional Ecosystem Office in December 2002 (REO 2002). Fifteenmile Creek has four main tributaries – Ramsey, Pine, Dry, and Eightmile Creeks. Ramsey, Pine, and Eightmile Creeks originate from the eastern ridgeline of the Cascade mountain range at an elevation of about 4,500 to 5,500 feet and they flow in an eastern direction, while entering Fifteenmile Creek at various elevations in the basin. Dry Creek originates in the foot hills just east of the Cascade mountain range at an elevation of about 2,500 feet and flows in a northern direction before entering into Fifteenmile Creek at about

river mile 24. Fifteenmile Creek flows into the Columbia River on the south bank just below The Dalles Dam near The Dalles, Oregon. The major portion of the basin lies in Wasco County with its headwaters mostly in Hood River County. The Mt. Hood National Forest manages 15 percent of the basin with 85 percent being located on private lands. The private lands are mostly located in the lower elevations (<1,500 feet) of the Basin and are being used as agricultural lands, growing primarily wheat, cherries, and cattle.

Agricultural production in the basin is a primary component of the local economy that contributes significantly at the county, state, regional, and national levels. As such, there exists an extensive network of water withdrawal facilities, ditches, and canals throughout the basin supplying irrigation water to croplands in the middle and lower basin. The entire basin contains lands ceded to the United States in the Treaty of 1855 between the U.S. and American Indians recognized today as the Confederated Tribes of the Warm Springs Reservation of Oregon.

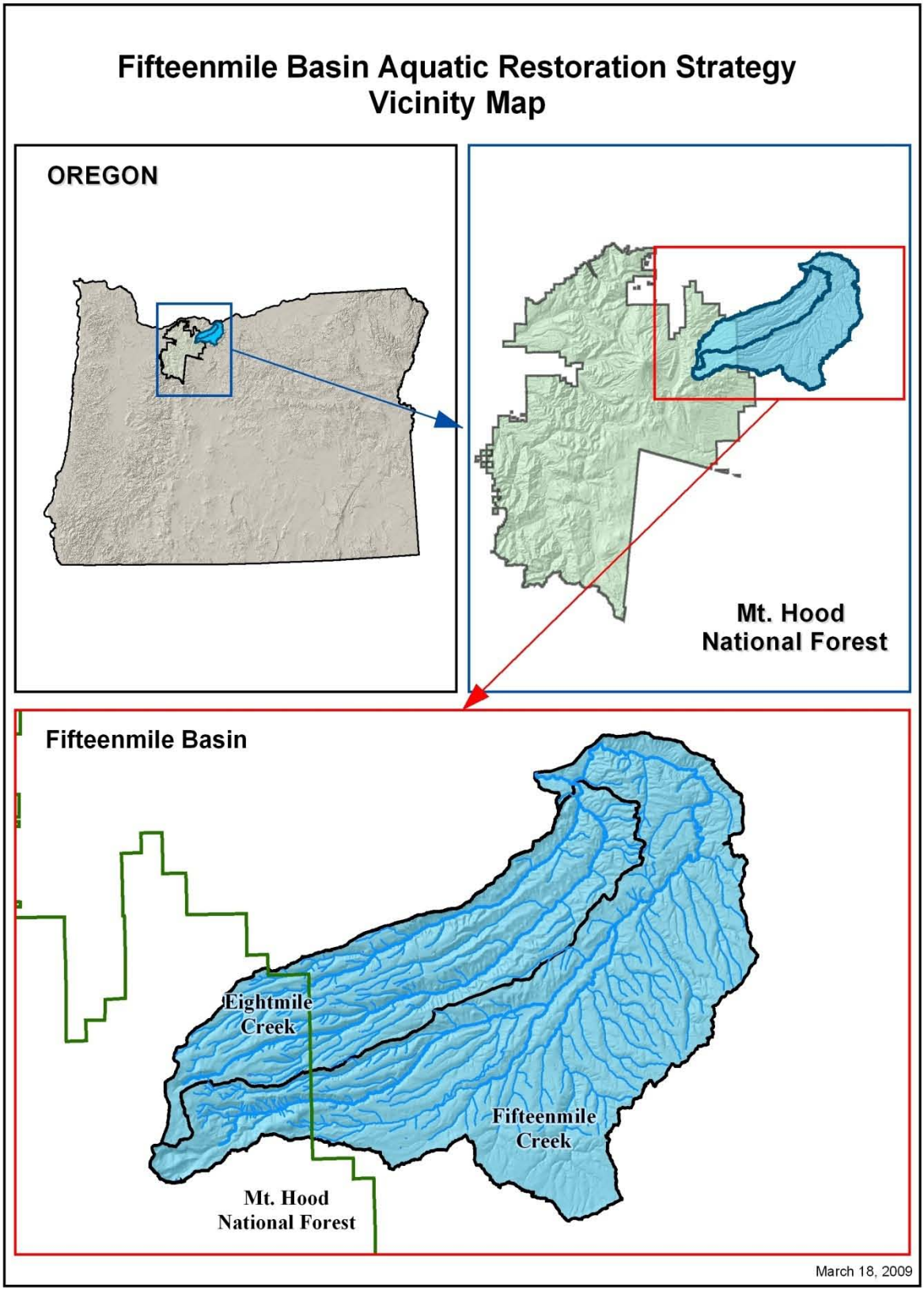

Figure 1. Fifteenmile Basin Vicinity Map

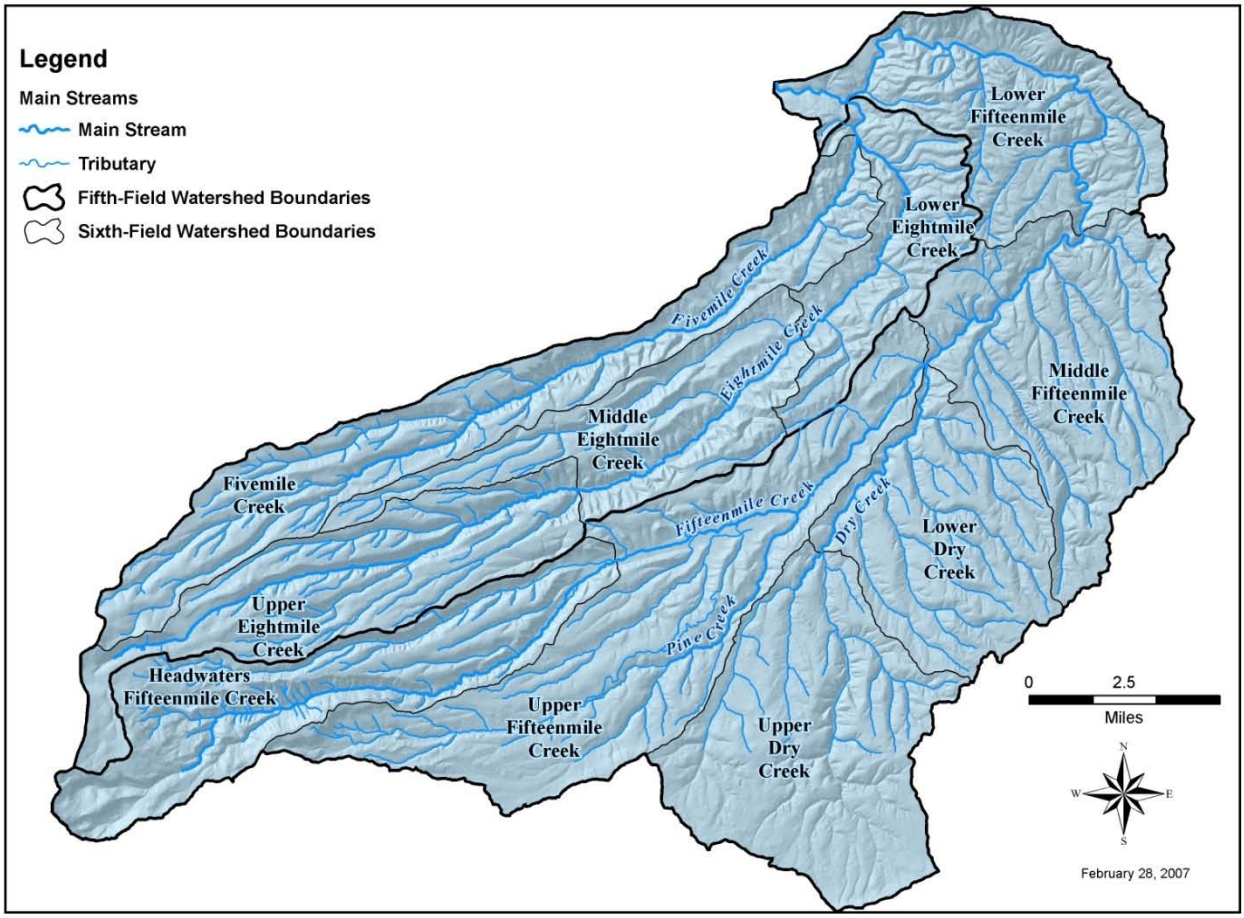

Figure 2. Fifteenmile Basin 5th and 6th Field Watershed Boundaries.

Native anadromous fish populations in the Fifteenmile Creek Basin include steelhead and Pacific lamprey. The native resident salmonid species include rainbow-type trout (which, pending a basin-wide genetic analysis, are believed to be interior redband trout) and cutthroat trout. Sea-run cutthroat trout are believed to be present in the basin, but most likely in low numbers. Non-native (unknown origin) Chinook and coho salmon can be sporadically found in the basin. Many of these fish species have dwindled to very low numbers. The decline in native, anadromous fish runs was witnessed throughout the 1900s and may be attributed to over-fishing, hydroelectric impacts, and habitat degradation. Many of these fish species have dwindled to very low numbers, and therefore, Middle Columbia River (MCR) Distinct Population Segment (DPS) steelhead trout are presently Federally listed as Threatened under the Endangered Species Act, and is managed by the National Marine Fisheries Service, and the interior redband trout (rainbow-type trout) is a Regional Foresters Special Status Species. Oregon Department of Fish and Wildlife has listed both interior redband trout and Pacific lamprey as Vulnerable (Table 1).

Table 1. ESA Listed Species Regional Foresters Special Status Species for Naturally Spawned Fish Species in the Fifteenmile Basin.

Population	Species	ESU/DPS[1]	ESA Status	Responsible Agency	Date
Steelhead	*Oncorhynchus mykiss*	Middle Columbia River Steelhead	Threatened	NOAA Fisheries	January 5, 2006
Interior Redband Trout	*Oncorhynchus mykiss ssp.*	All stocks	Not eligible for listing, Regional Forester's Sensitive and Oregon State Sensitive-vulnerable	Oregon Department Fish and Wildlife	December 1997
Chinook	*Oncorhynchus tshawytscha*	Not able to define	Not eligible for listing	NOAA Fisheries	June 28, 2005
Coho	*Oncorhynchus kisutch*	Not able to define	Not eligible for listing	NOAA Fisheries	June 28, 2005
Pacific Lamprey	*Lampetra tridentada*	Not able to define	Not eligible for listing	U.S. Fish and Wildlife Service	Dec 27, 2004
Coastal Cutthroat Trout	*Oncorhynchus clarki*	Southwest Washington/Columbia River	Improved Understanding; Listing Not Warranted	U.S. Fish and Wildlife Service	July 5, 2002

[1]An Evolutionarily Significant Unit (ESU) as defined by NOAA Fisheries is considered "distinct" (and hence a "species") under the Endangered Species Act in that it is reproductively isolated from other conspecific population units and represents an important component in the evolutionary legacy for the species (Waples 1991). A Distinct Population Segment (DPS) is a subdivision of a vertebrate species that is treated as a species for the purposes of listing under the ESA per the Department of Interior Fish and Wildlife Service and Department of Commerce National Oceanic and Atmospheric Administration "Policy Regarding the Recognition of Vertebrate Population Segments under the ESA" (Federal Register Notice, February 7, 1996).

Collaborative Partners

The partners in the Fifteenmile Creek Basin have a good history of collaboration. Many diverse interests are represented by the various stakeholders throughout the basin, and there continue to be several competing natural resources and economic forces at the forefront. Since 1997, this group of partners with diverse interests has worked collaboratively to build a healthy and sustainable community and environment through education, cooperation, and stewardship as is embraced in the Fifteenmile Creek Watershed Councils mission statement, which is to foster better stewardship of the Fifteenmile watershed resources, deal with issues in advance of resource degradation, and ensure sustainable watershed health, functions, and uses (Personal communication with SWCD Jen Clark, 2007).

This particular effort was launched in the same collaborative spirit, and was made open to all interested partners in the basin to participate and contribute. The development of this strategy was inspired and spearheaded by Forest Service staff from the Mt. Hood National Forest. However, it was continually emphasized at the series of meetings and

workshops that took place January through October 2006 that all stakeholders and partners involved in aquatic habitat restoration in the basin should contribute to the development of this strategy and its end products.

Without such broad participation, the overall strategy would have limited support and durability over the long term. The organizations and individual participants that contributed to the development of this strategy are listed in Table 2.

Table 2. List of organizations and individuals that contributed to the development of the Fifteenmile Basin Aquatic Habitat Restoration Strategy.

Organization/Individual	Participant(s)	Contribution
Confederated Tribes of the Warm Springs Reservation of Oregon (CTWS)	Joseph McCanna	Working Group Participant
National Marine Fisheries Service	Scott Hoefer	Provided Consultation/Input
Oregon Department of Environmental Quality (ODEQ)	Bonnie Lamb	Provided Consultation/Input
Oregon Department of Fish and Wildlife (ODFW)	Brian Benjamin	Working Group Participant
Oregon Water Resources Department (OWRD)	Bob Wood	Working Group Participant
U.S. Forest Service (USFS)	Gary Asbridge John Dodd Darcy Morgan Chris Rossel Dan Shively	Working Group Facilitator Working Group Participant Working Group Participant Working Group Participant Working Group Participant
Wasco County Soil & Water Conservation District (SWCD)	Jen Clark Josh Tompson	Working Group Participant Working Group Participant

Tie to Other Related Efforts

Several previous efforts have been made to assess and analyze stream channel, fish habitat, watershed, and water quality conditions in the basin. Each of these efforts has been extremely useful in diagnosing conditions and restoration opportunities in various locations in the basin. Taken individually, however, none of these previous efforts have culminated in a comprehensive, basin-wide aquatic habitat restoration strategy integrating the needs for both fish population recovery and water quality improvements. The following is a chronological summary of prior efforts relied upon for developing this basin-wide strategy.

USDA Forest Service Watershed Analyses

Summary of Previous Effort

In 1994, the U.S.D.A. Forest Service and Bureau of Land Management implemented the Northwest Forest Plan (USDA and USDI 1994) to guide management of lands in their jurisdiction across the range of the northern spotted owl, primarily from the crest of the

Cascades west to the Pacific Ocean in Oregon, Washington, and northern California. A key component of this plan designed to address the needs of many at-risk Pacific Salmon stocks at that time is the Aquatic Conservation Strategy (ACS). The ACS set forth four components to maintain and restore healthy watersheds for at risk fish stocks, other aquatic organisms, and municipal water supplies: key watersheds, riparian reserves, watershed analysis, and watershed restoration. The watershed analysis component of the ACS directed the development of comprehensive, interdisciplinary examinations of watersheds at the 5th field watershed scale. Watershed analysis objectives are to: 1) describe the current and historical physical, biological, and social characteristics of the watershed, 2) identify and analyze specific management issues, and 3) develop recommendations to assist in moving the watershed from its current condition towards its desired future condition (USDA 1995). These analyses, while conducted at the 5th field watershed scale, mostly evaluated conditions on federal lands only. In 1994, the original Miles Creek Watershed Analysis (MCWA) was completed and an updated version is currently being conducted by Forest Service staff from the Mt. Hood National Forest.

Specific Tie(s) to Development of This Strategy

Information and key findings from the MCWA were used to: 1) bolster our current understanding and knowledge of important fish populations present and habitat conditions, 2) assist in determining watershed condition and health, 3) assist in evaluating limiting factors for individual 6th field watersheds and particular areas in them, and 4) assist in identifying specific restoration actions or types of restoration actions needed to address limiting factors.

Fifteenmile Watershed Assessment

Summary of Previous Effort

With grant funding provided by OWEB, the Fifteenmile Coordinating Group (FCG) and Wasco County Soil and Water Conservation District (SWCD) completed a watershed assessment of the entire basin in March 2003 (Clark 2003). Much of the data and information from the Miles Creeks watershed analyses were incorporated into this assessment. In addition, lands in non-federal ownership were assessed and evaluated much in the same way. The assessment describes and analyzes the following elements:

- Watershed Description: *Social and Economic Background; Fish Species*.
- Watershed Conditions at the Time of Settlement: *Forest, Fire, and Stream; Patterns of Resource Use and Development*.
- Channel Types: *Channel Habitat Type Classification; Channel Modification*.
- Stream Flow, Runoff and Erosion: *Stream Flow History; Land Use Effects; Roads*.
- Surface Water Use
- Riparian and Wetlands Condition: *Riparian Vegetation; Wetlands*.

- Water Quality: *Temperature; Sediment*.
- Fish Habitat: *Private Lands; National Forest.*
- Upland Habitat: *Native Plants; Noxious Weeds*.
- Evaluation

Specific Tie(s) to Development of This Strategy

Much like the watershed analyses on federal lands, this watershed analysis effort provided useful information to: 1) bolster our current understanding and knowledge of important fish populations present and habitat conditions, 2) assist in determining watershed condition and health, 3) assist in evaluating limiting factors for individual 6th field watersheds and particular areas in them (primarily for portions of the basin in non-federal ownership), and 4) assist in identifying specific restoration projects and types of restoration actions needed to address limiting factors.

ODEQ Mid Columbia-Hood Subbasin Total Maximum Daily Load (TMDL)

Summary of Ongoing Effort

Often referred to as the TMDL Assessment, the Miles Creeks Temperature Total Maximum Daily Load was completed by ODEQ in December of 2008, and approved by EPA in February 2009. A TMDL defines the amount of a certain pollutant (such as water temperature or fine sediment) that can be present in a water body while still meeting water quality standards. The total permissible pollutant load is allocated to point, nonpoint, background, and future sources of pollution, along with a margin of safety (Lamb, B., R. Michie, and R. Snyder 2008). A significant portion of every stream in the Fifteenmile Creek Basin is listed as being water quality limited for either temperature or sediment by ODEQ (2004/2006) as required under Section 303(d) of the Clean Water Act (CWA). Specific water quality limitations, or impairments, are based on defined standards relating directly to specific beneficial uses such as fisheries, aquatic life, drinking water, recreation, irrigation, and others. Section 303(d) also requires ODEQ to establish a total maximum daily load for all listed water bodies designated as water quality limited.

The Miles Creeks Temperature TMDL will be incorporated in the Fifteenmile Creek Aquatic Habitat Restoration Strategy. The final TMDL, WQMP, and Response to Public Comments can be accessed on the Internet at:
http://www.deq.state.or.us/wq/tmdls/hood.htm#mch

Specific Tie(s) to Development of This Strategy

The primary component from this ongoing effort used was its analysis of data and identification of stream segments that are water temperature and sediment limited. Even though the ODEQ water temperature TMDL standards were just recently revised in December 2008 (Lamb, B., R. Michie, and R. Snyder 2008) we were able to use a substantial amount of that data from ODEQ efforts in developing the TMDL, and this information was useful in identifying specific stream reaches of concern for both water quantity and quality.

ODFW and NOAA Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment (Mid-C Steelhead Recovery Plan)

The ODFW and NOAA completed the Mid-C Steelhead Recovery Plan in August of 2008. The two agencies developed this plan as a blueprint for the recovery of the ten Middle Columbia River (Mid-C) steelhead populations found in Columbia River's Oregon tributaries (Fifteenmile Creek is one of those ten tributaries). The plan seeks to remove or minimize the long-term threats of Oregon's Mid-C steelhead population, as well as the not only remove them from the threatened and endangered species list, but to recover the DPS populations and their habitats to levels that are not only viable, but provide sustainable fisheries and other ecological, cultural, social, and economic benefits for future generations.

The Fifteenmile Creek Aquatic Habitat Restoration Strategy is consistent and complementary to the Mid-C Steelhead Recovery Plan. The Complete Conservation and Recovery Plan is available from the ODFW at http://www.dfw.state.or.us/fish/eas/mid-columbia/docs/Mid-C_Recovery_Plan_August_2008.pdf

Specific Tie(s) to Development of This Strategy

The primary component from the mid C recovery plan used for this analysis was its analysis of fish populations in Fifteenmile Basin, as well as identifying ongoing and near future restoration projects, which could be added to this document proposed restoration actions.

SWCD Fifteenmile Watershed Action Plan and Update

Summary of Previous Effort

Building from both the revised 2005 SWCD Fifteenmile Action Plan (revision planned for 2010 by the Fifteenmile Watershed Council (FWC)), the action plan is part of a two state-wide initiatives: 1) the Oregon Plan for Salmon and Watersheds and 2) the Healthy Streams Partnership. The action plan was developed in a collaborative manner, involving

private, local, state, and federal stakeholders in the basin. It lays out 6 specific action plan goals, each with measurable objectives and priority rankings, ongoing activities by the different stakeholders, and the future actions which will be in place by 2014.
The ultimate goal is to improve water quality and fish populations while allowing for agricultural industry to make a profit. The plan focuses on areas and restoration needs primarily on non-federal lands. The plan goals, objectives, and priorities to the FWC are as follows:

Goal 1 – "Maintain or improve soil quality and quantity."

- **Objective 1A)** "Runoff off and Erosion: 98 percent of agricultural acres in Fifteenmile Watershed will be farmed according to plans that produce erosion rates at or below "T", the soil loss tolerance."
  - **Priority:** High
- **Objective 1B)** "Soil Quality: 98 percent of agricultural acres in Fifteenmile will be farmed under management plans that maintain or increase organic matter."
  - **Priority**: High

Goal 2 – "Improve riparian and instream habitat."

- **Objective 2A)** "Riparian Vegetation: Allow establishment and development of adequate riparian vegetation for streambank stability and shading, consistent with site capacity."
  - **Priority**: High
- **Objective 2B)** "Reduce sediment from roads at all identified problem spots."
  - **Priority**: Medium
- **Objective 2C)** "Eliminate fish passage barriers."
  - **Priority**: Medium

Goal 3 – "Improve water quality and quantity."

- **Objective 3A)** "Develop and adopt integrated fruit production (IFP) or Selective Spray Systems on 80 percent of agricultural acres in Fifteenmile Watershed."
  - **Priority:** High
- **Objective 3B)** "Water Quantity: All surface water diversions in Fifteenmile will be metered and will be in compliance with water rights certificates."
  - **Priority:** Medium
- **Objective 3C)** "Water Quantity: Summer flows in Fifteenmile Creek through Dufur Valley and other areas with high spawning and rearing potential will be increased through voluntary means, including adoption of efficient technology, conversion of surface water to groundwater, instream transfers and leases."
  - **Priority:** High

- **Goal 4** – "Sustainably manage grassland and forestland resources."

    - **Objective 4A)** "Forest Harvest: Forest harvest operations will follow plans to minimize erosion and sedimentation."
        - **Priority:** Medium
    - **Objective 4B)** "Range Land Health: Improve ecological health of range lands to conditions comparable to native range."
        - **Priority:** Low
    - **Objective 4C)** "Fuels Buildup: Identify areas of dangerous fuels buildup and develop plans or programs to systematically address them."
        - **Priority:** Medium
    - **Objective 4D)** "New Noxious Weeds: Prevent invasion of new noxious weeds through education, reporting and quick response."
        - **Priority:** High

    - **Objective 4E)** "Established Noxious Weeds: Those noxious weeds that are already present and widely established should be managed to prevent further damage to the resources."
        - **Priority:** High

Goal 5 – "Increase upland water storage and availability."

- **Objective 5A)** "Improve soil health on crop and range lands to levels comparable with native prairie soils."
    - **Priority:** High
- **Objective 5B)** "Promote off-stream water storage for irrigation and sediment control."
    - **Priority:** Medium

Goal 6 – "Minimize sediment delivery to streams."

- This goal will be achieved through actions specified under the previously listed goals. No additional objectives are needed.
    - **Priority:** High

Specific Tie(s) to Development of This Strategy

The SWCD Action Plan for the basin was an extremely useful product in the development of this strategy. It provided much of the basis for participants' knowledge and understanding of the basin and particular restoration needs. More specifically, it laid out the restoration philosophy that was reviewed and endorsed in this effort. It also provides an inventory and prioritization of specific restoration actions throughout the basin, many of which were affirmed to address specific limiting factors in particular

6th field watersheds. Finally, it provided much of the basis for Chapter 4 in this strategy, outlining many of the programs and funding sources for restoration actions, technical assistance programs, and outreach and education needs and opportunities.

NPCC Subbasin Planning

Summary of Previous Effort

The Wasco County Soil and Water Conservation District was the lead agency with the assistance of the Fifteenmile Coordinating Group (FCG) in developing the Fifteenmile Creek Subbasin Plan for the Northwest Power and Conservation Council (NPCC), formerly the Northwest Power Planning Council. The subbasin plan was finalized as of May 25, 2004 (Clark 2004). The FCG was comprised of but not limited to the following entities:

- Confederated Tribes of the Warm Springs Indian Reservation (CTWS)
- Natural Resources Conservation Service (NRCS)
- National Oceanographic and Atmospheric Administration (NOAA) Fisheries
- Oregon Department of Agriculture (ODA)
- Oregon Department of Fish and Wildlife (ODFW)
- Oregon Department of Environmental Quality (ODEQ)
- US Forest Service (USFS)
- US Fish and Wildlife Service (USFW)
- Wasco County Soil and Water Conservation District (SWCD)
- Wy'East Resource Conservation and Development Council (Wy'East RC&D)

The plan was submitted to the Northwest Power and Conservation Council and adopted as part of the council's Fish and Wildlife Program. The plan identifies specific goals and biological objectives for fish and wildlife populations in the Fifteenmile Creek Basin and strategies to attain those goals and objectives over the next 10 to 15 years. The Fifteenmile Creek Subbasin Plan is one of several throughout the entire Columbia River Basin and is intended to assist the Bonneville Power Administration in fulfilling part of its mission by funding priority mitigation actions that benefit fish and wildlife populations adversely affected by the Federal Columbia River Power System (FCRPS) Hydroelectric Projects. The subbasin plan: 1) Contains an assessment of current and historic biological and physical conditions, 2) Outlines specific limiting factors suppressing fish and wildlife populations, 3) Identifies current programs and activities in place, and 4) Defines a management plan for the basin. The management plan for the basin outlines a vision with specific goals and biological objectives, prioritizes strategies to achieve those objectives, addresses consistencies with ESA and CWA requirements, and outlines research and monitoring needs. Specific strategies address both habitat restoration and protection of existing habitats.

Focal fish populations included steelhead, Pacific Lamprey, rainbow-type and cutthroat trout. Actual assessments of current and historic conditions were made for steelhead, rainbow-type, and cutthroat trout using the Ecosystem Diagnosis and Treatment (EDT) Model developed by Mobrand Biometrics, Inc. The primary limiting factors identified are: key habitat quantity, sedimentation, habitat diversity, low flows, peak flows, summer water temperature, and channel stability. A total of six restoration scenarios were evaluated for the aquatic focal species using the EDT model. Out of the six restoration strategies the wide spread implementation of riparian buffers on private lands produced the greatest increase in steelhead capacity and abundance and the second highest increase in productivity when using the EDT model. The EDT model identified the placement of large woody debris in key restoration reaches as having the second highest increases in capacity, abundance and productivity.

Specific Tie(s) to Development of This Strategy

The component of the subbasin plan primarily used in the development of this strategy pertains to the aquatic habitat related factors identified as limiting fish production predicted by the EDT model. Specific biological objectives for focal fish populations were not revisited. The subbasin plan addresses other critical factors aside from just habitat conditions, which affect current fish populations.

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Chapter 2 – Geographic Framework

Process Used to Determine Aquatic Habitat Restoration Priority

The working group identified three key components to be used in developing a restoration geographic focus for the basin. All three of these components were deemed equally important. The first component, Fish Species Priority, addresses the various focal fish species or populations in the basin, their distributions, and important habitats for spawning, rearing, and migration. The second component, Water Quantity, addresses stream reaches in the basin with known reduced in-stream flows due to irrigation diversions. The third component, Watershed Condition, addresses overall condition and health of the ten individual 6th field watersheds in the basin. These three components were integrated, as described below under the Synthesis section, to develop an overall restoration geographic focus for the basin. Figure 3 displays a diagram depicting the conceptual model used in the Synthesis section described below.

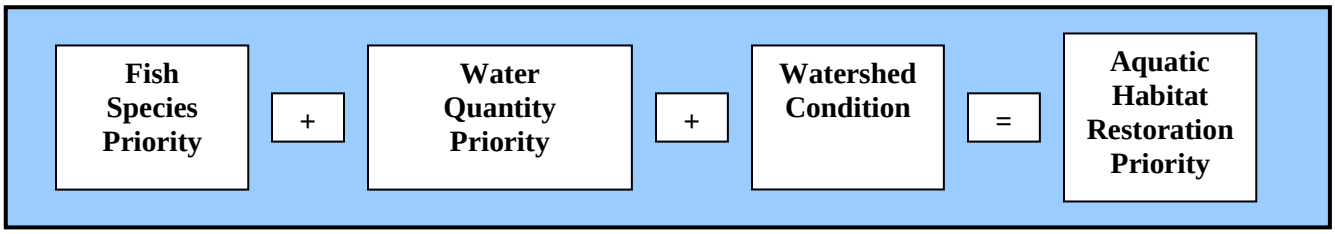

Figure 3. Conceptual Model Used to Integrate Fish Species, Water Quantity, and Watershed Condition to Establish Aquatic Habitat Restoration Priorities at the 6th Field Watershed Scale, Fifteenmile Creek Basin.

Fish Species Priority

The working group desired to identify aquatic habitat restoration needs in the basin that would address all native anadromous and resident salmonid species and Pacific lamprey. Native species were defined as offspring from adult fish spawning in natural habitat of the basins streams. Non-native species, such as Chinook and coho salmon, were not included. The working group decided to use the overall native salmonid and Pacific lamprey fish species present in the basin as the focal fish species for this effort (Table 3). Stream miles of known steelhead presence would be used as a watershed priority tie breaker.

Table 3. Fish Species Found in Fifteenmile Creek Basin.

Common Name	Scientific Name	Comments
Steelhead trout (used as a focal species)	*Oncorhynchus mykiss*	The primary steelhead habitat in the basin is located in the upper basin streams of Fifteenmile, Eightmile, Ramsey, and Fivemile Creeks.
Rainbow-type trout (used as a focal species)	*Oncorhynchus mykiss*	A past genetic sampling effort suggests the presence of the redband subspecies in the basin. There is some uncertainty and lack of consensus around the conclusiveness of the previous sampling effort. Thus, rainbow-type trout will be simply considered as resident *O. mykiss* without further refining it.
Cutthroat trout (resident and anadromous is used as a focal species)	*Oncorhynchus clarkii*	Cutthroat trout are found throughout Fivemile Creek, with the lowest stream reaches of Eightmile and Fifteenmile Creeks being used as a migration corridor. Very little is known about the sea run cutthroat in the basin, but the population is believed to be quite small.
Spring Chinook Salmon	*Oncorhynchus tshawytshaw*	Little is known about the Chinook salmon run in the basin, such as timing of their spawning migration and there distribution. Smolts have been collected on multiple years with the smolt trap, and adults have been seen at the Forest Boundary in Fifteenmile Creek.
Coho Salmon	*Oncorhynchus kisutch*	Coho salmon found in the basin are believed to be from hatchery strays. Spawning adults have been seen below Seufert Falls, and smolts have been collected on multiple years with the smolt trap located just upstream of Seufert Falls.
Pacific lamprey (used as a focal species)	*Lampertra tridentata*	A very important species to CTWS for harvest, spiritual, and cultural reasons. Distribution of the species in the basin is not very well-defined. Adults have been found in both Fifteenmile and Eightmile Creeks.
Western Brook Lamprey	*Lampertra richardsonii*	Like Pacific lamprey, Western Brook lamprey are believed to be present in Fifteenmile Creek, but distribution is unknown.
Sculpin	*Cottus spp*.	Found throughout the basin.
Mountain sucker	*Catostomus platyrhynchus*	Have been found in lower Fifteenmile Creek and tributaries.
Bridgelip sucker	*Catostomus columbianus*	Have been found in lower Fifteenmile Creek and tributaries.
Largescale sucker	*Catostomus macrocheilus*	Found below Seufert Falls.
Northern pikeminnow	*Ptychocheilus oregonensis*	Found below Seufert Falls.
Speckled dace	*Rhinichthys osculus*	Have been found in Ramsey Creek, believed to be present in other streams in Fifteenmile Creek Basin.
Redside shiner	*Richardsonius balteatus*	Found below Seufert Falls.
Chiselmouth	*Acrocheilus alutaceus*	Found below Seufert Falls.
Three Spined Stickleback	*Gasterosteus aculeatus microcephalus*	Found below Seufert Falls.

Non-native rainbow trout	*Oncorhynchus mykiss*	Non-native rainbow trout were stocked in Fifteenmile Creek at the Taylorville bridge until 1974 and downtown Dufur until 1991. Since 1994, Hanel Lake located in the upper stream reaches of an unnamed tributary to Hesslan Canyon drainage has had about 500 trout stocked annually from either a private fish hatchery out of Sandy, Oregon, or from ODFW's Oak Springs fish hatchery out of Maupin, Oregon.

Information in Table 3 is taken from information in the Fifteenmile Subbasin Action Plan (Table 3.1)

Fish population distribution maps for each species were developed using geographic information system (GIS) coverage's, from the Forest Service database. The working group reviewed the GIS maps and highlighted any inconsistencies between the GIS maps and other fish distribution surveys from ODFW. As with the Fifteenmile Subbasin Plan, the working group decided on using steelhead, rainbow-type and cutthroat trout, as well as Pacific lamprey as the focal species for this document. The working group reconciled the inconsistencies in distributions for each focal fish species and also attempted to identify or describe known spawning and/or rearing "hot spots." A "hot spot" was defined as a particular reach of stream (or portion of the basin) where one or both of the following applies: 1) there is a consistently high concentration of spawning adults on a year-to-year basis or 2) the population is known to be present only in that particular stream, or a portion of the basin. Index reaches developed for steelhead spawning surveys in 2003 by ODFW and FS were used for this purpose. Very little data or information is available from which to identify hot spots for species other then steelhead (one index reach was identified to be a "hot spot for Pacific lamprey in Fifteenmile Creek). Hence, the limited information on hot spots was not used to identify priority areas in the basin for other focal fish populations other than steelhead. The working group relied primarily on fish distributions.

Distribution maps for all of the focal fish species listed in Table 3, above, are presented in Appendix A. (Appendix A, MapA1)

Steelhead

Steelhead in the Fifteenmile Creek Basin is considered a wild run as there has never been a hatchery stocking program. The steelhead in the Fifteenmile Creek basin occur primarily in Fifteenmile, Eightmile, Ramsey, and Fivemile Creeks with only the lower stream reaches of both Dry and Pine Creeks being utilized by steelhead (Appendix A, Map A2).

The steelhead population in the Fifteenmile Creek Basin is recognized as both a "core" and "genetic legacy" population by the Middle Columbia Technical Recovery Team charged with developing technical guidance and analysis to aid in salmon recovery planning efforts (Personal Communications with ODFW Rod French, 2007). A *core population* is defined as one that either represented substantial portions of the ESU's/DPS's historical abundance or contained life-history strategies specific to the ESU/DPS. Core populations are considered to be important for maintaining the evolutionary legacy of the ESU/DPS, and managers are encouraged to give priority to these populations in recovery planning. A *genetic legacy population* is defined as one that either had minimal influence from nonendemic fish through artificial propagation practices or exhibits important life-history traits no longer found throughout the majority of the

ESU's/DPS'S historical range. Managers are encouraged to give recovery planning priority (such as in the Oregon Middle Columbia River Steelhead Recovery Plan developed by both ODFW and NOAA Fisheries in 2008) to genetic legacy populations since they retain the most intact representatives of the genetic composition of the ESU/DPS.

Rainbow-Type Trout

Rainbow-type trout distribution is also extensive throughout much of the basin (Appendix A, Map A3). There was considerable discussion in the working group whether or not redband trout (*O. mykiss gairdneri*) are present in the basin. For example, Schreck et al. (1986) grouped steelhead trout that are found in Fifteenmile Creek with the redband steelhead, but Behnke (1992) states, "these fish resemble coastal rainbow trout in their full suite of taxonomic characters more than they do other redband steelhead from east of the cascades." Currens, (1987) conducted a genetic study on differences between resident and anadromous rainbow trout in the Deschutes River basin. Currens found evidence that the trout in the White River basin (the southern boarding basin to Fifteenmile Creek basin) above White River Falls may be remnants of an ancestral redband trout population, which are morphologically more similar to redband trout from the Oregon desert basins. Unlike White River above the White River Falls, Fifteenmile Creek rainbow-type trout are not isolated from outside genetic flow, such as from steelhead trout. Since the study was not replicated or conducted on a basin-wide systematic sampling framework in Fifteenmile Creek basin, the working group came to agreement to consider the resident form of *O. mykiss* simply as rainbow-type trout. The group did not attempt to differentiate between coastal and inland forms.

Cutthroat Trout

Cutthroat trout have been identified to be present in the northern part of the Fifteenmile Creek Basin (Appendix A, Map A4). As part of Spruell et al. (1998) genetic study in the Hood River Basin, 30 fin clip samples were taken from fish found in the North Fork of Fivemile Creek (the working group believes the samples were really taken from Middle Fork of Fivemile Creek, due to the very limited fish distribution in North Fork of Fivemile Creek, which is isolated to its confluence with Middle Fork of Fivemile Creek). Genetic analysis indicated that 25 of the 30 samples were from cutthroat trout, and the other five samples were considered to be cutthroat-rainbow hybrids. It is believed by the working group that Fivemile Creek and the lower reaches of Eightmile and Fifteenmile Creeks are the primary areas occupied by cutthroat. Additional genetic studies need to be conducted throughout the basin to determine an accurate distribution of cutthroat use in the basin. The population status of the anadromous, sea-going form of cutthroat trout in the Fifteenmile Creek basin remains largely unknown, although it is believed the sea-run form was historically present.

Pacific Lamprey

Pacific lamprey distribution is relatively unknown in Fifteenmile Creek Basin (Appendix A, Map A5). What we do know comes from steelhead spawning surveys and smolt trap sampling (1998-2000, and 2003-2004) by ODFW and FS personnel. During the steelhead spawning surveys, any observations of Pacific lamprey adults or redds are recorded in the comments. The smolt trap

has periodically captured both adult and ammocoetes lamprey, and that information is also recorded. An assumption was made that the other three focal species most likely overlap the Pacific lamprey habitat in the basin, and that the aquatic habitat restoration needs for Pacific lamprey would be met by addressing the habitat needs of those other species.

Integration of Fish Population Priorities and Distributions

Once the distribution of each focal fish population was determined, the working group reviewed the focal fish population distribution at the 6th field watershed scale. The working group decided to use Number of Fish Species present in each 6th field watershed as the method for identifying important stream reaches to determine the Fish Species Priority. The method of Number of Fish Species used is described as follows:

Number of Fish Species Present – This method identifies all reaches in the basin where one, two, three, or four populations overlap in their known distributions. Furthermore, this method does not assign importance of one species over another, except in cases where there is a tie between 2 or more watershed priority rankings. In this case, the greater number of known river miles of steelhead habitat in each 6th field watershed would be the deciding factor in receiving the higher ranking. Figure 4 shows the results of this method for evaluating the importance of stream reaches in the basin for fish populations.

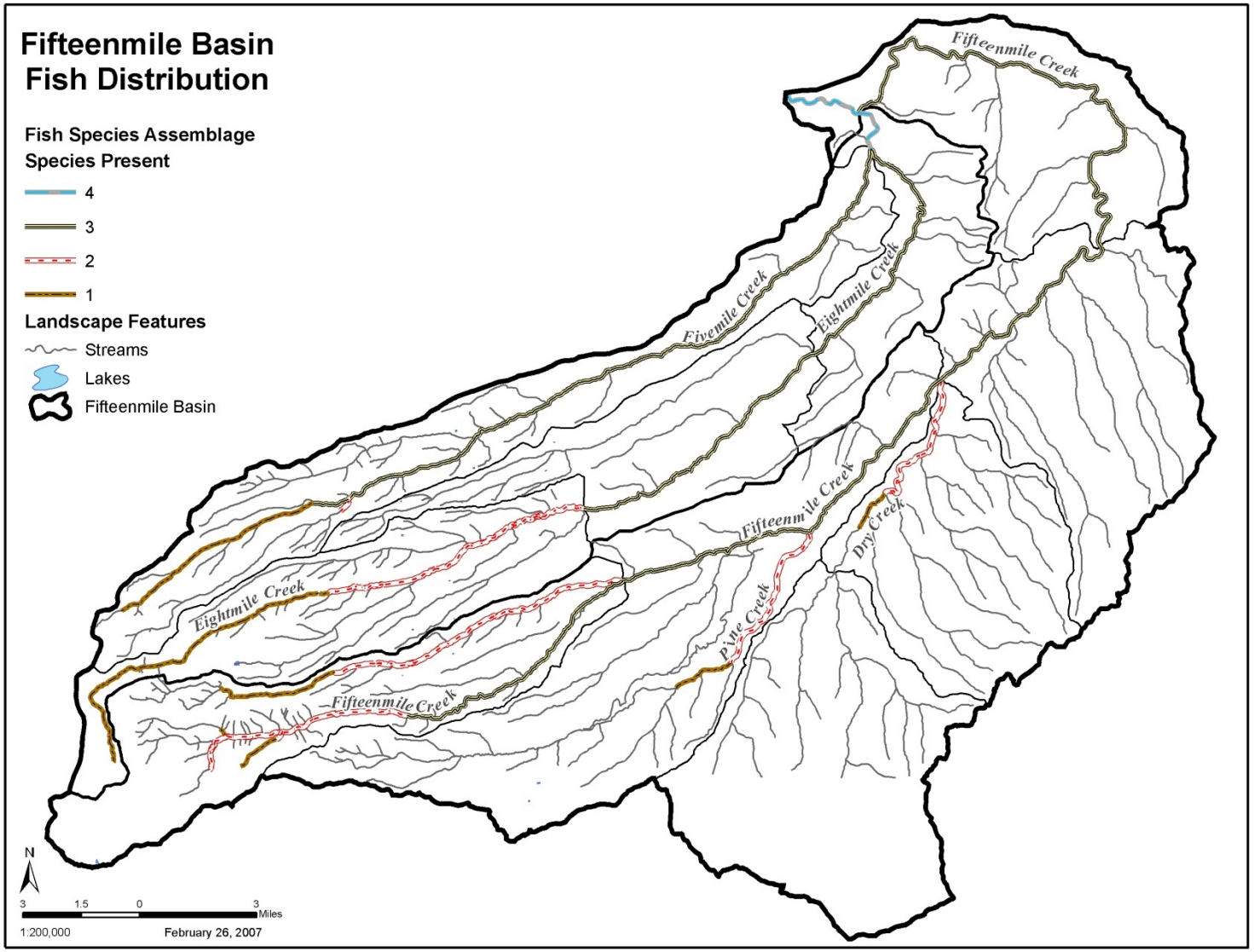

Figure 4. Number of Fish Species Present for Determining Fish Species Priority, Fifteenmile Creek Basin.

Water Quantity/Quality

The working group recognized that an aquatic habitat restoration strategy for the basin must address availability of in-stream flows. Substantial concerns exist with regard to the availability of in-stream flows primarily during low flow summer months in particular reaches throughout the basin. The Fifteenmile Creek Basin is very well known for its wheat, cherry, and livestock production, with an estimated value of $22 million per year (Personal Communication with USDA, Jim Bishop, 2007). A large portion of the water withdrawals in the basin directly support irrigation needs for alfalfa and pasture production (Personal Communication with Wasco County Watermaster, Bob Wood, 2007). While many water withdrawal improvements have been made in recent years to restore in-stream flows and several more are in progress, opportunities for implementing additional improvements exist. Water quality concerns in the basin relate to elevated stream temperatures, chemical pollutants, and turbidity/sediment. In almost all cases, concerns regarding elevated stream temperatures and lack of in-stream flows coincide with one another. Therefore, water quality parameters were not used in the watershed prioritization ranking.

Water Quantity

The working group reviewed all available streamflow data and water withdraw information previously collected and summarized in the basin, such as the listing of deeded water right holders and their allotted cfs use. There has yet to be a basin-wide streamflow assessment that accurately quantifies the impacts from multiple water withdrawals and diversions. Given this, the working group developed a map for the entire basin to serve as a "best estimate" of water withdrawal and diversion impacts to each 6th field watershed. The group prepared a basin-wide map depicting 6th field watershed scale affects from average or normal water withdrawal and diversion operations during an average flow year at summer low-flow conditions (i.e., August to early September). Four broad categories were selected to represent in-stream flow impacts at the 6th field watershed scale: 1) <25 percent of in-stream flows withdrawn or diverted, 2) 25-50 percent, 3) 50-75 percent, and 4) >75 percent. Figure 5 shows the results of this "best estimate" mapping effort. The watersheds of greatest concern are Middle Eightmile, Lower Fifteenmile, and Upper Eightmile. Both Middle Eightmile and Lower Fifteenmile watersheds have >75 percent in-stream flow diverted, and Upper Eightmile has about 75 percent in-stream flow diverted.

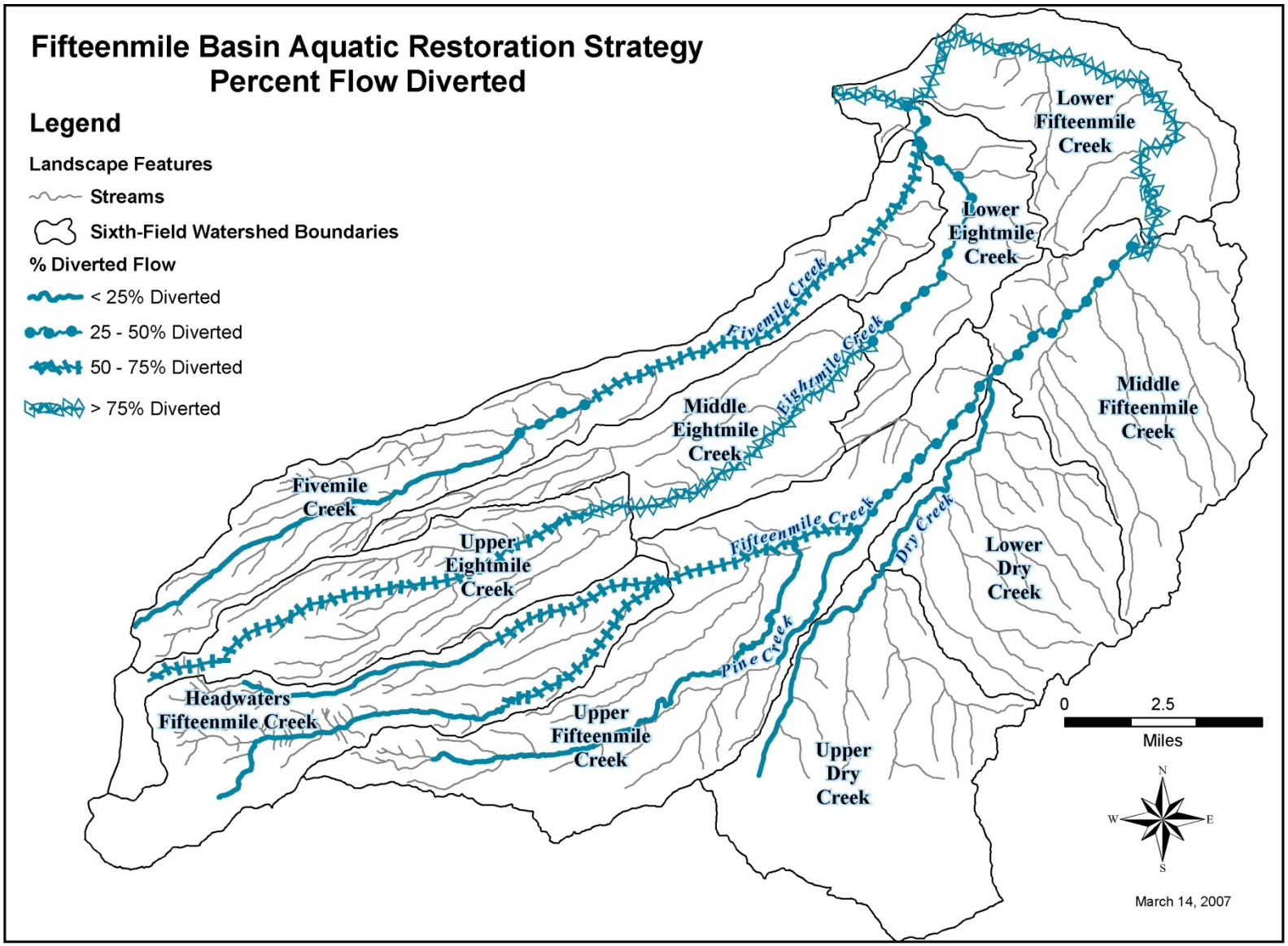

Figure 5. Percent In-stream Flow Diverted by Reach, Fifteenmile Creek Basin

Synthesis of Water Quantity

The working group utilized water quantity assessments at the basin-scale to develop a relative ranking of 6th field watersheds (Table 4). Table 6 ranks the highest concerns of the ten 6th field watersheds in the Fifteenmile Creek Basin for in-stream flows. A rank of "1" for the Middle Eightmile 6th Field watershed means it has the highest level of concern with regard to water quantity relative to all other 6th field watersheds in the basin. Conversely, a rank of "10" for the Lower Dry Creek 6th Field watershed means that it has the least level of water quantity concerns relative to the others. Key rational for the relative ranking outcomes is identified in Table 4.

Table 4. Water Quantity Rankings for 6th Field Watersheds, Fifteenmile Creek Basin.

6th Field Watershed	Water Quantity Rank	Rational
Middle Eightmile	1	>75% in-stream flows diverted in a large portion of the watershed
Lower Fifteenmile	2	>75% in-stream flows diverted within a large portion of the watershed
Upper Eightmile	3	75% in-stream flows diverted in a large portion of the watershed
Upper Fifteenmile	4	50% in-stream flows diverted in a large portion of the watershed
Lower Eightmile	5	25-50% in-stream flows diverted in a large portion of the watershed
Headwaters Fifteenmile	6	25-50% in-stream flows diverted in a large portion of the watershed
Middle Fifteenmile	7	25-50% in-stream flows diverted in a large portion of the watershed
Fivemile Creek	8	25-50% in-stream flows diverted in a large portion of the watershed
Upper Dry Creek	9	0-25% in-stream flows diverted in a large portion of the watershed
Lower Dry Creek	10	0-25% in-stream flows diverted in a large portion of the watershed

Note: *Rankings are from 1 to 10, where 1 = worst condition and 10 = best condition.*

Watershed Condition

Watershed condition is a function of a given watershed's inherent sensitivity to perturbation and its past management and natural disturbance histories. Watershed scientists and specialists often derive long lists of specific metrics to evaluate watershed condition. Examples of these metrics include geomorphic character, geologic composition, soil types, road density, aggregate recovery percentage or equivalent clearcut acreage, number of road/stream crossings, percentage of riparian area in early seral stand condition, channel stability, amount of in-stream woody debris, percent of fine sediment in riffles or spawning gravels, etc. A fundamental problem exists, however, when it comes to comparing these metrics for a given watershed against a set of standards or thresholds to classify its health as "excellent" or "poor" and anywhere in between on this spectrum. Further complicating this matter is the recently emerging concept in watershed science that watersheds tend to fluctuate in their condition over the long term based on the cyclical nature of large-scale natural disturbances such as floods, fire, or volcanic eruptions.

A watershed that may be in "excellent" condition today may suddenly be in a "poor" condition after it experiences a large-scale natural disturbance a year from now. Granted those watersheds that tend to be in a more healthy condition should be more resilient to these disturbances. The fact remains that it is extremely challenging to empirically evaluate watershed condition based on the types of metrics commonly used. Given this dilemma together with the fact that all previous watershed assessment data for the basin (USFS 1994 and Clark 2004) were summarized at the old 6th field watershed boundaries and were not summarized against a set of consistent metrics, the working group utilized an expert panel approach to rank relative watershed health for the ten 6th field watersheds.

Utilizing the expert panel approach, the working group identified six specialists, each one having extensive knowledge and field experience in the basin (Table 2). The professional backgrounds of the panelists include hydrology, geology, stream geomorphology, aquatic ecology, and fish biology. Each individual in the working group ranked the ten watersheds in the basin while explaining to the rest of the group the reasons for ranking each watershed the way they did (Table 5). After reviewing the results from the individual specialists, the working group averaged their results in the far right column of Table 5. The relative condition of each watershed was ranked relative to others in the basin on a scale of "1" to "10." A rank of "1" indicates that watershed determined to be in the best relative condition, and conversely a rank of "10" indicates that watershed in the worst relative condition. The ranking values were established in this manner, inverse to those for Number of Fish Species Present and Water Quantity, in order to emphasize a restoration philosophy of restoring those watersheds in better condition first (see Chapter 3 for a more detailed discussion of this restoration philosophy and its caveats). Individual specialists are identified in Table 5, below, by his or her initials and are also acknowledged above in Table 2, which lists the contributing organizations and individuals to this effort.

Headwaters Fifteenmile 6th field watershed was ranked number "1" unanimously by all specialists during the individual rankings and therefore it had a combined rank of "1." There were no other unanimous watershed rankings between all the specialists. Results from Table 5 are presented in a map of the basin shown in Figure 6.

Table 5. Watershed Condition Rankings for 6th Field Watersheds, Fifteenmile Creek Basin.

6th Field Watershed	Specialist Member Rankings						Combined Average	Combined Rank
	JD	BB	JC	JT	CR	BW		
Headwaters Fifteenmile	1	1	1	1	1	1	1.0	1
Upper Eightmile	3	2	2	3	2	2	2.3	2
Upper Fifteenmile	2	3	3	2	3	3	2.7	3
Middle Fifteenmile	5	4	5	4	4	6	4.7	4
Fivemile Creek	4	7	4	5	6	5	5.2	5
Middle Eightmile	7	5	7	7	5	4	5.8	6
Lower Eightmile	6	6	6	6	7	8	6.5	7
Upper Dry Creek	8	8	8	8	9	7	8.0	8
Lower Fifteenmile	10	9	9	9	8	10	9.2	9
Lower Dry Creek	9	10	10	10	10	9	9.7	10

Note: *Rankings are from 1 to 10, where 1 = best condition and 10 = worst condition.*

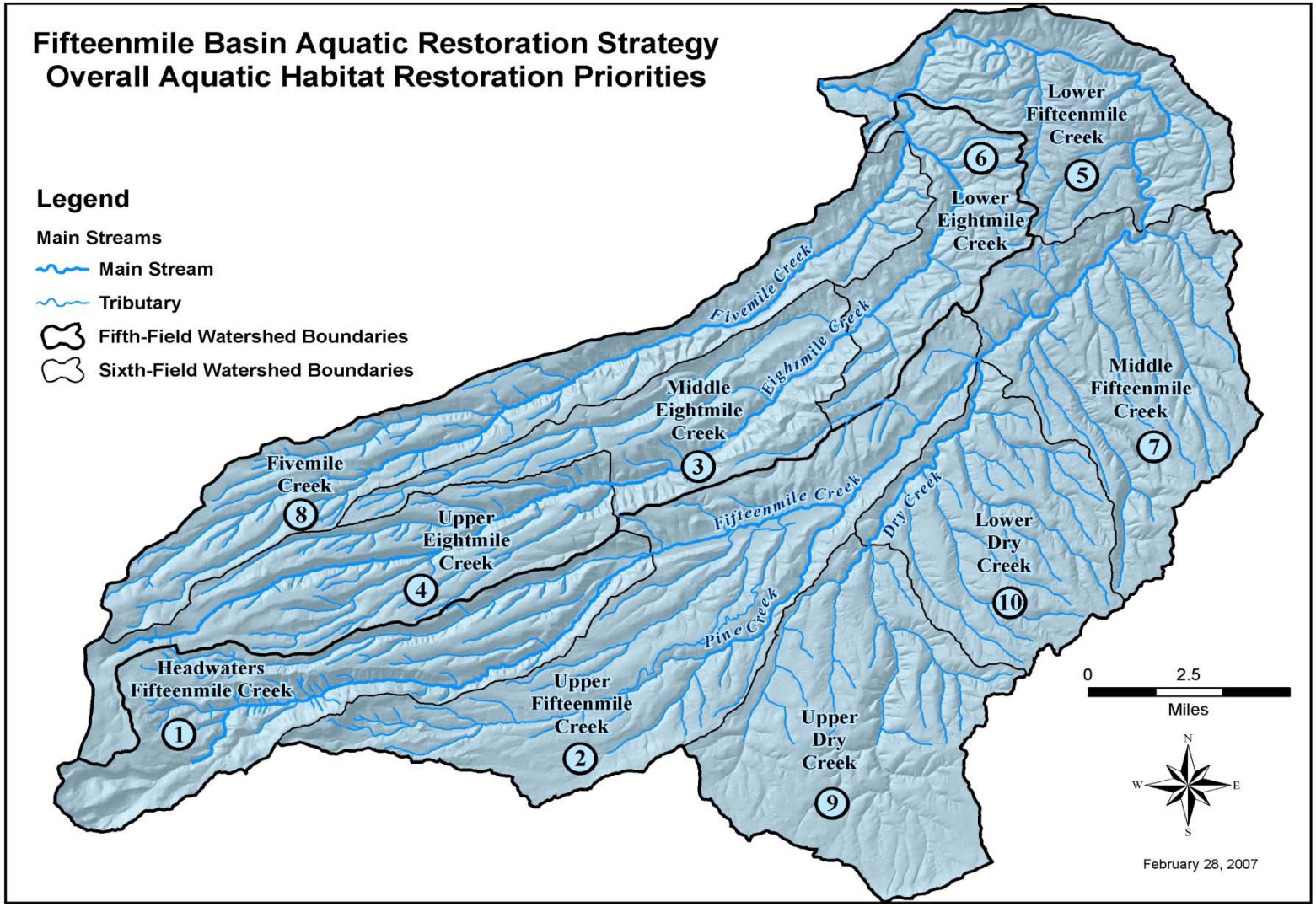

Figure 6. Relative Watershed Condition Rankings at the 6th Field Watershed Scale, Fifteenmile Creek Basin [Note: Rankings are from 1 to 10, where 1 = best condition and 10 = worst condition].

Synthesis & Results – Overall Aquatic Habitat Restoration Focus for the Basin

All three components, including Number of Fish Species Present, Water Quantity, and Watershed Condition, were integrated to develop the Aquatic Habitat Restoration Score for each 6th field watershed (Table 6). The lower a 6th watershed's Aquatic Habitat Restoration Score is, then the higher priority it would receive at the basin-scale. For example, if a 6th field watershed ranked "1" for all three components (Number of Fish Species Present, Water Quantity, and Watershed Condition), then it would receive an Aquatic Habitat Restoration Score of "3."

Three 6th field watersheds were tied for the lowest aquatic habitat restoration score; Headwaters Fifteenmile, Upper Fifteenmile, and Middle Eightmile. The working group used the amount of steelhead trout habitat known to be occupied in each of the 6th field watersheds tied for first lowest scores to establish the final priorities shown in the far right column in Table 6. Figure 6 displays the final results for the overall Aquatic Habitat Restoration Priority at the 6th field watershed scale for the Fifteenmile Creek Basin.

Table 6. Aquatic Habitat Restoration Priority for 6th Field Watersheds, Fifteenmile Creek Basin.

6th Field Watershed	Fish Species Priority[1]	Water Quantity Priority[2]	Watershed Condition[3]	Aquatic Habitat Restoration Score	Stream miles occupied by steelhead trout (Used for tie breakers)	Overall Aquatic Habitat Restoration Priority
Headwaters Fifteenmile	6	6	1	12	21.4	1
Upper Fifteenmile	4	4	3	12	14.6	2
Middle Eightmile	1	1	6	12	7.4	3
Upper Eightmile	3	3	2	12.5		4
Lower Fifteenmile	2	2	9	13.5		5
Lower Eightmile	5	5	7	14.5		6
Middle Fifteenmile	7	7	4	16		7
Fivemile Creek	8	8	5	18		8
Upper Dry Creek	9	9	8	27		9
Lower Dry Creek	10	10	10	27.5		10

Note: *Rankings are from 1 to 10, where 1 = highest priority and 10 = lowest priority.*

[1] *Highest priority given to watersheds with the most fish populations present.*

[2] *Highest priority given to watersheds with the most degraded water quantity/quality conditions.*

[3] *Highest priority given to watersheds in the best condition.*

Chapter 3 – Restoration Framework

In this chapter, a restoration philosophy is presented along with a summary of the process utilized, considering both altered watershed processes and corresponding factors limiting fish production, to arrive at the identification of specific restoration activities. Next, a series of tables are presented for each 6th field watershed identifying high priority aquatic habitat restoration actions that address the altered watershed processes and corresponding limiting factors. Finally, a second set of tables are presented, also on a 6th field watershed by watershed basis, providing an estimate of restoration action need (i.e., quantity) and cost for implementation.

Restoration Philosophy

The working group reviewed the restoration philosophy set forth in the updated 2005 Fifteenmile Action Plan (Clark 2005). In that previous effort, it was acknowledged and accepted that any effective restoration strategy must first focus on protecting the remaining high quality, productive aquatic habitats in the basin. This is widely accepted as the most effective and least costly means for ensuring healthy, intact aquatic habitat is maintained over the long term. Where human activities are degrading aquatic habitat, the next course of action would be to curtail those activities or ameliorate their impacts and allow conditions to recover naturally. In situations requiring long timeframes for recovery, then active restoration is encouraged to return those areas to healthy functioning conditions.

When considering commitments to active restoration, those watersheds in a more healthy condition should be considered priority over those that are heavily degraded. This philosophy is intended to ensure the maximum benefit for the investment made. With limited staff and funding to allocate towards active restoration needs in the basin, it is believed that greater benefits can be obtained by focusing first on high priority restoration actions in those watersheds that are in better condition. This is in contrast to a strategy that would focus limited resources first to those watersheds most heavily degraded, requiring larger investments over longer timeframes to attain desired results. After discussing both approaches, the working group agreed the best approach is the former:

Emphasize active restoration needs in watersheds that are in better condition!

However, this restoration philosophy was endorsed with a strong caveat:

There will always be high priority restoration needs in lower priority watersheds!

The working group acknowledged there will always be geographic-specific restoration opportunities, specific landowners or groups ready to take action, or unique funding sources that will direct active restoration investments in various portions of the basin irrespective of an overall prioritization strategy. The group strongly supports the continuation of high priority restoration activities even in the lower priority watersheds (Figure 6) as opportunities arise based on other factors and to maintain partnership relations that are critical for positive restoration momentum. The intent of the endorsed restoration philosophy is that over the long term where

active restoration investments are discretionary in nature; high priority restoration actions will be funded and implemented in priority watersheds in order to move the majority of watersheds in the basin with high ecological value more readily towards restored conditions.

Altered Watershed Processes

The working group developed a restoration framework that starts with identifying the primary and secondary altered processes for each watershed. The results from watershed assessments (USFS 1994 and Clark 2004) were carefully reviewed for each 6th field watershed to identify the primary and secondary altered processes. Examples of altered watershed processes include:

- Altered Flow Regime via Diversions
- Altered Peak and Base Flow Regime due to vegetation manipulation
- Increased Stream Temperature
- Loss of Floodplain Connectivity, Loss of Channel Sinuosity, and Channelization
- Lack of In-stream LWD
- Sedimentation
- Lack of Riparian Vegetation and Potential LWD Recruitment (current and future)
- Potential Nutrient Levels
- Potential Chemical Concentrations
- Impeded Fish Passage

Primary altered processes are those watershed processes and functions most greatly affected by past perturbations or existing conditions on the landscape. Watershed processes and functions that may also be altered, but not to as large a magnitude or geographic extent, are categorized as secondary. An understanding of these altered process and functions is important in order to identify specific restoration actions in specific locations in the watershed that address the root-causes of impairment. Next, the working group identified the limiting factors affecting fish production.

Summary of Limiting Factors

Limiting factors affecting fish production were determined in 2004 from a thorough basin-wide assessment utilizing the EDT model (Clark 2004). The working group utilized the results from this previous effort and worked through each 6th field watershed identifying the specific EDT limiting factors that correspond to each category of altered watershed process. At the same time, the specific geographic areas of concern in each 6th field watershed (i.e., subwatershed and/or stream reach) were identified such that high priority restoration actions could then be determined.

The remainder of this section summarizes the limiting factors analysis completed as part of the 2004 subbasin planning effort that utilized the Ecosystem Diagnosis and Treatment Model (see http://www.mobrand.com/edt/NWPCC/index.html for a description of the model). The key limiting factors are those where we have seen a large decrease, or loss, in that attribute compared

to the template condition. For most life stages all of the six primary limiting factors (habitat diversity, sediment load, flow, water temperature, key habitat quantity, and channel stability) played a role but there were differences by species and life stage.

Limiting Factor Definitions/Descriptions

Habitat Diversity *– The effect of the extent of habitat complexity in a stream reach on the relative survival or performance of the focus species.*

Habitat diversity, as defined by EDT, is the effect of the extent of habitat complexity in a stream reach on the relative survival or performance of the focal species. Essentially, the more diverse the habitat in any given reach the greater the chance the species will survive and flourish in that reach. Habitat diversity was a key limiting factor in 9 of the 12 lifestages identified in the EDT model (only egg incubation, 2+ -age migrant, and 2+-age transient rearing lifestages were not identified) with most stream reaches modeled as medium or low for needing protection and restoration for steelhead.

Habitat diversity is a function of gradient, channel confinement, riparian function, and large woody debris. Straightening of the stream channel and the confinement of the channel by roads and dikes is the primary cause of shortening the stream length and whereby increasing the stream gradients. Large wood levels are also lower today than historically due to logging and stream clean out. These are the primary reasons habitats are less complex today compared to the template condition. Other reason for the loss of habitat diversity in some reaches of Fifteenmile has been due to agriculture, railroads, or other infrastructure.

Sediment Load *– The effect of the amount of fine sediment present in, or passing through, the stream reach on the relative survival or performance of the focal species.*

The EDT model treats focal species lifestages differently in terms of the sediment load attribute[1] that is most limiting. Turbidity and/or embeddedness are more important in terms of survival or performance (i.e. they "drive" the model results) than the overall amount of fine sediment in streambed for all life stages except egg incubation when eggs and sac-fry are in the gravel. Embeddedness is more of a factor during inactive lifestages when juveniles need to find refuge in the substrate and turbidity is more limiting during active lifestages.

Sediment load was a limiting factor in the majority of all streams and most reaches modeled and it affected all focal species. Sediment load was a key limiting factor in 5 of the 12 lifestages identified in the EDT model (spawning, egg incubation, 0,1-age inactive, 1-age migrant, and pre-spawning migrant lifestages) with most stream reaches modeled as high or medium for needing protection and restoration for steelhead.

[1] The three attributes that make up the sediment load limiting factor are fine sediment (as in the amount of fine sediment), turbidity, and embeddedness.

Flow *– The effect of the amount of stream flow, or the pattern and extent of flow fluctuations, in the stream reach on the relative survival or performance of the focus species. Effects of flow reductions or dewatering due to water withdrawals are to be included as part of this attribute.*

According to EDT, both high flows and low flows reduce steelhead populations in every reach in the Fifteenmile subbasin. The natural fluctuations in flow levels throughout the subbasin are elevated by past management of irrigation withdrawals and other human-caused changes in the runoff characteristics of the watershed. In the absence of any withdrawals, the average monthly flow at the mouth of Fifteenmile Creek varies from 197 cfs in March to 10.7 cfs in August.[2] After irrigation withdrawals, the figure in August is 3.45. The rate of recurrence and scale of peak flows have been increased in Fifteenmile by changes in soil and vegetation characteristics of the uplands, and increases in roads including road locations and surfaces. Fifteenmile Watershed has experienced an increase of up to 650 percent in peak flows since the 1850's.[3]

Both high and low flow was a limiting factor in all streams and all stream reaches modeled and it affected all focal species. Flow was a key limiting factor in 5 of the 12 lifestages identified in the EDT model (Fry colonization, 0, 1, and 2+-age active rearing, and 0,1-age inactive lifestages) with most stream reaches modeled as medium or low for needing protection and restoration for steelhead.

Water Temperature *– Optimum water temperatures for focal species will vary between species and a species lifestages.*

Oregon Department of Environmental Quality set temperature criteria based on biological requirements of salmonids:

- During spawning periods (Winter & Spring) – Not to exceed 13C (55.4F).
- During rearing and migration periods (Summer) – Not exceed 18C (64.4F).
- Streams considered core coldwater habitat areas – Not to exceed 16C (60.8F) at any time of the year.

Water temperatures in parts of Fifteenmile Watershed exceed both the cold water standard and the rearing standard and it is believed to exceed the spawning standard, too. Although, most water temperature monitoring has focused on the summer rearing time. Fifteenmile Creek, Eightmile Creek, and Ramsey Creeks are listed for temperature on the 2004 Oregon State 303(d) list of Water Quality Limited Water bodies. As of December 2008 ODEQ has established a TMDL for water temperature of those streams located in the Miles Creeks subbasin, which includes Fifteenmile Creek Basin

[2] The statement was a footnote within the 2004 Fifteenmile Subbasin Plan, with the information coming from Oregon Water Resources Department website 2004 http://www.wrd.state.or.us/. These figures are based on modeling, which is calibrated to existing stream gage data, which can be accessed at the same website. Wood (2009), states that," these numbers come from our Water Availability Report System (WARS) and are the 50 percent exceedance estimates of natural stream flow. 50 percent exceedance means that we would expect that amount of water to be available at least 50 percent of the time."

[3] The statement was a footnote within the 2004 Fifteenmile Subbasin Plan, with the information coming from Wasco Co. SWCD, 2003a

Water temperature was a limiting factor in all streams and most reaches (all reaches located on Forest) modeled and it affected all focal species. Water temperature was a key limiting factor in 7 of the 12 lifestages identified in the EDT model (spawning, egg incubation, fry colonization, 0, 1, and 2+-age active rearing, and 0,1-age inactive lifestages) with most stream reaches modeled as high, medium, or low for needing protection and restoration for steelhead.

Key Habitat Quantity *– The relative quantity of the relative habitat type(s) utilized by the focus species during a life stage; quantity is expressed the percent of the wetted surface area of the stream channel.*

A key habitat is the primary habitat used by a particular focal species life stage. For example, the key habitats for adult spawning are pool tails and small cobble riffles whereas pools and glides are the key habitats for age 0 and 1 rearing. The EDT model compares the current amount of the various habitat types against the template condition, tracks whether there has been a loss or gain, and alters survival and performance of particular life stages accordingly. Although linked with habitat diversity, key habitat quantity is a focused assessment of those habitats particularly important to various life stages.

Key habitat quantity impacted only a few lifestages in various reaches. Key habitat quantity was a key limiting factor in 4 of the 12 lifestages identified in the EDT model (1 and 2+-age migrants, pre-spawning adult migrant and pre-spawning adult holding lifestages) with most stream reaches modeled as low or medium for needing protection and restoration for steelhead.

The loss of key habitat is very likely due to similar factors that have contributed to the loss of habitat diversity – increases in stream straightening and channel confinement by roads and dikes caused the shortening of the stream length and whereby increasing the stream gradient, as well as the reduction in the amount of large wood due to infrastructure and/or down cutting as a result of land management or channel alteration. Natural events, such as floods, have certainly contributed to key habitat loss (and gain) but we believe in many cases the negative effects of natural events have been exacerbated by land management.

Channel Stability *– The effect of stream channel stability (within reach) on the relative survival or performance of the focus species; the extent of channel stability is with respect to its streambed, banks, and its channel shape and location.*

Channel stability affected all focal species from the egg incubation life stage through juvenile rearing. Channel stability is tied primarily to the bed scour attribute – the more

bed scour the larger the effect[4] on the various life stages for each focal species. The most deleterious effect appeared to be during the egg incubation stage with moderate effects on the fry colonization and inactive rearing (i.e. overwintering) stages.

Channel stability, varies in the Fifteenmile Creek basin and is mostly associated with the natural stream channel geomorphology and hydrology found in the differing ecosystems of the basin. The headwater stream reaches found in the western part of the basin are (minus Dry Creek) in a higher gradient forested ecotype where as the middle and lower stream reaches found in the eastern and northeastern part of the basin are in a lower gradient shrub-steppe ecotype dominated by agriculture farming and ranching. Area managers do believe that past land management has led to increases in runoff rates and therefore has caused the stream channel stability to decrease. Past and present management activities that had/has an influence on channel instability are; past and present tilled agricultural practices (much improved since 1998), valley bottom roads, livestock grazing (much improved with riparian fence projects developed throughout the basin since 1986), and timber harvest have likely increased the flashiness of the system and the frequency and occurrence of peak flows. This has, in turn, increased bed scour in the basin.

Identification of Restoration Actions

Once each 6th field watershed was carefully examined by the working group to document the primary and secondary altered watershed processes and corresponding factors limiting fish production in specific locations, and then priority restoration actions were identified. Where specific restoration actions are known (i.e., planned or in progress), they are referenced, relying largely on the cataloging of restoration actions in the updated 2005 Fifteenmile Action Plan (Clark 2005). Otherwise, types of restoration activities in specific locations were identified to remedy altered watershed processes and ameliorate limiting factors. Where types of restoration activities were identified, they will need to be further investigated in order to determine project feasibility.

Results by 6th Field Watershed

Results from the application of the restoration framework are presented in tabular format for each 6th field watershed in order of restoration priority below. Those restoration actions that occur only on Forest are identified in **Bold.** All other restoration actions described below could occur both on and off Forest or only on private/tribal lands.

[4] In EDT the limiting factors, or survival factors, are described in terms of the relative loss or gain compared to the template condition. In the case of channel stability, which is driven primarily by bed scour, a "loss" of stability actually means there is more bed scour currently than historically and hence the effects are more deleterious.

6th Field Watershed: Headwaters Fifteenmile **(1)**

Altered Watershed Process (from WA)	**Corresponding Level 3 Survival Factors (from EDT)**	**Specific Location/Area**	**Restoration Actions (Bold** = On Forest Actions Only**)**
Primary			
Altered Flow Regime via Diversions	Fl, T, W, HD, HQ	Watershed-wide.	Implement conservation measures such as off-channel storage, irrigation efficiency projects, encourage installation and use of flow meters, etc. Encourage leasing and transfer of water rights to instream use. Promote conservation projects, such as the piping of the Orchard Ridge Ditch, where any saved water could be converted to an instream water right. Approach the "Little Ditch" landowner about transferring their rights to pump stations downstream and then remove Little Ditch. This should be less expensive than piping and increase flow between the ditch diversion and the new pump stations.
Altered Peak and Base Flow Regime due to vegetation manipulation	Fl, T, HD, HQ, CS, SL	Watershed-wide; City of Dufur land and private land from Forest boundary to confluence of Fifteenmile and Ramsey Creeks	Conversion to no-till farming, conversion to perennial crops/vegetation, reduce amount of roads, replant harvested conifer stands located on the upland slopes with a mix of Ponderosa Pine and Douglas Fir seedlings.
Increased Stream Temperature	T	Watershed-wide	Implement riparian planting and /or fencing projects on key stream reaches where shade is lacking or insufficient, implement water conservation measures, lease instream water rights, off-channel water storage, pipe Orchard Ridge Ditch starting from diversion to carry water savings downstream, explore spring enhancement projects.
Loss of Floodplain Connectivity, Loss of Channel Sinuosity, and Channelization	CS, HD, HQ, SL	From new Forest boundaries on Fifteenmile and Ramsey to their confluence	Implement stream restoration projects to improve channel connectivity to floodplains and side-channels. Berm and levee removal.
Lack of Instream LWD	HD, HQ, CS	From new Forest boundaries on Fifteenmile and Ramsey to their confluence	Implement stream restoration projects that increase LWD densities and improve habitat diversity and complexity.

Sedimentation	SL, CS,	Watershed-wide; rock quarry, agriculture and livestock in riparian area, and timber harvest on Fifteenmile; OHV use; 4421 road to Penny bridge and Taylor Grade road; Upper Fifteenmile Creek Road up to Penny bridge (with 3 fords)	Continue to improve agriculture practices (such as more no-till farming and fencing), evaluate and improve road drainage, etc. to reduce erosion, enhance riparian vegetation buffers by reforestation and long-term protection.
Lack of Riparian Vegetation and Potential LWD Recruitment (current and future)	HD, HQ, CS, T	Watershed-wide	Facilitate improvements in riparian stand conditions through fencing, planting, thinning, and other silvicultural applications. **Replant new parcel immediately above Forest boundary (**Check out off-site pine on old Mt. Fir parcel above Penny bridge).
Secondary			
Potential nutrient levels	Fo, DO	From new Forest boundaries on Fifteenmile and Ramsey to their confluence	Incorporate riparian buffer strips; add off-channel water sources. Implement Best Management Practices (BMP's) for better fertilizer, livestock and wastewater (including on-site sewage) management to help reduce nutrient sources from entering the stream channel.
Potential chemical concentrations	C, Fo	From new Forest boundaries on Fifteenmile and Ramsey to their confluence	Incorporate riparian buffer strips, Integrated Pest Management (IPM) – minimize or eliminate application next to streams, or use less toxic chemicals.
Impeded Fish Passage	O	Potential passage issues at fords during low flow periods. Road 4450 crossing on Ramsey Creek (baffled culvert). Diversion headwall located on new Ramsey Creek parcel.	Replace fords with bridges or modify channel configuration to deepen water by hardening fords with pit run, etc. **Replace Forest Rd 4450 culvert. Remove an abandoned diversion headwall at an irrigation diversion headgate.**

Abbreviations of EDT Survival Factors for the Fifteenmile Creek Basin:
Channel Stability = CS; Chemicals = C; Flow = Fl; Food = Fo; Habitat Diversity = HD; Obstructions = O; Sediment Load = SL; Temperature = T; Withdrawals = W; Key Habitat Quantity = HQ; Dissolved Oxygen = DO.

6th Field Watershed: Upper Fifteenmile **(2)**

Altered Watershed Process (from WA)	**Corresponding Level 3 Survival Factors (from EDT)**	**Specific Location/Area**	**Restoration Actions (Bold** = On Forest Actions Only**)**
Primary			
Altered Flow Regime via Diversions	Fl, T, HD, HQ	Watershed-wide; downstream effects of Orchard Ridge Ditch, (in Headwaters Fifteenmile), diversion next to Airstream property	Implement conservation measures such as off-channel storage, irrigation efficiency projects, encourage installation and use of flow meters, etc. Encourage leasing and transfer of water rights to instream use, such as approach the Underhill Ditch landowner about transferring their rights to pump stations downstream and remove the ditch. This should be less expensive than piping and increase flow between the ditch diversion and the new pump stations.
Altered Peak and Base Flow Regime via vegetation manipulation	Fl, T, HD, HQ, CS, SL	Watershed-wide	Conversion to no-till farming, conversion to perennial crops/vegetation.
Increased Stream Temperature	T	Watershed-wide; cattle ponds in Friend area	Implement riparian planting and /or fencing projects on key stream reaches where shade is lacking or insufficient, implement water conservation measures, lease instream water rights, off-channel water storage, piping upstream diversions to carry water savings downstream, explore spring enhancement projects.
Loss of Floodplain Connectivity, Loss of Channel Sinuosity, and Channelization	CS, HD, HQ, SL	Watershed-wide	Implement stream restoration projects to improve channel connectivity to floodplains and side-channels. Berm and levee removal.
Lack of Instream LWD	HD, HQ, CS	Watershed-wide	Implement stream restoration projects that increase LWD densities and improve habitat diversity and complexity.
Sedimentation	SL, CS	Watershed-wide	Sediment basins continue to improve agriculture practices (such as more no-till farming), evaluate and improve road drainage, etc. to reduce erosion, identify and evaluate agricultural equipment stream crossings, enhance riparian vegetation buffers by reforestation and long-term protection.

Potential nutrient levels	Fo, DO	Watershed-wide, Dufur City sewage treatment facility, Fifteenmile within city limits	Incorporate riparian buffer strips, add off-site water sources for livestock. Implement Best Management Practices (BMP's) for better fertilizer, livestock and wastewater (including on-site sewage) management to help reduce nutrient sources from entering the stream channel.
Lack of Riparian Vegetation and Potential LWD Recruitment (current and future)	HD, HQ, CS, T	Watershed-wide	Facilitate improvements in riparian stand conditions through fencing, planting, thinning, and other silvicultural applications.
Secondary			
Potential chemical concentrations	C, Fo	Watershed-wide	Incorporate riparian buffer strips, Integrated Pest Management (IPM) – minimize or eliminate application next to streams, or use less toxic chemicals. Improve residential chemical use.
Impeded Fish Passage	O	Potential passage issues at fords during low flow periods; fish ladder at Fifteenmile diversion next to Airstream property	Replace fords with bridges, modify channel configuration to deepen water by hardening fords with pit run, etc. Evaluate passage at Fifteenmile diversion.

Abbreviations of EDT Survival Factors for the Fifteenmile Creek Basin:
Channel Stability = CS; Chemicals = C; Flow = Fl; Food = Fo; Habitat Diversity = HD; Obstructions = O; Sediment Load = SL; Temperature = T; Withdrawals = W; Key Habitat Quantity = HQ; Dissolved Oxygen = DO.

6th Field Watershed: Middle Eightmile **(3)**

Altered Watershed Process (from WA)	**Corresponding Level 3 Survival Factors (from EDT)**	**Specific Location/Area**	**Restoration Actions (Bold** = On Forest Actions Only**)**
Primary			
Altered Flow Regime via Diversions	Fl, T, HD, HQ	Watershed-wide (Eightmile only)	Implement conservation measures such as off-channel storage, irrigation efficiency projects, encourage installation and use of flow meters, etc. Encourage leasing and transfer of water rights to instream use, such as piping upstream diversions to carry water savings downstream, and convert any saved water from the piping project to an instream water right.
Altered Peak and Base Flow Regime via vegetation manipulation	Fl, T, HD, HQ, CS, SL	Watershed-wide	Conversion to no-till farming, conversion to perennial crops/vegetation, reduce amount of roads.
Increased Stream Temperature	T	Watershed-wide (primarily Eightmile)	Implement riparian planting and /or fencing projects on key stream reaches where shade is lacking or insufficient, implement water conservation measures, lease instream water rights, off-channel water storage, piping upstream diversions to carry water savings downstream, evaluate possibility of eliminating diversions from springs (cold water) and replacing with another source, explore spring enhancement projects.
Loss of Floodplain Connectivity, Loss of Channel Sinuosity, and Channelization	CS, HD, HQ, SL	Watershed-wide	Implement stream restoration projects to improve channel connectivity to floodplains and side-channels. Berm and levee removal.
Lack of Instream LWD	HD, HQ, CS	Watershed-wide	Implement stream restoration projects that increase LWD densities and improve habitat diversity and complexity.
Sedimentation	SL, CS	Watershed-wide	Sediment basins continue to improve agriculture practices (such as more no-till farming), evaluate and improve road drainage, etc. to reduce erosion, enhance riparian vegetation buffers by reforestation and long-term protection.

Lack of Riparian Vegetation and Potential LWD Recruitment (current and future)	HD, HQ, CS, T	Watershed-wide	Facilitate improvements in riparian stand conditions through fencing, planting, thinning, and other silvicultural applications.
Secondary			
Potential nutrient levels	Fo, DO	Watershed-wide	Incorporate riparian buffer strips, add off-site water sources. Implement Best Management Practices (BMP's) for better fertilizer, livestock and wastewater (including on-site sewage) management to help reduce nutrient sources from entering the stream channel.
Potential chemical concentrations	C, Fo	Watershed-wide	Incorporate riparian buffer strips, Integrated Pest Management (IPM) – minimize or eliminate application next to streams, or use less toxic chemicals. Improve residential chemical use.
Impeded Fish Passage	O	Endersby Cutoff Culvert, potential passage issues at fords during low flow periods.	Culvert scheduled for replacement with bridge in 2006. Replace fords with bridges, modify channel configuration to deepen water by hardening fords with pit run, etc.

Abbreviations of EDT Survival Factors for the Fifteenmile Creek Basin:
Channel Stability = CS; Chemicals = C; Flow = Fl; Food = Fo; Habitat Diversity = HD; Obstructions = O; Sediment Load = SL; Temperature = T; Withdrawals = W; Key Habitat Quantity = HQ; Dissolved Oxygen = DO.

6th Field Watershed: Upper Eightmile **(4)**

Altered Watershed Process (from WA)	**Corresponding Level 3 Survival Factors (from EDT)**	**Specific Location/Area**	**Restoration Actions (Bold** = On Forest Actions Only**)**
Primary			
Altered Flow Regime via Diversions	Fl, T, HD, HQ	Watershed-wide (Eightmile only); Wolf Run ditch not yet piped near Camp Baldwin	Implement conservation measures such as off-channel storage, irrigation efficiency projects, encourage installation and use of flow meters, etc. Encourage leasing and transfer of water rights to instream use, such as finishing Wolf Run piping project near Camp Baldwin, and convert any saved water from the piping project to an instream water right.
Altered Peak and Base Flow Regime via vegetation manipulation	Fl, T, HD, HQ, CS, SL	Beetle kill area from headwaters to lower Eightmile Campground	Reduce amount of roads, reforestation, thinning, underburning.
Increased Stream Temperature	T	Potential near future (5-10 years) for entire watershed, especially downstream of Wolf Run ditch diversion	Implement riparian planting on key stream reaches where shade is lacking or insufficient, implement water conservation measures, lease instream water rights, off-channel water storage, piping upstream diversions to carry water savings downstream, explore spring enhancement projects to reduce ditch usage.
Sedimentation	SL, CS	Watershed-wide; ford below Forest boundary, main beetle kill area is west of FS road 4440	Evaluate and improve road drainage, and improve or eliminate fords to reduce erosion, enhance riparian vegetation buffers by reforestation and long-term protection. **Re-vegetate beetle kill areas**.
Lack of Riparian Vegetation and Potential LWD Recruitment (current and future)	HD, HQ, CS, T	Watershed-wide, issue will increase over the long term (short term recruitment will occur in beetle kill area)	Facilitate improvements in riparian stand conditions through planting, thinning, and other silvicultural applications.
Secondary			
Lack of Instream LWD	HD, HQ, CS	Off-forest	Implement stream restoration projects that increase LWD densities and improve habitat diversity and complexity.

Impeded Fish Passage	O	Potential passage issues at road fords during low flow periods. Road 44 crossing of Eightmile Creek	Replace fords with bridges or modify channel configuration to deepen water by hardening ford with pit run, etc. **Replace Forest Rd 4400 culvert.**

Abbreviations of EDT Survival Factors for the Fifteenmile Creek Basin:
Channel Stability = CS; Flow = Fl; Habitat Diversity = HD; Obstructions = O; Sediment Load = SL; Temperature = T; Key Habitat Quantity = HQ.

6th Field Watershed: Lower Fifteenmile **(5)**

Altered Watershed Process (from WA)	**Corresponding Level 3 Survival Factors (from EDT)**	**Specific Location/Area**	**Restoration Actions (Bold** = On Forest Actions Only**)**
Primary			
Altered Flow Regime via Diversions	Fl, T, HD, HQ	Watershed-wide (downstream effects of multiple upstream diversions)	Implement conservation measures such as off-channel storage, irrigation efficiency projects, encourage installation and use of flow meters, etc. Encourage leasing and transfer of water rights to instream use, such as piping upstream diversions to carry water savings downstream, and convert any saved water from the piping project to an instream water right.
Altered Peak and Base Flow Regime via vegetation manipulation	Fl, T, HD, HQ, CS, SL	Watershed-wide	Conversion to no-till farming, conversion to perennial crops/vegetation, reduce amount of roads.
Increased Stream Temperature	T	Watershed-wide	Implement riparian planting and /or fencing projects on key stream reaches where shade is lacking or insufficient, implement water conservation measures, lease instream water rights, off-channel water storage, piping upstream diversions to carry water savings downstream, explore spring enhancement projects.
Loss of Floodplain Connectivity, Loss of Channel Sinuosity, and Channelization	CS, HD, HQ, SL	Watershed-wide	Implement stream restoration projects to improve channel connectivity to floodplains and side-channels. Berm and levee removal.
Lack of Instream LWD	HD, HQ, CS	Watershed-wide	Implement stream restoration projects that increase LWD densities and improve habitat diversity and complexity.
Sedimentation	SL, CS	Watershed-wide	Sediment basins continue to improve agriculture practices (such as more no-till farming), evaluate and improve road drainage, etc. to reduce erosion, identify and evaluate agricultural equipment stream crossings, enhance riparian vegetation buffers by reforestation and long-term protection. Improve domestic on-site sewage system management.

Potential nutrient levels	Fo, DO	Watershed-wide	Incorporate riparian buffer strips; add off-site water sources for livestock. Implement Best Management Practices (BMP's) for better fertilizer, livestock and wastewater (including on-site sewage) management to help reduce nutrient sources from entering the stream channel.
Lack of Riparian Vegetation and Potential LWD Recruitment (current and future)	HD, HQ, CS, T	Watershed-wide	Facilitate improvements in riparian stand conditions through fencing, planting, thinning, and other silvicultural applications.
Secondary			
Potential chemical concentrations	C, Fo	Watershed-wide	Incorporate riparian buffer strips, Integrated Pest Management (IPM) – minimize or eliminate application next to streams, or use less toxic chemicals. Improve domestic on-site sewage system management and residential chemical use.

Abbreviations of EDT Survival Factors for the Fifteenmile Creek Basin:
Channel Stability = CS; Chemicals = C; Flow = Fl; Food = Fo; Habitat Diversity = HD; Sediment Load = SL; Temperature = T; Key Habitat Quantity = HQ; Dissolved Oxygen = DO.

6th Field Watershed: Lower Eightmile **(6)**

Altered Watershed Process (from WA)	**Corresponding Level 3 Survival Factors (from EDT)**	**Specific Location/Area**	**Restoration Actions (Bold** = On Forest Actions Only**)**
Primary			
Altered Flow Regime via Diversions	Fl, T, HD, HQ	Watershed-wide	Implement conservation measures such as off-channel storage, irrigation efficiency projects, encourage installation and use of flow meters, etc. Encourage leasing and transfer of water rights to instream use, such as piping upstream diversions to carry water savings downstream, and convert any saved water from the piping project to an instream water right.
Altered Peak and Base Flow Regime via vegetation manipulation	Fl, T, HD, HQ, CS, SL	Watershed-wide	Conversion to no-till farming, conversion to perennial crops/vegetation.
Increased Stream Temperature	T	Watershed-wide	Implement riparian planting and /or fencing projects on key stream reaches where shade is lacking or insufficient, implement water conservation measures, lease instream water rights, off-channel water storage, piping upstream diversions to carry water savings downstream, explore spring enhancement projects. Move the point of Diversion downstream into the receiving stream to allow the cold spring water a chance to make it into the receiving stream. Encourage and help people who have a primary surface water right, and a supplemental ground water right to convert their water rights so that their primary water right would be ground water and their supplemental water right would be surface water.
Loss of Floodplain Connectivity, Loss of Channel Sinuosity, and Channelization	CS, HD, HQ, SL	Watershed-wide	Implement stream restoration projects to improve channel connectivity to floodplains and side-channels. Berm and levee removal.
Lack of Instream LWD	HD, HQ, CS	Watershed-wide	Implement stream restoration projects that increase LWD densities and improve habitat diversity and complexity.

Sedimentation	SL, CS	Watershed-wide	Sediment basins continue to improve agriculture practices (such as more no-till farming), evaluate and improve road drainage, etc. to reduce erosion, enhance riparian vegetation buffers by reforestation and long-term protection.
Lack of Riparian Vegetation and Potential LWD Recruitment (current and future)	HD, HQ, CS, T	Watershed-wide	Facilitate improvements in riparian stand conditions through fencing, planting, thinning, and other silvicultural applications.
Secondary			
Potential nutrient levels	Fo, DO	Watershed-wide	Incorporate riparian buffer strips; add off-site water sources, fencing. Implement Best Management Practices (BMP's) for better fertilizer, livestock and wastewater (including on-site sewage) management to help reduce nutrient sources from entering the stream channel.
Potential chemical concentrations	C, Fo	Watershed-wide	Incorporate riparian buffer strips, Integrated Pest Management (IPM) – minimize or eliminate application next to streams, or use less toxic chemicals. Improve residential chemical use.
Impeded Fish Passage	O	Potential passage issues at potential water gaps and equipment crossings.	Identify and evaluate water gaps and equipment crossings.

Abbreviations of EDT Survival Factors for the Fifteenmile Creek Basin:
Channel Stability = CS; Chemicals = C; Flow = Fl; Food = Fo; Habitat Diversity = HD; Obstructions = O; Sediment Load = SL; Temperature = T; Key Habitat Quantity = HQ; Dissolved Oxygen = DO.

6th Field Watershed: Middle Fifteenmile **(7)**

Altered Watershed Process (from WA)	**Corresponding Level 3 Survival Factors (from EDT)**	**Specific Location/Area**	**Restoration Actions (Bold** = On Forest Actions Only**)**
Primary			
Altered Flow Regime via Diversions	Fl, T, HD, HQ	Watershed-wide (downstream effects of multiple upstream diversions)	Implement conservation measures such as off-channel storage, irrigation efficiency projects, encourage installation and use of flow meters, etc. Encourage leasing and transfer of water rights to instream use, such as piping upstream diversions to carry water savings downstream, and convert any saved water from the piping project to an instream water right.
Altered Peak and Base Flow Regime via vegetation manipulation	Fl, T, HD, HQ, CS, SL	Watershed-wide	Conversion to no-till farming, conversion to perennial crops/vegetation, reduce amount of roads.
Increased Stream Temperature	T	Watershed-wide	Implement riparian planting and /or fencing projects on key stream reaches where shade is lacking or insufficient, implement water conservation measures, lease instream water rights, off-channel water storage, piping upstream diversions to carry water savings downstream, explore spring enhancement projects.
Loss of Floodplain Connectivity, Loss of Channel Sinuosity, and Channelization	CS, HD, HQ, SL	Watershed-wide	Implement stream restoration projects to improve channel connectivity to floodplains and side-channels. Berm and levee removal.
Lack of Instream LWD	HD, HQ, CS	Watershed-wide	Implement stream restoration projects that increase LWD densities and improve habitat diversity and complexity.
Sedimentation	SL, CS	Watershed-wide	Sediment basins, continue to improve agriculture practices (such as more no-till farming), evaluate and improve road drainage, etc. to reduce erosion, identify and evaluate agricultural equipment stream crossings, enhance riparian vegetation buffers by reforestation and long-term protection.

Potential nutrient levels	Fo, DO	Watershed-wide	Incorporate riparian buffer strips, add off-site water sources for livestock. Implement Best Management Practices (BMP's) for better fertilizer, livestock and wastewater (including on-site sewage) management to help reduce nutrient sources from entering the stream channel.
Lack of Riparian Vegetation and Potential LWD Recruitment (current and future)	HD, HQ, CS, T	Watershed-wide	Facilitate improvements in riparian stand conditions through fencing, planting, thinning, and other silvicultural applications.
Secondary			
Potential chemical concentrations	C, Fo	Watershed-wide	Incorporate riparian buffer strips, Integrated Pest Management (IPM) – minimize or eliminate application next to streams, or use less toxic chemicals. Improve domestic on-site sewage system management and residential chemical use.

Abbreviations of EDT Survival Factors for the Fifteenmile Creek Basin:
Channel Stability = CS; Chemicals = C; Flow = Fl; Food = Fo; Habitat Diversity = HD; Sediment Load = SL; Temperature = T; Key Habitat Quantity = HQ; Dissolved Oxygen = DO.

6th Field Watershed: Fivemile Creek **(8)**

Altered Watershed Process (from WA)	**Corresponding Level 3 Survival Factors (from EDT)**	**Specific Location/Area**	**Restoration Actions (Bold** = On Forest Actions Only**)**
Primary			
Altered Flow Regime via Diversions	Fl, T, W, HD, HQ	Watershed-wide	Implement conservation measures such as off-channel storage, irrigation efficiency projects, encourage installation and use of flow meters, etc. Encourage leasing and transfer of water rights to instream use, such as piping upstream diversions to carry water savings downstream, and convert any saved water from the piping project to an instream water right.
Altered Peak and Base Flow Regime via vegetation manipulation	Fl, T, HD, HQ, CS, SL	Watershed-wide	Conversion to no-till farming, conversion to perennial crops/vegetation, reduce amount of roads. Reforestation, thinning, underburning in upper watershed.
Increased Stream Temperature	T	Watershed-wide	Implement riparian planting and /or fencing projects on key stream reaches where shade is lacking or insufficient, implement water conservation measures, lease instream water rights, off-channel water storage, and piping upstream diversions to carry water savings downstream.
Loss of Floodplain Connectivity, Loss of Channel Sinuosity, and Channelization	CS, HD, HQ, SL	Watershed-wide	Implement stream restoration projects to improve channel connectivity to floodplains and side-channels. Berm and levee removal in lower watershed.
Lack of Instream LWD	HD, HQ, CS	Watershed-wide.	Implement stream restoration projects that increase LWD densities and improve habitat diversity and complexity.
Sedimentation	SL, CS,	Watershed-wide	Continue to improve agriculture practices (such as more no-till farming and fencing), evaluate and improve road drainage, etc. to reduce erosion, enhance riparian vegetation buffers by reforestation and long-term protection.
Lack of Riparian Vegetation and Potential LWD Recruitment (current and future)	HD, HQ, CS, T	Watershed-wide	Facilitate improvements in riparian stand conditions through fencing, planting, thinning, and other silvicultural applications.

Secondary			
Potential nutrient levels	Fo, DO	Off-Forest watershed	Incorporate riparian buffer strips; add off-site water sources for livestock. Implement Best Management Practices (BMP's) for better fertilizer, livestock and wastewater (including on-site sewage) management to help reduce nutrient sources from entering the stream channel.
Potential chemical concentrations	C, Fo	Off-Forest watershed	Incorporate riparian buffer strips, Integrated Pest Management (IPM) – minimize or eliminate application next to streams, or use less toxic chemicals. Improve domestic on-site sewage system management and residential chemical use.
Impeded Fish Passage	O	Potential passage issues at fords during low flow periods. Two culverts on Road 4430.	Replace fords with bridges or modify channel configuration to deepen water by hardening fords with pit run, etc. **Replace Road 4430 culverts.**

Abbreviations of EDT Survival Factors for the Fifteenmile Creek Basin:
Channel Stability = CS; Chemicals = C; Flow = Fl; Food = Fo; Habitat Diversity = HD; Obstructions = O; Sediment Load = SL; Temperature = T; Withdrawals = W; Key Habitat Quantity = HQ.

6th Field Watershed: Upper Dry Creek **(9)**

Altered Watershed Process (from WA)	**Corresponding Level 3 Survival Factors (from EDT)**	**Specific Location/Area**	**Restoration Actions (Bold** = On Forest Actions Only**)**
Primary			
Altered Peak and Base Flow Regime via vegetation manipulation	Fl, T, HD, HQ, CS, SL	Watershed-wide	Conversion to no-till farming, conversion to perennial crops/vegetation, reduce amount of roads.
Increased Stream Temperature	T	Watershed-wide	Implement riparian planting and /or fencing projects on key stream reaches where shade is lacking or insufficient, implement water conservation measures, lease instream water rights, off-channel water storage.
Loss of Floodplain Connectivity, Loss of Channel Sinuosity, and Channelization	CS, HD, HQ, SL	Watershed-wide	Implement stream restoration projects to improve channel connectivity to floodplains and side-channels.
Lack of Instream LWD	HD, HQ, CS	Watershed-wide	Implement stream restoration projects that increase LWD densities and improve habitat diversity and complexity.
Sedimentation	SL, CS	Watershed-wide	Sediment basins continue to improve agriculture practices (such as more no-till farming), evaluate and improve road drainage, etc. to reduce erosion, enhance riparian vegetation buffers by reforestation and long-term protection.
Lack of Riparian Vegetation and Potential LWD Recruitment (current and future)	HD, HQ, CS, T	Watershed-wide	Facilitate improvements in riparian stand conditions through fencing, planting, thinning, and other silvicultural applications.
Secondary			
Altered Flow Regime via Diversions	Fl, T, HD, HQ	Watershed-wide	Implement conservation measures such as off-channel storage, irrigation efficiency projects, encourage installation and use of flow meters, etc. Encourage leasing and transfer of water rights to instream use, such as piping upstream diversions to carry water savings downstream, and convert any saved water from the piping project to an instream water right.

Potential nutrient levels	Fo, DO	Watershed-wide	Incorporate riparian buffer strips; add off-site water sources for livestock. Implement Best Management Practices (BMP's) for better fertilizer, livestock and wastewater (including on-site sewage) management to help reduce nutrient sources from entering the stream channel.
Potential chemical concentrations	C, Fo	Watershed-wide	Incorporate riparian buffer strips, Integrated Pest Management (IPM) – minimize or eliminate application next to streams, or use less toxic chemicals.
Impeded Fish Passage	O	Potential culverts, potential passage issues at fords during low flow periods.	Replace fords with bridges, modify channel configuration to deepen water by hardening fords with pit run, etc. Replace culverts if necessary.

Abbreviations of EDT Survival Factors for the Fifteenmile Creek Basin:
Channel Stability = CS; Chemicals = C; Flow = Fl; Food = Fo; Habitat Diversity = HD; Obstructions = O;Sediment Load = SL; Temperature = T; Key Habitat Quantity = HQ; Dissolved Oxygen = DO.

6th Field Watershed: Lower Dry Creek **(10)**

Altered Watershed Process (from WA)	**Corresponding Level 3 Survival Factors (from EDT)**	**Specific Location/Area**	**Restoration Actions (Bold** = On Forest Actions Only**)**
Primary			
Altered Peak and Base Flow Regime via vegetation manipulation	Fl, T, HD, HQ, CS, SL	Watershed-wide	Conversion to no-till farming, conversion to perennial crops/vegetation, reduce amount of roads.
Increased Stream Temperature	T	Watershed-wide	Implement riparian planting and /or fencing projects on key stream reaches where shade is lacking or insufficient, implement water conservation measures, lease instream water rights, off-channel water storage.
Loss of Floodplain Connectivity, Loss of Channel Sinuosity, and Channelization	CS, HD, HQ, SL	Watershed-wide	Implement stream restoration projects to improve channel connectivity to floodplains and side-channels. Berm and levee removal.
Lack of Instream LWD	HD, HQ, CS	Watershed-wide	Implement stream restoration projects that increase LWD densities and improve habitat diversity and complexity.
Sedimentation	SL, CS	Watershed-wide	Sediment basins continue to improve agriculture practices (such as more no-till farming), evaluate and improve road drainage, etc. to reduce erosion, enhance riparian vegetation buffers by reforestation and long-term protection.
Lack of Riparian Vegetation and Potential LWD Recruitment (current and future)	HD, HQ, CS, T	Watershed-wide	Facilitate improvements in riparian stand conditions through fencing, planting, thinning, and other silvicultural applications.
Secondary			
Altered Flow Regime via Diversions	Fl, T, HD, HQ	Watershed-wide	Implement conservation measures such as off-channel storage, irrigation efficiency projects, encourage installation and use of flow meters, etc. Encourage leasing and transfer of water rights to instream use, such as piping upstream diversions to carry water savings downstream, and convert any saved water from the piping project to an instream water right.

Potential nutrient levels	Fo, DO	Watershed-wide	Incorporate riparian buffer strips; add off-site water sources for livestock. Implement Best Management Practices (BMP's) for better fertilizer, livestock and wastewater (including on-site sewage) management to help reduce nutrient sources from entering the stream channel.
Potential chemical concentrations	C, Fo	Watershed-wide	Incorporate riparian buffer strips, Integrated Pest Management (IPM) – minimize or eliminate application next to streams, or use less toxic chemicals.
Impeded Fish Passage	O	Potential culverts, potential passage issues at fords during low flow periods.	Replace fords with bridges, modify channel configuration to deepen water by hardening fords with pit run, etc. Replace culverts if necessary.

Abbreviations of EDT Survival Factors for the Fifteenmile Creek Basin:
Channel Stability = CS; Chemicals = C; Flow = Fl; Food = Fo; Habitat Diversity = HD; Obstructions = O; Sediment Load = SL; Temperature = T; Key Habitat Quantity = HQ; Dissolved Oxygen = DO.

Basin Wide: Fifteenmile Creek Basin (Including Fifteenmile Creek and Eightmile Creek 5th Field Watersheds)

Altered Watershed Process (from WA)	Corresponding Level 3 Survival Factors (from EDT)	Area	Restoration Actions
Primary			
Altered Peak and Base Flow Regime due to vegetation manipulation	Fl, T, HD, HQ, CS, SL	Basin-wide	Look at individual watersheds for local area restoration action considerations.
Increased Stream Temperature	T	Basin-wide	Look at individual watersheds for local area restoration action considerations.
Sedimentation	SL, CS,	Basin-wide	Look at individual watersheds for local area restoration action considerations.
Lack of Riparian Vegetation and Potential LWD Recruitment (current and future)	HD, HQ, CS, T	Basin-wide	Look at individual watersheds for local area restoration action considerations.
Primary and Secondary			
*Altered Flow Regime via Diversions	Fl, T, HD, HQ	Basin-wide	Look at individual watersheds for local area restoration action considerations.
*Lack of Instream LWD	HD, HQ, CS	Basin-wide	Look at individual watersheds for local area restoration action considerations.

Abbreviations of EDT Survival Factors for the Fifteenmile Creek Basin:
Channel Stability = CS; Flow = Fl; Habitat Diversity = HD; Sediment Load = SL; Temperature = T; Key Habitat Quantity = HQ.

Estimation of Restoration Needs and Implementation Cost

Once specific restoration actions were identified for each 6th field watershed, estimates were made to identify the total need (i.e., quantity) and implementation costs of various projects. Restoration actions were grouped by activity type as follows:

- Fish Passage
  - Culvert-fish passage barriers
  - Irrigation diversion barriers
- Flow Restoration
  - Stream-flow restoration
- Road-Related
  - Potential roads for decommissioning and/or storm proofing
  - Annual road maintenance
- Riparian-Related
  - Riparian planting
  - Riparian thinning (pre-commercial)
  - Riparian thinning (commercial)
  - Other
- In-stream Related
  - Fish habitat improvement/LWD addition
  - Other
- Other/Miscellaneous

Where specific projects are known from the updated 2005 Fifteenmile Action Plan (Clark 2005), estimated costs are provided. State, county, tribal, and Forest Service surveys were reviewed to estimate the quantity and location of specific culvert-fish passage projects in each 6th field watershed. In most cases, an average cost of $250,000 per site was used to estimate the cost of implementing culvert-fish passage projects throughout the basin. Results from the Mt. Hood National Forest's Roads Analysis completed in 2003 (USFS 2003), and the 2008 Road Decommissioning for Aquatic Restoration Environmental Assessment (2008 Road Decommissioning EA) were utilized to estimate the quantity of road mileage in each watershed for restoration activity, including accelerated road maintenance, road storm-proofing, road decommissioning, and converting road to trail. The 2008 Road Decommissioning EA identified roads which would not be vital for completing the Forests on the ground work for the next 10 + years and therefore could be decommissioned in order to reduce aquatic concerns in the basin. All road decommissioning work identified in the 2008 Road Decommissioning EA was be completed by the summer of 2010. For the purposes of estimating road-related restoration activities, roads considered for storm-proofing average $1,000/mile while roads considered for annual maintenance at an average cost of $1,400/mile/year. Wasco County Roads department (WCRD) estimated road maintenance at an average cost of $415/mile/year (Personal communication with WCRD Don Uhalud, 2010). Creating and maintaining a healthy riparian tree stand will require decades of monitoring and sometimes treatment, such as riparian planting, precommercial thinning, and sometimes commercial thinning. Depending on the area the time line from planting seedlings to commercial thinning could be anywhere from 20 years to 80 years therefore, estimating a timeline of being able to say that we are done with riparian vegetation management is

unrealistic. Therefore, a 10 year timeline for work needed in riparian tree stands will be used for this action plan. Rough estimates were made to assess the quantity of riparian-related activities (i.e., planting, pre-commercial thinning, and commercial thinning) in each 6th field watershed on Forest by Fisheries Biologist Chris Rossel (USFS), silvicultural technician Tamara Shannon (USFS), silviculturalist Kim Smolt (USFS), and each 6th field watershed off Forest by Doug Thiesies (ODF). Average unit costs for implementation of riparian-related activities were assumed as follows: riparian planting ($500/acre), pre-commercial thinning ($500/acre on Forest and $200/acre off Forest), and commercial thinning ($3,000/acre). Rough estimates were also made to assess the quantity of in-stream related restoration activities, particularly fish habitat improvements/LWD additions, for each 6th field watershed by fisheries biologist Gary Asbridge (USFS). Ground-based operations were assumed for stream reaches with nearby road access, and an average implementation cost (including acquisition of logs and boulders) of $70,000/mile was assumed. A much higher average unit cost of $400,000/mile was assumed for remote stream reaches where aerial operations (i.e., by helicopter) would be required and/or for larger river reaches (primarily off-Forest) where detailed surveys, design, and construction by a qualified stream restoration construction company is likely to be required.

Average cost estimates for the various types of restoration activities are for project implementation (i.e., contract costs), and were based on known current costs for similar activities. Estimates for project planning (i.e., NEPA analysis, ESA consultation, permit acquisition, etc.), survey data collection and analysis (when and where needed), project design, landowner coordination, project administration, contingency, and monitoring (both pre- and post-) are not included. Prior to the submittal of any proposal for project funding, a more detailed assessment will be needed to accurately estimate these associated costs in addition to a more refined estimate of that particular project's implementation costs.

Results by 6th Field Watershed

The estimate of restoration need (i.e., quantity) together with an estimate of implementation costs by restoration activity type are summarize for each 6th field watershed in priority order below. Those restoration actions highlighted in Bold are projects located on Forest, but are not limited to only being located on Forest.

6th Field Watershed: Headwaters Fifteenmile (Priority = 1)

Restoration Action	Specific Location/Area	Quantity	Est. Project Cost	Comments
FISH PASSAGE ACTIONS				
Culvert-Fish Passage Barriers				
Ramsey Creek – Forest Service CMP Fish Passage Project (Forest Road 4450)	Ramsey Creek RM 10.6	1 site	$250,000	Cost est. from Ken Huskey Fish species: St, Rainbow-Type trout
Ramsey Creek – Boy Scouts of America Holding Pond Fish Passage Project (Diversion Dam Removal)	Ramsey Creek, RM 11.1	1 site	$5,000	Cost est. from Chris Rossel Fish species: St, Rainbow-Type trout
Irrigation Diversion Barriers				
Ramsey Creek – Forest Service Concrete Structure Fish Passage Project (Old Irrigation Diversion Dam)	Ramsey Creek RM 6.0	1 site	$4,500	Cost est. from Chris Rossel. Fish species: St, Rainbow-Type trout
Fish Passage Actions Sub-Total			**$259,500**	
FLOW RESTORATION ACTIONS				
Stream-flow Restoration				
Fifteenmile Creek – **Forest Service**, City of Dufur, and Private lands Orchard Ridge Ditch Piping Project	Fifteenmile Creek	About 4.5 mi.	$1,910,000	Pipe design completed in 2004. Cost est. from Josh Thompson Fish species: St, Rainbow-Type trout
Fifteenmile Creek –Private lands: Little Ditch Conversion to Pump Station Project	Fifteenmile Creek	About X miles	Undetermined	Still need to approach landowner (presently up for sale). Fish species: St, Rainbow-Type trout
Fifteenmile Creek – Leasing Instream Water Rights	Fifteenmile Creek	CFS leased Undetermined	Undetermined	Fish species: St, Rainbow-Type trout
Fifteenmile Creek – Off Channel Water Storage From Orchard Ridge Ditch	Fifteenmile Creek	1 Storage Site	Undetermined	Fish species: St, Rainbow-Type trout
Flow Restoration Actions Sub-Total			**$1,910,000 +**	
ROAD-RELATED ACTIONS				
Potential Road Decomm. and/or Storm Proofing				
All on Forest road decommissioning and storm proofing	Watershed-wide			

was completed by 2010				
Annual Road Maintenance				
Non-Federal Roads (County, State, Private)	Watershed-wide	13.61 miles	$5,648/year	Quantity est. by Don Uhalud WCRD (2010)
USFS Roads (access rating >4 per Roads Analysis)	Watershed-wide	16.96 miles	$23,744/year	
Road-Related Actions Sub-Total			**$29,392 +**	
RIPARIAN-RELATED ACTIONS FROM 2008 TO 2018				
Riparian Planting				
Riparian Planting	Watershed-wide	70 acres	$35,000	Quantity est. from Tamara Shannon, Chris Rossel, & Doug Thiesies (March 2008)
Riparian Thinning (pre-commercial)				
Riparian Thinning (pre-commercial/conifer release)	Watershed-wide	270 acres	$135,000	Quantity est. from Tamara Shannon, Chris Rossel, & Doug Thiesies (March 2008)
Riparian Thinning (commercial)				
Riparian Thinning (commercial)	Watershed-wide	165 acres	$495,000	Quantity est. from Kim Smolt, Chris Rossel, & Doug Thiesies (March 2008)
Other				
Riparian-Related Actions Sub-Total			**$665,000**	
IN-STREAM RELATED ACTIONS				
Fish Habitat Improvement/LWD Addition				
Olson Instream Habitat: Fifteenmile Creek Restoration/LWD Placement in about 1/8 RM reach	Fifteenmile Creek	1/8 RM and 1.5 acres	$13,200	Cost est. (not including log acquisition) by Chris Rossel. (January 2008)
Maintenance and effective monitoring of existing Log structures from the projects from the early 1990's and 2000's. Periodic monitoring would occur over the long-term, but especially after any significant flood event.	Watershed-wide	7.0 RM	$600 to $900 a year for monitoring,	Structure maintenance costs is to variable to pinpoint an accurate cost, but could range between $2,000 and $25,000 depending on level of maintenance needed. Cost est. by Chris Rossel (January 2008)

Other				
Fifteenmile Creek – Replace Stream Fords with Bridges or Modify Channel Configuration with Pit Run +Size Substrates to Discourage Spawning at the Ford Crossings	Fifteenmile Creek	3 sites	$7,500	Cost est. from Chris Rossel
Berm and Levee Removal	USFS boundary to Fifteenmile and Ramsey Creek Confluence	None identified	Undetermined	Identify, during the design phase of instream and floodplain restoration projects
In-Stream Related Actions Sub-Total			**$21,600 +**	
OTHER/MISCELLANEOUS ACTIONS				
Conversion to No-Till Farming	Watershed-wide	Undetermined	Undetermined	NRCS and SWCD working with private farmers to implement no-till practices (about 90% of the farmers practice no till)
Conversion to Perennial Crops/Vegetation	Watershed-wide	Undetermined	Undetermined	NRCS and SWCD working with private farmers to convert to perennial crops, CRP, orchards, and vineyards
Monthly Environmental Newspaper Add “Respect The River” or others	Basin	1 add	$115	Would reach about 10,000 readers in The Dalles Area
Other/Miscellaneous Actions Sub-Total			**$115 +**	
TOTAL EST. COST			**$2,885,607 +**	

6th Field Watershed: Upper Fifteenmile (Priority = 2)

Restoration Action	Specific Location/Area	Quantity	Est. Project Cost	Comments
FISH PASSAGE ACTIONS				
Culvert-Fish Passage Barriers				
None Identified	Watershed-wide	None identified	Undetermined	
Irrigation Diversion Barriers				
None Identified	Watershed-wide	None identified	Undetermined	
Fish Passage Actions Sub-Total			**Undetermined**	
FLOW RESTORATION ACTIONS				
Stream-flow Restoration				
Fifteenmile Creek –Private lands: Underhill Ditch Conversion to Pump Station Project	Fifteenmile Creek	Undetermined	Undetermined	Still need to approach landowner about the project. Fish species: St, Rainbow-Type trout
Fifteenmile Creek – Leasing Instream Water Rights	Fifteenmile Creek	CFS leased Undetermined	Undetermined	Fish species: St, Rainbow-Type trout
Fifteenmile Creek – Off Channel Water Storage From Orchard Ridge Ditch	Fifteenmile Creek	1 Storage Site	Undetermined	Fish species: St, Rainbow-Type trout
Pine Creek – Develop spring enhancement projects	Friend Area	Undetermined	Undetermined	Fish species: St, Rainbow-Type trout
Flow Restoration Actions Sub-Total			**Undetermined**	
ROAD-RELATED ACTIONS				
Potential Road Decomm. and/or Storm Proofing				
All on Forest road decommissioning and storm proofing was completed by 2010	Watershed-wide			
Annual Road Maintenance				
Non-Federal Roads (County, State, Private)	Watershed-wide	37.48 miles	$15,554/year	Quantity est. by Don Uhalud WCRD (2010)
USFS Roads (access rating >4 per Roads Analysis)	Watershed-wide	0.53 miles	$742/year	
Road-Related Actions Sub-Total			**$16,296 +**	
RIPARIAN-RELATED ACTIONS FROM 2008 TO 2018				
Riparian Planting				

Riparian Planting	Watershed-wide	50-100 acres	$25,000-$50,000	Quantity est. from Tamara Shannon, Chris Rossel, & Doug Thiesies (March 2008)
Riparian Thinning (pre-commercial)				
None Identified	Watershed-wide	50-100 acres	$10,000-$30,000	Quantity est. from Tamara Shannon, Chris Rossel, & Doug Thiesies (March 2008)
Riparian Thinning (commercial)				
Riparian Thinning (commercial)	Watershed-wide	50-100 acres	$150,000-$300,000	Quantity est. from Kim Smolt, Chris Rossel, & Doug Thiesies (March 2008)
Other				
None Identified				
Riparian-Related Actions Sub-Total			**$185,000-$300,000**	
IN-STREAM RELATED ACTIONS				
Fish Habitat Improvement/LWD Addition				
Lower Pine Creek Instream and Floodplain Restoration	Pine Creek	RM 0.0 to 3.0	Undetermined	Project design still needs to be completed prior to determining a cost estimate. Chris Rossel (2008)
Other				
Berm and Levee Removal	Watershed-wide	None identified	Undetermined	Identify, during the design phase of instream and floodplain restoration projects
In-Stream Related Actions Sub-Total			**Undetermined**	
OTHER/MISCELLANEOUS ACTIONS				
Conversion to No-Till Farming	Watershed-wide	Undetermined	Undetermined	NRCS and SWCD working with private farmers to implement no-till practices
Conversion to Perennial Crops/Vegetation	Watershed-wide	Undetermined	Undetermined	NRCS and SWCD working with private farmers to convert to perennial crops
Monthly Environmental Newspaper Add “Respect The River” or others	Basin	1 add	$115	Would reach about 10,000 readers in The Dalles Area

Other/Miscellaneous Actions Sub-Total			**$115 +**	
TOTAL EST. COST			**$201,411 + / $316,411 +**	

6th Field Watershed: Middle Eightmile (Priority = 3)

Restoration Action	Specific Location/Area	Quantity	Est. Project Cost	Comments
FISH PASSAGE ACTIONS				
Culvert-Fish Passage Barriers				
None Identified	Watershed-wide	None identified	Undetermined	
Irrigation Diversion Barriers				
None Identified	Watershed-wide	None identified	Undetermined	
Fish Passage Actions Sub-Total			**Undetermined**	
FLOW RESTORATION ACTIONS				
Stream-flow Restoration				
Eightmile Creek –Private lands: Pipe any upstream diversions Ditch Piping Project	Eightmile Creek	Undetermined	Undetermined	Pipe design not completed. Fish species: St, Rainbow-Type trout
Eightmile Creek- Develop Spring Enhancement Projects	Watershed-wide	Undetermined	Undetermined	Fish species: St, Rainbow-Type trout
Eightmile Creek – Leasing Instream Water Rights	Eightmile Creek	CFS leased Undetermined	Undetermined	Fish species: St, Rainbow-Type trout
Eightmile Creek – Off Channel Water Storage From Orchard Ridge Ditch	Japanese Hollow Creek	1 Storage Site	Undetermined	Fish species: St, Rainbow-Type trout
Flow Restoration Actions Sub-Total			**Undetermined**	
ROAD-RELATED ACTIONS				
Potential Road Decomm. and/or Storm Proofing				
USFS Roads (2008 Roads Decommissioning EA)	Watershed-wide	None identified	$0	Estimated Quantity of miles by Barlow Ranger District in 2008.
Annual Road Maintenance				
Non-Federal Roads (County, State, Private)	Watershed-wide	28.05	$11,640/yr	Quantity est. by Don Uhalud WCRD (2010)
USFS Roads (access rating >4 per Roads Analysis)	Watershed-wide	0.70 miles	$980/yr	

Road-Related Actions Sub-Total			**$12,620 +**	
RIPARIAN-RELATED ACTIONS FROM 2008 TO 2018				
Riparian Planting				
Riparian Planting	watershed-wide	50-100 acres	$25,000-$50,000	Quantity est. from Tamara Shannon, Chris Rossel, & Doug Thiesies (March 2008)
Riparian Thinning (pre-commercial)				
Riparian Thinning (pre-commercial/conifer release)	watershed-wide	50-100 acres	$10,000-$30,000	Quantity est. from Tamara Shannon, Chris Rossel, & Doug Thiesies (March 2008)
Riparian Thinning (commercial)				
Riparian Thinning (commercial)	watershed-wide	50-100 acres	$150,000-$300,000	Quantity est. from Kim Smolt, Chris Rossel, & Doug Thiesies (March 2008)
Other				
None Identified				
Riparian-Related Actions Sub-Total			**$185,000-$300,000**	
IN-STREAM RELATED ACTIONS				
Fish Habitat Improvement/LWD Addition				
None identified	Watershed-wide	None identified	Undetermined	Continue to look for opportunities in the watershed
Other				
Berm and Levee Removal	Watershed-wide	None identified	Undetermined	Identify, during the design phase of instream and floodplain restoration projects
In-Stream Related Actions Sub-Total			**Undetermined**	
OTHER/MISCELLANEOUS ACTIONS				
Conversion to No-Till Farming	Watershed-wide	Undetermined	Undetermined	NRCS and SWCD working with private farmers to implement no-till practices
Conversion to Perennial Crops/Vegetation	Watershed-wide	Undetermined	Undetermined	NRCS and SWCD working with private farmers to convert to perennial crops

Monthly Environmental Newspaper Add “Respect The River” or others	Basin	1 add	$115	Would reach about 10,000 readers in The Dalles Area
Other/Miscellaneous Actions Sub-Total			**$115 +**	
TOTAL EST. COST			**$197,735 + / $312,735+**	

6th Field Watershed: Upper Eightmile (Priority = 4)

Restoration Action	Specific Location/Area	Quantity	Est. Project Cost	Comments
FISH PASSAGE ACTIONS				
Culvert-Fish Passage Barriers				
Eightmile Creek Culvert at USFS Road 44 stream crossing	Eightmile Creek	1 site	$250,000	Design has not been completed as of 2008.
Irrigation Diversion Barriers				
Eightmile Creek - Wolfrun Irrigation Ditch Headgate Modify spillway for increased juvenile passage	Eightmile Creek	1 site	Undetermined	Design has not been completed as of 2008.
Fish Passage Actions Sub-Total			**$250,000 +**	
FLOW RESTORATION ACTIONS				
Stream-flow Restoration				
Eightmile Creek – Wolfrun Irrigation Ditch: Finish piping the irrigation ditch	Eightmile Creek	About 10 miles	$500,000	Quantity and Cost est. from Bob Durham (Wolfrun Irrigation Ditch Company)
Eightmile Creek – Leasing Instream Water Rights	Eightmile Creek	CFS leased Undetermined	Undetermined	Fish species: St, Rainbow-Type trout
Eightmile Creek – Off Channel Water Storage From Wolfrun Ditch	Eightmile Creek	1 Storage Site Undetermined	Undetermined	Fish species: St, Rainbow-Type trout
Flow Restoration Actions Sub-Total			**$500,000 +**	
ROAD-RELATED ACTIONS				
Potential Road Decomm. and/or Storm Proofing				
All on Forest road decommissioning and storm proofing was completed by 2010	Watershed-wide			
Annual Road Maintenance				
Non-Federal Roads (County, State, Private)	Watershed-wide	10.16 miles	$4,216/yr	Quantity est. by Don Uhalud WCRD (2010)
USFS Roads (access rating >4 per Roads Analysis)	Watershed-wide	12.23 miles	$30,578/yr	
Road-Related Actions Sub-Total			**$34,794**	
RIPARIAN-RELATED ACTIONS FROM 2008 TO 2018				
Riparian Planting				

Riparian Planting	watershed-wide	50 acres	$25,000	Quantity est. from Tamara Shannon, Chris Rossel, & Doug Thiesies (March 2008)
Riparian Thinning (pre-commercial)				
Riparian Thinning (pre-commercial/conifer release)	watershed-wide	230 acres	$55,000	Quantity est. from Tamara Shannon, Chris Rossel, & Doug Thiesies (March 2008)
Riparian Thinning (commercial)				
Riparian Thinning (commercial)	watershed-wide	185 acres	$555,000	Quantity est. from Kim Smolt, Chris Rossel, & Doug Thiesies (March 2008)
Other				
None Identified				
Riparian-Related Actions Sub-Total			**$635,000**	
IN-STREAM RELATED ACTIONS				
Fish Habitat Improvement/LWD Addition				
Eightmile Creek – LWD Addition	Eightmile Creek	About 2 miles	$150,000	This project is associated with a riparian vegetation treatment in the same area.
Eightmile Creek – Private lands just downstream of USFS boundary.	Eightmile Creek	About 2 miles	$100,000	Cost est. doesn't include the cost of 2 temporary bridges, which need to be installed prior to log haul. NEPA not complete as of 2008.
Other				
Berm and Levee Removal	Watershed-wide	None identified	Undetermined	Identify, during the design phase of instream and floodplain restoration projects
In-Stream Related Actions Sub-Total			**$250,000 +**	
OTHER/MISCELLANEOUS ACTIONS				
Conversion to No-Till Farming	Watershed-wide	Undetermined	Undetermined	NRCS and SWCD working with private farmers to implement no-till practices
Conversion to Perennial Crops/Vegetation	Watershed-wide	Undetermined	Undetermined	NRCS and SWCD working with private farmers to convert to perennial crops

Monthly Environmental Newspaper Add “Respect The River” or others	Basin	1 add	$115	Would reach about 10,000 readers in The Dalles Area
Other/Miscellaneous Actions Sub-Total			**$115 +**	
TOTAL EST. COST			**$1,669,909 +**	

6th Field Watershed: Lower Fifteenmile (Priority = 5)

Restoration Action	Specific Location/Area	Quantity	Est. Project Cost	Comments
FISH PASSAGE ACTIONS				
Culvert-Fish Passage Barriers				
None Identified	Watershed-wide	None identified	Undetermined	
Irrigation Diversion Barriers				
None Identified	Watershed-wide	None identified	Undetermined	
Fish Passage Actions Sub-Total			**Undetermined**	
FLOW RESTORATION ACTIONS				
Stream-flow Restoration				
Fifteenmile Creek – Leasing Instream Water Rights	Fifteenmile Creek	CFS leased Undetermined	Undetermined	Fish species: St, Rainbow-Type trout
Fifteenmile Creek – Develop Spring Enhancement Projects	Watershed-wide	None identified	Undetermined	Fish species: St, Rainbow-Type trout
Flow Restoration Actions Sub-Total			**Undetermined**	
ROAD-RELATED ACTIONS				
Potential Road Decomm. and/or Storm Proofing				
USFS Roads (2008 Roads Decommissioning EA)	Watershed-wide	None	$0	USFS lands not present in watershed
Annual Road Maintenance				
Non-Federal Roads (County, State, Private)	Watershed-wide	36.51	15,151/yr	Quantity est. by Don Uhalud WCRD (2010)
USFS Roads (access rating >4 per Roads Analysis)	Watershed-wide	None	$0	USFS lands not present in watershed
Road-Related Actions Sub-Total			**$15,151**	
RIPARIAN-RELATED ACTIONS				
Riparian Planting				
Riparian Planting	Watershed-wide	50 acres	$25,000	Quantity est. from Doug Thiesies (March 2008)
Riparian Thinning (pre-commercial)				
Riparian Thinning (pre-commercial/conifer release)	Watershed-wide	10 acres	$2,000	Quantity est. from Doug Thiesies

				(March 2008)
Riparian Thinning (commercial)				
Riparian Thinning (commercial)	Watershed-wide	None identified		Quantity est. from Doug Thiesies (March 2008)
Other				
None Identified				
Riparian-Related Actions Sub-Total			**$27,000**	
IN-STREAM RELATED ACTIONS				
Fish Habitat Improvement/LWD Addition				
Company Cutbank (Max Kaseberg) Restoration/LWD Placement (New)	Fifteenmile Creek	1/8 mile	$27,000	New Project Opportunity, Est. of quantity & cost from Josh Thompson (Sept. 2006)
Hammel Instream Habitat Restoration/LWD Placement (New)	Fifteenmile Creek	1.0 mile	$66,500	New Project Opportunity, Est. of quantity & cost from Josh Thompson and Chris Rossel (Sept. 2006).
William Johnson Lower Fifteenmile Instream Restoration/LWD and Boulder Placement	Fifteenmile Creek	¾ mile	$17,800	New Project Opportunity, Est. of quantity & cost from Josh Thompson and Chris Rossel (Sept. 2006).
Lower Fifteenmile Creek CTWSIR Instream Fish Habitat	Fifteenmile Creek	¼ mile	$7,600	New Project Opportunity, Est. of quantity & cost from Chris Rossel (Sept. 2006).
Olson Instream Habitat Restoration/LWD and Boulder Placement (New)	Fifteenmile Creek	1/8 mile	$13,200	New Project Opportunity, Est. of quantity & cost from Steve Springston and Chris Rossel (Sept. 2006).
IN-STREAM RELATED ACTIONS-CONTINUED				
Other				
Berm and Levee Removal	Watershed-wide	None identified	Undetermined	Identify, during the design phase of instream and floodplain restoration projects
In-Stream Related Actions Sub-Total			**$132,100 +**	
OTHER/MISCELLANEOUS ACTIONS				
Conversion to No-Till Farming	Watershed-wide	Undetermined	Undetermined	NRCS and SWCD working with private farmers to implement no-till practices

Conversion to Perennial Crops/Vegetation	Watershed-wide	Undetermined	Undetermined	NRCS and SWCD working with private farmers to convert to perennial crops
Monthly Environmental Newspaper Add “Respect The River” or others	Basin	1 add	$115	Would reach about 10,000 readers in The Dalles Area
Other/Miscellaneous Actions Sub-Total			**$115 +**	
TOTAL EST. COST			**$174,366 +**	

6th Field Watershed: Lower Eightmile (Priority = 6)

Restoration Action	Specific Location/Area	Quantity	Est. Project Cost	Comments
FISH PASSAGE ACTIONS				
Culvert-Fish Passage Barriers				
None identified	Watershed-wide	None identified	$0	
Irrigation Diversion Barriers				
None identified	Watershed-wide	None identified	$0	
Fish Passage Actions Sub-Total			**$0**	
FLOW RESTORATION ACTIONS				
Stream-flow Restoration				
Eightmile Creek – Develop Spring Enhancement Projects	Eightmile Creek	Undetermined	Undetermined	Fish species: St, Rainbow-Type trout
Eightmile Creek – Leasing Instream Water Rights	Eightmile Creek	CFS leased Undetermined	Undetermined	Fish species: St, Rainbow-Type trout
Eightmile Creek – Off Channel Water Storage From Orchard Ridge Ditch	Japanese Hollow Creek	1 Storage Site	Undetermined	Fish species: St, Rainbow-Type trout
Flow Restoration Actions Sub-Total			**Undetermined**	
ROAD-RELATED ACTIONS				
Potential Road Decomm. and/or Storm Proofing				
USFS Roads (2008 Roads Decommissioning EA)	Watershed-wide	None	$0	USFS lands not present in watershed
Annual Road Maintenance				
Non-Federal Roads (County, State, Private)	Watershed-wide	17.01 miles	$7,059/yr	Quantity est. by Don Uhalud WCRD (2010)
USFS Roads (access rating >4 per Roads Analysis)	Watershed-wide	None	0	USFS lands not present in watershed
Road-Related Actions Sub-Total			**$7,059**	
RIPARIAN-RELATED ACTIONS FROM 2008 TO 2018				
Riparian Planting				
Riparian Planting	Watershed-wide	50 acres	$25,000	Quantity est. from Doug Thiesies (March 2008)

Riparian Thinning (pre-commercial)				
Riparian Thinning (pre-commercial/conifer release)	Watershed-wide	10 acres	$2,000	Quantity est. from Doug Thiesies (March 2008)
Riparian Thinning (commercial)				
Riparian Thinning (commercial)	Watershed-wide	None identified		Quantity est. from Doug Thiesies (March 2008)
Other				
None Identified				
Riparian-Related Actions Sub-Total			**$27,000**	
IN-STREAM RELATED ACTIONS				
Fish Habitat Improvement/LWD Addition				
None Identified	Watershed-wide	None identified	Undetermined	
Other				
Berm and Levee Removal	Watershed-wide	None identified	Undetermined	Identify, during the design phase of instream and floodplain restoration projects
In-Stream Related Actions Sub-Total			**Undetermined**	
OTHER/MISCELLANEOUS ACTIONS				
Conversion to No-Till Farming	Watershed-wide	Undetermined	Undetermined	NRCS and SWCD working with private farmers to implement no-till practices
Conversion to Perennial Crops/Vegetation	Watershed-wide	Undetermined	Undetermined	NRCS and SWCD working with private farmers to convert to perennial crops
Monthly Environmental Newspaper Add "Respect The River" or others	Basin	1 add	$115	Would reach about 10,000 readers in The Dalles Area
Other/Miscellaneous Actions Sub-Total			**$115 +**	
TOTAL EST. COST			**$34,174 +**	

6th Field Watershed: Middle Fifteenmile (Priority = 7)

Restoration Action	Specific Location/Area	Quantity	Est. Project Cost	Comments
FISH PASSAGE ACTIONS				
Culvert-Fish Passage Barriers				
None	Watershed-wide	None identified	Undetermined	
Irrigation Diversion Barriers				
None	Watershed-wide	None identified	Undetermined	
Fish Passage Actions Sub-Total			**Undetermined**	
FLOW RESTORATION ACTIONS				
Stream-flow Restoration				
Fifteenmile Creek – Leasing Instream Water Rights	Eightmile Creek	CFS leased Undetermined	Undetermined	Fish species: St, Rainbow-Type trout
Fifteenmile Creek – Develop Spring Enhancement Projects	Watershed-wide	Undetermined	Undetermined	Fish species: St, Rainbow-Type trout
Flow Restoration Actions Sub-Total			**Undetermined**	
ROAD-RELATED ACTIONS				
Potential Road Decomm. and/or Storm Proofing				
USFS Roads (2008 Roads Decommissioning EA)	Watershed-wide	None	$0	USFS Land is not present in watershed
Annual Road Maintenance				
Non-Federal Roads (County, State, Private)	Watershed-wide	37.91 miles	$15,732/yr	Quantity est. by Don Uhalud WCRD (2010)
USFS Roads (None)	Watershed-wide	None	$0	USFS Land is not present in watershed
Road-Related Actions Sub-Total			**$15,732**	
RIPARIAN-RELATED ACTIONS FROM 2008 TO 2018				
Riparian Planting				
Riparian Planting	watershed-wide	50 acres	$25,000	Quantity est. from Doug Thiesies (March 2008)
Riparian Thinning (pre-commercial)				
Riparian Thinning (pre-commercial/conifer release)	watershed-wide	10 acres	$2,000	Quantity est. from Doug Thiesies

				(March 2008)
RIPARIAN-RELATED ACTIONS FROM 2008 TO 2018-CONTINUED				
Riparian Thinning (commercial)				
Riparian Thinning (commercial)	watershed-wide	None identified	$0	Quantity est. from Doug Thiesies (March 2008)
Other				
None Identified				
Riparian-Related Actions Sub-Total			**$27,000**	
IN-STREAM RELATED ACTIONS				
Fish Habitat Improvement/LWD Addition				
Wrentham Off Channel Habitat Restoration/LWD Placement (New)	Fifteenmile Creek	1/3mile	Undetermined	New Project Opportunity, Est. of quantity & cost from Steve Springston and Chris Rossel (Sept. 2006).
Other				
Berm and Levee Removal	Watershed-wide	None identified	Undetermined	Identify, during the design phase of instream and floodplain restoration projects
In-Stream Related Actions Sub-Total			**Undetermined**	
OTHER/MISCELLANEOUS ACTIONS				
Conversion to No-Till Farming	Watershed-wide	Undetermined	Undetermined	NRCS and SWCD working with private farmers to implement no-till practices
Conversion to Perennial Crops/Vegetation	Watershed-wide	Undetermined	Undetermined	NRCS and SWCD working with private farmers to convert to perennial crops
Monthly Environmental Newspaper Add “Respect The River” or others	Basin	1 add	$115	Would reach about 10,000 readers in The Dalles Area
Other/Miscellaneous Actions Sub-Total			**$115 +**	
TOTAL EST. COST			**$42,847 +**	

6th Field Watershed: Fivemile Creek (Priority = 8)

Restoration Action	Specific Location/Area	Quantity	Est. Project Cost	Comments
FISH PASSAGE ACTIONS				
Culvert-Fish Passage Barriers				
Fivemile Bridge Apron Removal	Upper Fivemile Road (WCRPW)	1 site	$1,100	"New Project Opportunity, Est. of quantity & cost from Josh Thompson (Sept. 2006).
Irrigation Diversion Barriers				
None Identified				
Fish Passage Actions Sub-Total			**$1,100**	
FLOW RESTORATION ACTIONS				
Stream-flow Restoration				
Fivemile Creek – Leasing Instream Water Rights	Watershed-wide	CFS leased Undetermined	Undetermined	Fish species: St, Rainbow-Type trout, Cutthroat trout
Fivemile Creek – Develop Spring Enhancement Projects	Watershed-wide	Undetermined	Undetermined	Fish species: St, Rainbow-Type trout
Flow Restoration Actions Sub-Total			**Undetermined**	
ROAD-RELATED ACTIONS				
Potential Road Decomm. and/or Storm Proofing				
USFS Roads (2008 Roads Decommissioning EA)	Watershed-wide	None identified	Undetermined	USFS will analyze future road needs in Fivemile Creek watershed in outyears
Annual Road Maintenance				
Non-Federal Roads (County, State, Private)	Watershed-wide	31.57 miles	$13,101/yr	Quantity est. by Don Uhalud WCRD (2010)
USFS Roads (access rating >4 per Roads Analysis)	Watershed-wide	14.04 miles	$19,656/yr	
Road-Related Actions Sub-Total			**$32,757 +**	
RIPARIAN-RELATED ACTIONS FROM 2008 TO 2018				
Riparian Planting				
Riparian Planting	watershed-wide	50-100 acres	$25,000-$50,000	Quantity est. from Tamara Shannon, Chris Rossel, & Doug Thiesies (March 2008)

Riparian Thinning (pre-commercial)				
Riparian Thinning (pre-commercial/conifer release)	watershed-wide	150-200 acres	$60,000-$70,000	Quantity est. from Tamara Shannon, Chris Rossel, & Doug Thiesies (March 2008)
Riparian Thinning (commercial)				
Riparian Thinning (commercial)	watershed-wide	150-200 acres	$450,000-$600,000	Quantity est. from kim Smolt, Chris Rossel, & Doug Thiesies (March 2008)
Other				
None Identified				
Riparian-Related Actions Sub-Total			**$535,000-$720,000**	
IN-STREAM RELATED ACTIONS				
Fish Habitat Improvement/LWD Addition				
Fivemile Creek Restoration/LWD Placement	Fivemile Creek	1.0 miles	$31,645	New Project Opportunity, Est. of quantity & cost from Chris Rossel (Sept. 2009)
Other				
Berm and Levee Removal	Watershed-wide	None identified	Undetermined	Identify, during the design phase of instream and floodplain restoration projects
In-Stream Related Actions Sub-Total			**$31,645**	
OTHER/MISCELLANEOUS ACTIONS				
Conversion to No-Till Farming	Watershed-wide	Undetermined	Undetermined	NRCS and SWCD working with private farmers to implement no-till practices
Conversion to Perennial Crops/Vegetation	Watershed-wide	Undetermined	Undetermined	NRCS and SWCD working with private farmers to convert to perennial crops
Monthly Environmental Newspaper Add "Respect The River" or others	Basin	1 add	$115	Would reach about 10,000 readers in The Dalles Area
Other/Miscellaneous Actions Sub-Total			**$115 +**	
TOTAL EST. COST			**$600,617 + / $785,617+**	

6th Field Watershed: Upper Dry Creek (Priority = 9)

Restoration Action	Specific Location/Area	Quantity	Est. Project Cost	Comments
FISH PASSAGE ACTIONS				
Culvert-Fish Passage Barriers				
None Identified	Watershed-wide	None Identified	Undetermined	
Irrigation Diversion Barriers				
None Identified				
Fish Passage Actions Sub-Total			**Undetermined**	
FLOW RESTORATION ACTIONS				
Stream-flow Restoration				
Dry Creek – Develop Spring Enhancement Projects	Watershed-wide	Undetermined	Undetermined	Fish species: St, Rainbow-Type trout
Dry Creek – Leasing Instream Water Rights	Dry Creek	CFS leased Undetermined	Undetermined	Fish species: St, Rainbow-Type trout
Flow Restoration Actions Sub-Total			**Undetermined**	
ROAD-RELATED ACTIONS				
Potential Road Decomm. and/or Storm Proofing				
USFS Roads (access rating <4 per Roads Analysis)	Watershed-wide	0	$0	USFS land is not present in watershed
Annual Road Maintenance				
Non-Federal Roads (County, State, Private)	Watershed-wide	23.11 miles	$9,590/yr	Quantity est. by Don Uhalud WCRD (2010)
USFS Roads (access rating <4 per Roads Analysis)	Watershed-wide	0	$0	USFS land is present in watershed
Road-Related Actions Sub-Total			**$9,590**	
RIPARIAN-RELATED ACTIONS FROM 2008 TO 2018				
Riparian Planting				
Riparian Planting	watershed-wide	50 acres	$25,000	Quantity est. from Doug Thiesies (March 2008)
Riparian Thinning (pre-commercial)				
Riparian Thinning (pre-commercial/conifer release)	watershed-wide	10 acres	$2,000	Quantity est. from Doug Thiesies (March 2008)

Riparian Thinning (commercial)				
Riparian Thinning (commercial)	watershed-wide	None identified		Quantity est. from Doug Thiesies (March 2008)
Other				
None Identified				
Riparian-Related Actions Sub-Total			**$27,000**	
IN-STREAM RELATED ACTIONS				
Fish Habitat Improvement/LWD Addition				
Dry Creek Habitat Enhancement/LWD and Boulder Placement (New)	Dry Creek	4.0 miles	$110,608	"New Project Opportunity, Est. of quantity & cost from Josh Thompson (Sept. 2006).
Other				
Berm and Levee Removal	Watershed-wide	None identified	Undetermined	Identify, during the design phase of instream and floodplain restoration projects
In-Stream Related Actions Sub-Total			**$110,608 +**	
OTHER/MISCELLANEOUS ACTIONS				
Conversion to No-Till Farming	Watershed-wide	Undetermined	Undetermined	NRCS and SWCD working with private farmers to implement no-till practices
Conversion to Perennial Crops/Vegetation	Watershed-wide	Undetermined	Undetermined	NRCS and SWCD working with private farmers to convert to perennial crops
Monthly Environmental Newspaper Add "Respect The River" or others	Basin	1 add	$115	Would reach about 10,000 readers in The Dalles Area
Other/Miscellaneous Actions Sub-Total			**$115 +**	
TOTAL EST. COST			**$147,313 +**	

6th Field Watershed: Lower Dry Creek (Priority = 10)

Restoration Action	Specific Location/Area	Quantity	Est. Project Cost	Comments
FISH PASSAGE ACTIONS				
Culvert-Fish Passage Barriers				
None Identified	Watershed-wide	None Identified	Undetermined	
Irrigation Diversion Barriers				
None Identified	Watershed-wide	None Identified	Undetermined	
Fish Passage Actions Sub-Total			**Undetermined**	
FLOW RESTORATION ACTIONS				
Stream-flow Restoration				
Dry Creek – Develop Spring Enhancement Projects	Watershed-wide	Undetermined	Undetermined	Fish species: St, Rainbow-Type trout
Dry Creek – Leasing Instream Water Rights	Dry Creek	CFS leased Undetermined	Undetermined	Fish species: St, Rainbow-Type trout
Dry Creek – Off Channel Water Storage From Dry Creek	Dry Creek	1 Storage Site Undetermined	Undetermined	Fish species: St, Rainbow-Type trout
Flow Restoration Actions Sub-Total			**Undetermined**	
ROAD-RELATED ACTIONS				
Potential Road Decomm. and/or Storm Proofing				
USFS Roads (access rating <4 per Roads Analysis)	Watershed-wide	0	$0	USFS land is not present in watershed
Annual Road Maintenance				
Non-Federal Roads (County, State, Private)	Watershed-wide	28.96 miles	$12,018/yr	Quantity est. by Don Uhalud WCRD (2010)
USFS Roads (access rating <4 per Roads Analysis)	Watershed-wide	0	$0	USFS land is not present in watershed
Road-Related Actions Sub-Total			**$12,018**	
RIPARIAN-RELATED ACTIONS FROM 2008 TO 2018				
Riparian Planting				
Riparian Planting	watershed-wide	50 acres	$25,000	Quantity est. from Doug Thiesies (March 2008)

Riparian Thinning (pre-commercial)				
Riparian Thinning (pre-commercial/conifer release)	watershed-wide	10 acres	$2,000	Quantity est. from Doug Thiesies (March 2008)
Riparian Thinning (commercial)				
Riparian Thinning (commercial)	watershed-wide	None identified		Quantity est. from Doug Thiesies (March 2008)
Other				
None Identified				
Riparian-Related Actions Sub-Total			**$27,000**	
IN-STREAM RELATED ACTIONS				
Fish Habitat Improvement/LWD Addition				
None Identified	Watershed-wide	None Identified	Undetermined	
Other				
Berm and Levee Removal	Watershed-wide	None identified	Undetermined	Identify, during the design phase of instream and floodplain restoration projects
In-Stream Related Actions Sub-Total			**Undetermined**	
OTHER/MISCELLANEOUS ACTIONS				
Conversion to No-Till Farming	Watershed-wide	Undetermined	Undetermined	NRCS and SWCD working with private farmers to implement no-till practices
Conversion to Perennial Crops/Vegetation	Watershed-wide	Undetermined	Undetermined	NRCS and SWCD working with private farmers to convert to perennial crops
Monthly Environmental Newspaper Add “Respect The River” or others	Basin	1 add	$115	Would reach about 10,000 readers in The Dalles Area
Other/Miscellaneous Actions Sub-Total			**$115 +**	
TOTAL EST. COST			**$39,133 +**	

Chapter 4 – Restoration Tools

Review of Various Programs for Funding Restoration Actions

There are several local, state, federal, and non-governmental programs available that provide funds or assistance in implementing watershed restoration activities. Many of these entities have their own emphasis areas, criteria, guidelines, and requirements; however, most of them emphasize cost-sharing amongst two or more partners on a given project proposal. A minimum cost-share criteria of 1:1 for federal to non-federal funding (cash and in-kind) is common. Here are some of the primary sources and programs:

American Farmland Trust

Founded in 1980, the American Farmland Trust is aimed at providing protection for farmlands in a manner that unites farmers, environmentalists, and policymakers. The Trust's three strategies are:

1) **Protect the best land** through publicly funded agricultural conservation easement programs;
2) **Plan for growth with agriculture in mind** through effective community planning and growth management; and
3) **Keep the land healthy** for farmland through encouraging stewardship and conservation practices.

Visit: http://www.farmland.org

Bonneville Power Administration

Through its Integrated Fish and Wildlife Program, the Bonneville Power Administration provides roughly $500 million annually to mitigate, protect, enhance, and recover fish and wildlife populations and their habitat in the Columbia River Basin. BPA has funded several projects in the Fifteenmile Creek Basin over the last three decades. Priorities established in the Northwest Power and Conservation Planning Council Subbasin Plan for the basin will serve as the primary basis for funding future project proposals.

Visit: http://www.efw.bpa.gov/Integrated_Fish_and_Wildlife_Program

Farm Services Agency

Farm Bill provides for two important programs; 1. The Conservation Reserve Program (CRP), which reverts, retired crop land back to native perennial vegetation for up to 15 years. 2. The Conservation Reserve Enhancement Program (CREP), which provides financial incentives to landowners to enhance their stream side land and install riparian buffers.

Visit: http://www.fsa.usda.gov

National Fish and Wildlife Foundation

The National Fish and Wildlife Foundation has a mission to conserve healthy populations of fish, wildlife, and plants on land and in the sea, through creative and respectful partnerships, sustainable solutions, and better education. The Foundation awards matching grants to projects that benefit education, habitat protection and restoration, and natural resource management. It offers two types of programs:

1) General Matching Grant Program, and
2) Special Grant Programs

Visit: http://www.nfwf.org

National Forest Foundation

Created by Congress at the official non-profit partner of the USDA Forest Service, the National Forest Foundation engages communities in activities that promote the health and public enjoyment of National Forest System lands across the country. The foundation encourages local involvement and grassroots participation in forest stewardship. It administers both private and corporate gifts of funds and land for the benefit of national forests.

Visit: http://www.natlforests.org

Oregon Department of Environmental Quality

The Oregon Department of Environmental Quality offers Nonpoint Source Pollution 319 Grants each year to address water quality impairments caused by nonpoint source pollution. These are federal funds provided to ODEQ by the Environmental Protection Agency. In fiscal year 2005, ODEQ awarded over $2 million in grants to government agencies and nonprofit organizations. Project proposals must demonstrate meeting needs related to the program's ten major elements.

Visit: http://www.deq.state.or.us/wq/nonpoint/wq319gt.htm

Oregon Department of Fish and Wildlife

The Oregon Department of Fish and Wildlife offers several programs in support of local watershed restoration opportunities. Some of the main programs are: 1) the Restoration and Enhancement Program that offers funds to implement fish restoration and enhancement projects; 2) the Salmon and Trout Enhancement Program that coordinates donated money, materials, equipment, and labor to accomplish stream habitat improvements, stream surveys, education projects, and hatch-box programs; 3) the Riparian Tax Incentive Program that provides a property tax incentive to private land owners for improving or maintaining riparian lands; 4) the Landowner Incentive Program that is coordinated through the U.S. Fish and Wildlife Service and provides funding for projects on private lands that enhance, protect, or restore habitats that benefit at-risk species; and 5) the Western Oregon Stream Restoration Program that provides direct technical support to watershed councils and private landowners in western Oregon to implement Oregon Plan measures to improve fish habitat.

Visit: http://www.dfw.state.or.us

Oregon Department of Land Conservation and Development

The Oregon Department of Land Conservation and Development offers Periodic Review and Technical Assistance Grants to local jurisdictions and tribal governments to completed projects to update and modernize comprehensive land-use plans and regulations. The grants are provided to jurisdictions that are completing a structured periodic review process and, through Technical Assistance grants, to jurisdictions with planning projects outside the structured plan update process. Periodic Review grants are used for completing tasks on established work programs.

Visit: http://www.lcd.state.or.us/LSC/grants.shtml

Oregon State University Extension Service

Oregon State University offers a number of applicable extension services for aquatic restoration opportunities. The OSU Watershed Extension Service is just one of these services, and its mission is to increase the capacity of groups and communities for conserving, improving, protecting, and sustaining watershed functions and values. Increasing capacity is achieved through research-based education, skill-building projects, and new partnerships among residents, local organizations, businesses, agencies, and educational institutions. To learn more about specific opportunities with this extension service and others,

Visit: http://extension.oregonstate.edu/index.php

Oregon Watershed Enhancement Board

The Oregon Watershed Enhancement Board (OWEB) provides annual grant funding to many types of projects including restoration, monitoring, assessment, watershed council support, land acquisition, and education. Over the last decade there have been several OWEB projects located in the Fifteenmile Creek Basin.

Visit: http://www.oweb.state.or.us

Natural Resources Conservation Service

The Natural Resources Conservation Service provides technical services and assistance as well as grant funding and special initiatives. One of their many programs is the Environmental Quality Incentives Program which was reauthorized in the Food, Conservation, and Energy Act of 2008 (2008 Farm Bill) to provide a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. The program offers both financial and technical assistance to assist farmers and ranchers install or implement structural and management practices on their eligible lands. To learn more about this program and many others,

Visit: http://www.nrcs.usda.gov

National Marine Fisheries Service

In 2000, National Marine Fisheries Service began implementing the Pacific Coastal Salmon Recovery Fund providing grants to state and tribal governments to assist in conservation and recovery actions. The purposes of this program are to: 1) Supplement existing state, tribal, and federal programs that foster development of federal-state-tribal-local partnerships in salmon and steelhead recovery and conservation and 2) Promote efficiencies and effectiveness in recovery efforts through enhanced sharing and pooling of capabilities, expertise, and information.

Visit: http://www.nwr.noaa.gov/Salmon-Recovery-Planning/PCSRF

River Network

River Network is a national non-profit organization dedicated to helping people understand, protect and restore rivers and their watersheds. The organization provides a vast array of information on tools and resources to accomplish watershed restoration activities. One such resource is the quarterly River Fundraising Alert which is designed to help river and watershed organizations support themselves financially and provides upcoming funding opportunities and deadlines. The organization also provides workshops that provide training on strategic planning, fundraising, river monitoring, and more.

Visit: http://www.rivernetwork.org

U.S. Environmental Protection Agency

The U. S. Environmental Protection Agency offers numerous watershed funding programs at the national level, including nonpoint source pollution funding, target watersheds grants, wetlands funding, and environmental education grants. In addition, Region 10 of the EPA offers specific grant opportunities to the states of Oregon, Washington, Idaho, and Alaska.

Visit: http://www.epa.gov/owow/funding/watershedfunding.html

U.S. Fish and Wildlife Service

The U. S. Fish and Wildlife Service offers several programs that promote watershed restoration and educational activities. One such program is the Partners for Fish and Wildlife Program established in 1987 aimed at working with landowners to improve habitat on private lands. Another is the Jobs in the Woods Program which is the Service's contribution to funding watershed restoration activities as part of the Northwest Forest Plan. The Service uses congressionally appropriated funds to assist in implementing restoration activities on nonfederal lands. Other assistance and funding opportunities are provided by the Fisheries Restoration and Irrigation Mitigation Act of 2000 (PL 106-502) and the North American Wetlands Conservation Act.

Visit: http://www.fws.gov/pacific

U.S.D.A. Forest Service

The U.S.D.A. Forest Service offers both technical assistance and funding for implementing watershed restoration activities. Congressionally appropriated funding is provided through several programs, including the Challenge Cost Share Program, Joint Venture Aquatic Restoration Program, and the Title II Payments to Counties Program (PL 110-343). Exercising the Wyden Authority allows these funds to be used on non-federal lands where benefits to federal resources can be demonstrated. For more information,

Contact: District Fish Biologist, Barlow Ranger District, (541) 467-2291

Wasco County SWCD

Wasco County SWCD has a Cost Share Program, which offers both technique assistance and funding for small projects with environmental benefits in Wasco County and appropriates funding annually for this program. This program allows individual landowners to apply for up to $5,000 on a project at 50 percent cost share, which includes in-kind contributions.

Contact: Wasco County SWCD, The Dalles, Oregon (541)296-6178

Technical Assistance/Outreach and Conservation Education

The working group identified technical assistance/outreach and conservation education as two additional critical components of an effective aquatic habitat restoration strategy for the basin. Clearly, the human element of a restoration strategy is critical for its long term success. In other words, ensuring that citizens and communities are engaged in watershed restoration activities is pivotal in securing support for long term watershed stewardship and managing for sustainable watershed resources. Providing technical assistance and outreach through various programs to private landowners, user groups, residents, recreationalists and other stakeholders in the basin is fundamental to adjusting practices and behaviors in such ways that promote more wise use of resources and afford them greater protection. Examples may include increasing awareness and application of improved irrigation technologies that conserve water, assisting in the development and application of best management practices for small timberland operations or livestock grazing to reduce sediment and nutrient delivery to streams, or providing information to community citizens on the effects of lawn chemicals (herbicides and insecticides), fertilizers, and wastewater (including on-site sewage) to aquatic resources. Other examples may include the development and maintenance of a conservation education program, such as Salmon Watch with the local schools to develop environmental awareness with the future land owners of the basin.

All of the improvements brought about through technical assistance and outreach, including those brought about through active restoration actions outlined in Chapter 3, can be easily be undermined or reversed if future generations are not provided the educational opportunities to learn about their connections to the watershed and their impacts on the land. Hence, conservation education for school children, as well as adults, is the second additional critical component of an effective strategy. This could be accomplished with school children programs such as Salmon Watch by Oregon Trout or Cascade Streamwatch by Wolftree, and adult programs conducted through the OSU extension office, or River Network. Other community educational programs may include the use of the “Respect the River” program, which was developed and used by several Forests in Region 6.

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Chapter 5 – Critical Information Gaps

Several information gaps emerged during the development of this strategy. By highlighting these information gaps, the working group hopes this will inform future decisions regarding monitoring, inventory, and refined assessment efforts in the basin. Listed in random order, the key information gaps were:

- Lack of a basin-wide streamflow assessment that characterizes natural streamflows and results of water withdrawals. The Wasco County Watermaster currently has four stream flow measuring sites with the lowest at the Kaser Ranch (RM 6) and the upper one at the City of Dufur diversion. Oregon Water Trust is running recorders at two of the four sites during the summer. No funding is presently available to have recorders for these four sites. The Wasco County Watermaster is currently working with the Fifteenmile Creek Watershed Council to find funding to install flow meters on all the diversions located on Fifteenmile, Ramsey, and Eightmile Creeks.

- Lack of a basin-wide inventory and continued monitoring of chemical pollutants in streams.

- Lack of biological information regarding the distribution and abundance of the following fish species: Steelhead trout (smolt production), cutthroat trout, rainbow-type trout, Pacific lamprey, Spring Chinook, and coho salmon.

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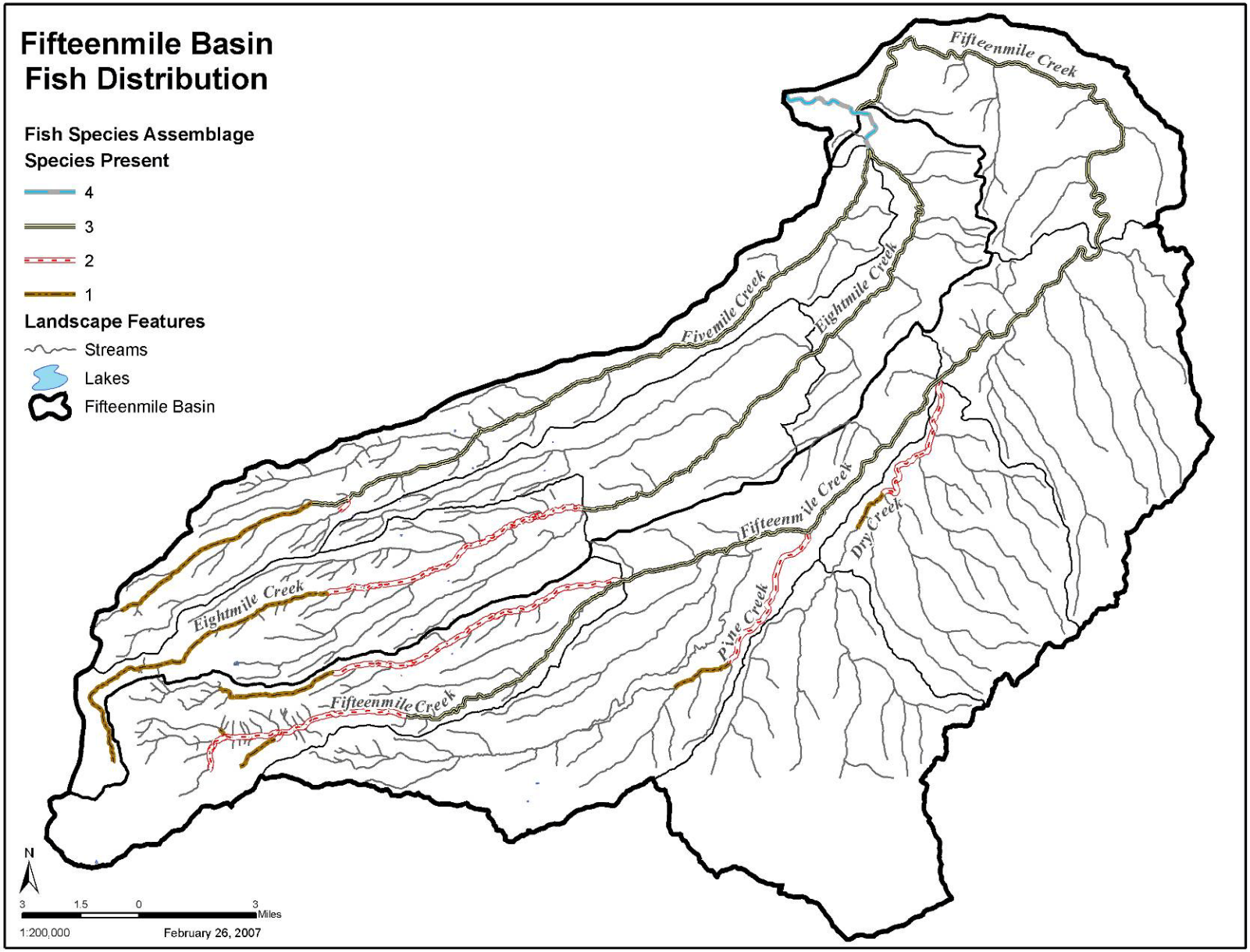
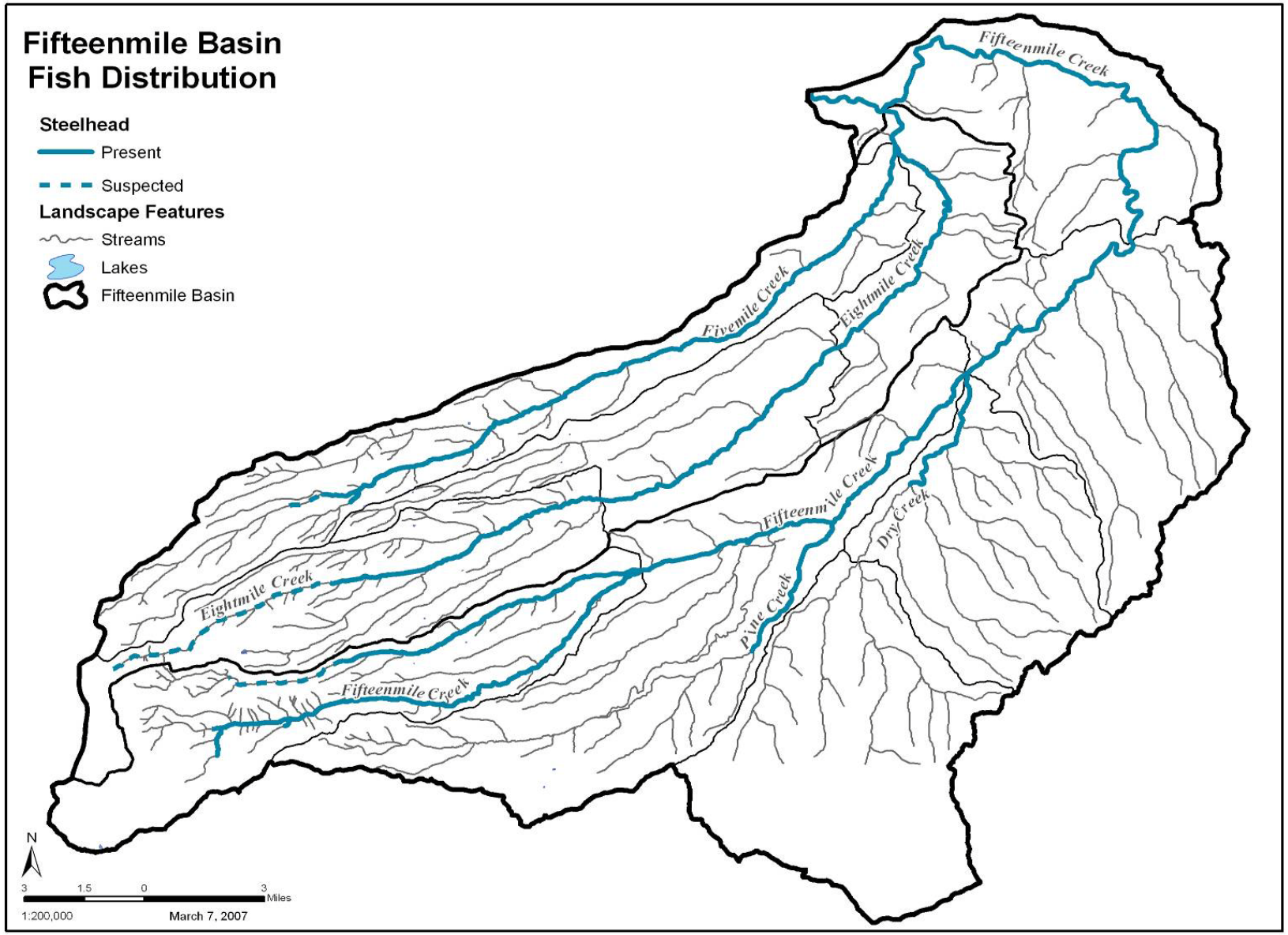
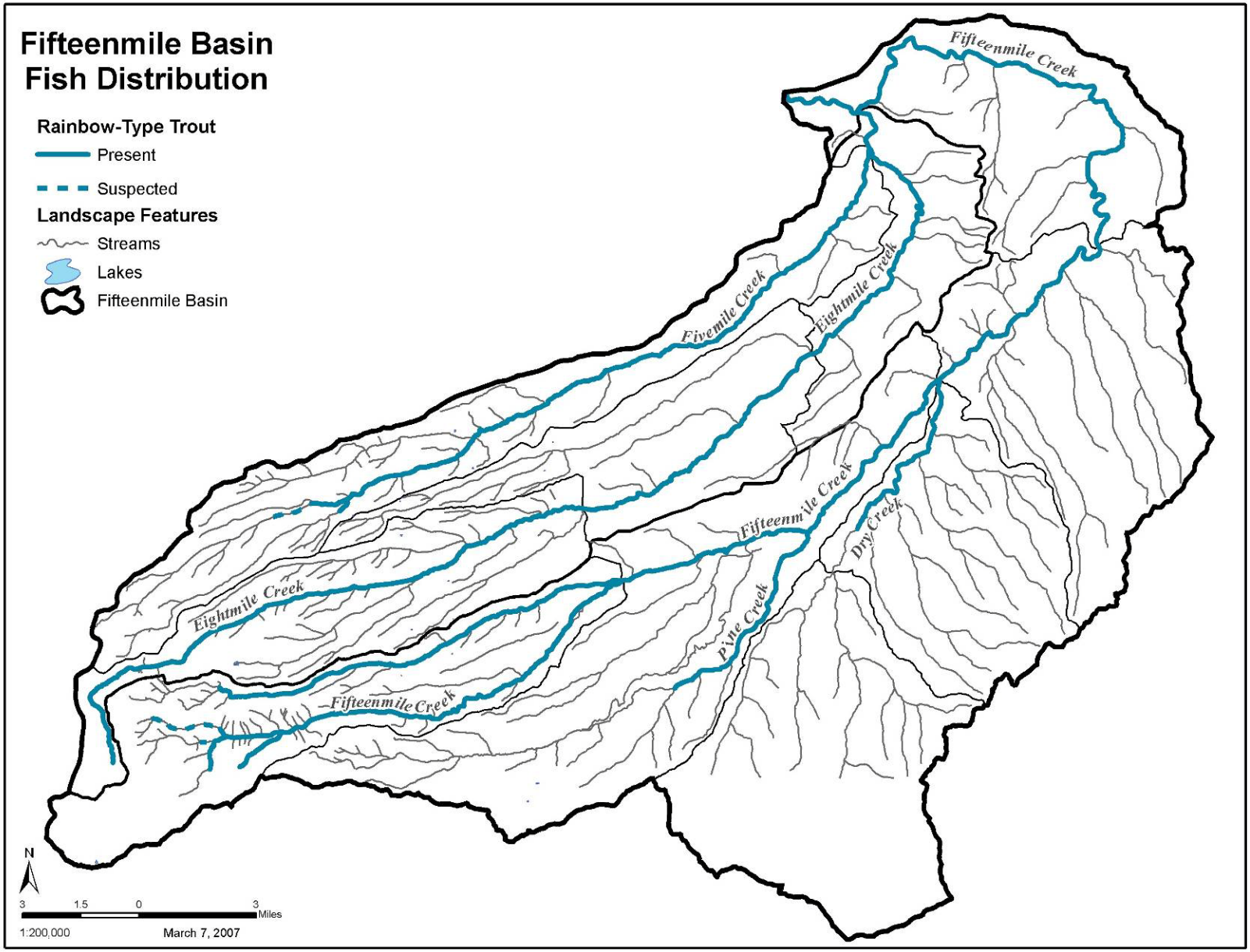
Appendix A –
Fish Population Distribution Maps for the Fifteenmile Creek Basin



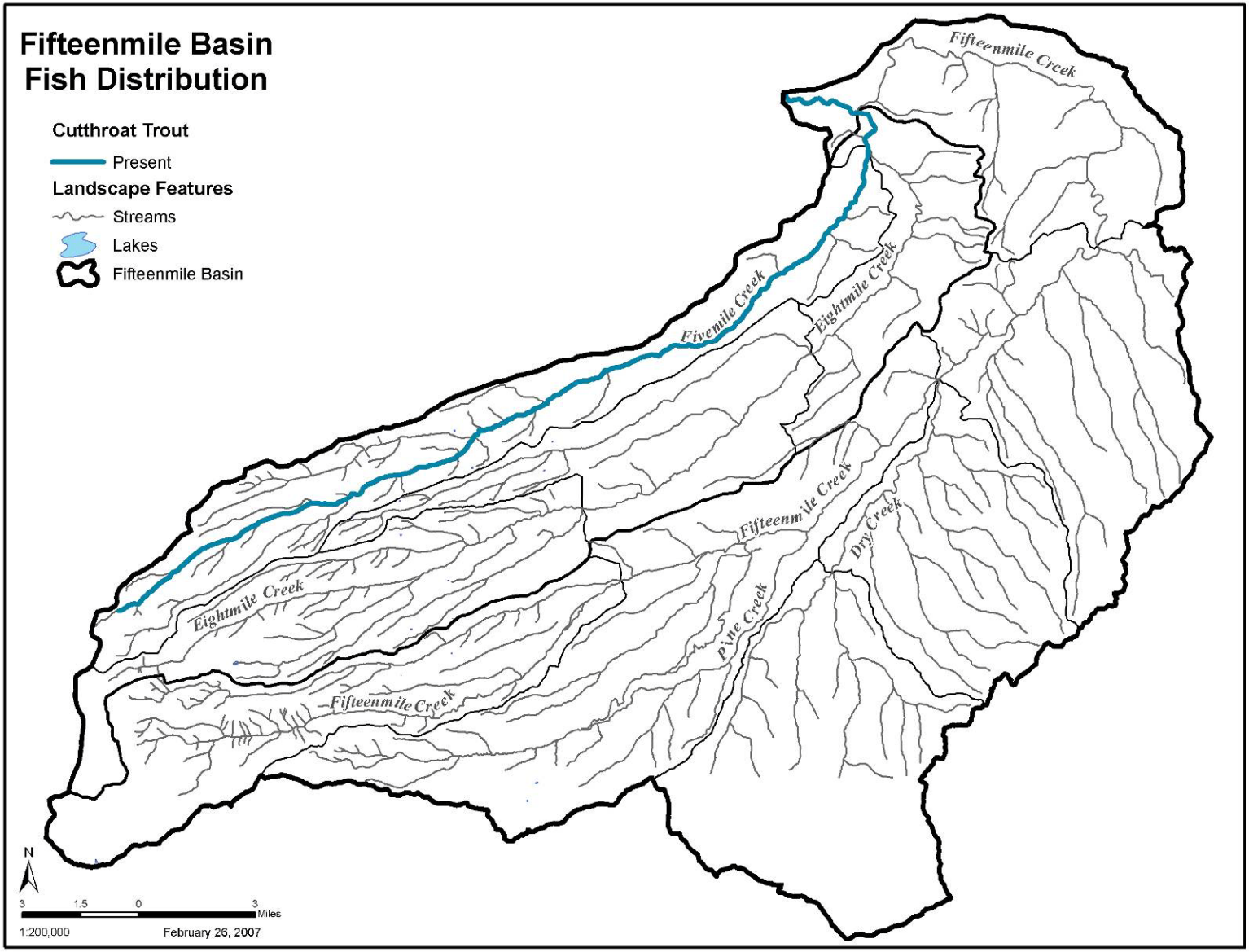
Map A1. Fish Species Assemblage in the Fifteenmile Creek Basin



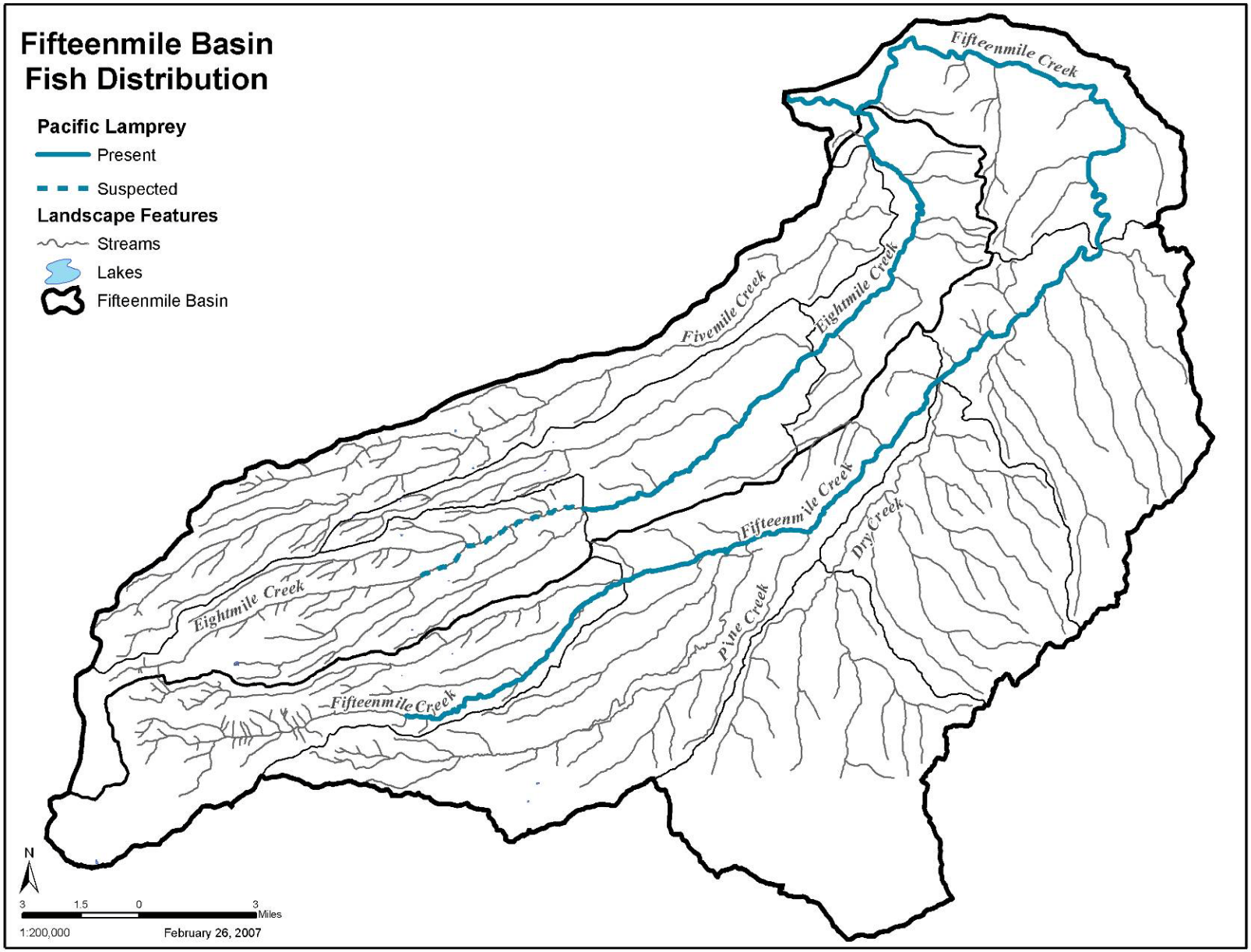
Map A2. Winter Steelhead Distribution in the Fifteenmile Creek Basin.



Map A3. Rainbow-Type Trout Distribution in the Fifteenmile Creek Basin.



Map A4. Cutthroat Trout Distribution in the Fifteenmile Creek Basin.



Map A5. Pacific Lamprey Distribution in the Fifteenmile Creek Basin.